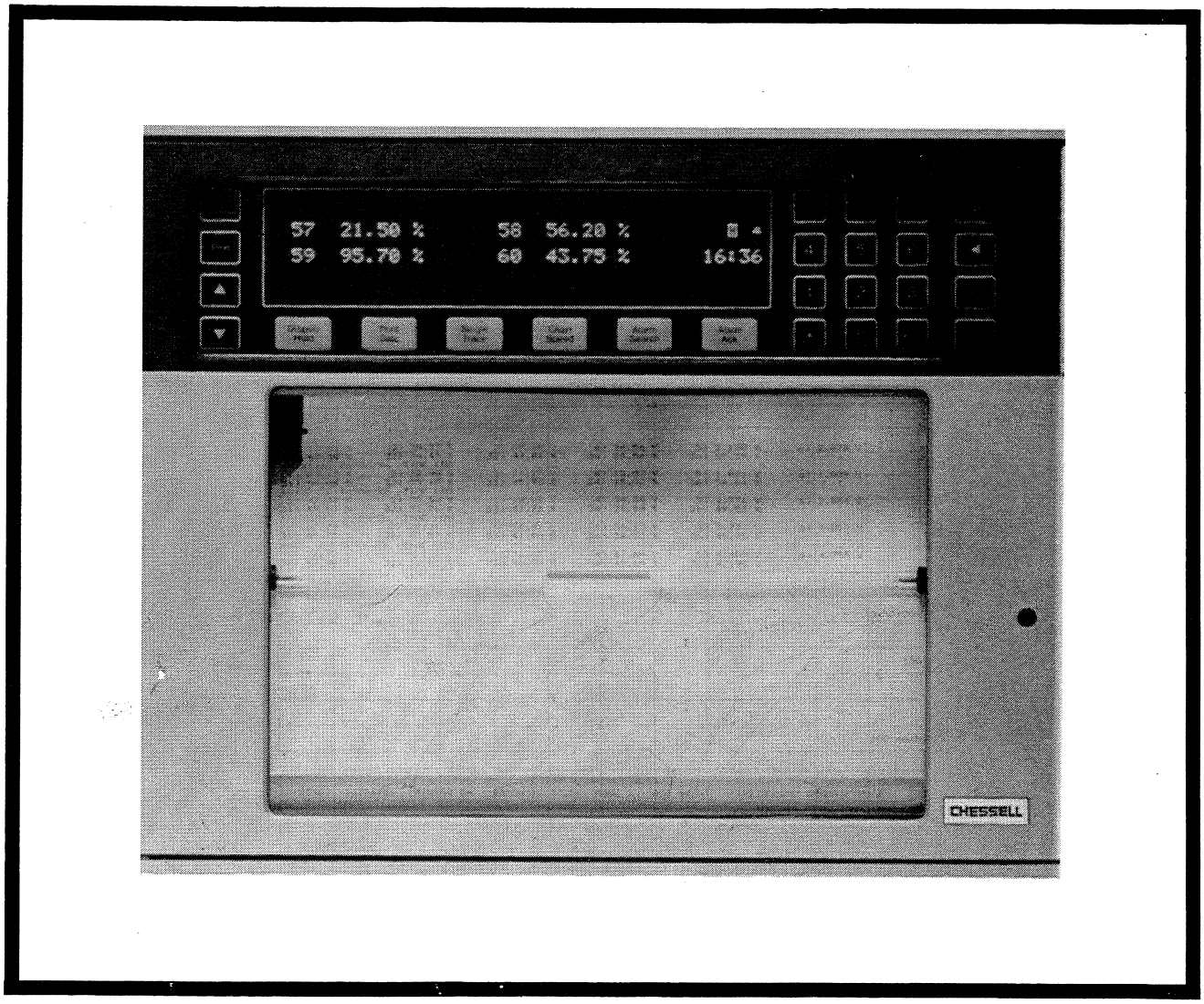
CHESSELL

Installation and operation manual
Model 4001



4001 INSTALLATION AND OPERATION MANUAL

MARK II CONTROL BOARD ADDENDUM

1.0 INTRODUCTION

This addendum describes the effect on the operation of the 4001 recorder due to the introduction of Version 7.1 of the product controller software in conjunction with the Mark II control board (AH239670).

The major features of the new control board are:

1. It incorporates a plug-in data pack which contains a non-volatile (EEPROM) memory for storing the recorder's configuration. This eliminates the requirement for a battery to support the memory. A number of data packs can be created, as a library of configurations, any of which can then be plugged into any 4001 fitted with the Mark II control board.

2. A plug-in board (ROM pack) containing the recorder's operating software. This means that any future up-grades (addition of serial communications, maths pack etc.) to the recorder can be carried out simply by replacing the ROM pack.

3. A plug-in board holding the real-time clock support battery. A large-value capacitor is included in the circuitry to maintain the clock chip voltage whilst the battery is being replaced. A 'Warning' message is displayed when the clock -support battery voltage is getting low, giving adequate notice to allow replacement before the clock timing starts to become erroneous.

4. An optical detector which causes print-head movement to be inhibited whilst the writing system is open

2.0 OPERATIONAL CHANGES

Generally, the changes in the operation of the recorder are transparent to the user. The most obvious changes are in the additional channel-specific descriptors for channels 1 to 30, and the extra error and warning messages displayed (described below). The following items should, however, also be noted:

2.1 INITIALISATION

The time taken to initialise the recorder is directly related to the complexity of its configuration; for most configurations, this results in a greatly reduced time to complete initialisation.

2.2 PRINTING RE-STARTED MESSAGE

Should a print command message be issued by the recorder software, but the command cannot be carried out because the writing system is open, the following message is printed on the chart as soon as the writing system is closed:-

hh:mm:ss dd/mm/yy* Printing Re-started

* The way in which the date is printed depends on the date format (US or EUropean) selected at the INSTRUMENT 2 page (described in section 6 of this manual).

Notes...

1. If the printer is turned off-line whilst the writing system is open, and remains off-line until after it has been closed again, the message will not be printed until the printer is turned on-line, or a configuration listing is requested.

2 If the printer is off-line at the time that the writing system is opened, and only the chart review keys (Section 3.4 of this manual) used until it is closed again, the re-start message will not be printed. This allows the chart to be reviewed or replaced without causing the message to be printed.

3 If the writing system is open at power-up, the 'power-on' and 'initialised' messages (section 2.7 of this manual) will not be printed when the writing system is closed.

2.3 SHORT CONFIGURATION LISTINGS

The full configuration listing is described in section 7 of this manual. With software version 7.1 and above, a shorter version of the configuration listing can be produced by operating the 'Print Data' key on the recorder's keyboard whilst a) the printer is off-line and b) the recorder is in run mode (i.e. not in programming mode). The printing process can be aborted by switching the printer on-line either momentarily or permanently.

The short listing is similar to the full listing but contains only the channel range settings.

2.4 WRITE INDICATION

To the top right of the display, there are three Status Indicators as described in the Instrument Status Indicator section of this manual.

The central indicator was previously reserved solely for Instrument Alarm Indication., but now has two further functions added.

1. It is now illuminated as an inverse C if a maths pack alarm occurs (ie a measuring channel used as a maths pack input is under range, over range or invalid.).
2. It is now illuminated as a solid block whenever data is being written to the data pack. This serves as a warning not to power-down the recorder until the write is complete.

Note...The instrument (inverse I) and maths pack (Inverse C) alarm indication take priority over the data writing indication, so if the instrument alarm is active, the data write indicator does not appear.

3.0 DATA PACKS

3.1 UN-USED DATA PACKS

At power-up, the recorder tries to initialise from the data pack. If the data pack is unused, the recorder recognises the fact, and initialises instead from the default data held in the ROM pack. This default data is loaded into the recorder's Random Access Memory (RAM) and is then copied to the data pack.

In a similar way, any subsequent configuration changes made by the operator will be written to the RAM area and copied to the data pack.

3.2 PREVIOUSLY PROGRAMMED DATA PACKS

At power-up, the information held in the data pack is loaded into the recorder's RAM area, and used as the configuration data base, instead of the default data held in the ROM pack.

Any subsequent changes to the configuration will be read into the RAM area and copied to the data pack.

3.3 CHANGE OF DATA PACK WITH POWER APPLIED

Once the recorder is powered-up and initialised, the contents of any data pack fitted will have been copied to the recorder's RAM area. If under these circumstances, the data pack is removed and either another one fitted (or even the same one re-fitted) or the pack slot is left empty, the recorder will recognise the fact that the original pack has been removed and will assume that a different one has been fitted.

Any attempt to make changes to the configuration will be accepted by the recorder, but the alterations will not will not be copied to the data pack. (In effect, any data pack fitted becomes 'Read Only' until the next power-down.) The error message '`Updates not written to data pack`' will be displayed.

4.0 UNIQUE CHANNEL DESCRIPTORS

Note...The channel-specific descriptors described in this section apply only to measuring channels (i.e. channels 1 to 30). For recorders fitted with the Maths pack option, channel descriptors 1 to 8 only, are available for channels 31 to 60.

4.1 CHANNEL CONFIGURATION

Nine channel descriptors are stored in the recorder's data base and appear as menu items in the Channel Scale page (described in Section 6 of this manual). Descriptors 1 to 8 (common descriptor pool) may be allocated to any (measuring or derived) channels. The ninth descriptor, which appears as a menu item only for channels 1 to 30, is unique to the channel being configured. Thus for each channel, one of the eight common descriptors can be selected for display / printing, or the channel's own unique descriptor can be chosen.

The unique channel descriptors can be factory configured, or can be configured and / or updated by means of a message configuration terminal, or via the Serial Link if the Communications option is fitted.

4.2 SERIAL COMMUNICATIONS

If the option software includes serial communications, the 30 channel descriptors can be read and/or written to by a host computer using the **channel** parameter mnemonic LG. The eight standard descriptors are accessed by the **instrument** parameter mnemonic CD, as usual (ref Serial communications instruction manual). Which of the nine descriptors is allocated to the channel being set up, is determined by bits 12 to 15 of the channel mnemonic EU (ref. Serial communications instruction manual).

The changes to the parameter mnemonic tables appearing in the Serial communications instruction manual, due to the introduction of the Mark II control board, are as follows.

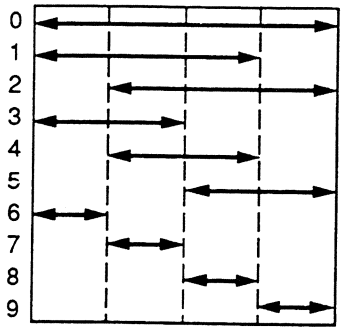
4.2.1 CHANNEL PARAMETER CHANGES

The parameter LG is introduced to allow access to the 30 channel parameters:

MNEMONIC	FORMAT	BITS	DEFINITION	PERMISSION W.R.T. HOST
LG	CHARACTER		CHANNEL DESCRIPTOR ONE 18 CHARACTER STRING UNIQUE TO THE CHANNEL BEING ACCESSED. (THE STRING MUST BE 18 CHARACTERS - SPACES MUST BE INSERTED TO FILL UNUSED CHARACTER SLOTS)	R/W

4.2.2 INSTRUMENT PARAMETER CHANGES

The parameter EU is modified to change the number of bits used for Engineering Unit string selection (1 of 13) and the number of bits used to select the channel descriptor (1 of 9).

MNEMONIC	FORMAT	BITS	DEFINITION	PERMISSION W.R.T. HOST
EU	HEX		ENGINEERING UNITS/CHANNEL DESCRIPTOR	
		0 TO 3	PRINT ZONE; INTEGER 0 TO 9  	R/W
		4 TO 7	0 = ° CELSIUS 4 = mV 1 = ° FAHRENHEIT 5 = V 2 = KELVINS 6 = MA 3 = ° RANKINE	R/W
		8 TO 11	SCALE UNITS; INTEGER 0 TO 12 (HEX 0000 TO 000C) SELECTS 1 OF 13 ENGINEERING UNIT STRINGS HELD IN RAM REF. CE (TABLE 5.1.3).	R/W
		12 TO 15	CHANNEL DESCRIPTOR; INTEGER 0 TO 8. SELECTS 1 OF 9 CHANNEL DESCRIPTOR STRINGS HELD IN RAM. 8 SELECTS THE UNIQUE (30 CHANNEL DESCRIPTOR) STRING; 1 TO 7 SELECT 1 OF 8 'COMMON' STRINGS.	R/W

4.3 MESSAGE CONFIGURATION TERMINAL

The introduction of the Mark II control board affects only the number of parameters read from and written to the recorder. The following description assumes that the operator is familiar with the Message Configuration Terminal and with the Message Configuration Terminal handbook HA239691 supplied with it.

Note...The original eight channel descriptors which are common to all channels retain the mnemonic CD. The individual (unique) channel descriptors have mnemonics LD1 to LD30.

4.3.1 EFFECTS OF THE INTRODUCTION OF THE MARK II CONTROL BOARD

a) When reading from the recorder, the parameters are requested in the same order as previously, but after the 'common' channel descriptors (CD) have been read, the version number (VN) is read. If the version number implies that the Mark II control board is fitted, the thirty individual channel descriptors are read one after the other, with a message on the display 'asking for LDN', where LD stands for legend (descriptor), and N for the channel number (1 to 30).

b) When writing to the recorder, the changes are as described for 'reading from the recorder', above, except that the Version Number is not sent.

c) When in edit mode, a new menu item appears:

Indiv. Ch. Desc.

When <EXE> is operated, the unit responds with the message:

Which channel?
(1 to 30) _

Once the correct channel number has been entered the text string for that channel may be edited as described in the Message Configuration Terminal handbook HA239691.

Note...When using the edit facility, it is not necessary to fill all eighteen characters. Any un-used characters will be filled with spaces by the terminal. Should any attempt be made to enter more than eighteen characters an audible warning is given and the string will not be accepted.

5.0 ERROR AND WARNING MESSAGES

5.1 ERROR MESSAGES

```
ERROR
UPDATES NOT WRITTEN TO DATA PACK
```

The above error message appears, and remains for two seconds, if an item of configuration is changed whilst no data pack is present, or if the original data pack has been removed (even if it is subsequently re-fitted).

The change data will be written to the RAM area on the control board, but will be lost at power-down.

5.2 WARNING MESSAGES

```
DATA PACK MISSING
Press ACKNOWLEDGE to reset
```

This message is displayed (after initialisation) if no data pack is fitted at power-up. The recorder will initialise using the default configuration held in the ROM data pack. The recorder will operate correctly, except in that no operator entered data will be present in the data base.

Operation of the Alarm Ack key clears the message.

5.2 WARNING MESSAGES (Cont.)

```
DATA PACK HAS BEEN MODIFIED
Press ACKNOWLEDGE to reset
```

The above message is displayed if the recorder discovers, during the initialisation period, that the data in the data pack is invalid. The recorder will use as much as possible of the data-pack data as possible, and will use default data where it is necessary.

Use of the Alarm Ack key clears the message from the display.

Note...It is recommended that after customer configuration has taken place, a full configuration listing is taken. If this is done, then a similar listing taken after the appearance of the above message will allow the areas of default data to be located, and the customer data for these areas can then be re-entered.

```
BATTERY NEEDS CHANGING
Press ACKNOWLEDGE to reset
```

The state of the clock-support battery is monitored at power-up, and once every 24 hours until power-down. The message above is displayed if the battery voltage is lower than expected. Use of the Alarm Ack key will clear the message from the display, but it will re-appear once every 24 hours, or at each subsequent power-up.

The battery is replaced by pulling the exhausted battery's board out of its control board socket, and either replacing the board assembly with a new one, or replacing the exhausted cell by a fresh one.

```
PRINT HEAD FAILURE
Press ACKNOWLEDGE to reset
```

The above message appears if the print head has failed and a request to print has been received by the printhead drive electronics. Use of the alarm Ack key will clear the message from the display, but it will re-appear every time the recorder tries to print. The local service centre should be contacted.

ADDENDUM TO THE 4001 INSTALLATION AND OPERATION MANUAL (MODIFICATION FOR SOFTWARE VERSION 4.8)

1.0 INTRODUCTION

For recorders fitted with software version 4.8, a number of enhancements have been made compared with the previous versions described in the main body of this document. (The software version fitted may be determined by accessing the Instrument Page 2 display, as described in section 6.7 — page 45.)

1.1 SWITCHING THE RECORDER ON (SECTION 2.7; PAGE 21)

The text appearing immediately below the "INITIALISING..." display should read as follows, for software version 4.8:-

> The recorder takes up to 70 seconds to initialise. During this time a minimum of 5 of the timing dots will disappear. At the end of initialisation, the internal buzzer sounds, and the background display (section 6.4) appears.
>
> At the start of the initialisation period, the "POWER ON" header line is printed. At the end of initialisation, the "INITIALISED" header is printed — see section 7 for details.

1.2 SPECIFICATION OF PRINT FORMATS (SECTION 7.1; PAGE 81)

Amend section 3 note to read:-

> NOTE: At power up, only the "POWER ON" header line is printed (i.e. the "PRINTER ON" message is suppressed.) At the end of the initialisation period, the message "INITIALISED" is printed in green.

1.3 MODES 2 AND 3 LOG HEADER MESSAGES (SECTION 7.3; PAGE 88)

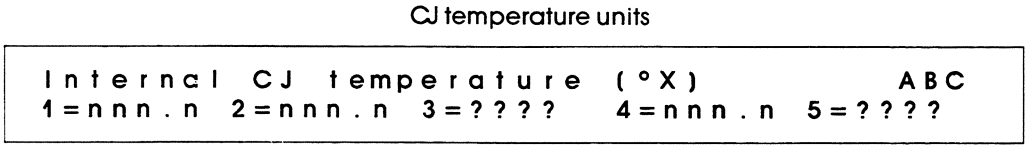
Date information now appears against all log headers. The date format is that set in the Instrument 2 page (section 6.7; page 45). The information printed is as shown below. Also shown is the REMOTE LOG header, printed when a data dump (DD) command is received over the serial data link.

HH:MM:SS DD/MM/YY TIME LOG
HH:MM:SS DD/MM/YY MANUAL LOG
HH:MM:SS DD/MM/YY REMOTE LOG
HH:MM:SS DD/MM/YY ALARM LOG

1.4 ACCESS TO INTERNAL CJ TEMPERATURE

The CJ temperature within the Signal Interface Modules (SIMs) associated with I/O board slots 1 to 5 may be determined, by accessing the INTERNAL CJ TEMPERATURE display page. This page also allows the units in which these temperatures are displayed to be selected.

INTERNAL CJ TEMPERATURE DISPLAY



ENTRY: The channel selection procedure described in Section 6.1 (page 40) should be followed, using 0 as the channel number, and using the page-scroll key (▼) to scroll through the instrument pages.

Note... This page is displayed only in program mode (Section 5.5 - page 39) and only when at least one of the I/O boards in slots 1 to 5 has returned a valid CJ temperature.

(CONTINUED)

EXIT: The channel exit procedure described in Section 6.2 (page 41) should be followed, or the page scroll (▼) key may be used to access the next page.

OPERATION: The page is viewable only in program mode, and is used:

a) to determine the CJ temperature as measured by DC input SIMs in slots 1 to 5.

b) to select either centigrade or Fahrenheit as the temperature units for the displayed CJ temperatures.

DISPLAY:

CJ TEMPERATURE UNITS

Select °F or °C using the field scroll (▲) key.

SLOT N CJ TEMP

CJ temperature returned by SIM in I/O slot N, where N is in the range 1 to 5 inclusive. The CJ temperature is updated once per second.

Empty slots, or slots fitted with I/O boards not supporting CJ measurement (e.g. resistance thermometer boards), or input board software versions prior to 3.1, cause ???? to be displayed.

1.5 ALARM SETTING WITH INVERTED SCALES

When setting alarms when inverted scales are in use, it should be noted that the alarm sense (e.g. rising or falling) is related to the input signal, but the alarm set points are related to the scale.

1.6 TIME AND DATE DISPLAY (SECTION 6.5; PAGE 43)

Add to the end of note 5: (Versions prior to 4.8 only.)

1.7 CHANNEL INPUT PAGE DISPLAY (SECTION 6.17; PAGE 57 — COLD JUNCTION)

Add note:-

With software versions 4.8 onwards, it is not necessary to set the CJC to OFF when using resistance thermometer inputs.

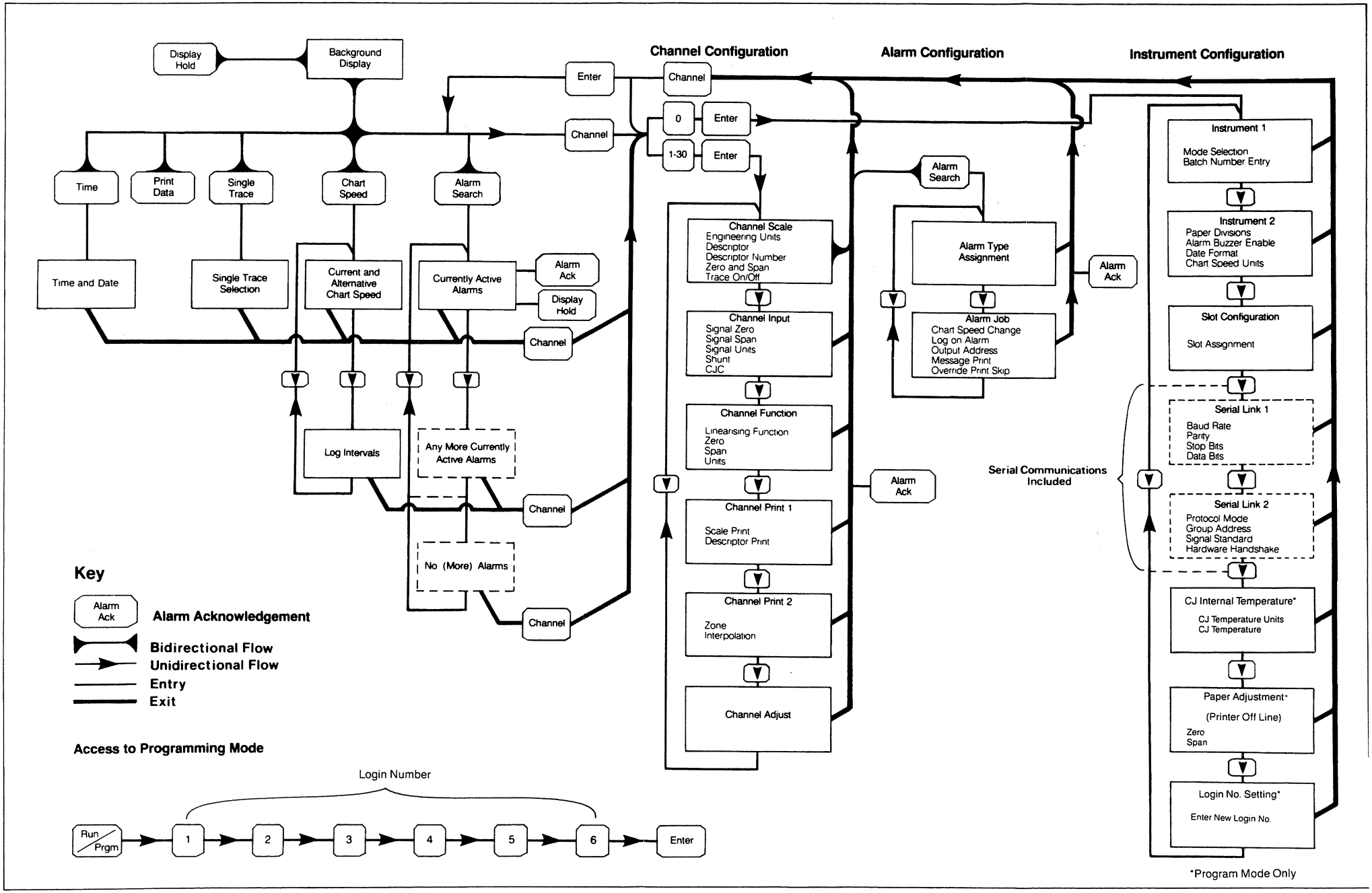
1.8 CHANNEL ADJUSTMENT PAGE DISPLAY (SECTION 6.21; PAGE 64)

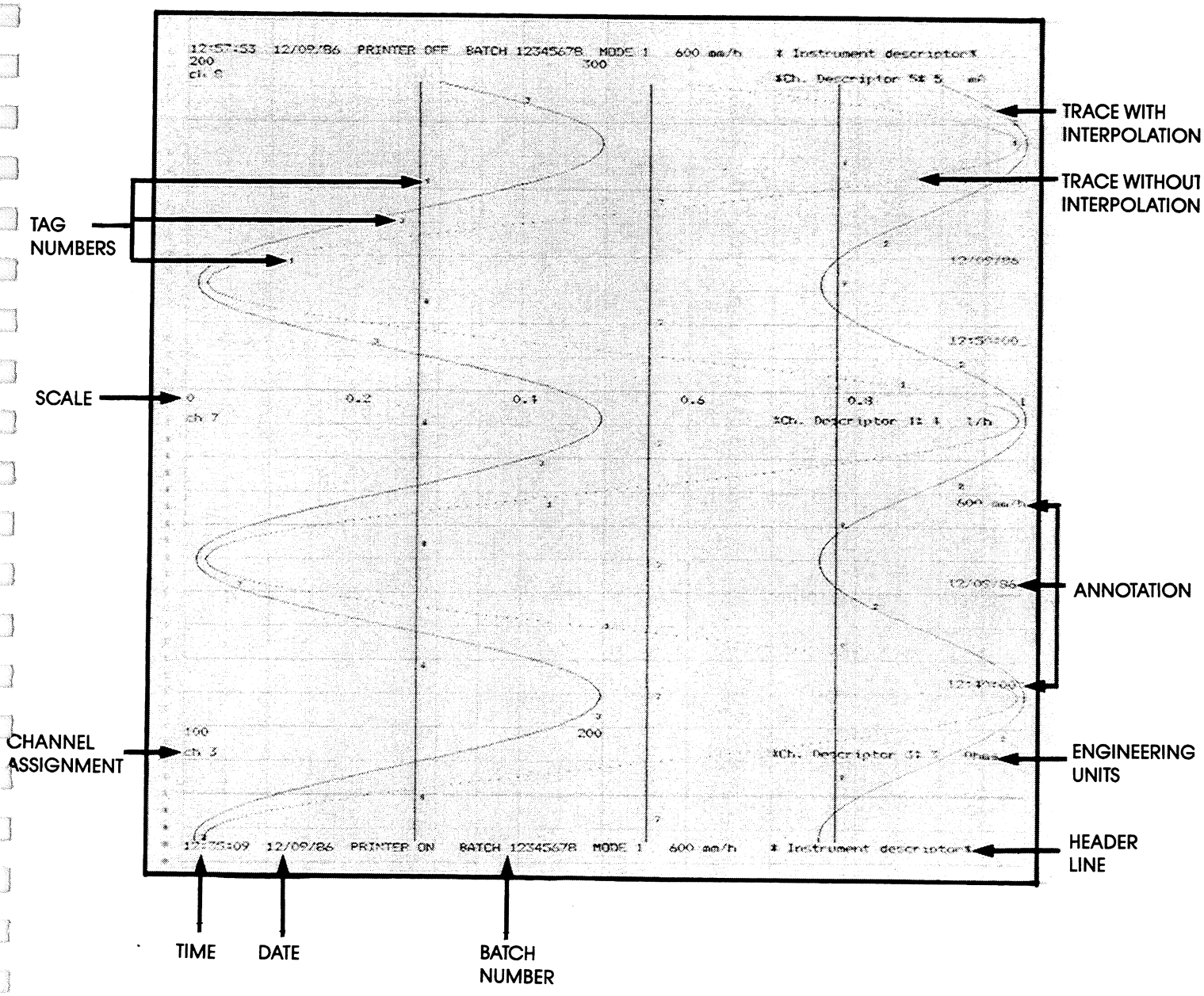
Add the following note to the end of the text:-

Note: Channel values displayed on channel pages are underlined for any channel which has been adjusted as described above. (This does not apply to the values appearing on the background display.)

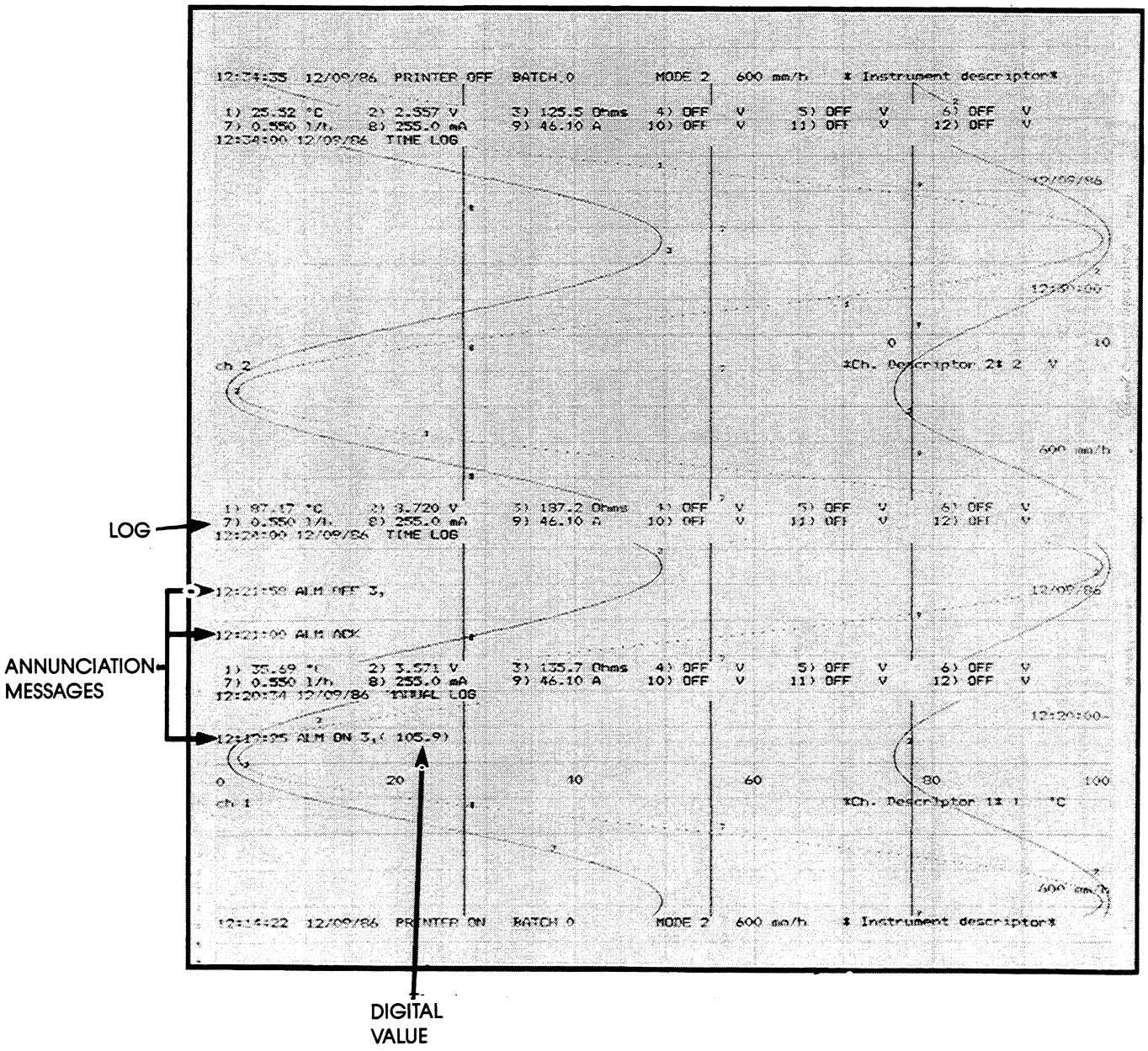
6.33 Access to Configuration Diagram

(Version 4.8)

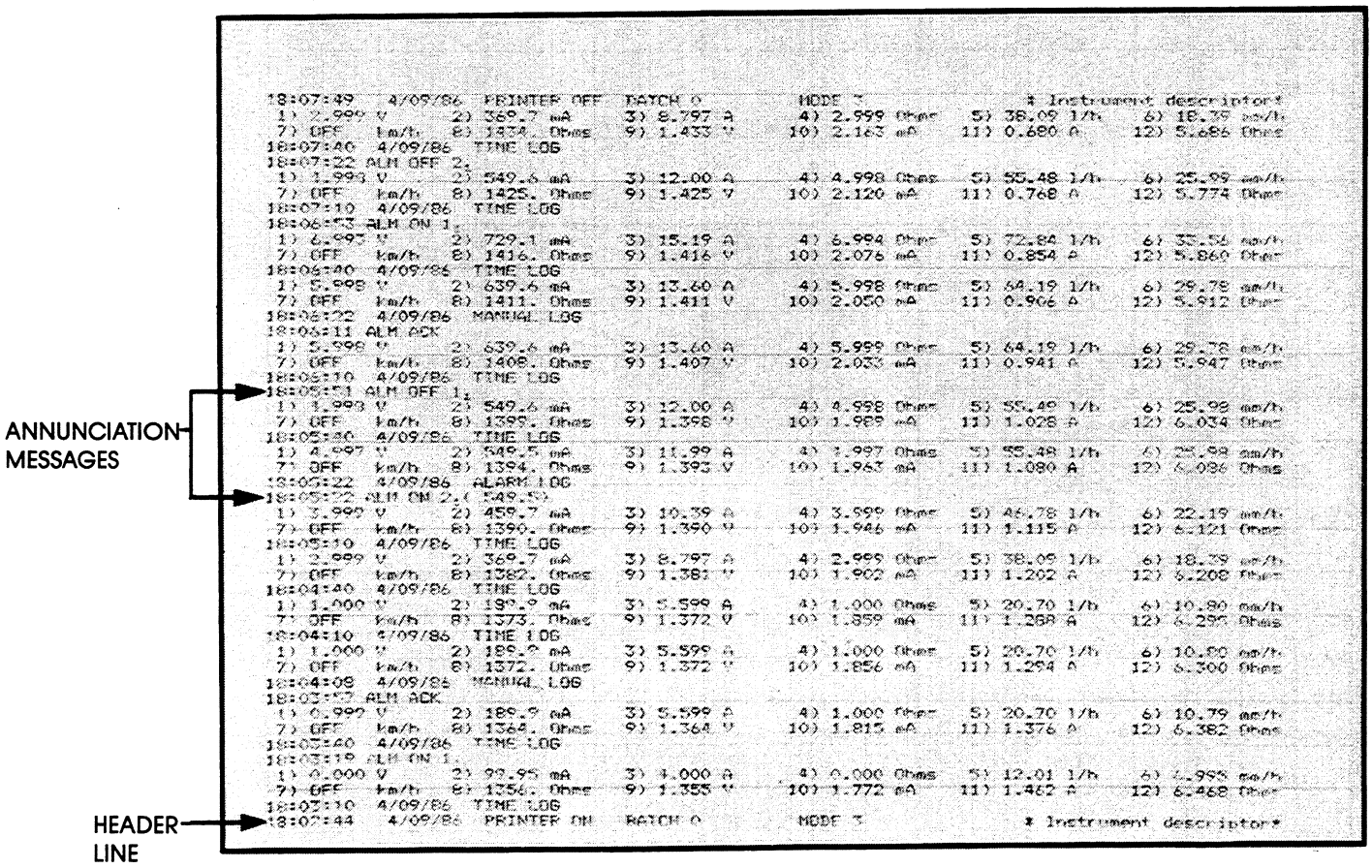




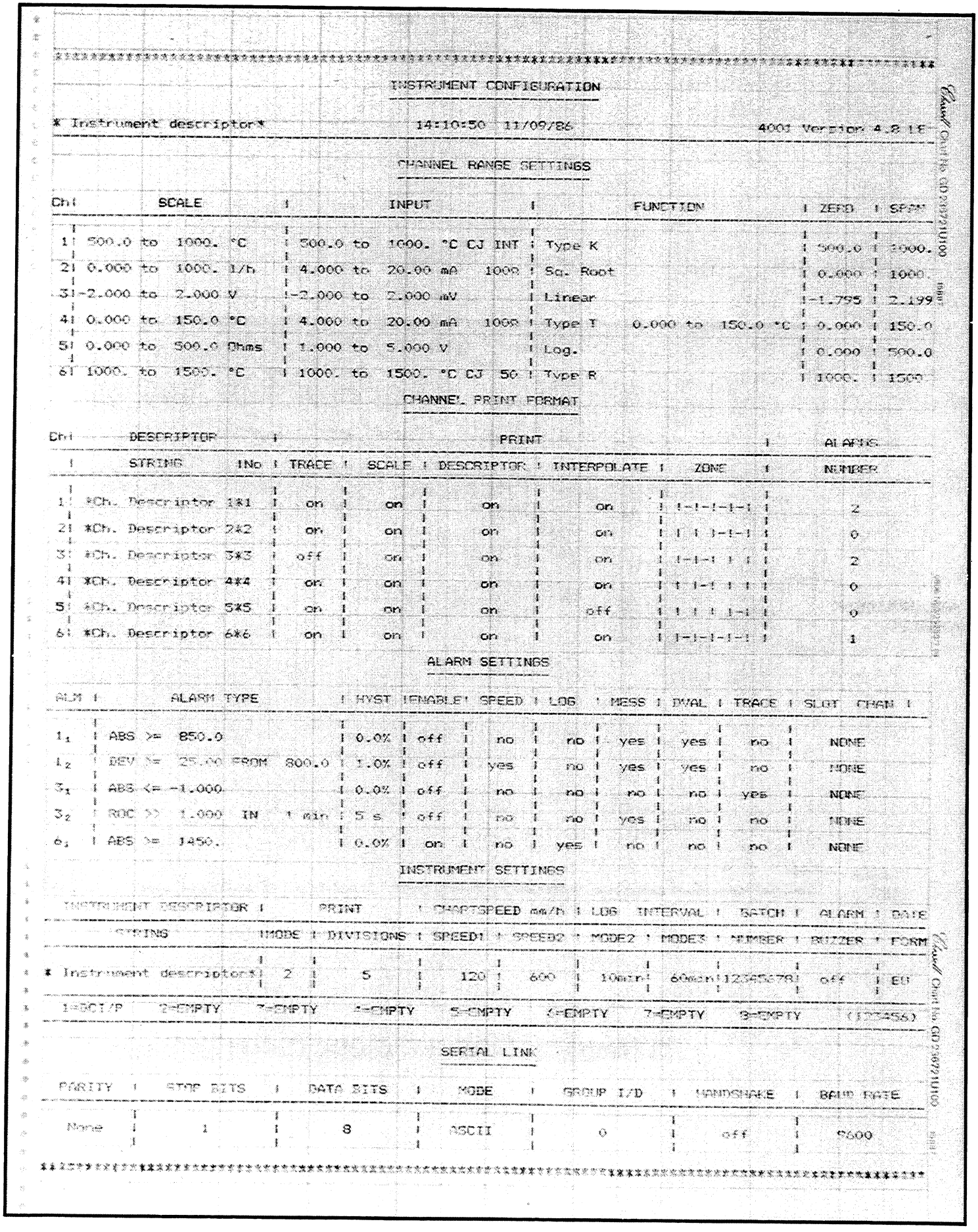
7.1 Mode 1 (Trend Mode) Chart Sample



7.2 Mode 2 (Text Mode) Chart Sample



7.3 Mode 3 (Tabular Mode) Chart Sample



INSTRUMENT CONFIGURATION

* Instrument descriptor* 14:10:50 11/09/86 4001 Version 4.8 1E

CHANNEL RANGE SETTINGS

Ch!	SCALE	INPUT	FUNCTION	ZERO	SPAN
1!	500.0 to 1000. °C	500.0 to 1000. °C CJ INT	Type K	500.0	1000.
2!	0.000 to 1000. l/h	4.000 to 20.00 mA 1000	Sq. Root	0.000	1000.
3!	-2.000 to 2.000 V	-2.000 to 2.000 mV	Linear	-1.795	2.199
4!	0.000 to 150.0 °C	4.000 to 20.00 mA 1000	Type T 0.000 to 150.0 °C	0.000	150.0
5!	0.000 to 500.0 Ohms	1.000 to 5.000 V	Log.	0.000	500.0
6!	1000. to 1500. °C	1000. to 1500. °C CJ 50	Type R	1000.	1500.

CHANNEL PRINT FORMAT

Ch!	DESCRIPTOR STRING	No	PRINT TRACE	SCALE	DESCRIPTOR	INTERPOLATE	ZONE	ALARMS NUMBER
1!	*Ch. Descriptor 1*1		on	on	on	on	!-!-!-!-!	2
2!	*Ch. Descriptor 2*2		on	on	on	on	! ! ! !-!-!	0
3!	*Ch. Descriptor 3*3		off	on	on	on	!-!-! ! !	2
4!	*Ch. Descriptor 4*4		on	on	on	on	! !-! ! !	0
5!	*Ch. Descriptor 5*5		on	on	on	off	! ! ! !-!	0
6!	*Ch. Descriptor 6*6		on	on	on	on	!-!-!-!-!	1

ALARM SETTINGS

ALM	ALARM TYPE	HYST	ENABLE	SPEED	LOG	MESS	DVAL	TRACE	SLOT CHAN
1_1	ABS >= 850.0	0.0%	off	no	no	yes	yes	no	NONE
1_2	DEV >= 25.00 FROM 800.0	1.0%	off	yes	no	yes	yes	no	NONE
3_1	ABS <= -1.000	0.0%	off	no	no	no	no	yes	NONE
3_2	ROC >= 1.000 IN 1 min	5 s	off	no	no	yes	no	no	NONE
6_1	ABS >= 1450.	0.0%	on	no	yes	no	no	no	NONE

INSTRUMENT SETTINGS

INSTRUMENT DESCRIPTOR STRING	PRINT MODE	DIVISIONS	CHARTSPEED mm/h SPEED1	SPEED2	MODE2	MODE3	LOG INTERVAL NUMBER	BATCH BUZZER	ALARM	DATE FORM
* Instrument descriptor*	2	5	120	600	10min	60min	12345678	off		EU

1=DCI/P 2=EMPTY 3=EMPTY 4=EMPTY 5=EMPTY 6=EMPTY 7=EMPTY 8=EMPTY (ITEMS6)

SERIAL LINK

PARITY	STOP BITS	DATA BITS	MODE	GROUP I/D	HANDSHAKE	BAUD RATE
None	1	8	ASCII	0	off	9600

7.4 Configuration Listing Chart Sample

4001 INSTALLATION AND OPERATION MANUAL

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DETAILED DESCRIPTIONS OF DISPLAYS

SPECIFICATION OF PRINT FORMATS

INSTRUMENT ALARMS AND SELF DIAGNOSTICS

LIST OF ILLUSTRATIONS

1.1 INTRODUCTION

The model 4001 recorder/data logger incorporates the latest distributed microprocessor technology to provide high speed data acquisition, display and recording functions. A maximum of 30 analogue input channels are scanned and checked for alarm every second. Individual channels may be configured to measure and record any of 8 standard non-linear temperature transducer types, or any linear signal. In addition, square root extraction, a logarithmic function, and up to three user specified linearising functions are available.

A pool of sixty alarm thresholds may be freely assigned among the input channels, and are individually configurable for the type of sensing, and the actions they perform.

The user may select from three different Print Format Modes, to display the measurements as analogue traces, digital values, or a combination of both. Individual channels may be configured to place the recorded traces in different zones of the paper, and to format the scale annotation to provide unambiguous and comprehensive recordings.

The 80 character vacuum fluorescent display presents information in plain language, including prompts and instructions. The key-panel has been designed to ensure that a user requires the minimum of familiarisation in order to be completely competent to use the recorder.

The paper transport system incorporates a fast forward, and review facility, to enable past record to be viewed without removing the chart. A built in tear-off facility and auto-take-up cassette ensure that, when required, chart samples may be removed with the minimum interruption to the recording.

At the heart of the recorder the main control board stores the user entered configuration in battery supported memory, and at power-up, configures the Programmable Input Modules with individual channel range and linearisation data. Once configured, the Input and Output cards are interrogated every second to acquire the measured values and perform any output functions.

Programmable Input Modules incorporate individual analogue to digital converters, per channel, and provide high accuracy input data with full galvanic isolation, to the product controller. There are two types of Programmable Input Module, each handling six input signals. The 2 wire DC Input Module handles all DC current and voltage signals, including thermocouples. The Resistance Thermometers Input Module handles resistance thermometers only.

Printing of analogue traces and digital values is achieved using a nine needle dot matrix printhead, operating in conjunction with a six colour disposable ink ribbon cartridge. The printhead and ribbon cartridge are mounted on two different carriage assemblies travelling below and above the chart paper. Both carriages are positioned by a stepping motor, the lower carriage position being detected by an optical feedback strip that provides 0.1 mm (0.04%) resolution. Selection of the colour to be printed is achieved by altering the relative position of the two carriages, using an electro-mechanical clutch associated with the positioning motor.

Before each pass of the printhead, the positioning system checks the position of the paper edge, to ensure the maximum accuracy of the recorded traces. If the paper has run-out, the printer automatically switches 'off-line' and a warning message appears on the display.

An optional serial communications port permits reading and writing of the recorder's configuration, measured values, text strings and the loading of special linearisation tables. RS 232C and RS 422 standards are supported to provide compatability with either Personal or Main Frame computers.

1.2 TECHNICAL SPECIFICATION

GENERAL

Number of recording channels	Maximum of 30, organised according to number and type of input modules fitted.
Types of Input/Output modules	Analogue (Vdc, mAdc, T/C), RTD, Relay Output.
Scanning speed	1 second for all active channels.
Electrical safety classification	IEC 348 class 1.
Memory protection	Battery supported for a minimum of 12 months, without line power applied.
Clock	Crystal controlled with 10 year battery life.

RECORDING SYSTEM

Printing system	Nine-needle dot-matrix printhead, with six colour disposable ink ribbon cartridge.
Printed colours	Red, Yellow, Green, Purple, Blue, Black.
Ink ribbon life	>5 million dots/colour. (1 Km at 0.2 mm dot interval).
Chart length	35 metres.
Chart width	270 mm overall. 250 mm calibrated.
Chart visible length	160 mm.
Chart speeds	mm/h 1200, 600, 300, 120, 60, 30, 20, 10, 5, and Off. in/h 50, 25, 10, 6, 4, 2, 1, ½, ¼, and Off.
Printhead positioning system	High speed stepper motor with optical position sensing.
Horizontal axis resolution	0.1 mm
Horizontal axis repeatability	0.1 mm
Vertical axis resolution	0.33 mm (Dot spacing).
Characters per line	100
Chart timing system	Time marks printed once per page. Page size is dependent on chart speed. See section 7.1 of this manual.

RECORDING SYSTEM FEATURES

Chart speed selection	9 selectable speeds and Off from metric or imperial menu. Operator selection of one of two speeds. May be disabled.
Chart handling facility	Operator panel for selection of accelerating fast forward or rewind chart review facility.
Trace interpolation	Provides additional, internally calculated printed points, to fill spaces between successive measurements.
Trace zoning	Measurements may be placed in any one of 10 predetermined chart zones.
Chart take up	Automatic take up cassette, with paper cutter.

OPERATOR INTERFACE

Display type	2 × 40 character vacuum fluorescent display, with full alpha numeric, 5 × 7 dot character font.
Display languages	English, French or German. as ordered.
Measured value presentation	4 digit, updated every second.
Keypanel	Sealed membrane keyboard, with tactile and audible feedback.

ALARMS

Alarm capability	Pool of 60 alarm thresholds. Freely assignable among all channels, and individually configurable for sense and action.
Alarm sensing	Absolute, Deviation, Rate of Change.
Alarm actions	Configurable selection of: Chart speed change. Log all channels on alarm. Alarm message print. Conditional trace printing. Output relay activation.
Alarm timing	1 second to recognition. 2 second to annunciation. 3 second to relay activation.
Alarm hysteresis	User configurable per alarm threshold, in 0.5% increments of span. From 0 to 9.5%.

ENVIRONMENT

Temperature limits:	Operation	0 to 50 Degrees C.
	Storage	− 20 to + 70 Degrees C in original packing.
Humidity limits:	Operation	10 to 80% RH non condensing.
	Storage	5 to 95% RH non condensing.

PHYSICAL

Case Size: Bezel	360 × 288 mm (14.17 × 11.34 in)
Length	517 mm (20.35 in)
Panel cutout	378 × 273.5 mm (14.88 × 10.77 in)
Weight	Approx 20 Kg. (Dependent on specification).

POWER REQUIREMENTS

Line supply	190 to 260 Vac 45 to 65Hz. 90 to 130 Vac 45 to 65 Hz. (User selectable).
Power consumption	40 VA for typical 12 channel specification.
Power interrupt protection	200 milliseconds power interruption has no effect.

ANALOGUE INPUT MODULE

All Performance figures are obtained under operating conditions as laid down in IEC484, and with open circuit sensor fail links set to "Floating", and unused channels set to 0 - 10 volts range, with inputs shorted.

BASIC SPECIFICATION

Number of inputs	Six
Input termination	By removable Signal Interface Module.
Type of inputs	DC Volts 0.62 mV to 10.24 V. (DC Volts >10.24 V require fitting of 100:1 attenuator in signal Interface Module). DC mA. Maximum current 50 mA. (Requires fitting of 100 ohm current shunt in Signal Interface Module. Thermocouples.
Mix of inputs	Any type to any of the six inputs.
Open circuit sensor detection	Up-scale, Down-scale, or floating by user selectable link.
Reference junction compensation for thermocouples	By temperature sensor, mounted on the input connector, within the Signal Interface Module.

BASIC PERFORMANCE

Measured performance	IEC 484 class .25 for linear inputs >= 6mV and <= 160 mV. IEC 484 class .1 for linear inputs >160 mV and <= 10.24 V.
Linearising accuracy	See tables 1 and 2
Degradation in accuracy when using standard attenuators	<128 Vdc: 0.1% >= 128 Vdc: 1.1%
Degradation in accuracy when using standard shunt resistors	0.1%
Additional voltage offset when using Up-scale or Down-scale sensor fail detection	20 micro Volts
Zero offset	5 microVolts: Typical 10 microVolts: Maximum
Common-mode noise rejection	>120 dB at 50 Hz.
Series-mode noise rejection	90 dB at 50 Hz.
Difference between CJ sensor and any terminal	+ / – 0.2 Degrees C.
CJC sensor absolute error	+ / – 0.5 Degrees C.
Isolation Channel — Channel and Channel — Ground	250 V RMS with respect to IEC 348 class 1
Overload capability	100 Volts continuous. 250 Volts for 1 second. All ranges.

NOTE: A channel requires 20 minutes after maximum overload before it will perform to specification.

LIMITS OF OPERATION

Maximum input to attentuator	250 Vdc
Maximum input to module	100 Vdc
Maximum power dissipation within Signal Interface Module	600 mW
Maximum series mode voltage at line frequency	0.7 x Maximum voltage of Hardware Range

TEMPERATURE INFLUENCE

CJ rejection ratio	30:1 typical. 25:1 minimum.
Input bias current	100 pA typical doubling every 10 Deg. C. above ambient temperature.
Zero offset drift	Doubles offset for every 10 Deg. C. above 35 Deg.C.
Gain drift	50 ppm / Deg. C Typical.

RESISTANCE THERMOMETER INPUT MODULE

All performance figures are obtained under operating conditions as laid down in IEC484, using a 100 ohm source, with zero lead resistance.

BASIC SPECIFICATION

Number of inputs	Six
Input Termination	By removable Signal Interface Module.
Type of inputs	2, 3, or 4 wire termination Resistance Temperature Detectors.
Input type selection	By soldered link on Signal Interface Module.

BASIC PERFORMANCE

Isolation Channel to Channel and Channel to Ground	250 V RMS with respect to IEC 348 class 1
Common-mode noise rejection	>120 dB at line frequency.
Series-mode noise rejection	90 dB at 50Hz.
Linearity	+ / – 0.05%
Typical current drive	0.6 mA
Measured Performance	IEC 484 class .25 for 110 to 138.5 ohm range. IEC 484 class .1 for 138.5 to 432.7 ohm range.
Influence of lead resistance	
4 Wire	0.06% / ohm Maximum 0.03% / ohm Typical
3 Wire	0.04% / ohm Maximum 0.02% / ohm Typical

LIMITS OF OPERATION

Maximum series mode voltage	– 7 to + 14 Volts.

TEMPERATURE INFLUENCE

Temperature coefficient: with respect to span	Zero + / – 25 ppm / Deg.C. typical. Span + / – 70 ppm / Deg.C.

HARDWARE RANGES

The recorder selects a "Hardware Range" which is determined by the millivolt range, or equivalent millivolt range for thermocouples, that is selected. For Resistance Temperature Detectors the Hardware Range is determined from the resistance range equivalent to the temperature range that is selected. The recorder will always select the lowest Hardware Range that will accomodate the range selected. For temperature transducers, the Hardware Range selected, may be determined from table 1. Table 1 also shows the maximum negative input for any Hardware Range, together with the minimum span that may be set. The thermocouple temperature ranges include allowance for a Reference Junction temperature range of 0 - 60 deg. C.

The selection of Hardware Range is automatic and transparent to the user.

Thermocouple, Pt100 RTD, square root or logarithmic linearisation accuracy may be determined at any specific measured temperature, or value from table 2.

e.g. If the recorder is configured for 0 - 1000 deg. C. for a type K thermocouple, Hardware Range 4 will be selected. Above 350 deg. C. the contribution to absolute error is <= 0.3 Deg.C.

TABLE 1

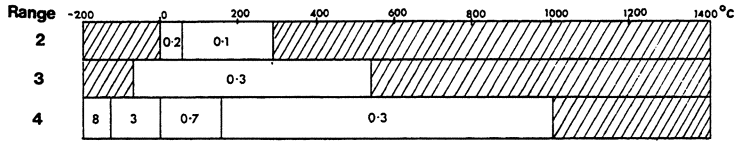
				ANALOGUE MODULE							RTD MODULE	
H/W Range	mV dc	I/P Res.	Min.Span (mV)	B	E	J	K	R	S	T	Pt 100	Min.Span (Ω)
1	-2 +10	>10 MΩ	0·62	-32+149				-50+960	-50+1035		-10+50	1·88
2	-4 +20		1·00	-32+1821	-5+280	-15+365	-40+485	-60+1680	-50+1770	-40+385	-20+100	2·62
3	-8 +40		1·78		-75+530	-100+710	-180+965	-60+1770		-195+401	-50+250	3·53
4	-16 +80		3·32		-225+1002	-210+1202	-223+1370			-264+401	-100+500	5·45
5	-32 +160		6·40								-200+1000	8·75
6	-64 +320		12·7									
7	-128 +640		25·1									
8	-256 +1280		50·0									
9	-512 +2560	1MΩ±2%	102·0									
10	-1024 +5120		201·0									
11	-2048 +10240		400·0									

LINEARISING TABLE ACCURACIES

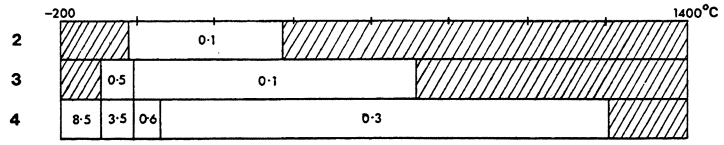
TABLE 2

Error in °C

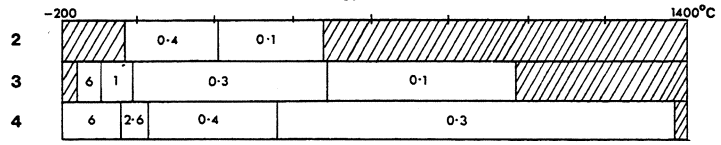
Type E



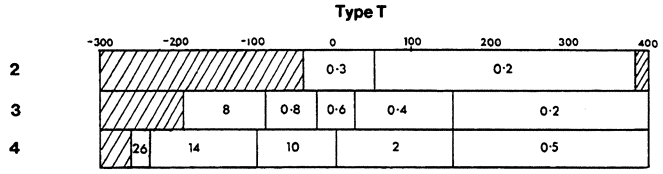
Type J



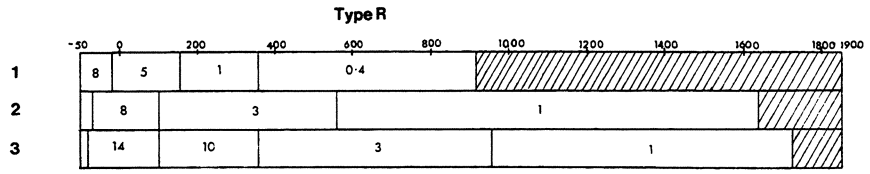
Type K



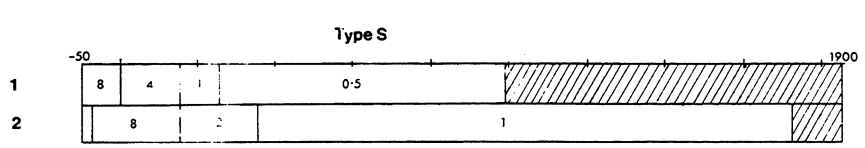
Type T



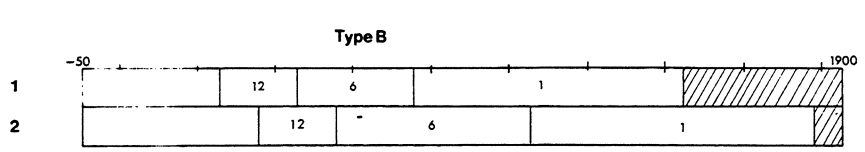
Type R



Type S

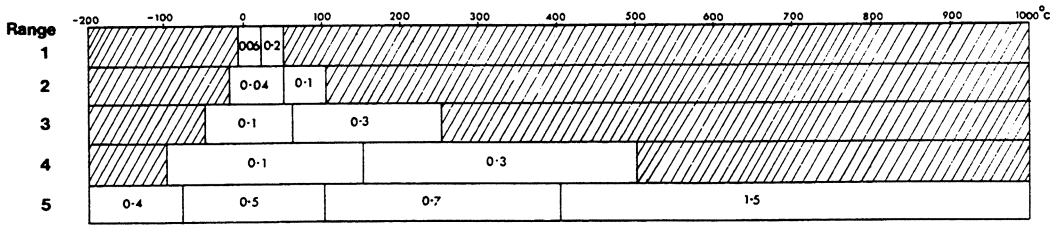


Type B



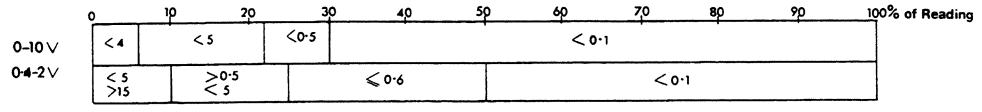
Pt 100

Error in °C

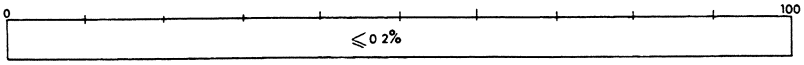


Square Root

Error in %



Log



OUTPUT MODULES

RELAY OUTPUT MODULE

There are two versions of the relay output option which share a common Relay Output Module but have one of two alternative Signal Interface Modules fitted.

The 'High Power' Signal Interface Module contains 4 relays, the 'Medium Power' Signal Interface Module contains 8 relays

HIGH POWER OPTION

Number of relays		4
Number of contacts		Single changeover
Maximum contact voltage		250 Vac RMS
Maximum contact current	Make:	10A
	Continuous:	8A
	Break:	8A
Maximum switchable power		45 Watts DC
with resistive load		2000 VA AC
Estimated life at max load.		75,000 operations.

MEDIUM POWER OPTION

Number of relays		8
Number of contacts		Single changeover
Maximum contact voltage		250 Vac RMS
Maximum contact current	Make:	8A
	Continuous:	3A
	Break:	2A
Maximum switchable power		60 Watts DC
with resistive load		500 VA AC
Estimated life at max load		10,000 operations.

NOTE:

In line with the company's policy of continuous improvement to its products, the company reserves the right to amend the above specification without notice.

1.3 HANDLING PRECAUTIONS

1) Before any circuit board contained in the recorder is removed or replaced, or any internal electrical connector is removed or replaced it is essential that the recorder be switched off, either using the power ON/OFF switch or by remotely isolating the supply.

2) All 4001 recorder circuit boards contain static sensitive components. Circuit boards should not be removed from the recorder without first having ensured that a working area suitable for working on Metal Oxide semiconductors has been set up and that the circuit board and the operative are at the same electro-static potential.

FAILURE TO OBSERVE THE HANDLING PRECAUTIONS LISTED ABOVE COULD LEAD TO FAILURE OF THE RECORDER'S CIRCUITRY. FAILURES SO CAUSED ARE OUTSIDE THE TERMS OF GUARANTEE.

WARNING

HAZARDOUS VOLTAGES ARE PRESENT OVER LARGE AREAS OF THE CIRCUIT BOARD WITHIN THE POWER SUPPLY MODULE OF THE RECORDER. ANY WORK REQUIRING THE REMOVAL OF THE COVER FROM THIS MODULE MUST BE CARRIED OUT BY QUALIFIED SERVICE PERSONNEL.

1.4 UNPACKING

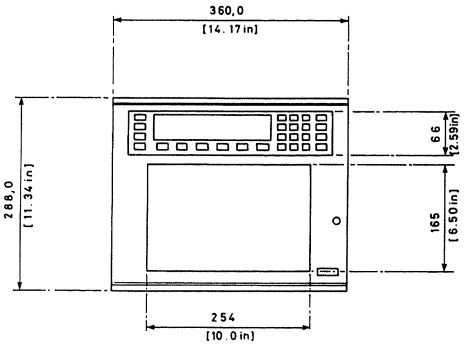
4001 recorders are shipped in a custom designed shockproof container, suitable for domestic or export shipment. If there is any evidence of extensive external damage to the cardboard case, contact the supplier of the recorder within 72 hours. The manufacturer will not accept liability, if not advised within 72 hours . The packaging should be retained for inspection by the manufacturer's representative or shipper.

If after careful examination of the recorder, there is no evidence of damage to it, the instrument may be installed.

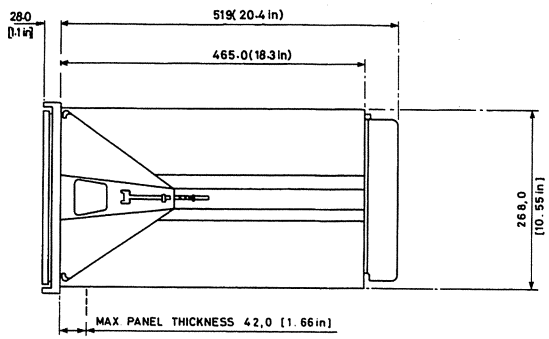
Remove the accessory tray from the shipping container and retain it and its contents. The recorder may be lifted from the case using the hand grips on the internal cradle.

It is advised that the shipping container and its internal packing be retained, should the recorder require future transportation.

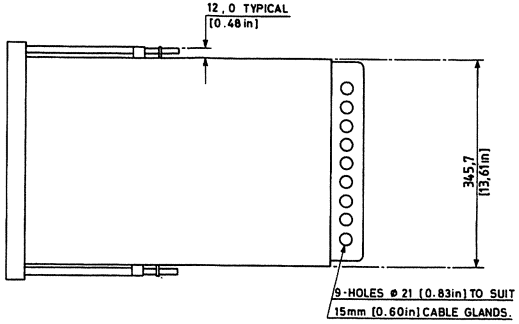
2.1 Installation Drawing



FRONT VIEW



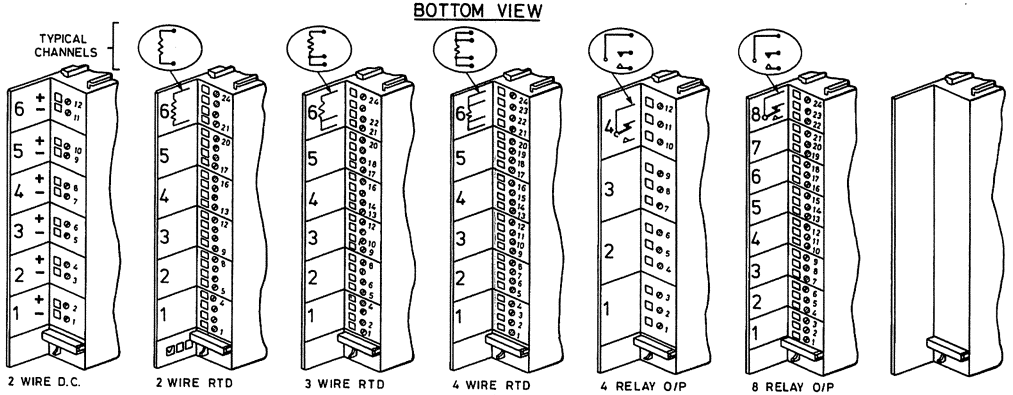
SIDE VIEW



UNPACKED WEIGHT	6pt – 18.5 kg
" "	30pt – 23.5 kg
PACKED WEIGHT	6 pt – 22.5 kg
" "	30pt – 27.5 kg
PACKED SIZE	664 x 450 x 460 mm
	[26.14 x 17.71 x 18.11in]

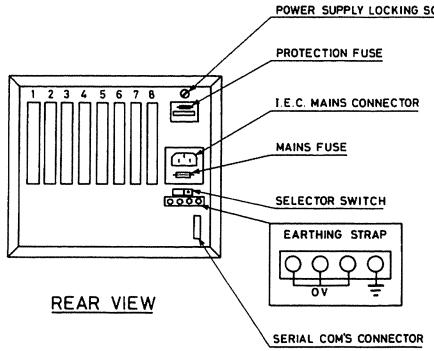
MAINS CONNECTOR

BOTTOM VIEW



MAINS FUSE RATING	
180 — 260V	1 AMP T
90 — 130	2 AMP T

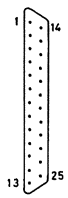
PROTECTION FUSE RATING
5 AMP FF



REAR VIEW

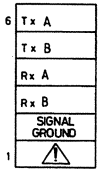
FROM REAR OF CASE

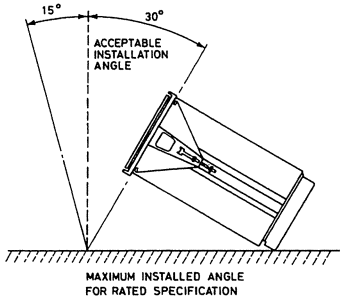
RS 232C

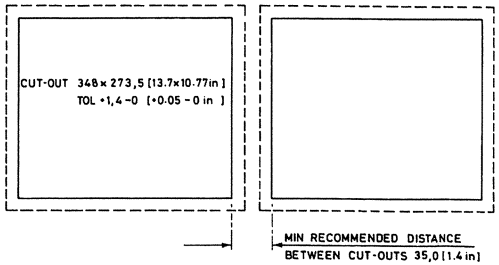


TERM	ASSIGN
1	PROTECTIVE GROUND
2	Tx
3	Rx
4	RTS
5	CTS
7	SIGNAL GROUND
8	DCD
14	RESERVED OUTPUT
19	RESERVED OUTPUT
20	DTR

RS 422







SLOT	1	2	3	4	5	6	7	8
TYPE								
TERMINALS	CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION	CONNECTION
24								
23								
22								
21								
20								
19								
18								
17								
16								
15								
14								
13								
12								
11								
10								
9								
8								
7								
6								
5								
4								
3								
2								
1								

2.2 PORTABLE CASE VERSION

4001 recorders may be supplied either for panel mounting, or suitable for portable use. When supplied for portable use the recorder is equipped with two fold down carrying handles, mounted on the side panels, and four rubber feet.

PRECAUTIONS

Both portable and panel mounting cases are designed to satisfy IP 54 standards of environmental protection. However, in order to achieve optimum performance from the recorder, areas of intense heat, electromagnetic radiation and humidity should be avoided.

Caution should be exercised when using a portable recorder which overhangs the edge of a desk or table top. Whilst the recorder will not overbalance with the access system withdrawn, any additional weight applied to the access system could cause the centre of gravity to move forward of the rubber feet and the recorder may overbalance.

In all other respects panel mounted and portable recorders are identical, and will require the same operational and configuration procedures to be used.

CLEANING

The use of solvent cleaners to remove dirt and stains should be avoided. A soft cloth moistened with water should be sufficient to remove most stains and finger marks. Cleaning operations should only be undertaken with the recorder isolated from the supply.

CONVERSION TO PANEL MOUNTING

If it is required to convert a portable recorder to panel mounting the side plates must be removed and the carrying handles unscrewed from the side plates.

To remove the side plates, remove the rear terminal cover, followed by the thrust plates, and slide the side plates rearwards from the case extrusion.

After removal of the carrying handles the side plates should be returned into the extrusion, with the panel jack mounting hole nearer the bezel of the recorder. Replace the thrust plates and rear terminal cover, and unscrew the rubber feet from the underside of the case.

Installation in the panel can then proceed after reference to section 2.3 of this manual.

PADDED CARRYING CASE

In addition to the options mentioned above, a Padded Carrying Case, part number LA 237619, is available, which affords protection to the recorder during transportation, and storage. Due to the insulating effect of the Padded Carrying Case, the recorder should not be operated when contained within the Padded Carrying Case, as an excessive internal temperature will result, with a consequent degredation of the measurement accuracy and long term reliability.

2.3 MOUNTING IN A PANEL

4001 recorders may be supplied either for panel mounting, or suitable for portable use. When supplied for panel mounting the recorder is supplied with two panel mounting clamps.

Refer to the Installation Drawing, Illustration 2.1, to determine the panel cut-out size and installation restrictions. Particular attention should be paid to the minimum recommended distance between adjacent instruments, which is advised both for ease of access and panel strength considerations.

Ensure that the Access System is securely retained within the recorder case prior to mounting the recorder in the panel aperture.

Insert the recorder through the pre-cut panel aperture, and with the weight of the recorder supported, clip the panel jacks into the holes in the recorder side plates, and tighten the jacking screws until the springs of the panel jacks are compressed to approximately half of their free length.

CAUTION Do not use excessive force to tighten the panel jacks, as undue strain will be placed on the recorder bezel, which may lead to distortion of the door sealing, and difficulty in closing or locking the door.

Once the recorder is securely mounted in the panel aperture, the 2 shipping clamps (one each side of the chart) may be removed, and the wiring and cabling installed.

It is recommended that the shipping clamps, once removed, be retained against future transport requirements of the recorder.

2.4 WIRING — GENERAL

In order to install the power, signal and output wiring to the recorder, the gasketed rear terminal cover must be removed, by unscrewing the six retaining screws.

A gland plate is mounted underneath the terminations, which may be removed, if the number, or size of the cabling precludes its use. The gland plate is secured by four screws located on the underside of the plate.

NOTE: The dust integrity of the case will not meet the specification to which the recorder was designed, without the gland plate in place.

In line with sound practise, power wiring and signal wiring should be run in separate cables, to minimise the electrical noise pick-up, and it is further recommended that signal wiring follows a different cable routing to power wiring. Whilst the noise immunity specification of 4001 recorders is exceptionally good, consideration given to this aspect of the installation will preclude expensive re-cabling work.

2.4.1 WIRING — POWER

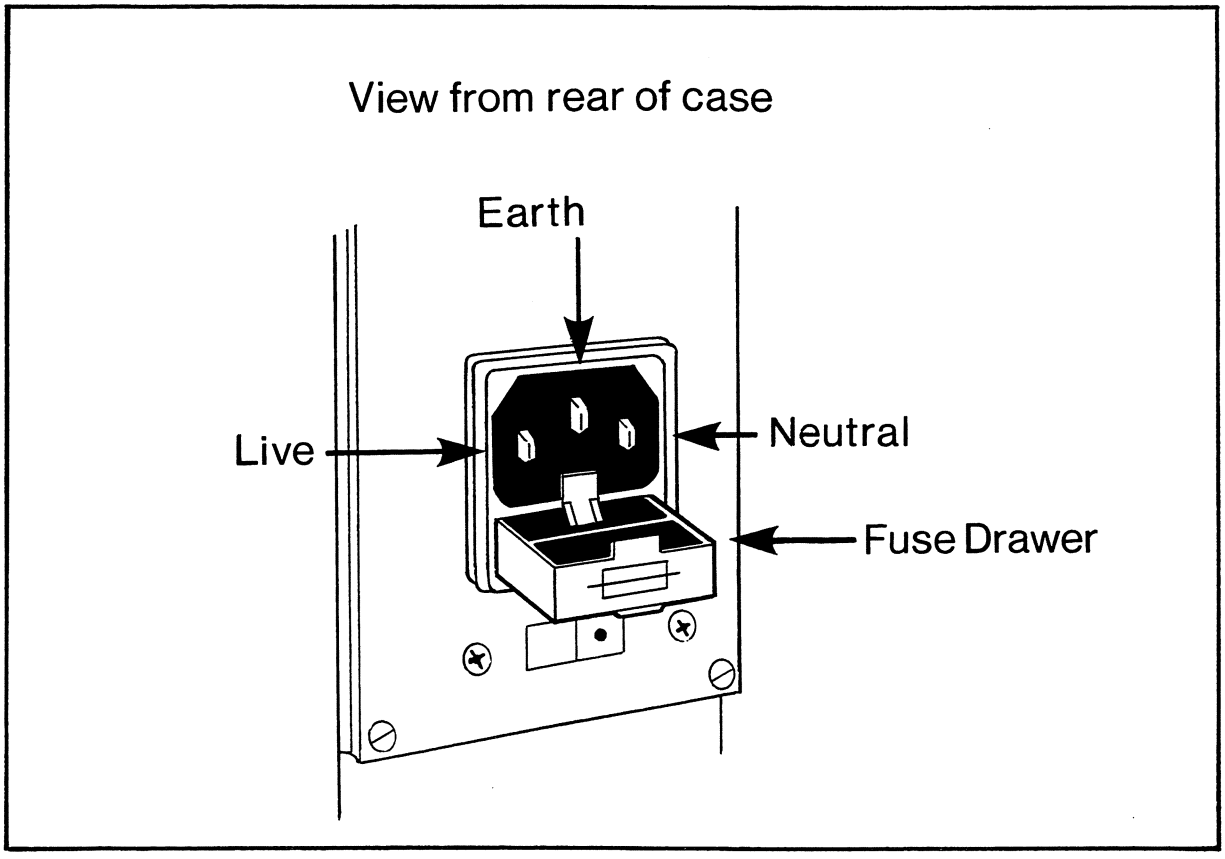
Before connecting the supply to the recorder, check that the recorder has been set to operate on the correct supply voltage and frequency by referring to the Supply Voltage Label mounted on the right hand side plate, inside the rear terminal cover. If the recorder requires converting to operate on a different supply, refer to section 2.6 of this manual.

The Line Supply is terminated on a standard IEC connector which is plugged into the rear of the Power Supply of the recorder.

Locate the connector in the accessory pack and terminate the cabling by reference to Illustration 2.4.1. The connector used is suitable for a maximum conductor cross sectional area of 1.5 mm^2.

Earthing Link

The earthing link is accessible after removing the rear terminal cover and is factory fitted. DO NOT REMOVE THIS LINK unless the instrument ØV terminal is to be connected to an external safety earth. Removing the link permits the instrument ØV line and some of the exposed chassis of the writing system to float. Under certain fault conditions this will prove hazardous to an operator.



2.4.1. Mains Connector Termination

2.4.2 WIRING — SIGNAL INPUTS

All input signal wiring is terminated into the recorder via the Signal Interface Moules (SIM's) which are associated with each Input Module in the Card Cage.

Each type of Input Module has a matching SIM which must only be connected to the same type of Input Module. Each SIM incorporates the user connection terminals, any pre-conditioning components, and the connector to the Input Module, together with the appropriate termination label.

If wiring the recorder for the first time, refer to sections 4.2, 4.3, and 4.4. before proceeding.

It will be found helpful to start terminating to the SIMs at the extreme left of recorder (Channels 1 - 6) and work towards the right.

The card cage is populated, with input modules, from left to right, (when viewed from the terminal cover) and from right to left with output modules.

Conductors may be stranded or solid with a cross sectional area from 0.5 - 2.5 mm^2.

2.4.3 WIRING — RELAY OUTPUTS

All relay output wiring is terminated into the recorder via the Relay Signal Interface Modules. The Relay Signal Interface Modules contain either four 'High Power', or eight 'Medium Power' relays, providing volt-free changeover contacts.

A Relay Signal Interface Module should not be plugged onto any other card but a Relay Output Module. Failure to observe this precaution could damage the Module and invalidate the guarantee.

Output Relay Modules are loaded in the Card Cage from right to left when viewed from the terminal cover.

The termination label, mounted on the Relay Signal Interface Module, shows the state of the contacts in the unpowered, or alarm condition.

The maximum ratings for the output relays are given in the recorder Technical Specification. See section 1.2.

The maximum conductor cross sectional area that may be connected to the Relay Signal Interface Module is 2.5 mm^2.

2.4.4 SERIAL COMMUNICATIONS PORT

4001 recorders are fittea, as standard, with a 25 pin 'D' connector which is used as a Serial Communications port. The port is enabled only when the Serial Communications option is specified on the purchase order to the manufacturer.

Two hardware standards are supported, RS 232C, which uses the standard 25 pin 'D' type connector, and RS 422 which requires the fitting of a converter assembly which plugs into the standard connector.

The connector is mounted on the rear terminal panel and is accessible after removing the rear terminal cover. See Illustration 2.4.4.

The pin assignments for the two communications standards are shown in Illustration 2.4.5. Full details of the function and installation requirements of the Serial Communications port are described in a supplementary manual, Part No HA 237231.

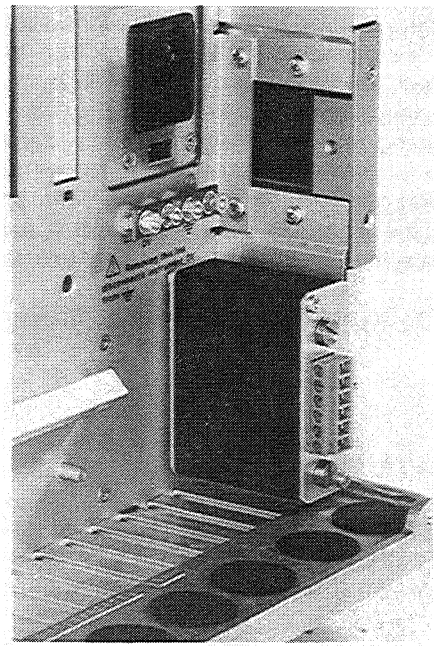
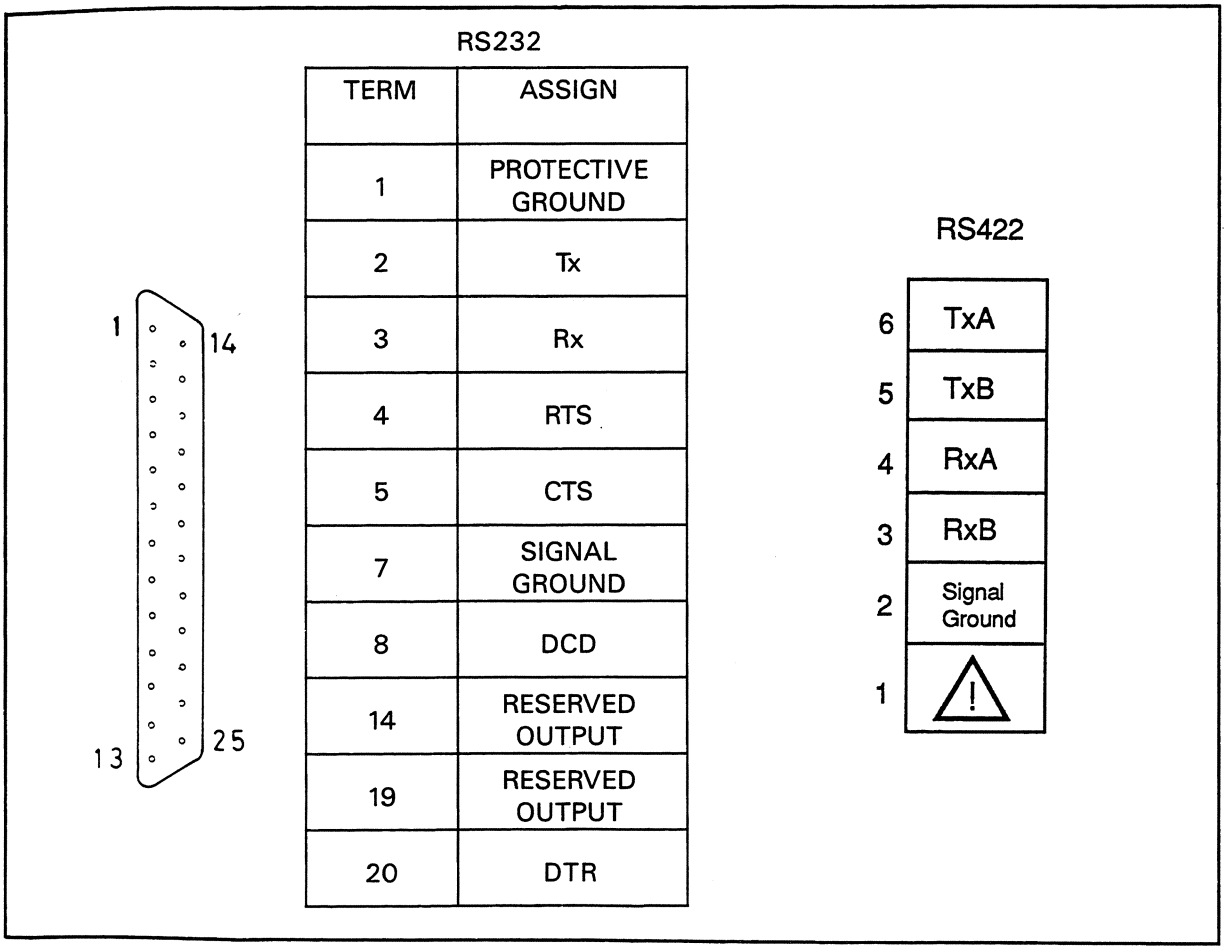


Figure 2.4.4.

The pin assignments for the two communications standards are shown in Illustration 2.4.5. Full details of the function and installation requirements of the Serial Communications port are described in a supplementary manual, Part No HA 237231.



2.4.5 Pin Assignments of RS232C and RS422 Connectors

2.5 DOOR GLASS REMOVAL

The door fitted to 4001 recorders is fitted with float glass, non reflective glass, or perspex window material. Two separate windows are provided, for the main chart area, and for the display and key-panel. Two separate seals are fitted, round the complete door, and round the key-panel.

If required, the top window for the display and key-panel may be removed to provide access to the key-panel, at the same time retaining the dust integrity of the recorder as a whole.

If it is required to remove the top window, open the recorder door and remove the countersunk screws securing the polished metal plate on the rear of the door. Both windows are held in a rubber moulding. Release the top window from the moulding and replace the bottom window, rubber moulding, and securing plate onto the door with the countersunk screws.

CAUTION Do not overtighten the countersunk screws.

2.6 CHANGING THE SUPPLY VOLTAGE

4001 recorders are equipped with a high efficiency switched mode power supply that is extremely tolerant of supply voltage and frequency variations. Two supply voltage ranges are catered for. The recorder will operate satisfactorily with a supply which is maintained within the following limits:

a) 180 - 260 Volts AC 45 - 65 Hz
b) 90 - 130 Volts AC 45 - 65 Hz

In addition to the protection against interruption, provided by the wide tolerance of voltage and frequency variations, the recorder will continue to function normally even if the supply is totally interrupted for up to 200 ms — or greater, depending on the recorder's configuration.

If it is required to change the recorder to operate on a different supply voltage proceed as follows.

a) Isolate the line supply to the recorder.

b) Remove the rear terminal cover of the recorder, and disconnect the line supply lead.

c) The voltage selector switch is located immediately underneath the power connector. Move the slide switch to the position corresponding to the supply voltage required. See Illustration 2.6.

Figure 2.6

d) Change the supply fuse to the value appropriate to the supply voltage selected.

180 - 260 V = 1 Amp 'T' Type
90 - 130 V = 2 Amp 'T' Type

e) Change the supply voltage label, located on the right rear side panel, to indicate the new supply voltage to be used.

f) Reconnect the line supply connector, replace the rear terminal cover and switch on the supply.

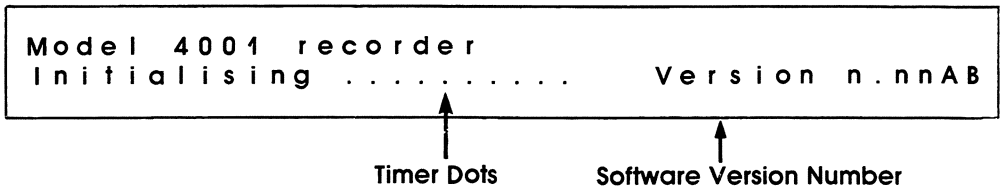
2.7 SWITCHING THE RECORDER ON

Before switching the recorder on for the first time, it is essential to check that the line supply voltage provided is within the voltage and frequency limits written on the Supply Voltage label, located on the right hand side plate, inside the rear terminal cover. If the recorder requires converting to run on a different supply voltage see section 2.6 of this manual. Failure to observe this precaution may lead to serious damage to the recorder which is not covered by the manufacturer's guarantee.

Check that the Access System is fully secured by the latches. The power switch is located at the bottom left side of the front of the Access System.

The power switch actuates a push rod to the switch mounted on the Power Supply Module, thus ensuring that there are no hazardous potentials anywhere within the Access System.

To switch the recorder on, depress the power switch, which has a latching action. The display will light and show the Initialisation Display.



The recorder takes up to 40 seconds to initialise. During this time, the timer dots will disappear. At the end of the initialising period the internal buzzer will sound and the recorder will enter the Background Display. See section 6.4 of this manual for details of the Background Display.

During the initialising period the recorder will print the 'Power On' Header Line. See section 7.1 for details.

2.7 (cont)

Version number — n.nn = software version number
A = L (with communications link) or N (without communications link)
B = E (English) F (French) or G (German)

If the recorder is being switched on for the first time it will be necessary to complete the configuration procedures described in section 4.1 of this manual.

2.8 CHANGING THE FUSES

4001 recorders are protected by two fuses, both accessable at the rear of the Power Supply Module. In order to gain access to the fuse holders, the rear terminal cover must be removed, and the line supply should be isolated remotely.

SUPPLY FUSE

The supply fuse is located within the same moulding as the line supply connector and is contained in a pull-out drawer underneath the connector. See Illustration 2.8.1. There are two positions in the drawer. The position nearest the front of the recorder is the active position, the position nearest the rear of the recorder holds a spare fuse.

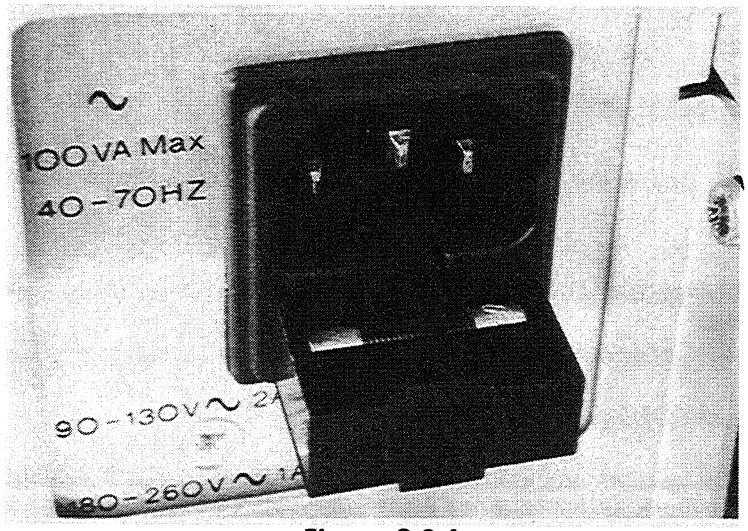


Figure 2.8.1

The fuse used is a 20 mm Time Delay fuse. Use of any other type of fuse will lead to premature rupture of the fuse at switch on.

4001 recorder Power Supply Modules incorporate thermistors to limit the inrush current at switch on. If the recorder is switched on and off repeatedly the fuse may rupture due to the thermistors not having cooled sufficiently to limit the inrush current.

To replace the fuse, pull out the drawer, and remove the existing fuse. This may then be replaced by a fuse of the correct rating.

If a fuse ruptures immediately following replacement, contact the nearest service base for assistance. Service locations are listed on the rear cover of this manual.

SUPPLY FUSE RATINGS

The fuse rating appropriate to the two different supply volatages, are:-

180 — 260 V = 1 Amp 'T' Part No. CS 236673
90 — 130 V = 2 Amp 'T' Part No. CH 050023

PROTECTION FUSE

In addition to the Supply fuse a protection fuse is mounted on the Power Supply Module to protect the internal circuitry of the recorder. To replace the Protection fuse, isolate the line supply, and compress the fuseholder between the thumb and forefinger, and pull the fuse holder outwards. See Illustration 2.8.2.

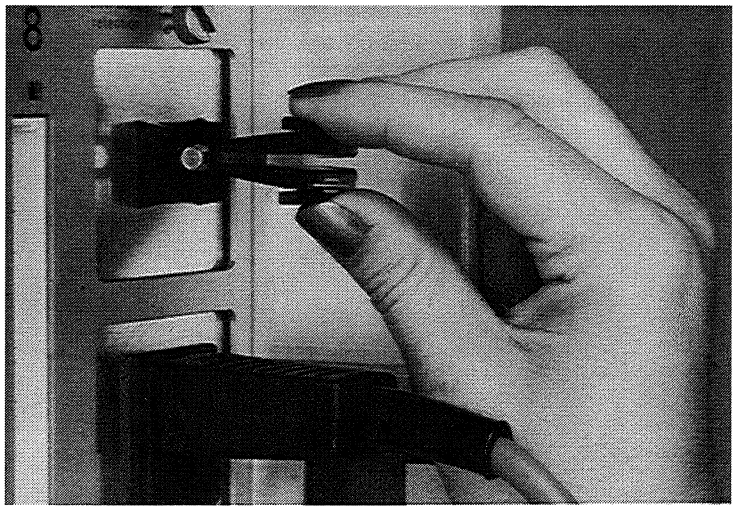


Figure 2.8.2

The Protection fuse is a 20 mm 5 Amp Fast Blow fuse, part No. CS 237285 and is the same for both line supply voltages.

If a fuse ruptures immediately following replacement, contact the nearest service base for assistance. Service locations are listed on the rear cover of this manual.

ROUTINE OPERATION

3.1 OPENING THE DOOR

4001 recorders are supplied with a DIN standard door lock, located on the right side of the door, and will be supplied with the door locked.

Locate the two keys in the accessory pack, and unlock the door using an anti-clockwise motion.

The door is hinged at the left side, and may be opened by gripping the indent, moulded in the right hand door edge, and pulling outwards. (See illustration 3.1.)

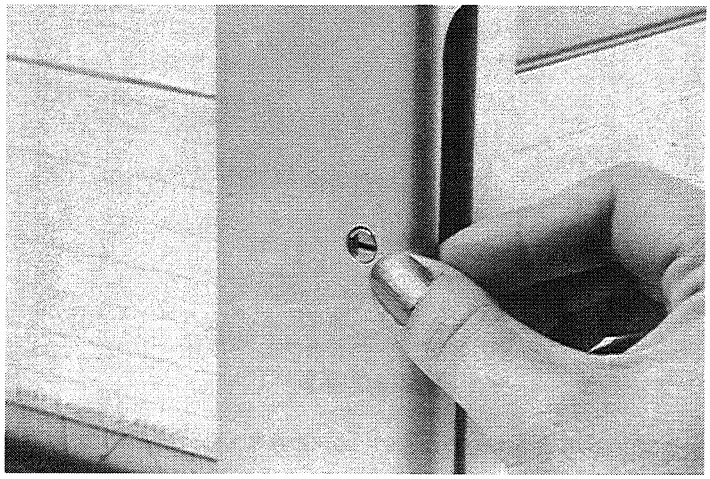


Figure 3.1

A firm pressure is required to overcome the retaining catch, which holds the door closed under normal operation.

3.2 OPENING THE ACCESS SYSTEM

CAUTION

BEFORE THE ACCESS SYSTEM IS OPENED, THE PRINTER MUST BE SWITCHED OFF-LINE. FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN DAMAGE TO THE WRITING SYSTEM.

First open the door by following the instructions in section 3.1. Then, with the thumbs of each hand, release the Access System from the case by using an outward hinging motion, and pulling the Access system forwards. See illustration 3.2.1. The Access System runs on support rails, and pulls straight out from the case, until stopped by safety catches.

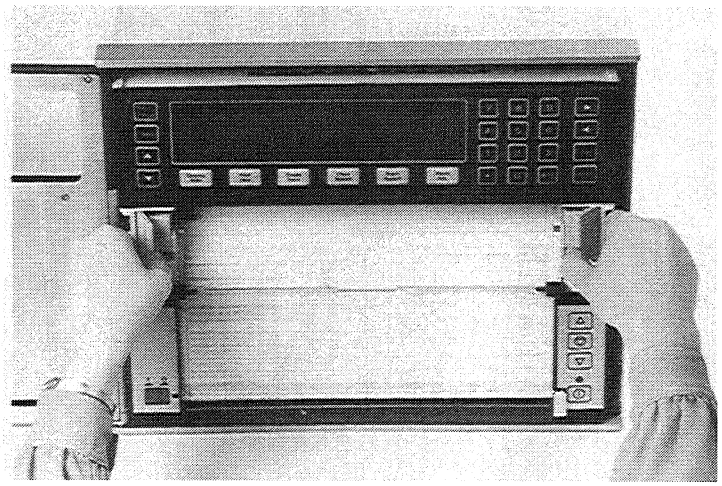


Figure 3.2.1

With the Access System withdrawn as far as the safety catches, depress the top of the Access System catches, to enable the Display Module to be raised. See illustration 3.2.2. With the Display Module open, it is possible to load the Chart, and Ink Ribbon Cartridge.

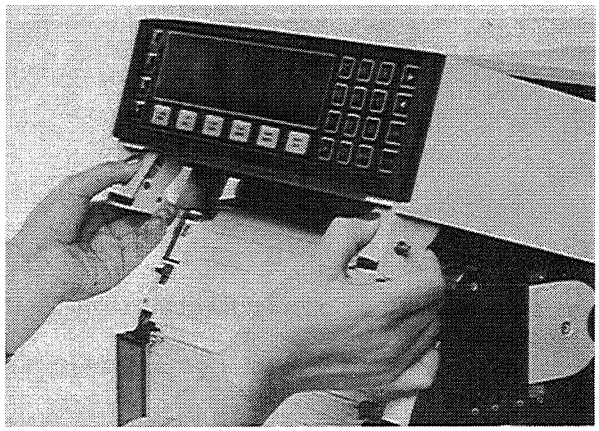


Figure 3.2.2

In order to configure the 'Failsafe Settings' on the Input Modules, described in section 4.3, it is necessary to swing the Access System open.

Having withdrawn the Access System as far as the safety catches, locate the retaining pin, at the back of the right hand side plate of the Access System. See illustration 3.2.3.

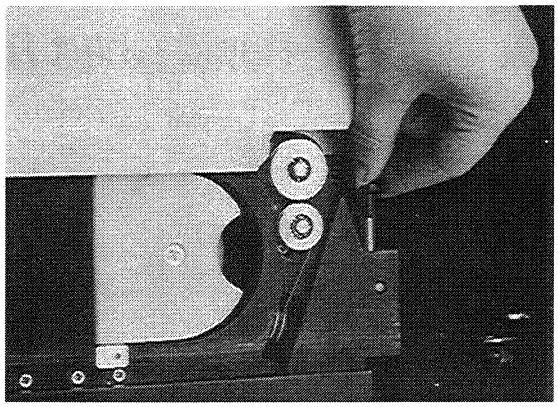


Figure 3.2.3

While supporting the weight of the Access System, with the left hand, lift up the retaining pin, and swing the Access System to the left.

NOTE. Before removing any of the connectors or the I/O modules it is important to read the Handling Precautions. Section 1.3.

3.3 CLOSING THE ACCESS SYSTEM

If the Access System has been swung open, return it to the closed position and replace the retaining pin.

The Display Module may be returned to its operating position by lowering it down, and firmly pushing the top of the Display Module cover, until the catches engage. Do not continue to press after the Display Module catches have been felt to engage, as unnecessary stress will be placed on the Ink Ribbon Cartridge.

The Access System may now be pushed firmly back into the case, until the Access System locks are felt to engage. See illustration 3.3.

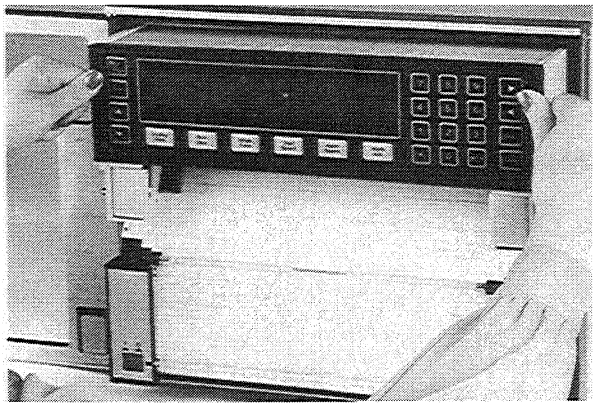
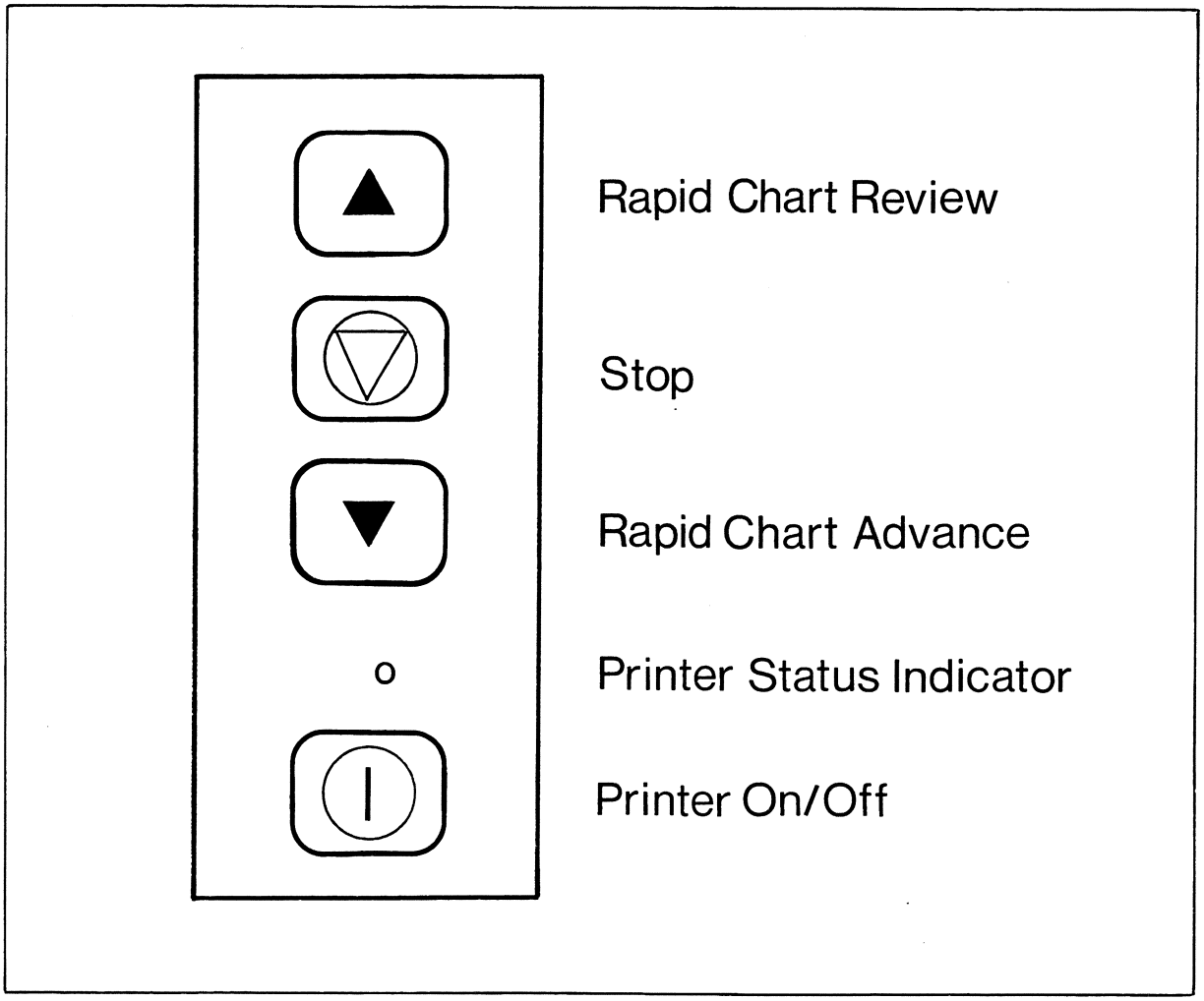


Figure 3.3

3.4 PRINTER CONTROL KEYPAD

The Printer Control Keypad is located at the bottom right of the recorder mainframe, and comprises four keys and a Printer Status Indicator.

The keys provide functions for paper feed control, and switching the printer on and off. See illustration 3.4.



3.4 Printer Control Key Pad

After the power-up initialisation the Printer Status Indicator will be illuminated indicating that the printer is "On-line".

3.4.1 SWITCHING THE PRINTER OFF

If it is required to switch the Printer off line, for servicing or consumables replacement, or to use the Rapid Chart Advance or Review facilities, press the Printer On/Off Key. See illustration 3.4.

The Printer Status Indicator will go out, and the recorder will print the "Printer Off Header". (For a full explanation see section 7.1.)

Any text queued in the text buffer will be printed immediately before the "Printer Off Header".

When the Printer is "Off-line", all inputs are continuously monitored and all normal displays and alarm actions will be performed.

3.4.2 RAPID CHART ADVANCE FACILITY

The Rapid Chart Advance facility is used during chart loading, or after reviewing a portion of the finished recording, to return the chart to its previous position.

Before using the Rapid Chart Advance the Printer must be switched "Off-line". See the previous section.

To advance the paper, press the Advance key. If the key is continuously pressed, the rate of paper feed will accelerate to the maximum speed. Any intermediate speed may be obtained by releasing the key when the required speed is achieved.

The paper feed may be stopped at any time by pressing the Stop key, or the Review key.

It is recommended that a speed of approximately 2 cm/s is used, when initially feeding the chart into the auto-take-up cassette.

To return to the original recording position, use the Rapid Chart Review facility described in section 3.4.3.

3.4.3 RAPID CHART REVIEW FACILITY

The Rapid Chart Review facility is used to review the finished record which is held on the take-up roller.

Before using the Rapid Chart Review facility, the Printer must be switched "Off-Line". See section 3.4.1.

To review the paper, press the Review key. If the key is continuously pressed, the rate of paper feed will accelerate to the maximum speed. Any intermediate speed may be obtained by releasing the key when the required speed is achieved.

The paper feed may be stopped at any time by pressing the Stop key, or the Rapid Advance key.

To return to the original recording position, use the Rapid Chart Advance facility described in section 3.4.2.

3.4.4 SWITCHING THE PRINTER ON

To continue recording, after using the Rapid Chart Advance or Review facilities, or if the printer is off for any other reason, it is necessary to switch the Printer "On-Line".

Press the Printer key. The Printer Status Indicator will illuminate and the recorder will print the "Printer On" header. (For a full explanation see section 7.1.)

The recorder will then return to its normal mode of operation.

3.5 LOADING THE CHART

CAUTION

BEFORE THE ACCESS SYSTEM IS OPENED, THE PRINTER MUST BE SWITCHED OFF-LINE. FAILURE TO OBSERVE THIS PRECAUTION WILL RESULT IN DAMAGE TO THE WRITING SYSTEM.

NOTE: Before inserting a new chart, any dust should be gently removed from the edge detect resolver and print head (see fig. 3.5.1).

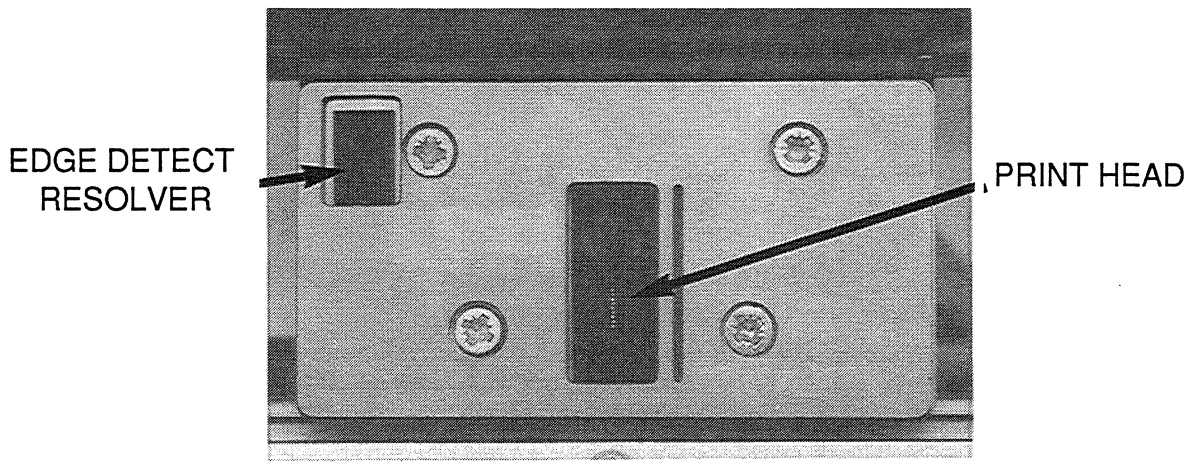


Figure 3.5.1

4001 recorders feature an Auto-take-up cassette mechanism and Rapid Chart Advance and Review facilities, that greatly simplify paper handling.

Additionally, paper drive is controlled by precision rubber grip wheels rather than the traditional sprocket drive and holed paper. This system ensures greater tolerance of paper size variations due to humidity changes.

The recorder is supplied with a 35 metre roll chart, conforming to DIN standard dimensions. Chart grids of 80, 100, 120, 140 and 150 divisions are available. Part No. GD 236721 (xxx). (x = the number of divisions.)

First open the door, withdraw the Access System, and lift up the Display Module, as described in sections 3.1, and 3.2.

The new paper roll is loaded by hinging open the End Cheek Door, with the right hand, and engaging the supply roll mandrel, onto the left hand drive spiggot. Take care to locate the keyway, on the paper mandrel, with the key on the drive spiggot. The End Cheek Door is then returned ensuring that the peg is located in the centre of the paper mandrel. See illustration 3.5.2

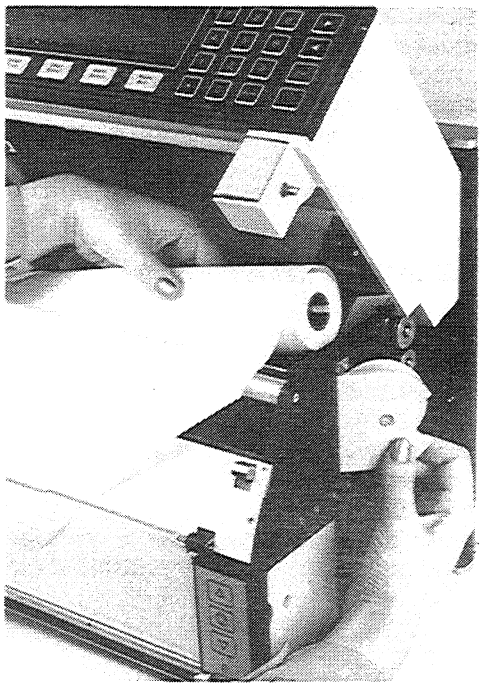


Figure 3.5.2

Pull the paper over the top of the printer mechanism and feed the tapered portion of the paper between the clear plastic and white platens.

Pull the clear plastic platen forward, against its retaining springs, and feed the paper between the drive rollers, ensuring that the paper is not running to either side. See illustration 3.5.3.

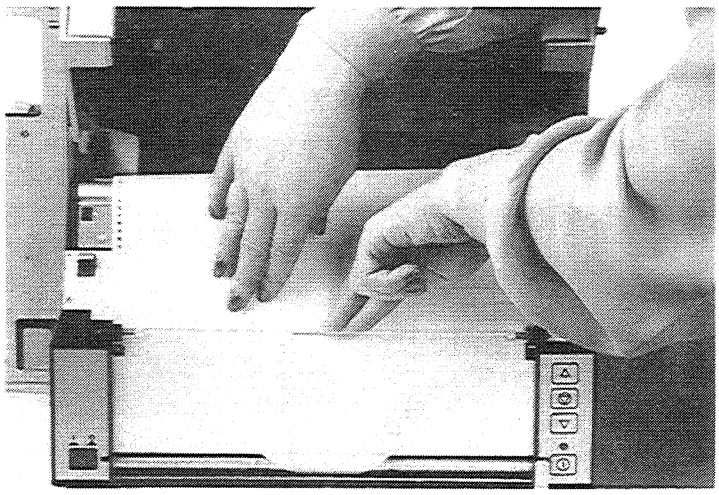


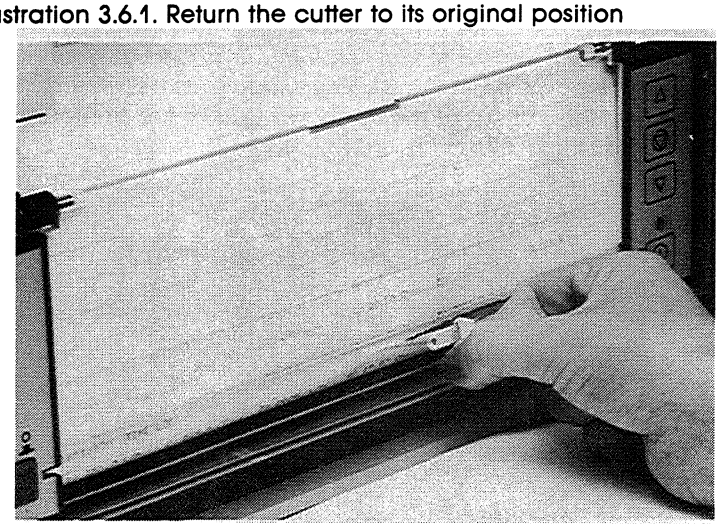
Figure 3.5.3

Use the Rapid Advance key to feed the paper into the Auto-take-up cassette mechanism. It may be necessary to pull the clear plastic platen forward to adjust its position on the drive rollers and ensure that it aligns correctly, but once the paper is gripped by the take-up mechanism, no further alignment should be required. See illustration 3.5.3.

3.6 REMOVING A SAMPLE OF CHART

4001 recorders feature an Auto-take-up cassette mechanism which eliminates the need for a paper take up spool and its attendant clips or sticky tape. When it is required to remove a section of record, the paper must first be cut, using the inbuilt paper cutter.

Grip the handle of the Paper Cutter, pull it outwards and to the left until the full width of the paper has been cut. See illustration 3.6.1. Return the cutter to its original position



The recorder Access System must then be withdrawn to the safety catches. See section 3.2. Slide open the door covering the Take-up roller, see illustration 3.6.2.

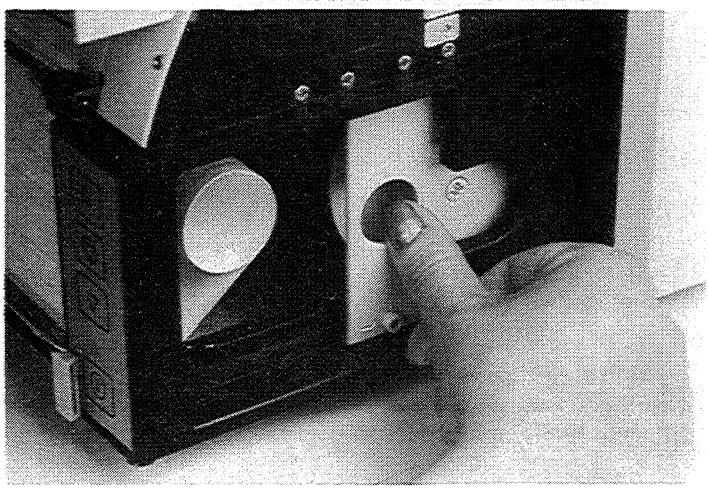


Figure 3.6.2

Grip the end of the chart, and pull the chart straight out. See illustration 3.6.3.

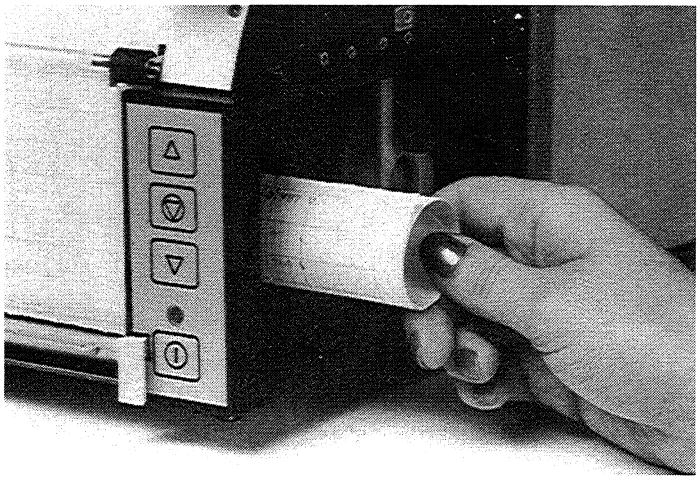


Figure 3.6.3

Close the sliding door and return the Access System into the case. If the recorder is to be used with the Access System withdrawn, the Sliding Door must be closed to ensure that the paper is correctly aligned on the Take-up roller.

3.7 INK RIBBON CASSETTE LOADING

CAUTION

BEFORE THE ACCESS SYSTEM IS OPENED, THE PRINTER MUST BE SWITCHED OFF-LINE. FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN DAMAGE TO THE WRITING SYSTEM.

4001 recorders are supplied with a custom designed, six colour Ink Ribbon Cassette. The Ink Ribbon Cassette is held in the Top Carriage by means of four retaining lugs and a securing clip.

First withdraw the Access System, and open the Display Module as described in section 3.2.

Position the Top Carriage over the cut-out at the left hand side of the printer moulding, by gently moving the Top Carriage. See illustration 3.7.1.

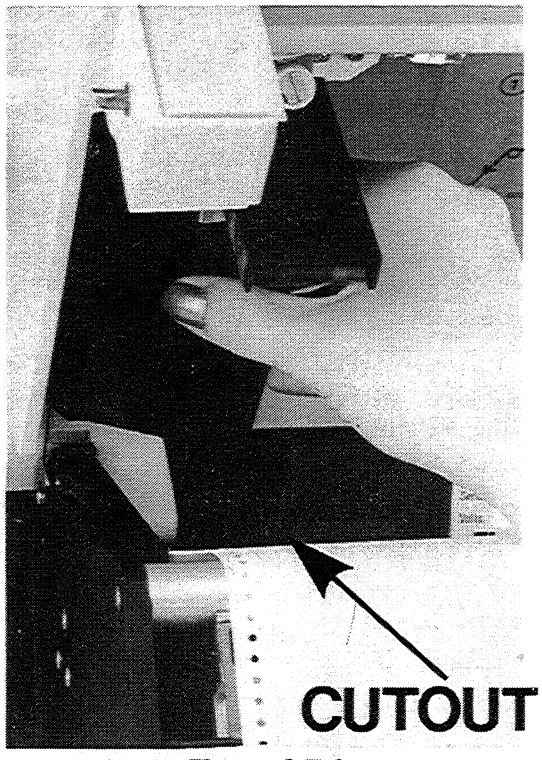


Figure 3.7.1

The Ink Ribbon Cartridge is inserted by locating the lugs on the cartridge body in the front two retaining clips on the Top Carriage, by using a firm backward pressure. The remaining two lugs are engaged by hinging the cartridge firmly upwards and backwards. See illustration. 3.7.2.

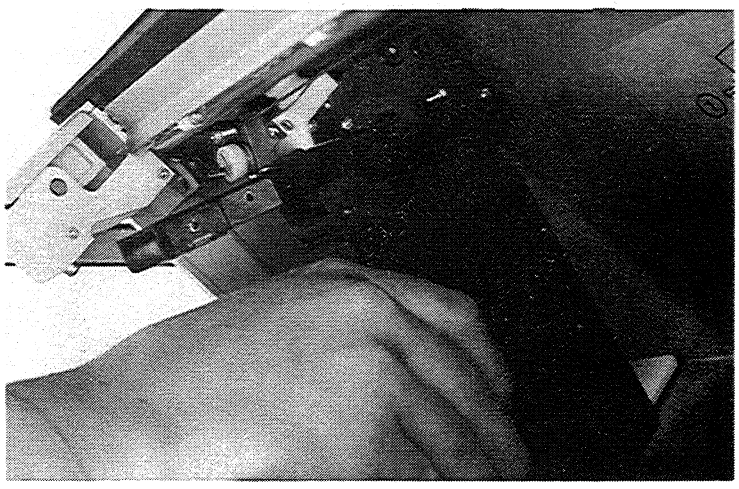


Figure 3.7.2

The Securing Clip is then swung to the left to support the underside of the Ink Ribbon Cartridge. See illustration 3.7.3.

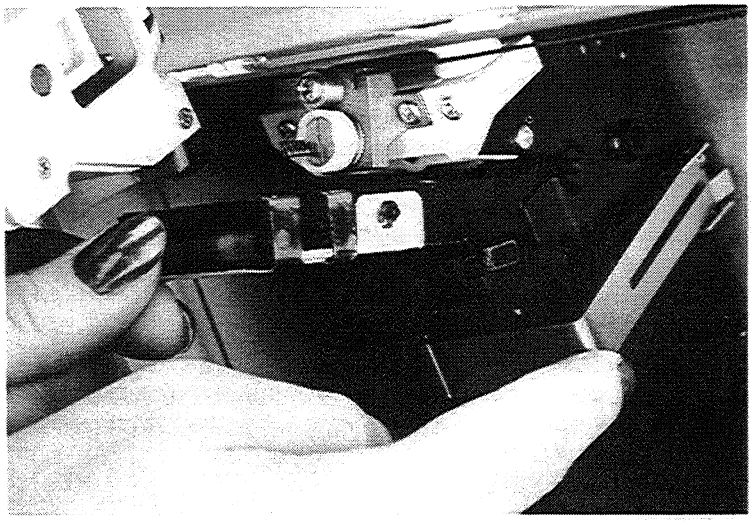


Figure 3.7.3

3.8 INK RIBBON CASSETTE REMOVAL

CAUTION

BEFORE THE ACCESS SYSTEM IS OPENED, THE PRINTER MUST BE SWITCHED OFF-LINE, FAILURE TO OBSERVE THIS PRECAUTION MAY RESULT IN DAMAGE TO THE WRITING SYSTEM

First switch the Printer off line, withdraw the Access System, and open the Display Module as described in section 3.2.

Carefully position the Top Carriage and Ink Ribbon Cartridge over the cut-out at the left side of printer moulding and release the Securing Clip by swinging it to the right.

The Ink Ribbon Cartridge may now be removed by firmly pulling downwards and outwards, to disengage the rear lugs, and then pulling straight out to disengage the front lugs.

NOTE: The Ink Ribbon Cartridge is a disposable item and cannot be re-inked.

The ink used in the ribbon is an oil based indelible ink. Care should be taken to avoid contact with clothing.

HARDWARE CONFIGURATION PROCEDURES

4.1 RECORDER CONFIGURATION — GENERAL

4001 recorders may be supplied in two levels of configuration.

1) USER CONFIGURABLE
   When supplied for user configuration, only the standard functions, and customised text strings have been set in the recorder's data base during manufacture. The recorder will have been customised with the following facilities:—
   a) Up to eight alpha-numeric Channel Descriptors.
   b) Up to twelve alpha-numeric Engineering Units strings.
   c) One alpha-numeric Instrument Descriptor.
   d) Up to three non standard linearisation tables.
   All other areas of the recorder's configuration will be in a "default" condition used to conduct manufacturing tests, and the full configuration procedure described in this section should be completed.

2) FACTORY CONFIGURED
   When supplied as factory configured, in addition to the customised information described above, the recorder will have been configured to the purchaser's specification, by setting the following items:—
   e) Current shunts and/or attenuators.
   f) Fail safe links.
   g) Individual Channel range, scale and chart formats.
   Items "e", "f" and "g" may be changed by the user to match any change in application, by following the configuration procedures described in this manual.
   The configuration of the alarms will require completing by the user, on Factory Configured recorders.

If the recorder is being configured for the first time, it is recommended that the following sequence is adopted for functional and familiarisation purposes.

1) Fitting of Shunts and Attenuators. (DC and Thermocouples)
2) Setting the number of terminations. (Resistance Thermometers)
3) Selection of fail-safe settings. (DC and Thermocouples)
4) Software configuration as described in section 5.2.

4.2 FITTING SHUNT RESISTORS AND ATTENUATORS (2 WIRE DC)

The programmable Input Modules used in 4001 recorders, will accept input signals from 0.6 mV to 10.24V. Each channel is configured for range using the display and key-panel, and in addition any pre-conditioning components such as current shunt resistors, or attenuators will require fitting within the Signal Interface Module associated with that channel.

If the recorder has been Factory Configured the shunt resistors and attenuators will have been fitted in accordance with the ordered specification, if supplied as User Configured any shunt resistors or attenuators ordered will be supplied loose in a bag taped to the recorder door.

a) Remove the rear terminal cover by removing the six retaining screws.

b) Identify the Signal Interface Module associated with the channel to be configured, using the identification label mounted within the rear terminal cover.

WARNING. Before proceding further great care should be taken to isolate all external signals from the recorder. If in any doubt, the channel to channel and channel to ground potentials of all inputs should be checked with a test meter, to identify any hazardous potentials.

c) For convenience, any input wiring should be removed from the Signal Interface Module, although the configuration procedure may be completed with the input wiring in place, provided that all hazardous potentials have been isolated remotely.

d) Remove the Signal Interface Module by depressing the retaining latch underneath the moulding, and at the same time pulling the module firmly backwards out of the extruded channels in the case.

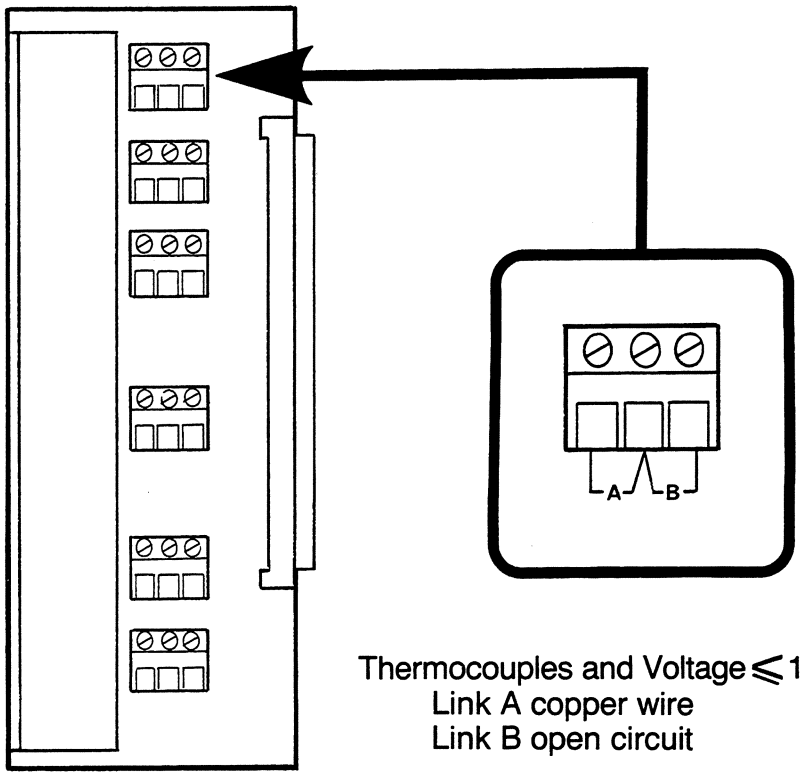
e) Remove the three screws retaining the cover of the Signal Interface Module and lift off the cover, to reveal the internal printed circuit board.

f) Each channel is identified on the silk screening of the printed circuit board, and is provided with a three way terminal block with the two mounting positions labelled "A" and "B".

g) Identify the resistors in the accessory pack.

ATTENUATORS	"High Value"	= 990 Kohms 0.1% 15 ppm/°C.
	"Low Value"	= 10 Kohms 0.1% 15 ppm/°C.
SHUNTS		= 100 ohms 0.1% 15ppm/°C Or as specified.

Fit the resistors in the appropriate position in the terminal blocks by reference to Illustration 4.2.



Thermocouples and Voltage ≤ 10·24V DC
Link A copper wire
Link B open circuit

DC Current Signals
Link A copper wire
Link B shunt resistor (100 R. STD)

DC Voltages > 10·24V DC
Link A 990K ohm resistor
Link B 10K ohm resistor

4.2 Shunts and Attenuators — DC Signal Interface Module

h) When configuration is completed, refit the printed circuit board and cover, and return the module into its original location, taking care that the locating peg at the base of the module engages with the hole in the back panel, and that the retaining catch is securely located.

4.3 FAILSAFE SETTINGS (2 WIRE DC)

The programmable Input Modules used in 4001 recorders may be configured to provide upscale or downscale sensor fail detection when measuring thermocouples or spans below 1.28V. Above 1.28 V the recorder will always drive to 0 volts for an open circuit input.

If the recorder has been Factory Configured the sensor fail links will have been fitted in accordance with the ordered specification, if supplied as User Configured, the links will have been fitted on the centre pins, which does not provide fail safe action.

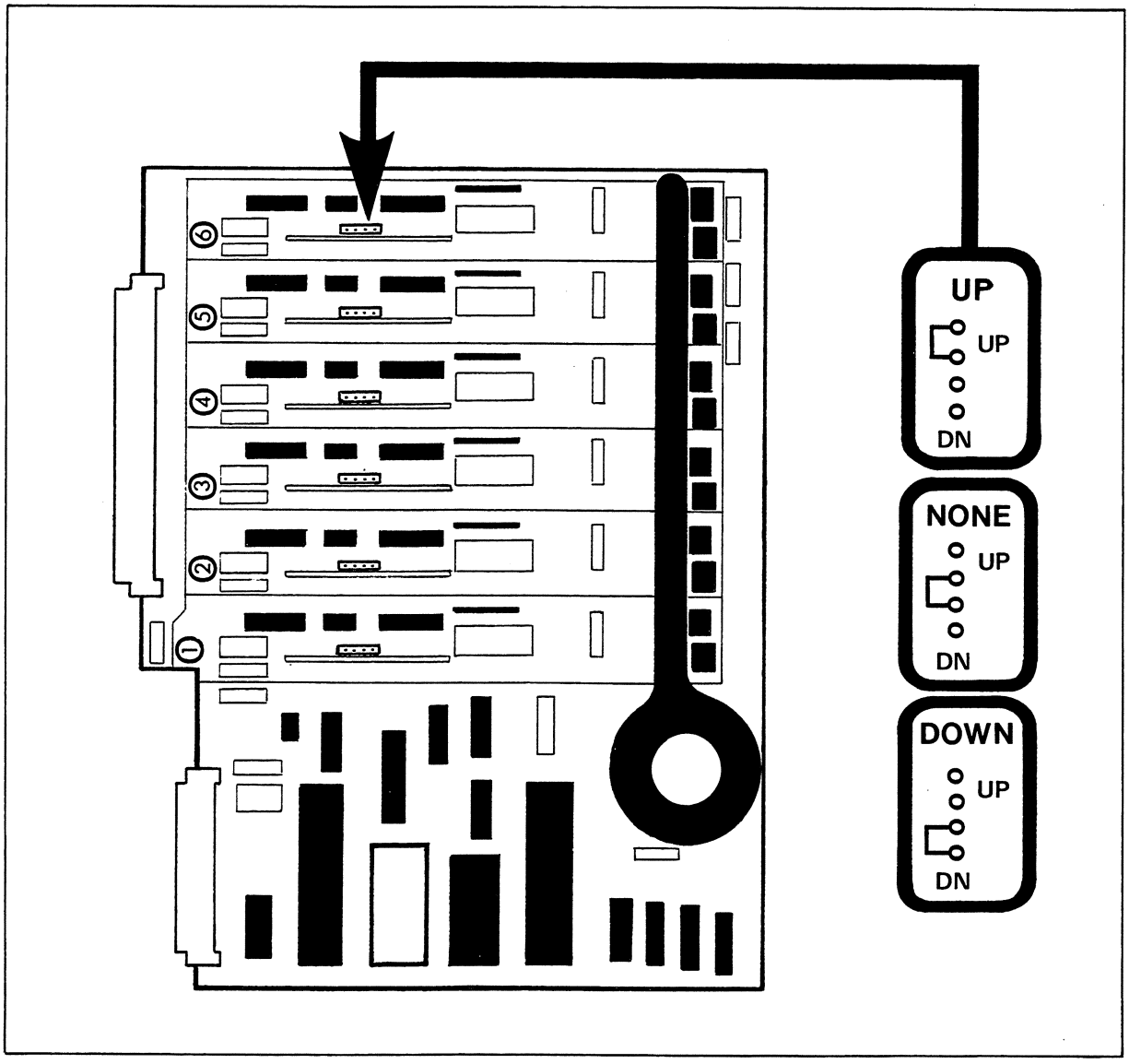
The sensor fail links, are located on the Programmable Input Card, a link being fitted for each channel.

a) Isolate the power supply to the recorder.

b) Open the Access System by reference to section 3.2.

c) Remove the card retaining bracket, mounted across the card cage, and withdraw the Input Module to be configured.

d) Identify the channel to be configured from the silk screening adjacent to the input connector. Remove the link which will have been positioned on the centre two terminals at the factory, and select the sensor fail mode required, by reference to illustration 4.3.



4.3 Fail Safe Links — DC Input Module

UP = The recorder will drive to the right, and give an overrange indication (>Range) on the display, when the sensor is open circuit or disconnected.

DOWN = The recorder will drive to the left, and give an underrange indication (<Range) on the display, when the sensor is open circuit or disconnected.

NONE = The recorded value will float, the indicated value will not be meaningful.

e) Return the Input Module to its original position in the card cage, and replace the retaining bracket. All Input Modules should be configured before closing the Access System and switching the recorder back on.

NOTE.
For inputs greater than 1.28V, the fail-safe links will not cause drive and should therefore be left in the 'NONE' position.

4.4 TERMINATION SETTINGS (RESISTANCE THERMOMETER)

The programmable Input Modules, used for measuring Resistance Thermometers, in 4001 recorders, may be configured to accept 2, 3 or 4 termination leads to the Resistance Thermometers.

When the installation demands that the sensors be mounted more than a few metres from the recorder, it is recommended that 3 or 4 termination leads are used, to minimise the effect of lead resistance on the accuracy of the measurement.

Although each channel may be independently configured for the number of terminations to be used, recorders supplied from the manufacturer will have all channels, on the same Input Module, configured to the same number of terminations, and be as specified in the ordered specification.

To change the number of termination leads to be used follow the procedure described in this section.

a) Remove the rear terminal cover by removing the six retaining screws.

b) Identify the Signal Interface Modules associated with the channel to be configured, using the identification label mounted within the rear terminal cover.

WARNING. Before proceding further, great care should be taken to isolate all external signals from the recorder. If in any doubt, the channel to channel, and channel to ground potentials, of all inputs, should be checked with a test meter, to identify any hazardous potentials.

c) For convenience, any input wiring should be removed from the Signal Interface Module, although the configuration procedure may be completed with the input wiring in place, provided that all hazardous potentials have been isolated remotely.

d) Remove the Signal Interface Module by depressing the retaining latch underneath the moulding, and at the same time pulling the module firmly backwards out of the extruded channels in the case.

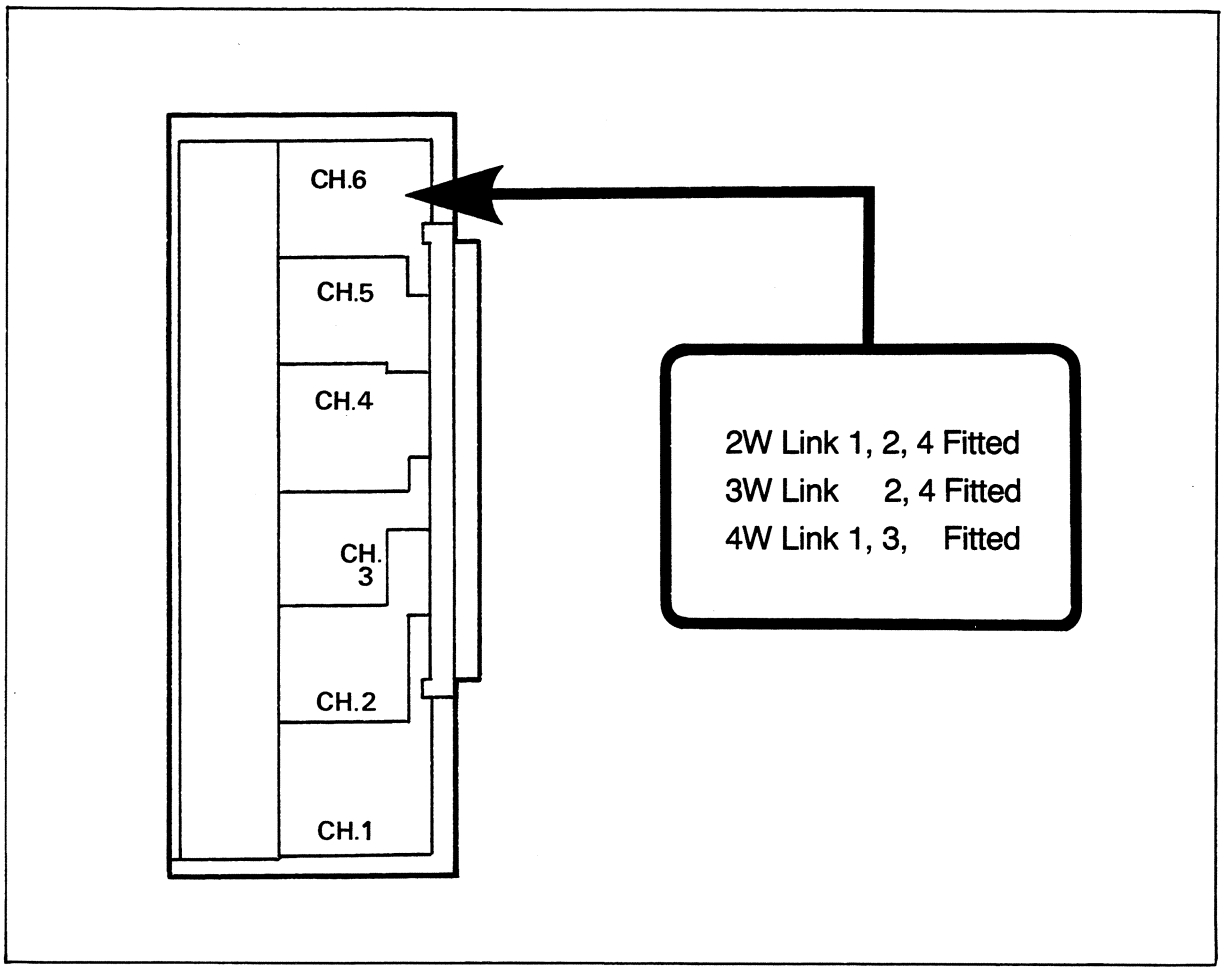
e) Remove the three screws retaining the cover of the Signal Interface Module and lift off the cover, to reveal the internal printed circuit board.

f) Each channel is identified on the silk screening of the printed circuit board, and has provision for fitting up to four soldered links associated with each channel.

g) Refer to Illustration 4.4 and add or remove links to achieve the correct number of terminations, as defined in the accompanying table. The use of a pneumatic solder sucker is recommended to minimise damage to the printed circuit board when extracting redundant links.

h) When configuration is completed, refit the printed circuit board and cover, and return the module into its original location, taking care that the locating peg at the base of the module engages with the hole in the back panel, and that the retaining catch is securely located.

i) NOTE: Resistance thermometer inputs must not be left open circuit when the instrument is switched on. Unused inputs should be shorted. Failure to observe this precaution will result in the channel failing to read when reconnected. The instrument will require switching off and on to reset.



4.4 Termination Setting — R.T. Signal Interface Module

DETAILED DESCRIPTIONS OF DISPLAYS

5.1 PRINCIPLES OF DISPLAY AND KEY PANEL OPERATION

The Operator Interface combines a comprehensive, 80 character display, and tactile key-panel which is designed for simplicity of operation, and ease of understanding. An audible annunciator located behind the key-panel confirms key depression.

Auto repeat of a key's function occurs in two stages after the key is held down. After two seconds, and a further speed up after four seconds.

The Operator Interface may be operated in one of two modes:

INTERROGATION MODE. In this mode the user has full access to the configuration of the recorder but the functions that may be changed are limited to the following:

a) Changing between two preset chart speeds.
b) Selecting Print Format Mode.
c) Entering a Batch Number.

PROGRAMMING MODE. This mode is accessed following the entry of a Login number, a user-set number of up to six digits, and permits the setting of all User Configurable parameters.

Configuration changes may be made with the recorder on line to the measuring channels and does not interrupt the scanning and alarm detection functions of the recorder.

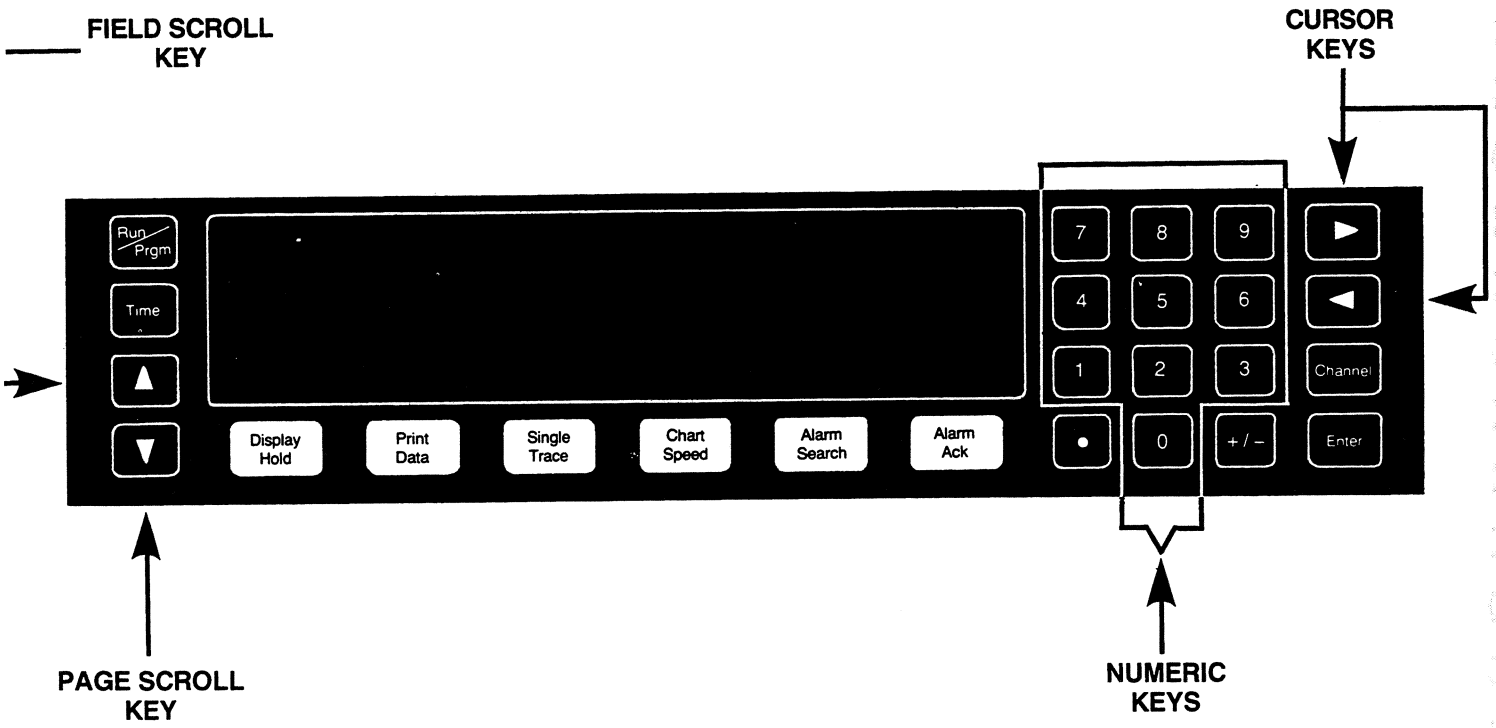
The principal rules for using the Operator Interface are:

1) Having used a key to access a particular page of the display. the same key is used to exit that page and return to either the Background Display or the Channel Scale page.
2) The Page Scroll key "V" is used to scroll progressively through the pages.
3) The Field Scroll key " ^ " is used to view the menu within a particular Field.
4) The Cursor keys, "<" and ">" are used to position thecursor under the Field to be configured.
5) Whenever a change is made to a display an Edit indicator in the Instrument Status Field illuminates to show that a change has been made. The new entries are sent to the recorder's data base only after the ENTER key has been be pressed.
6) All Measuring Channel pages may be altered during an editing sequence and all parameters are confirmed by pressing the ENTER key at the end of the sequence. All other pages require the ENTER key to be pressed before leaving the page.
7) If at any time an invalid key is used the display will show an error message directing the user to the source of the error.

5.2 SEQUENCE OF PROGRAMMING

It is recommended that if programming the recorder for the first time the following sequence is adopted for functional and familiarisation purposes.

1) Time and Date.
2) Instrument configuration.
3) Chart Speed and Log Interval.
4) Individual Channel range and Scale.
5) Alarm Settings and actions.



5.3 Key Panel Layout

5.4 ACTION OF KEYS

4001 recorders are fitted with a custom designed Tactile Key-panel. Key depression is confirmed by an internal audible annunciator, which is heard when a key is depressed.

AUTO REPEAT

If it is required to repeat a key's function a number of times, as when scrolling the hours or minutes in the Time and Date page display for example, the key may be held down.

Auto repeat of a key's function occurs in two stages. After two seconds the key will start to repeat its function at quarter second intervals. If the key remains held down for four seconds the auto repeat speed increases to eight times per second until the key is released.

KEY LAYOUT

The keys are layed out to enable both hands to be used, which helps to speed up the entry of the parameters during configuration.

The larger, Primary function keys are those, most likely to be used during normal operation of the recorder. The smaller Secondary keys are used during configuration and when examinining the configuration.

MAINTENANCE

The environmentally sealed key-panel and display window are not user serviceable items. Should the key-panel require cleaning, use only a soft cloth moistened with water. The use of solvent or abrasive cleaners should be avoided. Care should be taken to avoid pressing the Display window/filter when returning the Access System into the case.

5.5 ENTERING AND LEAVING PROGRAMMING MODE

In order to change any of the parameters which can not be altered in the Interrogation Mode, it is necessary to enter the Programming Mode.

Programming Mode may be accessed when viewing any of the displays, and having followed the procedure outlined in this section, the recorder will return to the display being viewed when the procedure was initiated.

To enter Programming Mode proceed as follows.

1) Press the RUN/PRGM key and the display will show the following message:—

2) Use the Numeric keys to enter the Login Number which will be 123456 when the recorder is first delivered, and then press the ENTER key.

NOTE: When in Programming Mode it is possible to set any number to act as the Login Number. See section 6.12 for the procedure.

3) The display will return to the display previously viewed and a flashing cursor will appear under the character positions at the right of the top line. This cursor is the Programming Mode Indicator and is visible in all displays.

4) An additional cursor will be present, depending upon the display being viewed, which may be positioned by the Cursor keys, and is used to access a particular Field.

If the Login Number is not correctly entered the recorder will display an error message:

To leave Programming Mode, press the RUN/PRGM key. The Cursor will disappear and the recorder will function in the Interrogation Mode.

DETAILED DESCRIPTION OF DISPLAYS

6.1 CHANNEL SELECTION

In order to examine the configuration of a Measuring Channel, or the Instrument, it is necessary to follow the Channel Selection procedure described in this section.

The configuration of a Measuring Channel or the Instrument, is contained in a number of pages. At the completion of the following procedure the first page will be displayed.

Instrument configuration is held in Channel 0.

To access a Channel, say 24;

1) Press the CHANNEL key. The display will show the prompt;

```
Channel selection                    ABC
First digit
```

2) Use the NUMERIC keys to enter the most significant digit of the Channel Number, (2 in this example). The display will show the promt;

```
Channel selection                    ABC
Second digit or ENTER
```

3) Use the NUMERIC key to enter the least significant digit of the Channel Number, (4 in this example). The display will show the promt;

```
Channel selection                    ABC
Press ENTER
```

4) Follow the prompt and press the ENTER key. The display will show the first page of Channel 24's configuration.

NOTE: It is not necessary to enter a leading zero for Channel numbers 1 to 9, or for the Instrument configuration in Channel 0.

If the recorder has been supplied or configured for less than 30 Channels, it will still be possible to view the configuration of the 30 channels, although an invalid indication (??????) will be displayed as the measured value.

If the Channel number selected is out of the range 0 — 30 then the display will show the following message.

```
                     ERROR           ABC
Channel number out of range
```

The message will be displayed for two seconds, and then return to the previously viewed display. It will be necessary to start the channel selection sequence from the beginning.

6.2 CHANNEL EXIT PROCEDURE

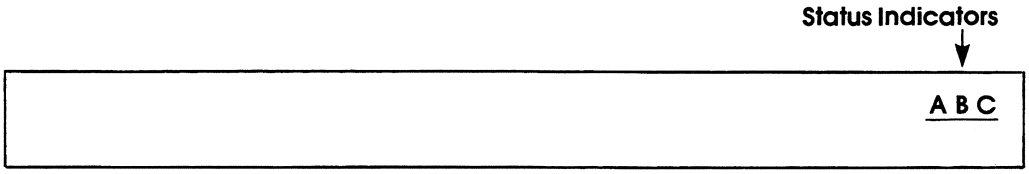
In order to examine the configuration of a Measuring Channel, or the Instrument it is necessary to follow the Channel Selection procedure described in section 6.1. To leave the Channel or Instrument configuration displays the Channel Exit procedure, described in this section should be followed.

1) Press the CHANNEL key. The display will show the prompt:

2) Follow the display prompt and press the ENTER key. The display will then return to the Background Display.

NOTE: When examining the configuration of any of the Measuring Channels the ALARM SEARCH key is used to examine the configuration of any alarms associated with the Channel. In order to view the Active Alarm Summary page (see section 6.28) the Channel Exit procedure, described above, must be followed.

6.3 INSTRUMENT STATUS INDICATORS



There are three Instrument Status Indicators located at the right of the top line of the display. These Indicators are visible in all of the display Pages once the recorder has completed the Initialisation sequence.

Character A Background Display.

Blank — Normal five second selection of four Channel Variables.
Inverse H — Group of four Channel Variables Held. See Background Display for detailed instructions.

Single Trace Indicator

Blank — Not in Single Trace Mode.
Inverse S — Single Trace Mode selected.

Edit Indicator

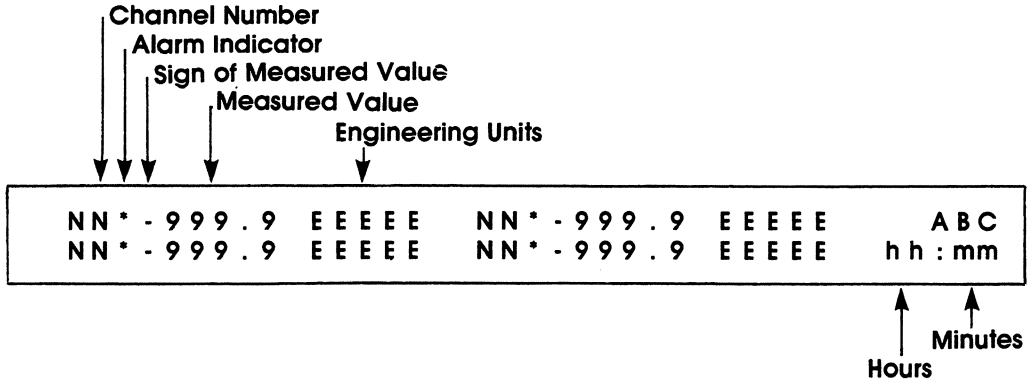
Blank — ENTER key need not be used.
Inverse E — An item of configuration has been changed and requires the ENTER key to be pressed to confirm the change.

Remote Programming Indicator

Blank — The recorder is under local programming control.
Inverse P — Programming Mode is disabled by a supervisory computer.

Character B	Instrument Alarm Indicator
Blank	— Normal operation. No Instrument Alarm Present.
Inverse I	— If flashing, an Instrument Alarm is present, but is not acknowledged. If steady the Instrument Alarm has been acknowledged. Refer to section 8.1 for the interpretation of Instrument Alarms.
Character C	Channel Alarm Indicator
Blank	— No Channel Alarms Currently Active.
Bell Symbol	— If flashing a Channel Alarm has been present since the ALARM ACK. key was last pressed. If steady one or more Channel Alarms are present on the recorder and have been previously acknowledged.
Underlines	Programming Mode Indicator
Blank	— The recorder is being used in Interrogation Mode.
Flashing	— The recorder is being used in Programming Mode.

6.4 THE BACKGROUND DISPLAY



ENTRY	1) After Initialisation Sequence at Power Up. 2) Entered by default on return from other displays.
EXIT	To any other display by following the required key sequence.
OPERATION	Display cycles at five second intervals showing a group of four channels simultaneously. The time is displayed in 24 hour format. By pressing the DISPLAY HOLD key, cycling is interrupted, and the Display Hold character lights in the Instrument Status Field. By pressing the PAGE SCROLL key the next group of four channels will be displayed. By pressing the DISPLAY HOLD key, the normal five second cycle will restart, and the Display Hold character will disappear.
DISPLAY	
Channel Number	In the range 1 to 30.
Alarm Indicator	A bell symbol. If flashing, an alarm associated with the channel has been active, and has not been acknowledged. If steady, an alarm is active and has been acknowledged.
Sign of Measured Value	Blank : The reading is positive. "—" : The reading is negative.

Measured Value

The measured value of the Channel is displayed as a scaled value in engineering units. The reading is shown to 4 digit resolution, with a floating decimal point. Alternative displays are:—

??????	—	Invalid reading
>Range	—	Measured Value is over range.
<Range	—	Measured Value is under range.
Off	—	The Channel is switched Off.

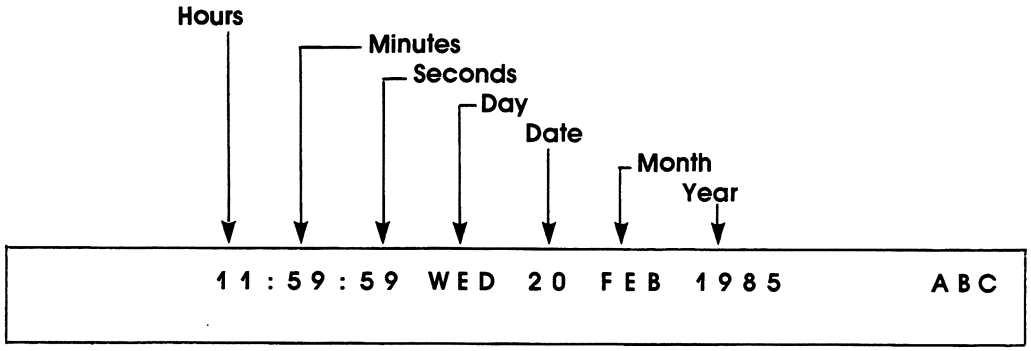
Engineering Units

A five character descriptor of the engineering units of the Channel.

Hours and Minutes

The current time is shown using the 24 hour format.

6.5 TIME AND DATE DISPLAY



ENTRY — By pressing the TIME key.

EXIT — By re-pressng the TIME KEY.

OPERATION

When in the Interrogation mode time is displayed in the 24 hour format. The display is updated every second.

When in the Programming mode the clock may be set. To alter any parameter, position the cursor under the item and use the FIELD SCROLL key to increment the parameter. When the ENTER key is pressed the new values are written to the internal clock.

NOTE:

1) The cursor can not be positioned under the seconds field, which will be set to zero when the ENTER key is pressed.

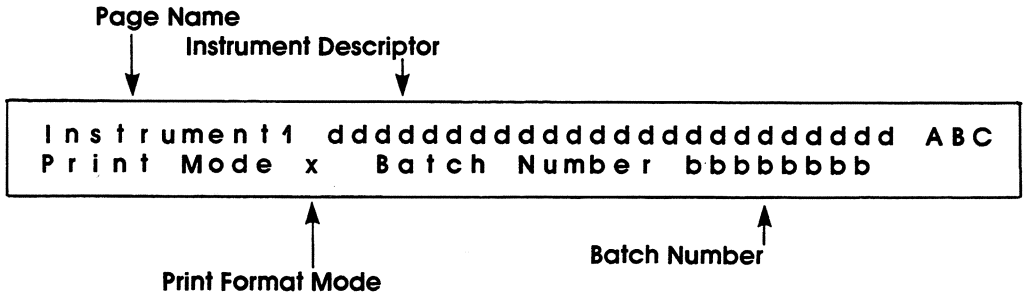
2) The cursor can not be positioned under the Day field which will be set to the correct day automatically.

3) The Date Format selected in the Instrument 2 Page does not affect the format of this display.

4) The display is not updated in Programming Mode.

5) It is necessary to re-set the date at New Year (if the power is off at the time the year changes) and at Leap Year.

6.6 INSTRUMENT 1 PAGE DISPLAY



ENTRY — Follow the Channel selection procedure described in section 6.1, using 0 as the Channel number.

EXIT — Follow the Channel exit procedure described in section 6.2 or use the PAGE SCROLL key to view the next page of the Instrument Configuration.

OPERATION — The display is used to view and change the Print Format Mode, and to enter a new Batch Number, in either Interrogation or Programming Mode.
To change Print Format Mode, position the cursor under the Print Mode field and use the FIELD SCROLL key to access the required Mode. Press the ENTER key and the new Mode will be selected. A Message will be printed on the chart to indicate the new Mode and the time of the change.
To enter a new Batch Number use the NUMERIC and "." keys to enter the new number. If a mistake is made continue entering digits until the display overflows, and re-enter. When the correct number is shown, press the ENTER key. The recorder will print the BATCH START header line on the chart.

DISPLAY

Page Name

Instrument 1 is the first page of the Instrument configuration pages.

Instrument Descriptor

A character string, (maximum 24 characters) which has been customised during manufacture, and appears in the Header Line of the recording, to describe the function of the recorder.

Print Format Mode

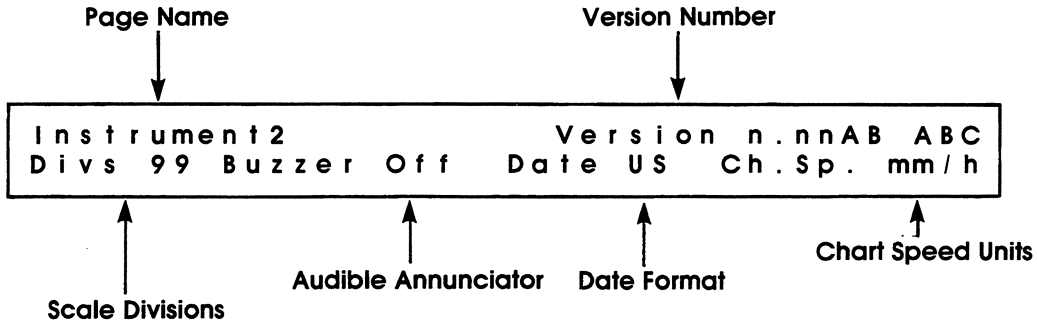
Selects the method used to present data on the recording. For a full description of the Print Format Modes, refer to section 7.
1 = Trend Mode
2 = Text Mode
3 = Tabular Mode

NOTE: When Modes 1 or 2 are selected the CHART SPEED key will show the Chart Speed display. When Mode 3 is selected the CHART SPEED key will show the Log Intervals display.

Batch Number

A numerical string comprising numbers 0 — 9 and decimal points, which appears in the Header Line of the recording. Entry of a new Batch Number causes the BATCH START Header Line to be printed.

6.7 INSTRUMENT 2 PAGE DISPLAY



ENTRY

Follow the Channel selection procedure described in section 6.1, using 0 as the Channel number. Then use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2. Or use the PAGE SCROLL key to view the next page of the Instrument Configuration.

OPERATION

The page may be viewed but not altered in Interrogation Mode. When in Programming Mode, position the cursor under the Field to be changed and use the FIELD SCROLL key to view the menu.

DISPLAY

Page Name

Instrument 2 is the second page of the Instrument configuration pages.

Version Number

Gives the software level of the instrument.
n.nn is the software version no.
A is L if serial data link software is supplied
or N if not.
B is E, F or G according to language (English, French, German respectively).

Scale Divisions

A number between 1 and 10 which represents the number of major scale divisions in addition to zero that will be printed on the chart. 1 will give 0 and 100%, 2 will give 0, 50 and 100% divisions, etc.

Audible Annunciator

If set to "On" the buzzer within the recorder will sound when there is an unacknowledged Channel Alarm.

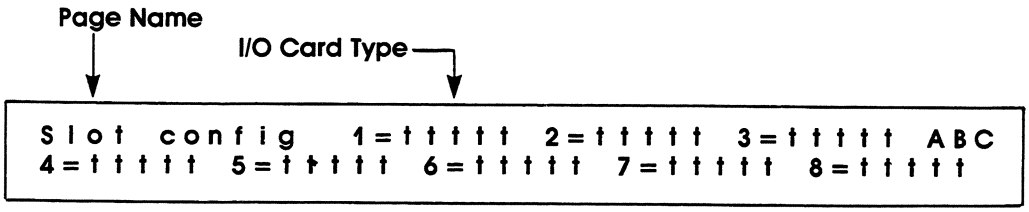
Date Format

Sets the format in which the date will be printed in the recording. The format within the Time and Date page is not affected.
EU = dd:mm:yy
US = mm:dd:yy

Chart Speed Units

Sets the menu of speeds that appear in the Chart Speed display. The range of speeds are:—
in/h = Inches/hour 50, 25, 10, 6, 4, 2, 1, ½, ¼, and Off.
mm/h = Millimetres/hour 1200, 600, 300, 120, 60, 30, 20, 10, 5, and Off.

6.8 SLOT CONFIGURATION PAGE DISPLAY



ENTRY — Follow the Channel selection procedure described in section 6.1 using 0 as the Channel number. Then use the PAGE SCROLL key.

EXIT — Follow the Channel exit procedure described in section 6.2. Or use the PAGE SCROLL key to view the next page of the Instrument Configuration.

OPERATION — The page may be viewed but not altered in Interrogation Mode. When in Programming Mode, position the cursor under the Field to be changed and use the FIELD SCROLL key to view the menu. The menu is the same in all Fields.

DISPLAY

Page Name

Slot Configuration is the third page of the Instrument configuration pages.

I/O Card Type

The entries in these Fields inform the product controller which type of Input or Output modules are fitted in the card cage. The product controller uses this data to determine whether it is receiving the correct response from the I/O modules at power up.
Each module slot should be configured to the module fitted

EMPTY =Ignore this Module. May be used to disable a card, even if fitted. Set if the card position is not occupied.
DCI/P =2 Wire DC Input Module for Thermocouples and DC signals.
RTI/P =Resistance Thermometer Input Module.
EXI/P =All inputs are sent via the Serial Communications Link.
REL 4 =Relay Output Module with 4 output relays.
REL 8 =Relay Output Module with 8 output relays.

NOTE: Additional I/O modules will be released in the future that will have individual mnemonics to match their function. See the addendum section at the rear of this manual.

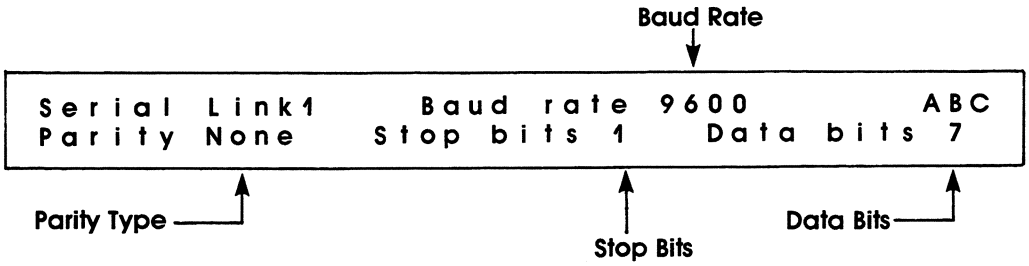
RULES FOR SLOT CONFIGURATION

1) An "Input" may be a 2 Wire DC, or RTD card, or External.
2) There must be an "Input" in Slot 1.
3) Only slots 1—5 may be used for inputs.
4) Channel numbers are assigned automatically as the table:

SLOT NUMBER	CHANNEL NUMBER
1	1 — 6
2	7 — 12
3	13 — 18
4	19 — 24
5	25 — 30

5) Output cards must be positioned in the highest slot number available.
6) Output cards may not be positioned in between "Inputs".

6.9 SERIAL LINK 1 PAGE DISPLAY



ENTRY — Follow the Channel selection procedure described in section 6.1, using 0 as the Channel number. Then use the PAGE SCROLL key.

N O T E : — If Serial Communications software is not included in the recorder Operating System this page is not displayed.

EXIT — Follow the Channel exit procedure described in section 6.2. Or use the PAGE SCROLL key to view the next page of the Instrument Configuration.

OPERATION — The page is not displayed in Interrogation Mode.
The Serial Link 1 page is the first of two pages used to set the protocol for the Serial Communications port.
Use the CURSOR keys to position the cursor under the field to be set and use the FIELD SCROLL key to view the menu. The menus are listed in the Display section below.

DISPLAY

Baud Rate

May be set to; 9600, 4800, 2400, 1200, 600, 300, or 110, Baud.

Parity Type

May be set to None, Odd, or Even parity.

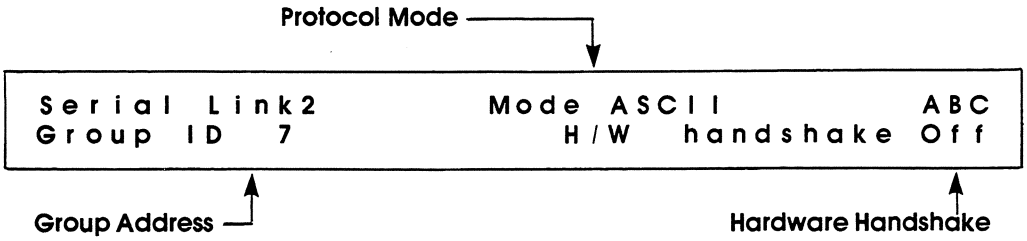
Stop Bits

May be set to 1, or 2 Stop Bits.

Data Bits

May be set to 7, or 8 Data Bits.

6.10 SERIAL LINK 2 PAGE DISPLAY



ENTRY — Follow the Channel selection procedure described in section 6.1, using 0 as the Channel number. Then use the PAGE SCROLL key.

N O T E : — If Serial Communications software is not included in the recorder Operating System this page is not displayed.

EXIT — Follow the Channel exit procedure described in section 6.2 or use the PAGE SCROLL key to view the next page of the Instrument Configuration.

OPERATION — The page may be viewed but not altered in Interrogation Mode.
The Serial Link 2 page is the second of two pages used to enter the protocol for the Serial Communications port.
Use the CURSOR keys to position the cursor under the field to be set and use the FIELD SCROLL key to view the menu. The menus are listed in the Display section below.

DISPLAY

Protocol Mode

May be set to ASCII or ANSI. For full details of the protocol standard, refer to the Serial Communications Instruction manual.

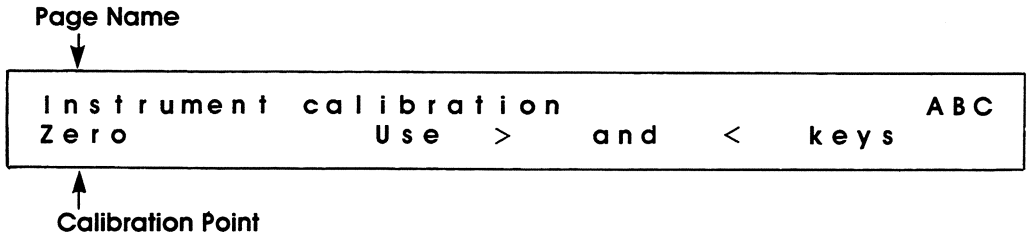
Group Address

A maximum of 8 x 4001 recorders may be present on a single link. The Group Address may be set to; 0, 1, 2, 3, 4, 5, 6, or 7.

Hardware Handshake

May be set to "On" or "Off". "On" enables the 4001 Hardware Handshake.

6.11 INSTRUMENT CALIBRATION PAGE DISPLAY



ENTRY

Follow the Channel selection procedure described in section 6.1, using 0 as the Channel number. Then use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Instrument Configuration.

OPERATION

The instrument Calibration page is used to align the printer to the zero and span lines on the chart paper.
The page is not displayed in Interrogation Mode.
When in Programming Mode, use the FIELD SCROLL key to select "Zero" for the left edge, and "Span" for the right edge of the paper.
The printer must be switched "Off-Line". (See section 3.4.1). DO NOT use the rapid chart advance, or review keys after switching the printer off-line. If the chart is moving whilst the calibration facility is selected an error occurs and it is necessary to switch the recorder Off and then On in order to recover.
Operation of one of the CURSOR keys will cause the chart to advance, and a line of dots to be produced, allowing the precise point of printing to be seen. The cursor keys are used to move the servo system left or right to bring this line into coincidence with the chart grid.
During the printing of dots the servo system will move backwards and forwards to advance the ink ribbon.
Paper advance is stopped, when calibration is complete, by operation of the FIELD SCROLL key, to scroll to the other parameter.

DISPLAY

Page Name

Instrument Calibration is the fourth page of the Instrument configuration pages.

Calibration Point

Zero = The extreme left hand chart grid line.
Span = The extreme right hand chart grid line.

6.12 NEW LOGIN NUMBER PAGE DISPLAY

Page Name

```
Login Number  Enter new Login No.        ABC
One – six digits followed by ENTER
```

ENTRY

Follow the Channel selection procedure described in section 6.1 using 0 as the Channel number. Then use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Instrument Configuration

OPERATION

The page will not be displayed in Interrogation Mode.
The New Login number page is the first of two pages used to enter a new login number, which will over-write the existing number.
Follow the display prompt and use the NUMERIC keys to enter a number of up to six digits to be used as the number. The number is not shown on the display. Press the ENTER key, and the display will change to:—

```
Login Number  Re-enter new Login No.  ABC
One – six digits followed by ENTER
```

Use the NUMERIC keys to enter the same digits as before, and then press ENTER. If the two numerical strings are identical, the new login number will be accepted, and the old number will be over written. If accepted, the message below will be displayed for 2 seconds, or until a further key is operated.

```
Login Number                            ABC
Change has been accepted
```

NOTE:

The "+/–", and "." keys may not be used in the login number.
When the recorder is delivered from the factory the login number is set to 123456.

DISPLAY

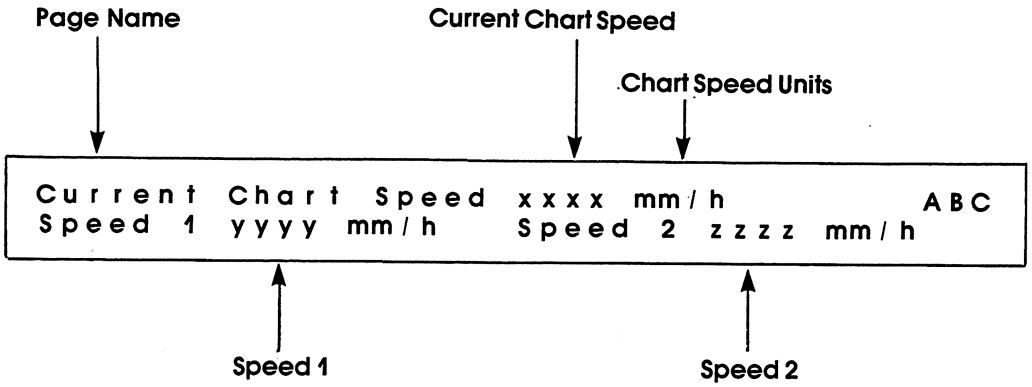
Page Name

The New login number is the fifth page of the Instrument configuration pages.

NOTE:

It is recommended that a note of the new number is placed on file. Alternatively a configuration listing should be taken before returning to the Interrogation mode.
It is not possible to determine the number other than via the Configuration Listing which can only be obtained when in Programming mode.

6.13 CHART SPEED PAGE DISPLAY



ENTRY

By pressing the CHART SPEED key when Print Format Modes 1 or 2 have been selected or using the PAGE SCROLL key when viewing the LOG INTERVALS display.

EXIT

By pressing the CHART SPEED key which will return the display to the Background Display. By using the PAGE SCROLL key to view the Log Intervals display, or by selecting any other display.

OPERATION

When in Interrogation Mode use the FIELD SCROLL key to toggle between the two available speeds.
When in Programming Mode the cursor is positioned using the CURSOR keys. To change the Current Chart Speed, position the cursor under the Current Chart Speed field and use the FIELD SCROLL key to toggle between the two speeds.
To change the speeds shown in Speeds 1 and 2, position the cursor under the Speed to be changed and use the FIELD SCROLL key to view the menu of speeds. Having changed the speeds press the ENTER key to confirm the changes.

DISPLAY

Page Name

The function of the display. Chart speed is displayed first when Print Format Modes 1 or 2 have been selected in the Instrument 1 page.

Current Chart Speed

The speed at which the paper is driven. The Current Chart Speed is printed in the right margin of the chart and in the Header Line. Any change in speed is annunciated, together with the time of change, in the left margin of the chart.

Chart Speed Units

There are two chart speed menus resident within the recorder. Millimeters per hour and Inches per hour. The Chart Speed Units are set by the selection of the units in the Instrument 2 page.

Speed 1

Speed 1 is the default or "normal" speed.

Speed 2

Speed 2 is a speed that is set if the recorder is configured to change speed on alarm, or an external chart speed change is initiated. Speed 2 may be selected manually in this page.

NOTE: The speeds set in Speed 1 or 2 may be the same, or 1 be lower or higher than 2, without restriction.

MENU: mm/h — 1200, 600, 300, 120, 60, 30, 20, 10, 5 and OFF
in/h — 50, 25, 10, 6, 4, 2, 1, ½, ¼, and OFF

NOTE: When the Chart Speed is set to OFF, no traces or annotation will be printed.

The following Table shows the relationship between Chart Speed, Data Print Rate, Annotation Page Size and the Time for a page to be printed.

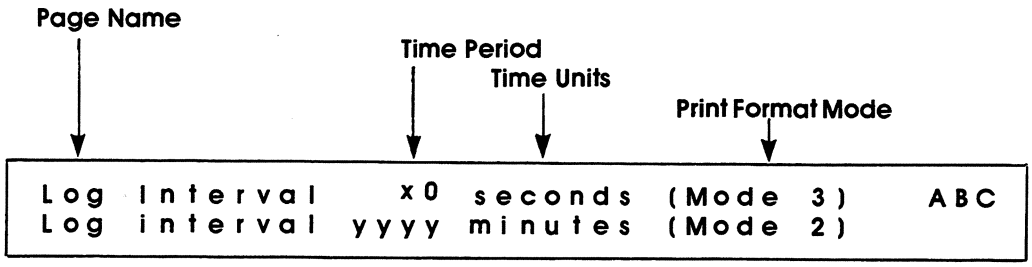
METRIC

SPEED		DATA PRINT	NEEDLES	PAGE	TIME/	PRINT CYCLE
mm/h	Time/cm	RATE	USED	SIZE cm	PAGE	TIME
1200	30 sec	1 sec	9	10	5 min	9 sec
600	1 min	2 sec	9	10	10 min	18 sec
300	2 min	4 sec	6	10	20 min	24 sec
120	5 min	10 sec	3	12	1 h	30 sec
60	10 min	20 sec	2	12	2 h	40 sec
30	20 min	40 sec	1	12	4 h	40 sec
20	30 min	1 min	1	10	5 h	60 sec
10	1 h	2 min	1	10	10 h	2 min
5	2 h	4 min	1	10	20 h	4 min
OFF	—	—	—	—	—	—

IMPERIAL

SPEED		DATA PRINT	NEEDLES	PAGE	TIME/	PRINT CYCLE
in/h	Time/in	RATE	USED	SIZE in	PAGE	TIME
50	1.2 min	1 sec	9	5	6 min	9 sec
25	2.4 min	2 sec	9	5	12 min	18 sec
10	6 min	5 sec	5	5	30 min	25 sec
6	10 min	9 sec	3	6	1 h	27 sec
4	15 min	12 sec	2	4	1 h	36 sec
2	30 min	24 sec	1	4	2 h	48 sec
1	1 h	48 sec	1	5	5 h	48 sec
½	2 h	96 sec	1	5	10 h	96 sec
¼	4 h	192 sec	1	5	20 h	192 sec
OFF	—	—	—	—	—	—

6.14 LOG INTERVALS PAGE DISPLAY



ENTRY

By pressing the CHART SPEED key when Print Format Mode 3 has been selected or using the PAGE SCROLL key when viewing the CHART SPEED display.

EXIT

By pressing the CHART SPEED key which will return the display to the Background Display. By pressing the PAGE SCROLL key to view the Chart Speed display, or by selecting any other display.

OPERATION

The display may be viewed but not altered in Interrogation Mode. When in Programming Mode, use the CURSOR keys to position the cursor under the field to be changed.
To set the Mode 3 Log Interval, position the cursor under the Time Units field, and use the FIELD SCROLL key to set "Minutes" or "Seconds". Move the cursor to the Time Period field and use the NUMERIC keys to enter the Log Interval.
To set the Mode 2 Log Interval, position the cursor under the Time Period field and use the NUMERIC keys to enter the time in minutes.

NOTE:

The Mode 2 Log Interval may only be set in Minutes.
Setting 0 Minutes or seconds for Modes 2 or 3 switches the Timed Log off. After setting, use the ENTER key to confirm the change.

DISPLAY

Page Name

The Log Intervals are displayed first when Print Format Mode 3 has been selected in the Instrument 1 page.

Time Period

The period in minutes or seconds between Timed Logs. The first Log will commence from the whole minute after the Logging function is set. Mode 3 Log Intervals may be set in tens of seconds, minimum 10 seconds, and minutes. Mode 2 Log Intervals may only be set in minutes. The maximum period in either Mode is 9999 minutes.
Setting 0 minutes in either Mode switches off the Timed Log function in that Mode.

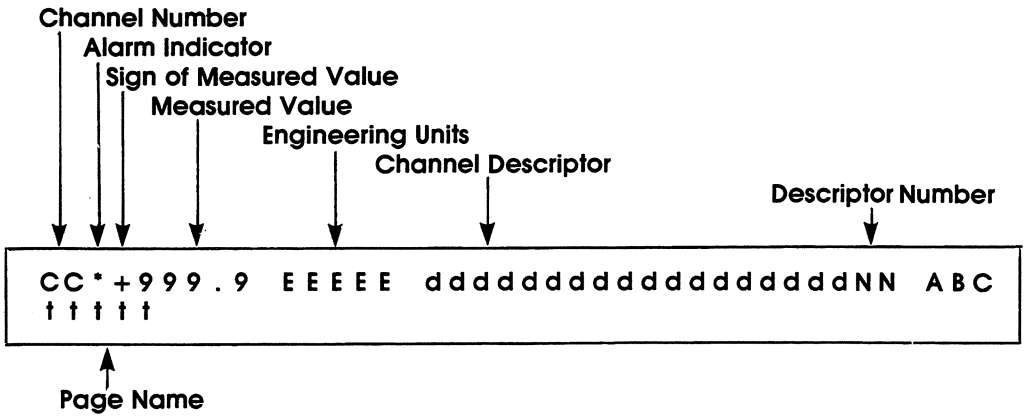
Time Units

May be set to minutes or seconds for Mode 3. The Mode 2 Time Units field is fixed as minutes.

Print Format Mode

For a full specification of the three Print Format Modes see section 7.

6.15 CHANNEL PAGES GENERAL



ENTRY — Follow the Channel selection procedure described in section 6.1, using the required Channel number.

EXIT — Follow the Channel exit procedure described in section 6.2.

OPERATION — The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1.
When in Programming Mode each Channel may be configured separately or the configuration of any Channel may be copied to any other Channel. All fields within a page are accessed using the CURSOR keys.

NOTE: — All Channel pages requiring configuration should be set before pressing the ENTER key to confirm the settings.

EXAMPLE: — To copy Channel 1 configuration to Channel 6. Access Channel 1 using the Channel selection procedure described in section 6.1. Use the CURSOR keys to position the cursor under the Channel Number. Use the FIELD SCROLL key to increment the Channel Number to 6, and then press the ENTER key.

DISPLAY — There are six pages associated with each Measuring Channel. The format of the top line of the page remains the same but may only be altered when viewing the Channel Scale page.

Channel Number

In the range 1 — 30 is the number of the Input Measuring Channel.

Alarm Indicator

A bell symbol. If flashing, an alarm associated with the channel has been active, and has not been acknowledged.
If steady, an alarm is active and has been acknowledged.

Sign of Measured Value

Blank : The reading is positive.
"–" : The reading is negative.

Measured Value

The measured value of the Channel is displayed as a scaled value in engineering units. The reading is shown to 4 digit resolution, with a floating decimal point. Alternative displays are:—

??????	— Invalid reading
>Range	— Measured Value is over range.
<Range	— Measured Value is under range.
Off	— The Channel is switched Off.

NOTE: 1) After an new configuration has been entered, the Measured Value display will show an Invalid reading, (??????), during the period that the Input Card is being re-ranged.

NOTE: 2) The overrange and underrange indication is displayed when the measured value is either 10% greater or less than the Zero and Span points set in the Channel Scale Page.

Engineering Units

A five character descriptor of the engineering units of the Channel. The Engineering Units are set in the Channel Scale page.

Channel Descriptor

A character string of up to 18 characters used to describe the function of the Channel. Up to eight Channel Descriptors have been customised during manufacture and are selected using the FIELD SCROLL key. One of the Channel Descriptors is normally reserved as a blank string, which avoids having to assign an inappropriate Descriptor to a Channel.

Descriptor Number

A two digit number may be added to the end of the Channel Descriptor to increase the flexibility of the Descriptor. Use the NUMERIC keys to enter a single or two digit number. If a mistake is made, continue to enter the digits until the display overflows. If a number is not required use the "." key twice to enter two blanks.

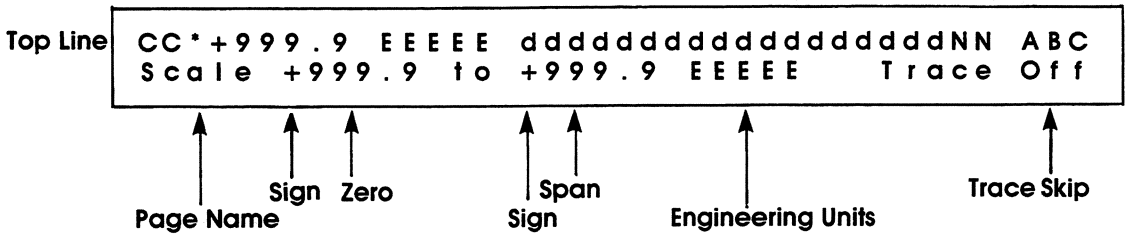
Page Name

Is the title or function of the page. The six different pages are described in detail in the following sections. The pages appear in a fixed sequence. To move to the next page use the PAGE SCROLL key. The sequence is:—

Scale
Input
Function
Print Format 1
Print Format 2
Adjustment

The display will return to the Scale Page if the PAGE SCROLL key is used after viewing the Adjustment Page.

6.16 CHANNEL SCALE PAGE DISPLAY



ENTRY

Follow the Channel selection procedure described in section 6.1, using the required Channel number.

EXIT

Follow the Channel exit procedure describe in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Channel's configuration.

OPERATION

The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1. To view the next page use the PAGE SCROLL key.
When in Programming Mode use the CURSOR keys to position the cursor under the Field to be altered. The instructions for setting individual Fields are described in the DISPLAY section below.

DISPLAY

Top Line

The Top Line of the display is the same in all Channel configuration pages, but may be altered only in the Channel Scale page. A full description is given in section 6.15.

Page Name

The Scale Page is the first of six pages holding a Channel's configuration. The Scale page contains configuration relevant to the presentation of the Input signal on the display and on the chart.

Sign

The sign of the Zero and Span points on the scale. Use the "+/−" key to set the sign when the cursor is positioned under the Zero or Span Fields. "−"= negative. Blank = positive.

Zero

The value to be used for the scale, corresponding to the Low Value of the Input Signal. Use the NUMERIC and "." keys to enter up to four digits and a decimal point. With whole numbers the decimal point will appear in the display to give the maximum resolution to the reading.

Span

The value to be used for the scale corresponding to the High Value of the Input Signal. Use the NUMERIC and "." keys to enter up to four digits and decimal point. With whole numbers the decimal point will appear in the display to give the maximum resolution to the reading.

Engineering Units

A five character string used to display the engineering units of the Channel. Up to twelve character strings have been customised at the time of manufacture. Use the FIELD SCROLL key to view the menu. The Engineering Units set in this position are echoed in the Top Line of the display.

Trace Skip

May be set to "On" or "Off". When "On" the Channel will produce a trace in Print Format Modes 1 and 2. When "Off" the Channel will not be recorded in Print Format Modes 1 or 2 unless the Trace Skip is overridden by an alarm. See section 6.26 on Alarm Jobs.
The Channel will always be Logged in Mode 3 and when a Log is requested in Mode 2.

6.17 CHANNEL INPUT PAGE DISPLAY

ee = mV, or V

Top Line

```
CC*+999.9 EEEEE ddddddddddddddddddNN ABC
I/P +999.9 to 999.9 ee
```

Page Name, Sign, Low Value, Sign, High Value, Signal Units

ee = mA

```
CC*+999.9 EEEEE ddddddddddddddddddNN ABC
I/P +999.9 to +999.9 ee Shunt xxx Ω
```

Shunt Resistor Value

ee = Deg. F, C, K, or R

```
CC*+999.9 EEEEE ddddddddddddddddddNN ABC
I/P +999.9 to +999.9 ee CJC Ext. 999 ee
```

Cold Junction, CJ Temperature, Temperature Units

ENTRY

Follow the Channel selection procedure described in section 6.1, using the required Channel number.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Channel's configuration.

OPERATION

The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1. To view the next page use the page PAGE SCROLL key.
When in Programming Mode use the CURSOR keys to position the cursor under the Field to be altered. The instructions for setting individual Fields are described in the DISPLAY section below.

DISPLAY

Top Line

The Top Line of the display is the same in all Channel configuration pages. A full description is given in section 6.15.

Page Name

The Input (I/P) Page is the second of six pages holding a Channel's configuration. The Input page contains configuration relevant to the range and units of the Input signal. The number of fields, and the configuration information required, will depend upon the units set in the Signal Units field.

Sign

The sign of the Low and High Value points of the Input Signal. Use the "+/−" key to set the sign when the cursor is positioned under the Low Value or High Value Fields.
"−" = negative.
Blank = positive

Low Value

The minimum value of the Input Signal to be measured and recorded. For Thermocouples and Resistance Thermometers, this point may be expressed as a temperature in degrees F, C, K or Rankin. For all other signals use the Electrical Signal quantity. Use the NUMERIC and "." keys to enter up to four digits and any decimal point. Leading zeros are not required.

High Value

The maximum value of the Input Signal to be measured and recorded. For Thermocouples and Resistance Thermometers, this point may be expressed as a temperature in degrees F, C, K or Rankin. For all other signals use the Electrical Signal quantity. Use the NUMERIC and "." keys to enter up to four digits and any decimal point. Leading zeros are not required.

Signal Units

May be set to mA, mV, V, Deg. F, C, K or Rankin. The Signal Units determine the additional items of Configuration that are required.

ee = milliamps

Shunt Resistor Value

If a current signal is to be measured, a Shunt Resistor must be mounted in the Signal Interface Module to provide a Voltage input signal to the measuring circuit. See section 4.2 for mounting details. Use the NUMERIC keys to enter the value of the Shunt Resistor fitted, in ohms. Minimum value = 1 ohm. Maximum value 999 ohms.

NOTE: The standard shunt resistors supplied are 100 ohms.
The maximum recommended power dissipation within the Signal Interface Module, is 600 mW.

ee = Deg. F, C, K or Rankin

Cold Junction

The Cold Junction type may be set to:—

Off = No Cold Junction Compensation applied. For use with Resistance Thermometers, or where an external ice point reference is to be used.

Int. = Internal. The Cold Junction Temperature is sensed at the terminal block and automatic correction for ambient temperature variations is performed.

Ext. = External. Use where the Cold Junction Temperature is maintained at a known temperature at a point remote from the recorder. When Ext. is selected the Cold Junction Temperature field will appear on the display.

Use the FIELD SCROLL key to view the above menu.

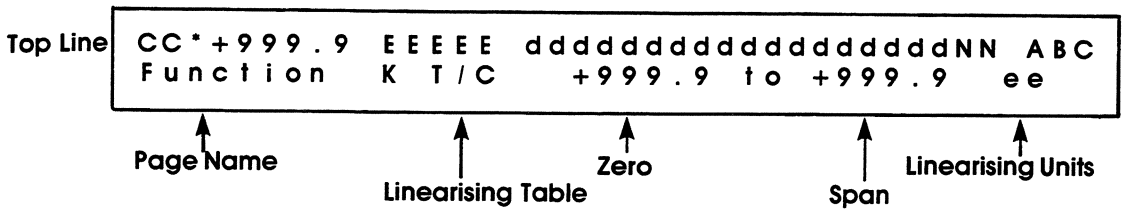
Cold Junction Temperature

This field only appears when External Cold Junction is set in the Cold Junction field. Use the NUMERIC keys to enter the temperature of the External C J. Only positive integer values within the relevant linearisation range may be set, to a maximum of 999 Degrees.

Temperature Units

The units in which the External Cold Junction Temperature is expressed. This field can not be altered and is automatically set to the same units as the Signal Units.

6.18 CHANNEL FUNCTION PAGE



ENTRY

Follow the Ghannel selection procedure described in section 6.1, using the required Channel number, and use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Channel's configuration.

OPERATION

The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1. To view the next page use the PAGE SCROLL key.
When in Programming Mode use the CURSOR keys to position the cursor under the Field to be altered. The instructions for setting individual Fields are described in the DISPLAY section below.

DISPLAY

Top Line

The Top Line of the display is the same in all Channel configuration pages. A full description is given in section 6.15.

Page Name

The Function Page is the third of six pages holding a Channel's configuration. The Function page holds configuration relevant to the type of linearisation applied to the measurement, if any, and the range over which it is linearised.

Linearising Table

The Linearising Table to be applied to the measurement. Use the FIELD SCROLL key to view the menu set out below. In addition to the standard Tables listed, up to three more tables may have been specified when the recorder was purchased. The mnemonics for the different characteristics are given below.

TYPE B =Type B Thermocouple Pt 6%Rh/Pt 30%Rh
TYPE E =Type E Thermocouple Chromel/Constantan
TYPE J =Type J Thermocouple Iron/Constantan
TYPE K =Type K Thermocouple Chromel/Alumel
TYPE R =Type R Thermocouple Pt/Pt 13%Rh
TYPE S =Type S Thermocouple Pt/Pt 10%Rh
TYPE T =Type T Thermocouple Copper/Constantan
PT100 =Platinum Resistance Thermometer 100 ohms @ 0 Deg. C
138.5 ohms @ 100 Deg. C

Note 1 Sq Root =Square Root Extraction
Note 2 Log =Logarithmic (Single Decade)
Linear =No linearisation applied
Note 3 Ext. =Channel is transmitted from a Host Computer
Off =Channel is ignored by the Product Controller
Note 5 Pt100 Tx = For use with resistance thermometer transmitters.

The choice of Signal Units in the Channel Input page, and the Linearising Table selected, will determine whether the non-linear thermocouple signal is directly connected or is super-imposed on a higher level signal. In the latter case the fields to the right of the Linearising Table field will be displayed and require configuring. In all other cases no additional entries are required.

Zero

This field will only be displayed if the linearisation range of the signal is required. See previous section. Use the NUMERIC and '+/−' keys to enter the value of the start point on the linearising characteristic corresponding to the input signal zero set in the Channel Input page. See example below.

Span

This field will be displayed only if the linearisation range of the signal is required. Use the NUMERIC and '+/−' keys to enter the value of the finishing point on the linearising characteristic corresponding to the input signal span in the Channel Input page. See example below.

Linearising Units

This field will only be displayed if the linearisation range of the signal is required. If a temperature transducer type has been set in the Linearising Table field, then use the FIELD SCROLL key to view the temperature units available. For all cases other than temperature transducers the linearising units will be fixed and can not be altered.

NOTE 1 & 2

When using Square Root extraction or Logarithmic functions the input signal Low and High Value points entered in the Input page, must correspond exactly with the output of the transducer when fed with the zero and full scale inputs for which the transducer has been calibrated.
The recorder will apply the complete linearising function, over the input range entered in the Input page. Failure to observe this precaution will lead to totally inaccurate readings.

NOTE 3

External channels have their Measured Values transmitted to the recorder via the Serial Communications link. See the supplementary manual, Part No. HA 237231.

NOTE 4

The mnemonic displayed for a user specified table will vary. If no user specified tables are included the menu will include EMPTY 1, EMPTY 2, EMPTY 3.

NOTE 5

When using the Pt100 table with voltage or current input signals, the Cold Junction field in the Channel Input Page (section 6.17) must be set to OFF. Any other setting will result in the 'INVALID CHANNEL PARAMETER' message being displayed.

Useable Linearisation Ranges

The following ranges are the maximum useable linearisation ranges for the temperature transducer types listed. If these ranges are exceeded the recorder will display an invalid reading (??????) as the measured value.

Transducer Type	Valid range (degs C)	
	Version 4.6	Post-version 4.6
Type B	−32 to 1821	−9 to 1821
Type E	−261 to 1002	−225 to 1002
Type J	−210 to 1202	−210 to 1002
Type K	−262 to 1370	−223 to 1370
Type R	−49 to 1770	−70 to 1771
Type S	−50 to 1770	−50 to 1770
Type T	−264 to 401	−264 to 401
Pt. 100	−199 to 997	−205 to 1004

USEABLE LINEARISATION RANGES

EXAMPLE 1

It is required to display and record an input signal of 4 — 20 mA which is derived from a thermocouple transmitter, range 0 — 1000°C, using a Type K Thermocouple.

```
CC*+999.9 °C      ddddddddddddddddddNN ABC
Scale        0 to    1000 C          Trace On
```

```
CC*+999.9  C      ddddddddddddddddddNN ABC
I/P          4 to          20 mA Shunt 100 Ω
```

```
CC*+999.9  C      ddddddddddddddddddNN ABC
Function   K T/C          0    to   1000    C
```

EXAMPLE 2

It is required to display and record an input signal of 1000 to 1500°C from a directly connected Type R thermocouple.

```
CC*+999.9  C      ddddddddddddddddddNN ABC
Scale     1000 to    1500   C       Trace On
```

```
CC*+999.9  C      ddddddddddddddddddNN ABC
I/P     1000 to   1500   C   CJC Int
```

```
CC*+999.9  C      ddddddddddddddddddNN ABC
Function   R T/C
```

EXAMPLE 3

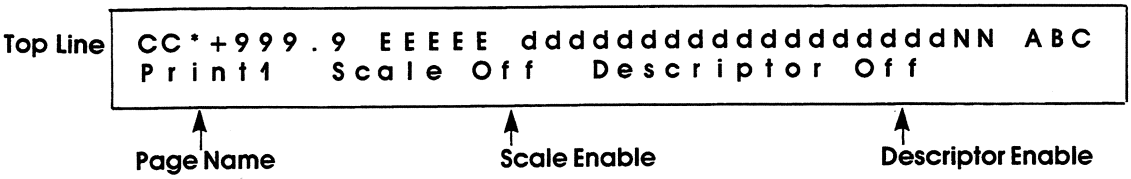
It is required to display and record, as a linear flow signal, the output of 0 — 20 mA from a differential pressure transducer, connected across an orifice plate, range 0 — 8000 Lt/h.

```
CC*+999.9  C      ddddddddddddddddddNN ABC
Scale        0 to    8000   Lt/h   Trace On
```

```
CC*+999.9  C      ddddddddddddddddddNN ABC
I/P          0 to     20   mA     Shunt 100 Ω
```

```
CC*+999.9  C      ddddddddddddddddddNN ABC
Function   Sq.Rt.
```

6.19 PRINT 1 PAGE



ENTRY

Follow the Channel selection procedure described in section 6.1, using the required Channel number, and use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Channel's configuration.

OPERATION

The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1. To view the next page use the PAGE SCROLL key.
When in Programming Mode use the CURSOR keys to position the cursor under the Field to be altered. The instructions for setting individual Fields are described in the DISPLAY section below.

DISPLAY

Top Line

The Top Line of the display is the same in all Channel configuration pages. A full description is given in section 6.15.

Page Name

The Print 1 page is the fourth of six pages holding a Channel's configuration. The Print 1 page enables the user to determine whether a Channel's Scale or Descriptor are printed on the chart in Print Format Modes 1 or 2.

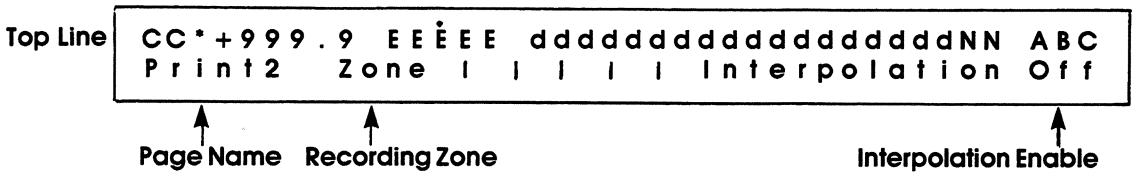
Scale Enable

When set to "On" the Scale of the Channel will be printed on the chart. The Scale will be calculated from the configuration entered in the Channel Scale page. See section 6.16. The number of major divisions will be calculated according to the number set in the Scale Divisions field in the Instrument 2 page. See section 6.7. If the Channel is zoned over less than the full chart width, the Scale will be printed with the zero and span points only. See section 6.20 on zoning.
Use the FIELD SCROLL key to toggle the field "On" or "Off".

Descriptor Enable

When set to "On" the Channel Descriptor will be printed on the chart in complement to the scale. The Channel Descriptor comprises the Descriptor set in section 6.15 and the Descriptor Number.
Use the FIELD SCROLL key to toggle the field "On" or "Off".

6.20 PRINT 2 PAGE DISPLAY



ENTRY

Follow the Channel selection procedure described in section 6.1, using the required Channel number, and use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to return to the Scale page of the Channel's configuration.

OPERATION

The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1. To view the next page use the PAGE SCROLL key.
When in Programming Mode use the CURSOR keys to position the cursor under the Field to be altered. The instructions for setting individual Fields are described in the DISPLAY section below.

DISPLAY

Top Line

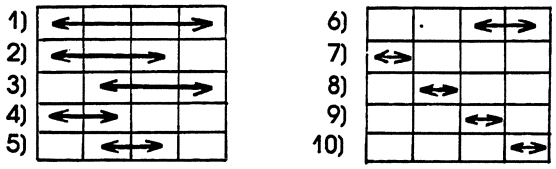
The Top Line of the display is the same in all Channel configuration pages. A full description is given in section 6.15.

Page Name

The Print 2 page is the fifth of six pages holding a Channel's configuration. The Print 2 page enables the user to place the recorded trace in one of 10 zones and set the Interpolation facility.

Recording Zone

A Channel may be set to record over all, or a limited area of the chart. The zones are fixed and appear in the display in the following order.

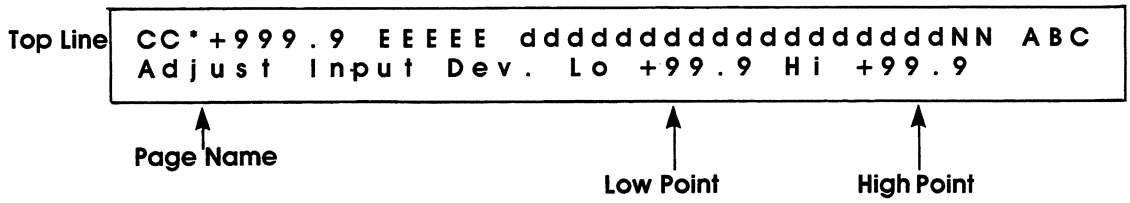


Selecting a zone other than Zone 1, will cause the Scale, if printed, to be printed with the zero and span points only.
Use the FIELD SCROLL key to view the menu.

Interpolation Enable

When set to "On", the recorder will calculate and print additional dots to join readings that would otherwise be separated. Using Interpolation emulates a continuous line recording.
Use the FIELD SCROLL key to toggle the field "On" or "Off".

6.21 CHANNEL ADJUSTMENT PAGE DISPLAY



ENTRY

Follow the Channel selection procedure described in section 6.1, using the required Channel number, and use the PAGE SCROLL key.

EXIT

Follow the Channel exit procedure described in section 6.2.
Or use the PAGE SCROLL key to view the next page of the Channel's configuration.

OPERATION

The Channel Configuration pages may be viewed but not altered in Interrogation Mode. To move to the next Channel use the FIELD SCROLL key. The Channel Number increments from 1 to 30 then returns to 1. To view the next page use the PAGE SCROLL key.
When in Programming Mode use the CURSOR keys to position the cursor under the Field to be altered. The instructions for setting individual Fields are described in the DISPLAY section below.
The facility is included to permit the adjustment of a Channel to compensate for the non-conformity of a temperature transducer to standard millivolt, or resistance tables.
To adjust the Channel proceed as follows, after allowing a minimum of 45 minutes for the recorder to reach operating temperature, and after the transducer has been connected.
Note...Input adjustments may be made to only one channel at a time.

1) Set and ENTER the configuration in the Channel Scale, Input, and Function pages.

2) Expose the transducer to a temperature as close as possible to the Scale Zero temperature, and maintain the transducer at this temperature whilst adjustments are made.

3) Read the value given by the recorder in the display on the Top Line, and determine the deviation from the actual temperature. Enter this in the Low Point field as described below.

4) Repeat the procedure at a temperature as close as possible to the Scale Span temperature, and enter the deviation in the High Point field, as described below.

5) Press the ENTER key. The offsets will then be used to calculate new zero and span values for the Scale. The reading shown in the Top Line will now show the corrected value, and the display will change to.

6) When it is required to return the Channel to standard calibration use the CURSOR keys to place the cursor under the word "Re-standardise", and use the FIELD SCROLL key to switch the adjustments off. The display will then return to display shown at the top of the page. Press ENTER and the Channel will be returned to its internal standard.

DISPLAY

Top Line

The Top Line of the display is the same in all Channel configuration pages. A full description is given in section 6.15.

Page Name

The Adjustment page is the sixth of six pages holding a Channel's configuration. The Adjustment page enables a two point recalibration to be performed on the Channel scaling. The adjustment is peformed by introducing two offsets in the scaling of the Channel. This requires that the facility be used with consideration, as it is possible to introduce significant linearising errors, if a major recalibration is attempted.
Adjustments should be limited to +/− 5% of span to minimise these effects.

Low Point

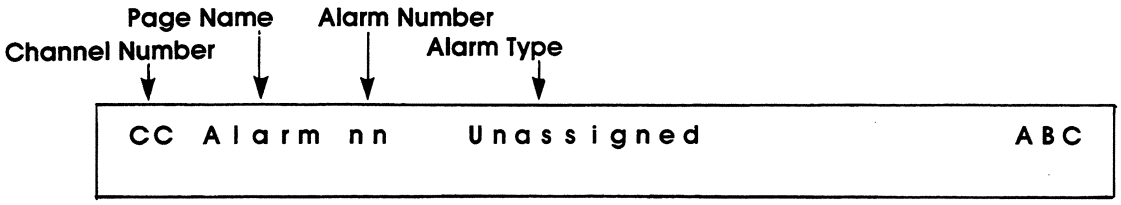
Use the NUMERIC "+/−" keys to enter the deviation obtained by the procedure described in the OPERATION section.
If the reading is above the known value enter as a negative deviation. If below, enter as a positive deviation.

High Point

Use the NUMERIC and "+/−" keys to enter the deviation obtained by the procedure described in the OPERATION section.
If the reading is above the known value enter as a negative deviation. If below, enter as a positive deviation.

6.22 CHANNEL ALARMS GENERAL

4001 recorders incorporate as, standard, a pool of sixty alarm thresholds that may be freely assigned among the measuring Channels. Each alarm is configurable for the type of sensing and the jobs that it performs when it becomes active.
Alarms are associated with a Channel after the Channel has been configured. If the recorder is being configured for the first time follow the procedure described in this section.



ENTRY

Start by selecting one of the Channel configuration pages, then press the ALARM SEARCH key.

EXIT

1) By configuring the alarm type.
2) By pressing the ALARM SEARCH key to return to the Channel Scale page.
3) By selecting any other display.

OPERATION

The display only appears in the Programming mode. Use the CURSOR keys to position the cursor under the Alarm Type field and use the FIELD SCROLL key to view the different alarm types.
After programming the first alarm, all subsequent alarms on the same Channel, are programmed by using the CURSOR keys to position the cursor under the Alarm Number, and using the FIELD SCROLL key to access the next alarm.
When in the Interrogation mode the display will show the first of any alarms that are programmed for the Channel. Any additional alarms are viewed by positioning the cursor under the Alarm Number and using the FIELD SCROLL key to access the additional alarms. If there are no alarms associated with the Channel the display will show the following message.

DISPLAY

Channel Number

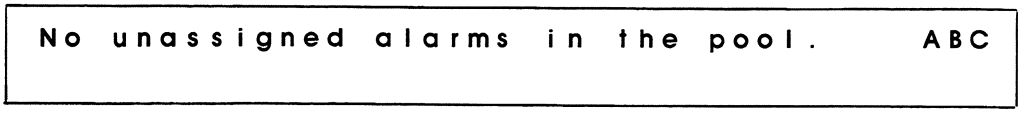
The number of the measuring Channel associated with the alarm. In the range 1 to 30.

Page Name

All the alarm configuration pages use the common Page Name.

Alarm Number

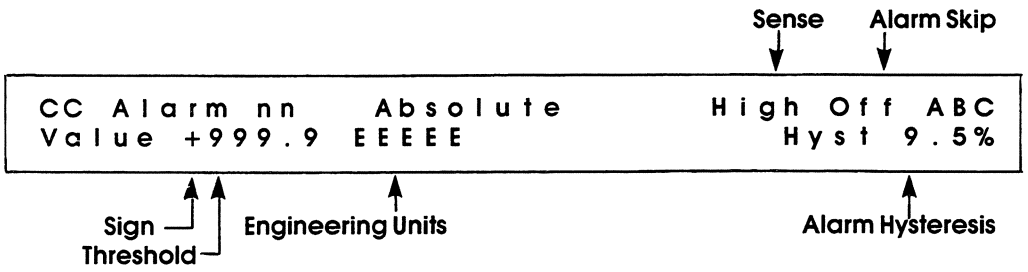
Each Channel may have as many alarms as required up to the maximum of sixty. Sixty being the number of alarms available for the recorder as a whole. When all the alarms in the pool have been used the display will show the following message:—



Alarm Type

The type of alarm sensing to be performed. There are three types of alarm sensing. Absolute, Deviation, and Rate of Change. If the Alarm Type is set to Unassigned, the default setting, the alarm is returned to the pool.
For details of the alarm types, see the following sections.

6.23 CHANNEL ALARM PAGE DISPLAY — ABSOLUTE



ENTRY

Press the ALARM SEARCH key when viewing any of the Channel configuration pages, and scrolling the Alarm Type field.

EXIT

1) By using the ALARM SEARCH key to return to the Channel Scale page.
2) By using the PAGE SCROLL key to view the assoicated Alarm Job display.
3) By selecting any other display.

OPERATION

The Alarm Displays may be viewed but not altered in Interrogation mode.
When in Programming mode use the CURSOR keys to position the cursor under the field to be configured. The instructions for setting individual fields are described in the DISPLAY section below.
Absolute Alarms provide a single Threshold Value, at which the alarm is activated.

DISPLAY

Sense

Use the FIELD SCROLL key to set "High" or "Low".
High= Alarm active when Measured Value is above the Threshold.
Low= Alarm active when Measured Value is below the Threshold.

Alarm Skip

Use the FIELD SCROLL key to set "On" or "Off".
On= Alarm will carry out all configured jobs.
Off= Alarm disabled, but not returned to the pool.

Sign

Use the "+/−" key to set the sign of the Threshold. The Threshold must be within the Scale Range set in the Channel Scale page.

Threshold

Use the NUMERIC and "." keys to enter the Threshold value for the alarm. The Threshold must be within the Scale Range set in the Channel Scale page.

Engineering Units

The Engineering units cannot be set in the Alarm pages. The Units displayed are the same as those set in the Channel Scale page.

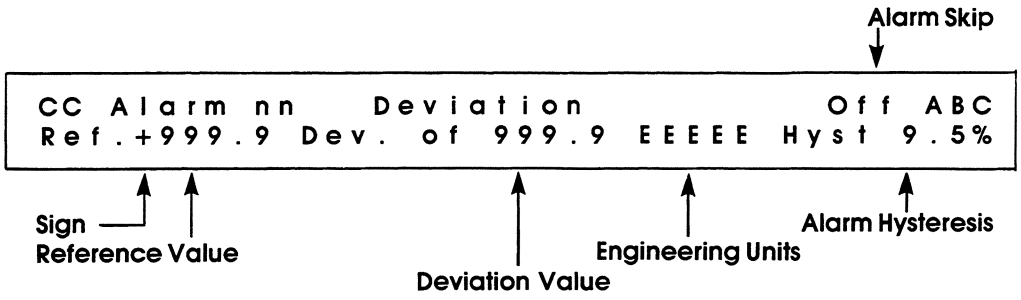
Alarm Hysteresis

Use the FIELD SCROLL key to increment the required amount of hysteresis for the alarm. The field increments in 0.5% steps from 0 to 9.5%. The setting is expressed as a percentage of the span of the Scale Range. When set on a High alarm the alarm becomes active at the Threshold, but does not reset until the Measured Value has fallen to the set percentage below the Threshold. The converse applies to Low alarms.
Hysteresis will prevent false triggering of alarms on Channels measuring noisy process signals.

NOTE 1) The threshold values for alarms are stored as a percentage of the scale range set-up via the Channel Scale Page. Examination of the previously configured alarms may reveal that these values have been rounded to fit the available resolutions.

2) When changing the scale range, any previously configured alarm thresholds for that channel will be re-calculated and displayed as a percentage of the new range.

6.24 ALARM PAGE DISPLAY — DEVIATION



ENTRY

Press the ALARM SEARCH key when viewing any of the Channel configuration pages, and scrolling the Alarm Type field.

EXIT

1) By using the ALARM SEARCH key to return to the Channel Scale page.
2) By using the PAGE SCROLL key to view the associated Alarm Job display.
3) By selecting any other display.

OPERATION

The Alarm Displays may be viewed but not altered in Interrogation mode.
When in Programming mode use the CURSOR keys to position the cursor under the field to be configured. The instructions for setting individual fields are described in the DISPLAY section below.
Deviation Alarms provide two Threshold Values set equally either side of a Reference Value.

DISPLAY

Alarm Skip

Use the FIELD SCROLL key to set "On" or "Off".
On = Alarm will carry out all configured jobs.
Off = Alarm disabled, but not returned to the pool.

Sign

Use the "+/−" key to set the sign of the Reference Value. The Reference Value plus or minus the Deviation Value, must be within the Scale Range set in the Channel Scale page.

Reference Value

Use the NUMERIC and "." keys to enter the Reference Value for the alarm. The Reference Value plus or minus the Deviation Value, must be within the Scale Range set in the Channel Scale Page.

Deviation Value

Use the NUMERIC keys to enter the Deviation about the Reference Value at which the alarms are to be detected.

Engineering Units

The Engineering units cannot be set in the Alarm pages. The Units displayed are the same as those set in the Channel Scale page.

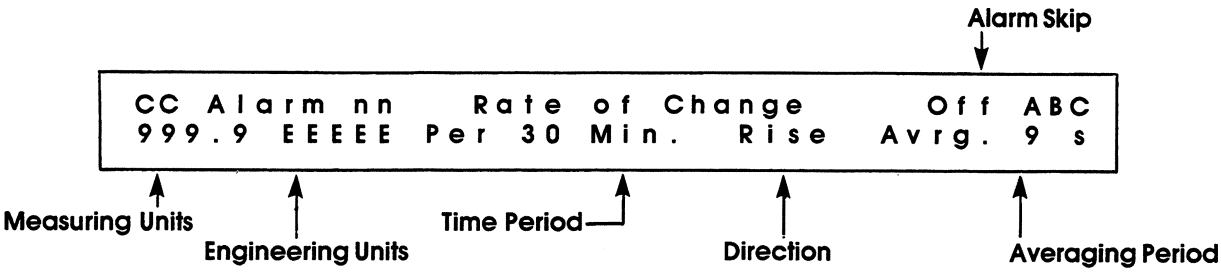
Alarm Hysteresis

Use the FIELD SCROLL key to increment the required amount of hysteresis for the alarm. The field increments in 0.5% steps from 0 to 9.5%. The setting is expressed as a percentage of the span of the Scale Range. When set the alarm becomes active at either of the two values set by the Reference and Deviation Values but does not reset until the Measured Value has returned within the Deviation limits plus or minus the set percentage. Hysteresis will prevent false triggering of alarms on Channels measuring noisy process signals.

NOTE 1) The threshold values for alarms are stored as a percentage of the scale range set-up via the Channel Scale Page. Examination of the previously configured alarms may reveal that these values have been rounded to fit the available resolutions.

2) When changing the scale range, any previously configured alarms for that channel will be re-calculated and displayed as a percentage of the new range.

6.25 CHANNEL ALARM PAGE DISPLAY — RATE OF CHANGE



ENTRY

Press the ALARM SEARCH key when viewing any of the Channel configuration pages, and scrolling the Alarm Type field.

EXIT

1) By using the ALARM SEARCH key to return to the Channel Scale page.
2) By using the PAGE SCROLL key to view the associated Alarm Job display.
3) By selecting any other display.

OPERATION

The Alarm Displays may be viewed but not altered in Interrogation mode.
When in Programming mode use the CURSOR keys to position the cursor under the field to be configured. The instructions for setting the individual fields are described in the DISPLAY section below.
Rate of Change Alarms become active when the change in the Measured Value exceeds a limit expressed in Measuring Units per Time Period. Detection of Rates of Fall and Rates of Rise, may be set. It is not possible to detect both conditions with a single alarm. Alarms are detected by calculating the one second equivalent increment of the Measuring Units and Time Period settings, and activating the alarm when the difference between two successive readings exceeds this increment. To eliminate false triggering, due to noisy signals, an Averaging Period of up to to 9 seconds may be set. The Alarm will still be activated within a second but the Measured Value will have been averaged over the previous N seconds. N being the Averaging Period.

DISPLAY

Alarm Skip

Use the FIELD SCROLL key to set "on" or "Off".
On = Alarm will carry out all configured jobs.
Off = Alarm disabled, but not returned to the pool.

Measuring Units

Use the NUMERIC and "." keys to enter the number of Measuring Units. The number must be less than the difference between the Scale Span, and Scale Zero set in the Channel Scale page.

Engineering Units

The Engineering units can not be set in the Alarm pages. The Units displayed are the same as those set in the Channel Scale page.

Time Period

Use the FIELD SCROLL key to view the menu of Time Periods,

1 Sec. 10 Secs. 30 Secs. 1 Min. 10 Mins. 30 Mins. 1 Hour.

Direction

Use the FIELD SCROLL key to set the Direction to Rise or Fall.
When set to "Rise", the recorder will alarm when successive readings of the Measured Value exceed previous values.
When set to "Fall", the recorder will alarm when successive readings of the Measured Value are lower than previous values.

Averaging Period

Use the FIELD SCROLL key to set the Averaging Period between 1 and 9 Seconds.

NOTE: 1) An Invalid (??????), Overrange (>Range), or Underrange (<Range) reading of the Measured Value will force the Alarm to be active.

2) At Power-up the Rate of Change Alarms will be active for 1 second, at the end of the Initialising Period, until valid input data is acquired.

3) Due to the fundamental resolution of the recorder there is a limit to the minimum value of change that can be detected in the 1 second scanning period. The result of the equation;

$$\frac{\text{Measuring Units} \times 16{,}384}{\text{Scale Span} - \text{Scale Zero}} \div \text{Time Period (in Seconds)}$$

must be greater than or equal to 1.

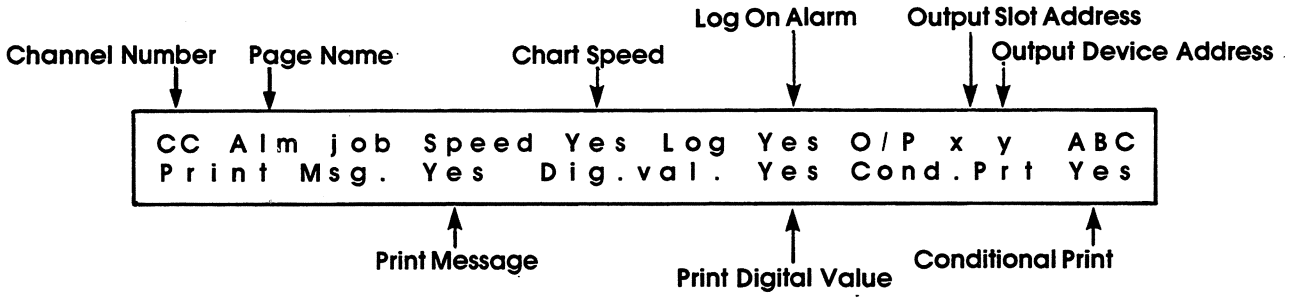
4) The maximum rate of change that can be detected is a function of the settings in the Channel Scale page.

Rate of Change < (Scale Span — Scale Zero)/second.

5) The threshold values for alarms are stored as percentages of the scale range, set up via the Channel Scale Page. Examination of previously configured alarms may reveal that these values have been rounded to fit the available resolution.

6) When changing the scale range, any previously configured alarm thresholds for that channel will be re-calculated and displayed as a percentage of the new range.

6.26 ALARM JOB PAGE DISPLAY



ENTRY

Press the PAGE SCROLL key when viewing any of the Alarm pages.

EXIT

1) By using the PAGE SCROLL key to view the associated Alarm page.
2) By using the ALARM SEARCH key to return to the Channel Scale page.
3) By selecting any other display.

OPERATION

The Alarm Job page may be viewed but not altered in Interrogation mode. When in Programming mode use the CURSOR keys to position the cursor under the field to be configured. The instructions for setting individual fields are described in the DISPLAY section below.

DISPLAY

Page Name

There is an Alarm Job page associated with every alarm which defines the actions that an alarm performs when the Alarm Skip flag, set in the Alarm page, is set "On".

Chart Speed

Use the FIELD SCROLL key to set the field to "Yes" or "No".
When set to "Yes", the recorder will switch to Speed 2 which is set in the Chart Speed page. See section 6.13. If a number of Alarms are set to change Chart Speed, the Chart Speed will only return to Speed 1 after the last Alarm has cleared.
The Chart Speed only relates to Print Format Modes 1 and 2.

Log On Alarm

Use the FIELD SCROLL key to set the field to "Yes" or "No".
When set to "Yes", the recorder will print a Log of all Channels if operating in Mode 3 Printout Format.

Output Slot Address

Use the FIELD SCROLL key to scroll a number between 0 and 8.
The Output Slot Address is the position of the Output Card in the Card Cage, to which the Alarm should be addressed. When set to 0, there will be no output action. The Slot Number set must be occupied by a Relay Output Card, and the correct card type must be set in the Instrument Slot Configuration page. See section 6.8.

Output Device Address

Use the FIELD SCROLL key to scroll a number between 1 and 8.
The Output Device Address is the individual device to be set on the card, specified in the previous field, when the Alarm is activated. Any number of alarms may share a common address. The number set must be valid for the type of Output Card installed.

CARD TYPE	VALID ADDRESS
High Power Relay Card	1 — 4
Medium Power Relay Card	1 — 8

Print Message

Use the FIELD SCROLL key to set the field to "Yes" or "No".
When set to "Yes" the recorder will print a message in the left hand chart margin when the alarm is activated and de-activated.
Messages are only printed in Print Format Modes 2 and 3.

hh:mm:ss ALM ON XX yy	——	On Activation.	XX=Channel Number
hh:mm:ss ALM OFF XX yy	——	On De-activation	yy=Alarm Number

Print Digital Value

Use the FIELD SCROLL key to set the field to "Yes" or "No".
When set to "Yes" the value of the Channel at the time of the alarm occurrence will be appended to the Message set in the previous field.

hh:mm:ss ALM ON XX yy (999.9)

Conditional Print

Use the FIELD SCROLL key to set the field to "Yes" or "No".
When set to "Yes" the alarm will override the Trace Skip, set in the Channel Scale page. The Channel will record on alarm only. If the Trace Skip field is set to "On" the Conditional Print field has no effect.

6.27 SINGLE TRACE SELECTION DISPLAY

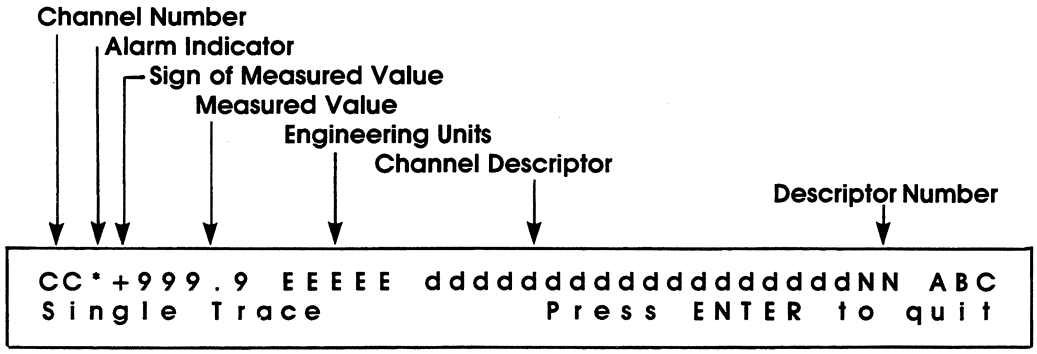
From time to time it may become desirable to follow a single Channel and isolate all other Channels from the recording. The Single Trace facility permits this method of recording. During Single Trace operation all other Channels are monitored by the recorder and the normal Alarm actions will be carried out.

To select a Channel for Single Tracing follow the procedure described in this section.

1) Press the SINGLE TRACE key. The display will show the message:—

```
Input channel no. __ then ENTER        ABC
Single Trace          Press ENTER to quit
```

2) Follow the display prompt and use the NUMERIC keys to enter the single or two digit number of the Channel to be selected for Single Tracing, leading zeros are not required.
3) Press the ENTER key. The Display will show the message:—



4) An inverse "S" character will light in the Instrument Status character "A" position, to indicate that Single Trace Mode has been selected.
5) To return to the Background Display press the SINGLE TRACE key. Alternatively any other display may be selected.
6) To leave the Single Trace mode of recording, reselect the Single Trace display, and follow the display prompt and press the ENTER key. The display will then return to the Background Display and the Single Trace indicator in the Instrument Status field, will go out.

DISPLAY

Channel Number

In the range 1 — 30 is the number of the Channel selected.

Alarm Indicator

A bell symbol. If flashing an alarm associated with the channel has been active, and has not been acknowledged.
If steady, an alarm is active and has been acknowledged.

Sign of Measured Value

Blank — The reading is positive.
"–" — The reading is negative.

Measured Value

The measured value of the Channel is displayed as a scaled value in engineering units. The reading is shown to 4 digit resolution, with a floating decimal point. Alternative displays are:—

??????	—	Invalid reading
>Range	—	Measured Value is over range
<Range	—	Measured Value is under range.
Off	—	The Channel is switched Off, and cannot be Single Traced.

Engineering Units

A five character descriptor of the engineering units of the Channel.

Channel Descriptor

A character string of up to 18 characters used to describe the function of the Channel.

Descriptor Number

A two digit number added to the end of the Channel Descriptor to increase the flexibility of the Descriptor.

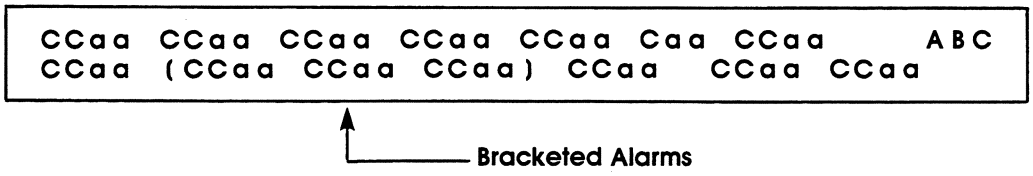
6.28 ACTIVE ALARM SUMMARY PAGE DISPLAY

The Active Alarm Summary page may only be viewed when **NOT** in one of the Channel, Instrument or Alarm displays, and provides both a complete picture of all currently Active Alarms, and the history of their occurrence.

If there are any Channel Alarms active within the recorder, the Channel Alarm Indicator, character "C" in the Instrument Status field, will be illuminated.

To view the Alarm Summary page.

1) Return to the Background Display if viewing one of the Channel Instrument, or Alarm, displays.
2) Press the ALARM SEARCH key. The following is an example of what will be displayed.



3) The display shows all Alarms as: CC = Channel Number. aa = Alarm Number. Bracketed Alarms occurred within a one second time interval and as such can not be differentiated for the sequence of occurrence within that one second time band.
   Steady Alarms have been previously acknowledged. Flashing Alarms have not been acknowledged.
   The earliest occuring Alarm is situated at the left of the top line of the display, and successively occuring alarms appear left to right on the top and then the bottom line of the display.
4) If the page is full of Alarms, press the PAGE SCROLL key to view the next page of Alarms which will have the same format.
5) If there are no more Alarms to be displayed the display will be:—

6) To return to the Background Display press the ALARM SEARCH key.
   Any other display may be selected from the Alarm Summary display.
   NOTE: The Display is not updated after selection. It is therefore necessary to return to the Background Display and re-select the display to obtain the current Active Alarm status.
   The display will automatically time out after 30 seconds, if no keys are pressed, and return to the Background Display.
   Alternatively, the DISPLAY HOLD key may be used to allow time for the display to be interpreted. The Display Hold character in the Instrument Status field will light. Press the DISPLAY HOLD key to reinstate automatic time out, or select another display.

6.29 ALARM ACKNOWLEDGEMENT STRATEGY

The comprehensive alarm facilities of the recorder permit its use as a primary alarm detection system. In order to simplify the task of the operator, indication of alarms is provided at the following locations.

Instrument Status Indicator — Active alarm on the recorder

Channel Alarm Indication — Against any indicated channel

Individual Alarm Indication — Against the Active Alarm

Active Alarm Summary — All Active Alarms and their history

Alarm indications appearing in the Instrument Status field and against Channels and individual Alarms will capture fleeting alarms.

Flashing indicators signify an unacknowledged alarm.

Steady indicators signify an acknowledged alarm.

Following acknowledgement, when viewing a valid display, the indication will clear if the alarm is no longer active. The indication will go steady if the alarm remains active.

The Active Alarm Summary only shows currently Active Alarms.

Alarms can only be acknowledged by selecting the correct page, thus requiring the user to investigate the reason for the alarm. The pages and the alarms acknowledged are set out below.

Active Alarm Summary

All alarms are acknowledged. Any alarm indicators that are flashing, will become steady.

Any Channel Page

All alarms associated with that Channel are acknowledged. The relevant Channel alarm indicator will go steady if any active alarm remains. The Instrument Status Indicator will go steady if the Channel acknowledged was the only Channel in alarm.

Individual Alarms

The individual alarm is acknowledged. If there are any other active but unacknowledged alarms on that Channel, the Channel Alarm Indicator will remain flashing. If there are no other alarms active on the Channel the alarm indicator will go steady, if the alarm remains active, if not the indicator will go out.

The Instrument Status indicator will go steady if the alarm acknowledged was the only one active on the recorder.

6.30 ERROR MESSAGES

ERROR	ABC
Message	

ENTRY — Error messages are displayed automatically, whenever an error is made.

EXIT — Error displays remain for two seconds, or until another key is pressed, which ever is the sooner. After time-out, the display will return to the previously selected display.

DISPLAYS — Error messages will be displayed on a number of different occasions. Many of the Error messages are specific to a display, in which case the appropriate section of the manual is indicated in the following description. There are additional Error messages that can occur in any display. The Error messages are described in aphabetical order.

NOTE: — If an Error message is displayed during any configuration procedures, the reason for the error should be found and corrected before proceeding. Configurations which are in error are not written to the recorder's data base. In the case of a Channel's configuration, all items of the configuration must be correct for the new configuration to be accepted.

Channel not active

Whenever Single Trace is selected for a Channel which is either switched Off or when the slot is set to EMPTY. See sections 6.8, and 6.18.

Channel number out of range

Whenever a channel number outside the range 0—30 is used during the Channel Selection procedure. See section 6.1.

Invalid alarm address

Whenever the alarm Output Slot Address in the Alarm Job page Display, is set to a Slot not known by the recorder to be occupied by an Output Card. Also if the Output Device Address is set to an address number too high for the card type fitted. See sections 6.8. and 6.26.
Will also be displayed when an active alarm is addressed to a card slot which is changed, when viewing the Slot Configuration page, to a non alarm card type. See section 6.8.

Invalid alarm parameter

Whenever an alarm threshold is set outside the Channel Scale range. See sections 6.22 — 6.25, and 6.16.

Invalid channel I/P range. Fit attenuator

Whenever the input signal range is set to a value beyond the capability of the input card. i.e.:<-2.048V or >10.24 V.
A 100:1 resistive attenuator must be fitted for input signals outside this range. See section 6.17 and 4.2.

Invalid channel parameter

Whenever any of the following rules for Channel configuation are broken. See sections 6.15 — 6.21.

1) The Scale High Value must be greater than the Scale Zero.
2) The Input High Value must be greater than the Input Low Value.
3) The Shunt Resistor Value must be greater than 0 ohms.
4) The Linearising Range Span must be greater than the Linearising Range Zero.
5) Incorrect Engineering Units for Square Root, Log, Linear Table (should be mV, V or mA).
6) Linearisation limits exceeded
7) External CJ temp outside linearisation range.
8) Empty linearisation table not present.
9) Empty linearisation table limits not calculated yet.

The incorrect configuration is not written to the recorder's data base. All errors must be corrected before the ENTER key is pressed again.

Invalid keystroke

Whenever an invalid keystroke is pressed.
Whenever the NUMERIC keys are used for a field requiring the use of the FIELD SCROLL key.
Whenever the FIELD SCROLL key is used for a field requiring the use of the NUMERIC keys.
Check the valid keys in the appropriate section of the manual.

Invalid Login number

Whenever an incorrect Login number is used to obtain access to Programming Mode. See section 5.5.

Invalid slot configuration

Whenever the Rules for Slot Configuration are broken. See section 6.8.

No instrument cal. during config. dump.

Whenever it is attempted to carry out an instrument calibration when a configuration listing is being printed. Both are procedures requiring the printer to be off-line and the Programming mode to be selected. See sections 6.11 and 6.32.

No PRINT DATA in mode 1.

Whenever the PRINT DATA key is pressed when Print Format Mode 1 is set in the instrument 1 page. The facility for a Manual Log is not included in Print Format Mode 1. See sections 6.6 and 7.1.

No single trace in Mode 3

The Error message appears if it is attempted to select Single Trace operation when the recorder is operating in Mode 3 Print Format Mode, the Logging mode. If Single Trace operation is required, select Modes 1 or 2 in the Instrument 1 page, see section 6.6.

Printer must be on-line to print a Log.

Whenever the PRINT DATA key is pressed with the printer off-line. See section 3.4.4.

Priviledged operation

Whenever it is attempted to change a field, when in Interrogation mode, that can only be changed in Programming mode.

Program mode disabled

Whenever it is attempted to enter the Programming mode when the recorder is being reconfigured via the Serial Link.

6.31 WARNING MESSAGES

ENTRY

Warning messages are displayed automatically, to warn of errors detected by the instrument.
When the error is detected, the printer is switched OFF LINE, and the Warning Message is displayed.

EXIT

To reset, follow the display promt and press the ALARM ACK. key. The display will return to the Background Display.
The printer will require to be switched back ON LINE, to restore normal operation.

DISPLAYS

The Warning messages and the reasons for their occurrence are set out below.

```
Warning Paper missing                    ABC
Press ACKNOWLEDGE to reset
```

Detected when the writing system fails to detect the edge of the chart at a specific position. Replace or realign the chart paper.

```
Warning Cartridge missing                ABC
Press ACKNOWLEDGE to reset
```

Detected when the writing system does not recieve a signal from the reflector mounted on the Ink Ribbon Cartridge. This Warning will be displayed if the Access system has been opened or the Ink Ribbon Cartridge is not fitted.

```
Warning I/P capabilities exceeded        ABC
Press ACKNOWLEDGE to reset
```

Displayed under the following circumstances:
a) Input span less than minimum analogue card span.
b) Input span less than minimum RTD card span.
c) Maximum analogue card input range exceeded.
d) Maximum RTD card input range exceeded.
If the serial data link is in use, a call of 'ST' for the relevant channel will reveal which of these errors is present.

```
Warning Servo System failure             ABC
Press ACKNOWLEDGE to reset
```

Displayed if a failure in the drive system is detected.

For example:—
a) Upper or lower carriage cord or cord-pulley failure.
b) Feedback opto failure.
c) Dirt on feedback strip.
d) Clutch failure.
e) Ribbon cassette jam.

6.32 OBTAINING A CONFIGURATION LISTING

When the recorder has been fully configured, it is recommended that a hard copy of the configuration is produced, to enable future changes to be made, without having to search through the configuration displays.

A full description of the Configuration Listing is given in section 7.4 of this manual

To obtain a Configuration Listing the recorder must be:

a) In the Programming Mode. See section 5.5

b) The Printer must be Off Line. See section 3.2.1.

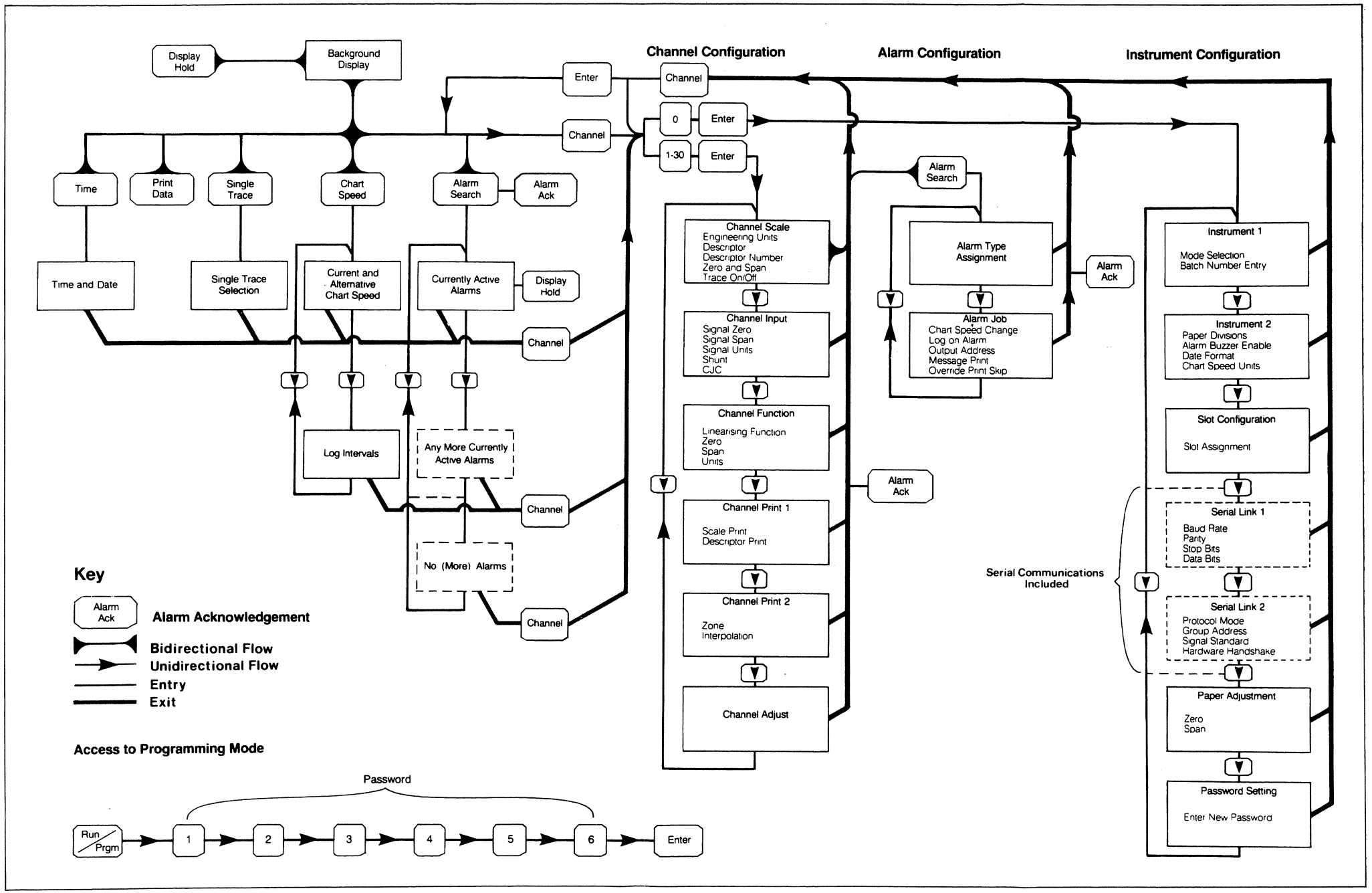
When the above two conditions are satisfied, press the PRINT DATA key. The recorder will then list the complete configuration.

Once initiated the Configuration listing can not be stopped until it is completed other than by switching off the power.

When the recorder has completed the Configuration Listing it may be returned to normal operation

CAUTION Before initiating the Configuration Listing procedure, it is advised that a check is made on the amount of paper left on the supply roll, as a fully configured recorder may require 1.5 metres of paper to complete the listing.

6.33 Access to Configuration Diagram



SPECIFICATION OF PRINT FORMATS

7.1 MODE 1 (TREND) PRINT FORMAT MODE

GENERAL

1) Mode 1 Print Format gives absolute priority to paper length/time synchronisation. The only time that synchronisation is lost is at the start of a new Batch.
2) The PRINT DATA key does not print a Log when Mode 1 and Interrogation Mode is selected.

HEADER LINE

3) There are four versions of the Header Line which differ by the statements they contain:

   POWER ON Printed in GREEN
   PRINTER ON Printed in GREEN
   BATCH START Printed in GREEN
   PRINTER OFF Printed in RED

   The reason for their occurrence is self explanatory.

NOTE: At power up only the "POWER ON" Header Line is printed i.e. The "PRINTER ON" message is suppressed.

4) The time is always printed at the extreme left and in the format hh:mm:ss. Time of occurrence is always printed in BLUE.
5) The date format is user selectable via the Instrument 2 Page display, and will be printed in the format selected. See section 6.7.
6) The "Batch Number" is entered by the user via the Instrument 1 Page display, and may contain, characters "0—9" and ".". See section 6.6.
7) The "Instrument Descriptor" may be up to 24 alpha-numeric characters and is customised at the time of manufacture.
8) When the "PRINTER OFF" Header is printed all messages queued in the text buffer will be printed prior to the Header.

ANNOTATION

9) Annotation will commence at a logical whole number division or multiple of hours following printing of the Header.
10) Annotation will be printed in PURPLE.

11) Scales are formed by dividing the span of measurement by a number between 1 and 9 to calculate the position and value of the major scale divisions. The number is entered via the INSTRUMENT 2 page. See section 6.7.

DIVIDER	CARDINAL POINTS	% INCREMENTS	PAPER DIVISIONS
1	2	100	ANY
2	3	50	ANY
3	4	33.3	90, 120, 150
4	5	25	80, 100
5	6	20	100
6	7	16.7	120, 150
7	8	14.3	140
8	9	12.5	80
9	10	11.1	90
10	11	10	100

12) Scales are printed in BLACK.

13) Annotation is arranged in "Pages". The sequence of items to be printed is:—Time, Date, Speed, and Scale. Page length will depend on paper speed, in line with the table below. After printing the header line, annotation will commence with the next appropriate message (time, chart speed, date or scale) at a position to give a whole number time interval.

METRIC

SPEED		DATA PRINT	NEEDLES	PAGE	TIME/	PRINT CYCLE
mm/h	Time/cm	RATE	USED	SIZE cm	PAGE	TIME
1200	30 sec	1 sec	9	10	5 min	9 sec
600	1 min	2 sec	9	10	10 min	18 sec
300	2 min	4 sec	6	10	20 min	24 sec
120	5 min	10 sec	3	12	1 h	30 sec
60	10 min	20 sec	2	12	2 h	40 sec
30	20 min	30 sec	1	12	4 h	40 sec
20	30 min	1 min	1	10	5 h	60 sec
10	1 h	2 min	1	10	10 h	2 min
5	2 h	4 min	1	10	20 h	4 min
OFF	—	—	—	—	—	—

IMPERIAL

SPEED		DATA PRINT	NEEDLES	PAGE	TIME/	PRINT CYCLE
in/h	Time/in	RATE	USED	SIZE in	PAGE	TIME
50	1.2 min	1 sec	9	5	6 min	9 sec
25	2.4 min	2 sec	9	5	12 min	18 sec
10	6 min	5 sec	5	5	30 min	25 sec
6	10 min	9 sec	3	6	1 h	27 sec
4	15 min	12 sec	2	4	1 h	36 sec
2	30 min	24 sec	1	4	2 h	48 sec
1	1 h	48 sec	1	5	5 h	48 sec
½	2 h	96 sec	1	5	10 h	96 sec
¼	4 h	192 sec	1	5	20 h	192 sec
OFF	—	—	—	—	—	—

14) The minus sign printed after the Time indicates the point on the paper corresponding to the time printed.

15) Zoned traces have the left and right of scale points only printed. The Descriptor will be printed across the full paper width.

16) Engineering units are limited to 5 characters, and are placed to the right of the Channel Descriptor, which in turn is right hand justified.

17) Scale numerals are limited to the sign, and 5 characters. (Digits or the decimal point). Leading zeros are suppressed.

18) Channel Descriptors are limited to a maximum of 18 characters plus 2 digits for the Descriptor Number, from the standard font.

19) Channel assignment is printed at the left end of the Descriptor line, identical channels will be grouped together, with a hyphen.

20) Each channel may be configured to print the Scale, and/or the Channel Descriptor, and Engineering Units. See section 6.19 (Channel Print 1 Page display). Channel association is always printed.

21) Scales and Descriptor lines are printed in BLACK.

22) A maximum of 8 channel descriptors may be specified. It is advised that one of them is left blank to avoid having to assign an inappropiate descriptor to a channel.

CHANGE MESSAGES

23) Messages annunciating chart speed change are printed in the left margin, and are left justified. These messages are formatted:—

"hh:mm:ss xxxx mm/h" or "hh:mm:ss xx in/h"
Speed change messages are printed after manual or Alarm initiated speed changes.
Time of occurrence is printed in BLUE, the message is printed in YELLOW.

24) Following the entry of a Batch Number the message:—
hh:mm:ss Date BATCH START BATCH xxxxxxxx Mode x xxxx mm/h INSTRUMENT IDENTIFICATION
will be printed, and is treated as a Header Line in reformatting the annotation. The time of occurrence is printed in BLUE, the message is printed in GREEN.

25) Following a print mode change the message:—
hh:mm:ss MODE x
Will be printed in the left margin. Time of occurrence is printed in BLUE the message is printed in YELLOW.

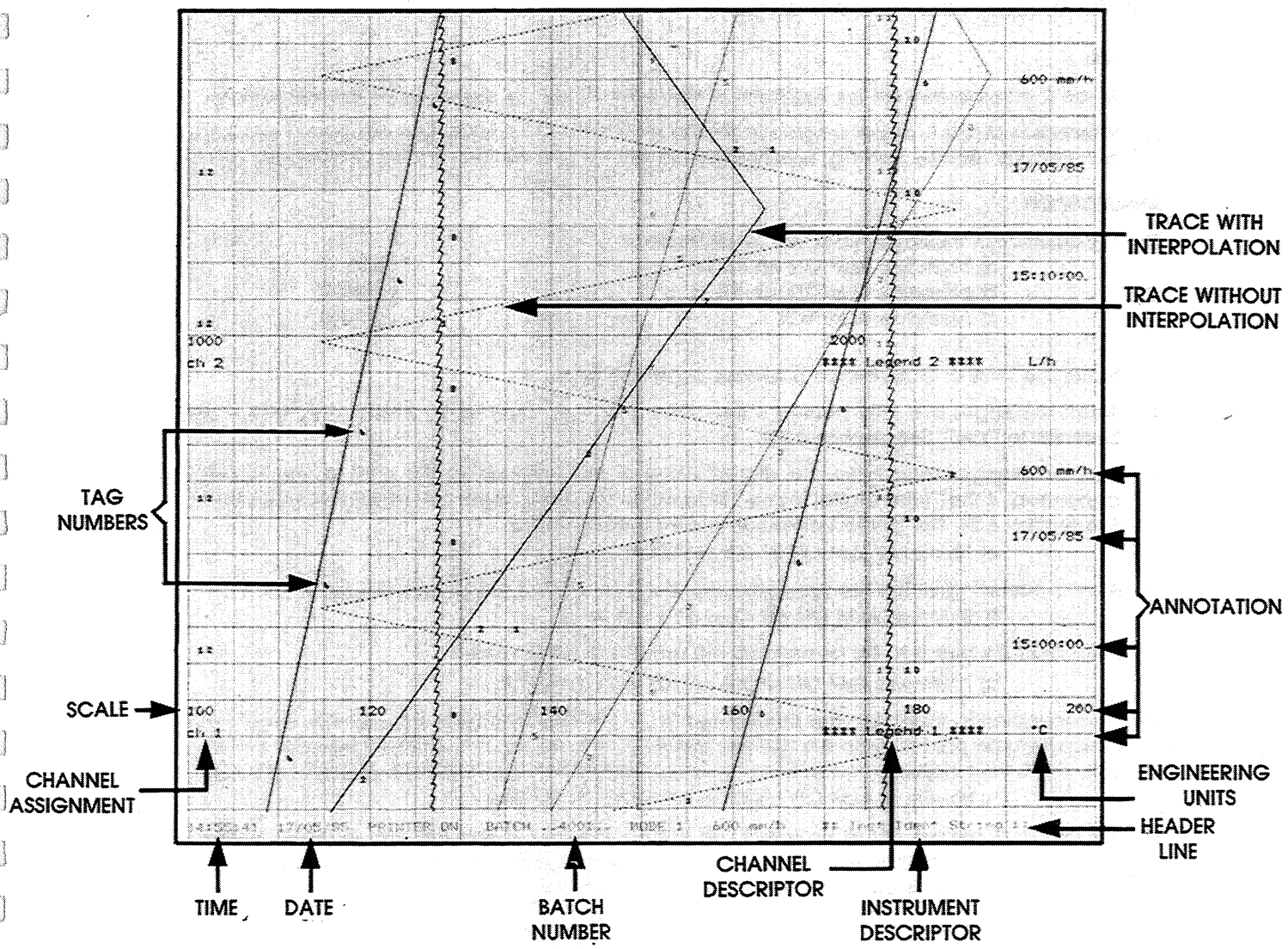
26) Following the selection of Single Trace mode the message:—
hh:mm:ss SINGLE TRACE ch xx
will be printed in the left margin. Time of occurrence is printed in BLUE, the message in YELLOW.

TAGGING

27) Tags are printed against each trace in the colour of that trace, and are printed one per line for all active channels.

28) Tags are printed in ascending channel number order. A worst case of 30 channels gives 9 cm. between successive tags, of the same Channel.

29) Tags are normally printed in the next available full character space to the right of the trace. If the trace is printed in columns 97 — 99 the tag will be printed on columns 97 or 98. This may mean the appearance of the tag on the left of the trace.



7.1 Mode 1 (Trend Mode) Chart Sample

7.2 MODE 2 TEXT PRINT FORMAT MODE

GENERAL

1) Mode 2 incorporates all the functions of Mode 1 but has the following additional features.

2) Whereas in Mode 1, paper length synchronisation with time is never lost; in Mode 2, when a number of messages require printing, synchronisation will be sacrificed in favour of message printing.

ANNUNCIATION

3) The additional message types are listed below:—

a) hh:mm:ss ALM ON ch XX xx	(RED)
b) hh:mm:ss ALM OFF ch XX xx	(GREEN)
c) hh:mm:ss ALM ACK	(GREEN)

NOTE: The Time of Occurrence is always printed in RED.

4) Alarm messages are only printed if the "Print Message" field in the Alarm Job Page display has been set to "Yes". See section 6.26.

5) Alarm messages may have the digital value of the channel at the time of alarm occurrence appended, if the "Print Digital Value" field in the Channel Alarm Job page has been set to "Yes". See section 6.26. The printed message will be modified to:—

e) hh:mm:ss ALM ON ch XX xx (123.4)

6) Alarms occurring within the same one second scan period are grouped together:—

f) hh:mm:ss ALM ON ch XX xx YY yy ZZ zz

If the digital value is to be appended the group will be printed:—

g) hh:mm:ss ALM ON ch XX xx (123.4) YY yy (567.8)

7) All annunciation messages are printed on the first free line available. If two events occur requiring a message to be printed before a free text line is available they will be joined together in a single line of text with their individual times of occurrence appended, to a maximum of a third of a page width.

h) hh:mm:ss ALM ON ch XX xx hh:mm:ss ALM OFF YY yy

8) If a group of alarms occur such that the buffer holding the queued annunciation messages will overflow, paper length/time synchronisation will be sacrificed and the text buffer will be emptied by printing all messages currently waiting in the queue.

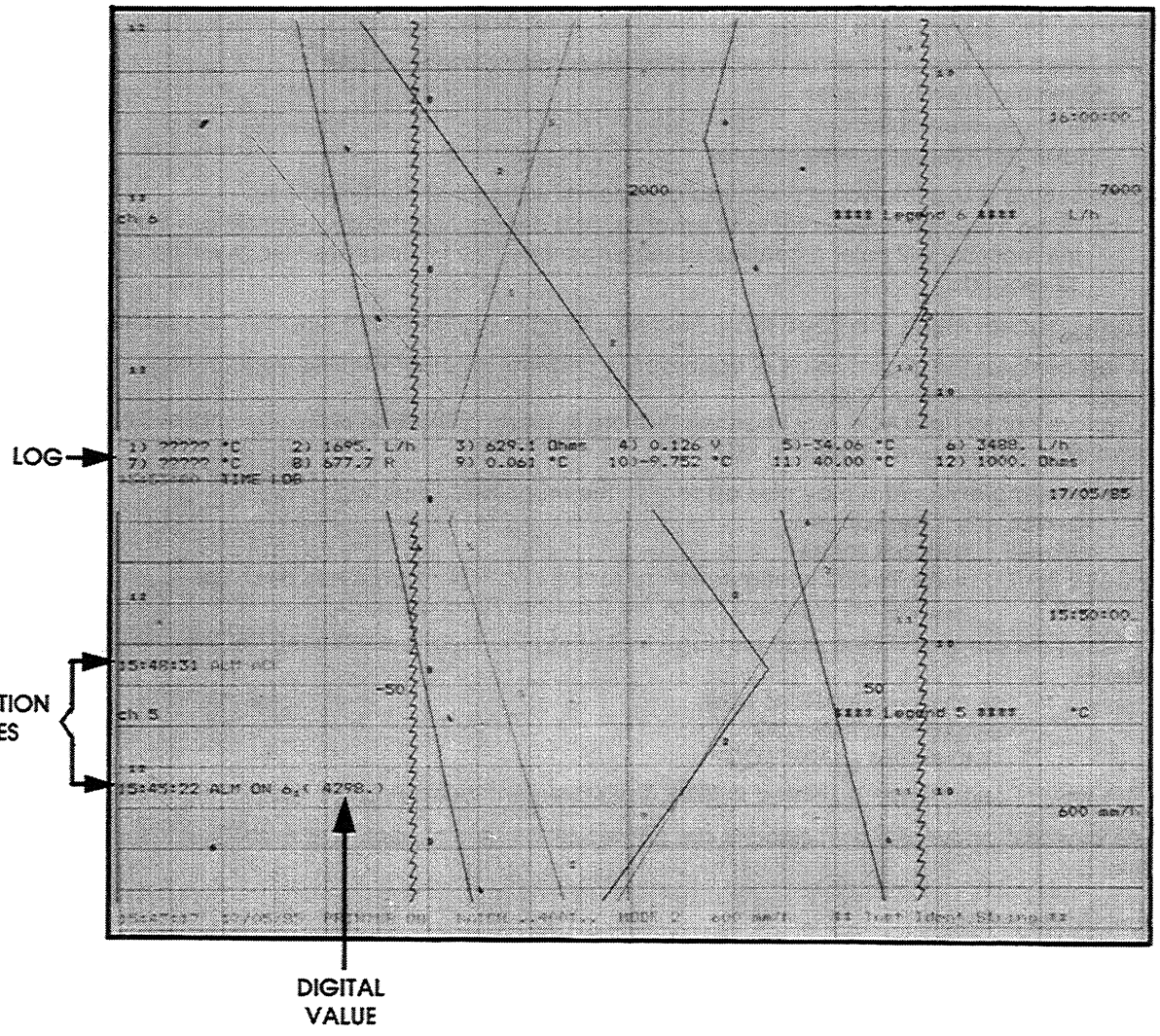
9) All queued messages waiting in the text buffer will be printed immediately whenever the following events occur:—

1) The printer is switched OFF.
2) The Print Format mode is changed.
3) A Batch Number is entered.
4) The text buffer overflows.
5) The PRINT DATA key is pressed.

LOGGING

10) The Print Data key will cause a full Log of the digital values of all measuring channels to be printed. The format of the log will be the same as Mode 3.
A log is printed in Real Time and will break Paper Length/Time synchronisation. Any text, which is queued in the text buffer, will be printed immediately before the Log is printed.

11) Timed Logs may be set to occur at regular intervals by setting a log interval in the Log Intervals display. The interval may be between 1 and 9999 minutes. 0 minutes = OFF.



7.2 Mode 2 (Text Mode) Chart Sample

7.3 MODE 3 TABULAR PRINT FORMAT MODE

GENERAL

1) Mode 3 Print Format is fundamentaly different from modes 1 and 2 in that all measurements are presented as "Logs" of the input channels presented in digital form to 4 digit resolution.
There are no analogue traces and the paper is only fed to create a new print line, and does not feed continuously.

2) As a result of "1", above, many of the paper formatting instructions in the configuration pages are not relevant to mode 3 format but still require entering for modes 1 and 2.

LOGS

3) The Timed Log interval is set in the Log Intervals page. See section 6.14
Minimum interval Minutes = 1
Minimum interval Seconds = 10
Maximum interval = 9999 minutes

NOTE: a) Setting a Log Interval of 0 Minutes or seconds will turn off the Timed Log.
b) When the Log Interval is set to 10 seconds, and a large number of Channels are to be Logged, the recorder will enter a continuous logging mode. The times between logs will be longer than 10 seconds.

4) Each Channel Alarm Job Page has a field for setting a Log on Alarm function. See section 6.26.

5) A log contains the digital value of each active channel together with the engineering units which have been assigned to that channel.
Logs are printed in BLACK. Any channels that are in alarm at the time of the log will have the digital value and engineering units printed in RED.

6) The following statements may also appear in the measured value log.
>RANGE = Over range
<RANGE = Under range
? ? ? ? ? = An invalid configuration or range and input signal has been set.
OFF = Channel switched Off in the Channel Function page.

7) All logs are preceded by a short message indicating the means of initiating the log. The valid messages are:—
a) hh:mm:ss MANUAL LOG
b) hh:mm:ss TIME LOG
c) hh:mm:ss ALARM LOG
The time of occurrence is printed in BLUE. The statement identifying the type of log is printed in BLACK.

8) All logs and annunciation messages are printed at the time of occurrence and are followed by a blank line.

ANNUNCIATION MESSAGES

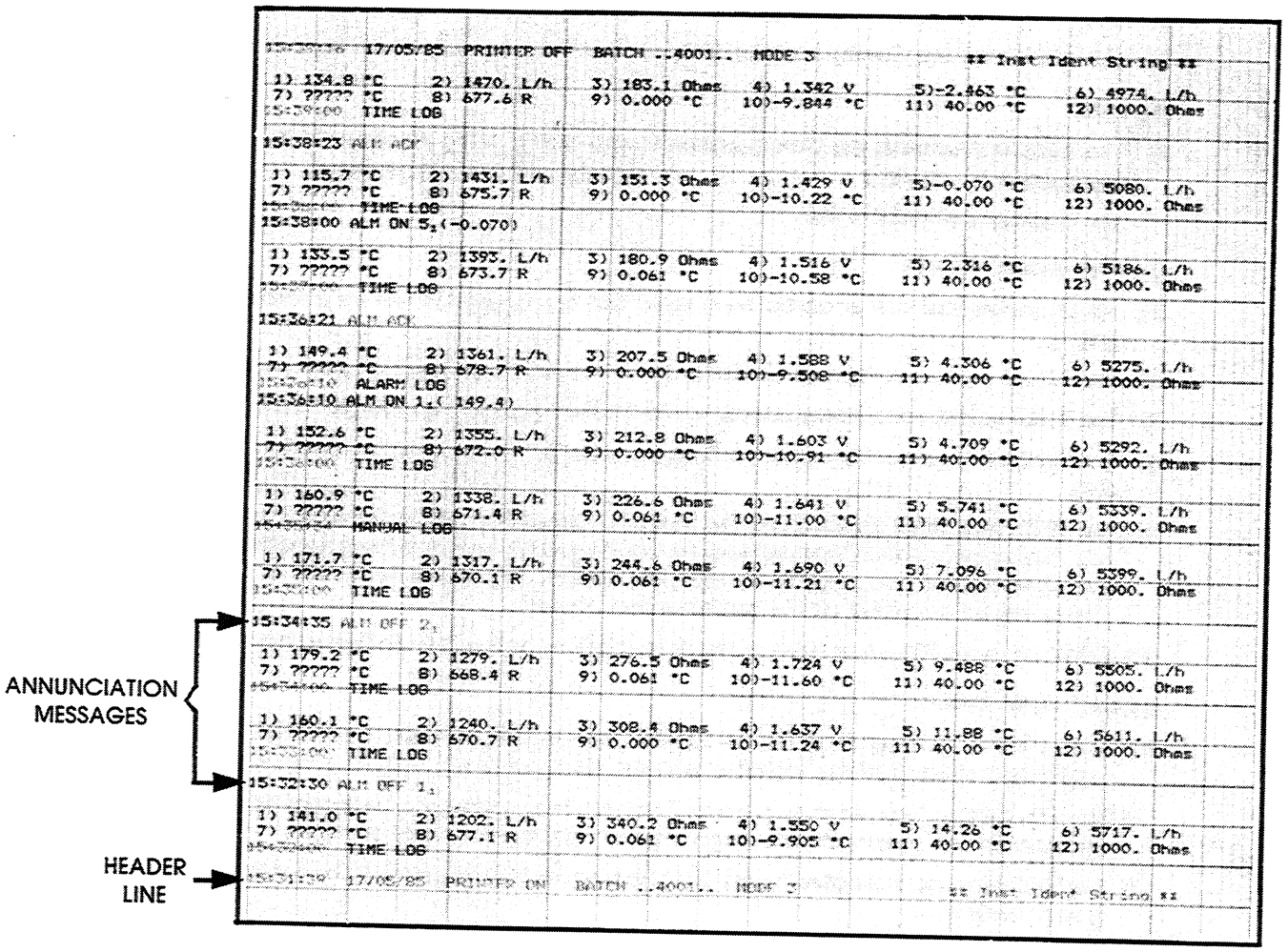
9) In addition to the logs there are a series of annunciation messages:—
a) hh:mm:ss ALM ON XX xx (RED)
Printed when any channel enters alarm.
b) hh;mm:ss ALM OFF XX xx (GREEN)
Printed when any channel exits alarm. NOTE as for channels entering alarm.
c) hh:mm:ss ALM ACK (GREEN)
Printed when the alarm acknowledge key is pressed, when in a valid display.
The Time of Occurrence of Alarm Messages are printed in RED.

10) Digital values may be appended to alarm annunciation statements as in mode 2.

CHANGE MESSAGES

11) The entry of a new Batch Number will initiate the Batch Start Header.

12) The selection of a new Print Format Mode will initiate the following message.
hh:mm:ss MODE x
Time of occurrence is printed in BLUE, the message is printed in YELLOW.



7.3 Mode 3 (Tabular Mode) Chart Sample

7.4 CONFIGURATION LISTING

GENERAL

1) The Configuration listing is divided into five sections.
   a) Channel Range Settings
   b) Channel Print Format
   c) Alarm Settings
   d) Instrument Settings
   e) Serial Link Settings

2) Due to the direction of the paper feed the Configuration Listing is printed in reverse order.

3) Once initiated the Configuration Listing can not be stopped except by switching the printer off.

HEADER

4) The Header preceeds the Configuration Listing and is in the standard form:—
   INSTRUMENT DESCRIPTOR . INSTRUMENT CONFIGURATION hh:mm:ss dd/mm/yy
   The Header is printed in RED.

CHANNEL RANGE SETTINGS

5) All Channels that are enabled by a valid Slot Configuration will be printed in this section of the listing.

6) The SCALE section comprises entries in the Channel Scale Page display. Section 6.16.

7) The INPUT section comprises entries made in the Channel Input Page display. Section 6.17.

8) The FUNCTION section comprises entries made in the Channel Input Function Page display. Section 6.18.

9) The ZERO and SPAN sections are the actual end points used for deriving the Scale Zero and Span, after the entries in the Channel Adjustment Page display have been incorporated. If the Channel Adjustment facility has not been used the values appearing in this section of the Configuration Listing will be the same as the Scale section above.

10) Channel numbers are printed in the colour of that trace. The configuration is printed in BLACK.

CHANNEL PRINT FORMAT

11) Entries in the Channel Print Format section are derived from settings in the Channel Scale, Print 1, and Print 2 Page displays, together with the total number of alarms assigned to the Channel.

12) The STRING and No. sections are the Channel Descriptor and Descriptor Number assigned to the Channel in the Channel Scale Page display. See sections 6.15, and 6.16.

13) The TRACE section indicates the setting of the Trace Skip flag in the Channel Scale Page display. See section 6.16.

14) The SCALE and DESCRIPTOR section indicates the setting of the Scale and Descriptor Enable flags in the Print 1 Page display. See section 6.19.

15) The INTERPOLATION and ZONE sections indicate the settings of the Interpolation Enable flag and Recording Zone fields in the Channel Print 2 Page display. See section 6.20.

16) The ALARMS NUMBER section indicates the total number of alarms that are asigned to the Channel. The details of the settings and actions are listed in the ALARM SETTINGS section of the Configuration Listing.

17) Channel numbers are printed in the colour of that trace. The configuration is printed in BLACK.

ALARM SETTINGS

18) Entries in the Alarm Setting section reflect the type of alarms, their threshold values and actions as set in the Alarm, and Alarm Job Pages.

19) If no Alarms have been assigned the statement "No Alarms Allocated" is printed in RED.

20) The ALM section indicates the Channel number and Alarm number. The Alarm number is printed as a descending character.

21) The ALM TYPE section indicates the type of threshold and the threshold settings set in the Channel Alarm Page displays. See sections 6.22 to 6.25.

22) The HYST section indicates the amount of hysteresis for Absolute and Deviation Alarms, or the Averaging Period for a Rate of Change Alarm set in the Channel Alarm Page displays. See sections 6.23 to 6.25.

23) The Direction of Rate of Change alarms is indicated by the Chevrons after the "ROC" statement in the ALARM TYPE section.

>> = Rate of Rise.
<< = Rate of Fall.

24) The SKIP section indicates whether the Alarm Skip flag, set in the Channel Alarm Page displays is set to "On" or "Off". See sections 6.23 to 6.25.

25) The SPEED, LOG, MESS, DVAL, TRACE, SLOT, and CHAN sections indicate the settings of the flags and the Output Slot and Device addresses in the Alarm Job Page display associated with the Alarm. See section 6.26.

26) Channel and Alarm numbers are printed in the colour of that trace. The configuration is printed in BLACK.

INSTRUMENT SETTINGS

27) The entries in the Instrument Settings section indicate the settings of the common recorder functions.

28) The INSTRUMENT IDENT STRING section indicates the Instrument Descriptor which was customised at the time of manufacture.

29) The MODE section indicates the Print Format Mode set in the Instrument 1 Page display. See section 6.6.

30) The DIVISIONS section indicates the setting of the Scale Divisions field in the instrument 2 Page display. See section 6.7.

31) The SPEED 1 and SPEED 2 sections indicate the settings of the two chart speeds in the Chart Speed Page display. See section 6.13.

32) The MODE2 and MODE3 LOG INTERVALS section indicates the settings of the Log Intervals in the Log Intervals Page display. See section 6.14.

33) The BATCH NUMBER section indicates the Batch Number set in the Instrument 1 Page display. See section 6.6.

34) The ALARM BUZZER section indicates the setting of the Audible Annunciator field in the Instrument 2 Page display. See section 6.7.

35) The DATE FORM section indicates the setting of the Date Format field in the Instrument 2 Page display. See section 6.7.

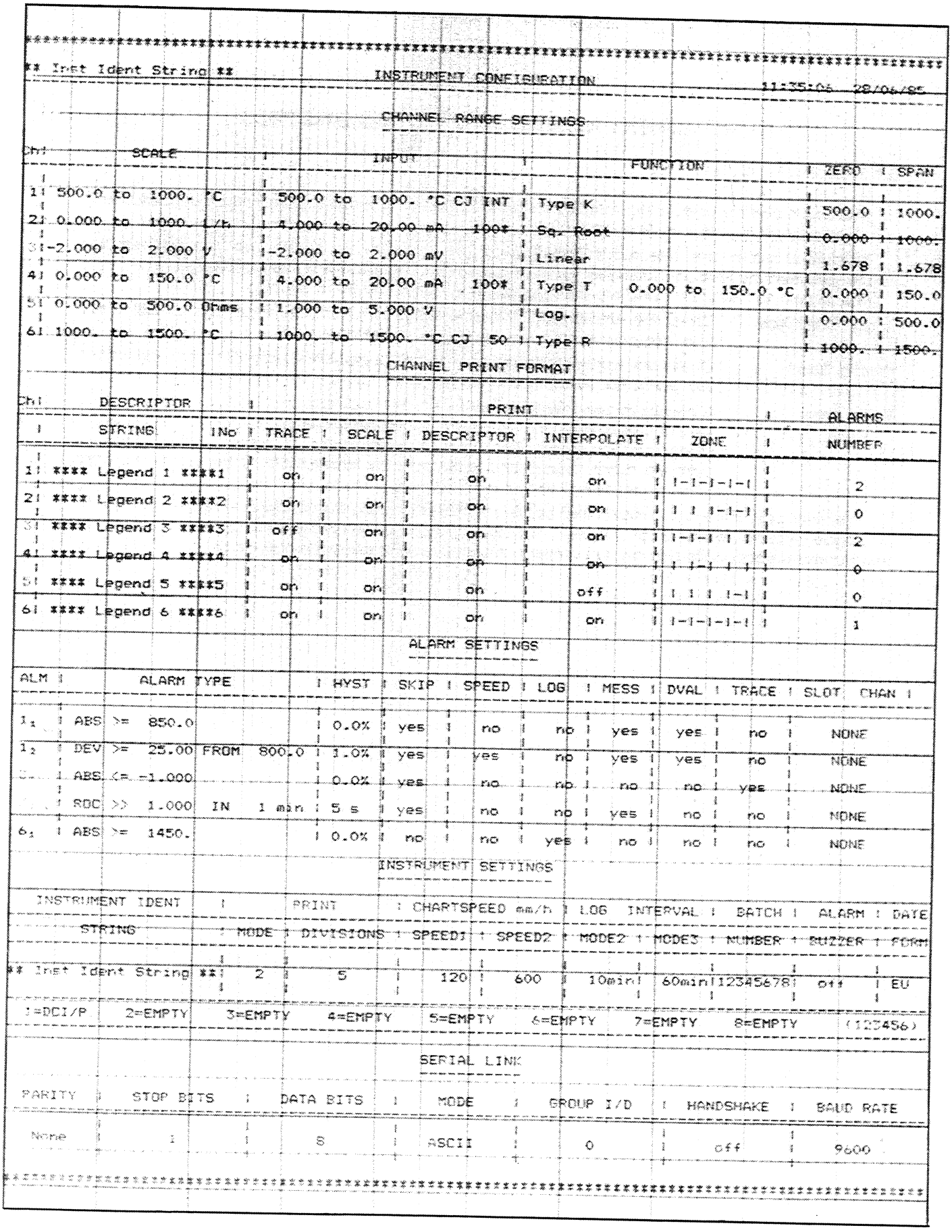
36) The line below the above settings indicates the settings of the I/O Card Types in the Slot Configuration Page display. See section 6.8.

37) The number in brackets at the end of the Slot Configuration line is the Login Number.

SERIAL LINK

38) If the recorder is not specified with the Serial Communications option this section of the Configuration Listing is not printed.

39) The entries in the Serial Link section indicate the settings of the fields in the Serial Link 1 and 2 Page displays. See sections 6.9 and 6.10.



** Inst Ident String **

INSTRUMENT CONFIGURATION

11:35:06 28/06/85

CHANNEL RANGE SETTINGS

Ch!	SCALE	INPUT	FUNCTION	ZERO	SPAN
1!	500.0 to 1000. °C	500.0 to 1000. °C CJ INT	Type K	500.0	1000.
2!	0.000 to 1000. l/h	4.000 to 20.00 mA 100Ω	Sq. Root	0.000	1000.
3!	-2.000 to 2.000 V	-2.000 to 2.000 mV	Linear	1.678	1.678
4!	0.000 to 150.0 °C	4.000 to 20.00 mA 100Ω	Type T 0.000 to 150.0 °C	0.000	150.0
5!	0.000 to 500.0 Ohms	1.000 to 5.000 V	Log.	0.000	500.0
6!	1000. to 1500. °C	1000. to 1500. °C CJ 50	Type R	1000.	1500.

CHANNEL PRINT FORMAT

Ch!	DESCRIPTOR STRING	!No	PRINT TRACE	SCALE	DESCRIPTOR	INTERPOLATE	ZONE	ALARMS NUMBER
1!	**** Legend 1 ****1		on	on	on	on	!-!-!-!-!	2
2!	**** Legend 2 ****2		on	on	on	on	! ! !-!-!	0
3!	**** Legend 3 ****3		off	on	on	on	!-!-! ! !	2
4!	**** Legend 4 ****4		on	on	on	on	! !-! ! !	0
5!	**** Legend 5 ****5		on	on	on	off	! ! ! !-!	0
6!	**** Legend 6 ****6		on	on	on	on	!-!-!-!-!	1

ALARM SETTINGS

ALM !	ALARM TYPE	HYST	SKIP	SPEED	LOG	MESS	DVAL	TRACE	SLOT CHAN
1_1	ABS >= 850.0	0.0%	yes	no	no	yes	yes	no	NONE
1_2	DEV >= 25.00 FROM 800.0	1.0%	yes	yes	no	yes	yes	no	NONE
2_1	ABS <= -1.000	0.0%	yes	no	no	no	no	yes	NONE
	ROC >> 1.000 IN 1 min	5 s	yes	no	no	yes	no	no	NONE
6_1	ABS >= 1450.	0.0%	no	no	yes	no	no	no	NONE

INSTRUMENT SETTINGS

INSTRUMENT IDENT STRING	PRINT MODE	DIVISIONS	CHARTSPEED mm/h SPEED1	SPEED2	LOG INTERVAL MODE2	MODE3	BATCH NUMBER	ALARM BUZZER	DATE FORM
** Inst Ident String **	2	5	120	600	10min	60min	12345678	off	EU

1=DCI/P 2=EMPTY 3=EMPTY 4=EMPTY 5=EMPTY 6=EMPTY 7=EMPTY 8=EMPTY (123456)

SERIAL LINK

PARITY	STOP BITS	DATA BITS	MODE	GROUP I/D	HANDSHAKE	BAUD RATE
None	1	8	ASCII	0	off	9600

7.4 Configuration Listing Chart Sample

INSTRUMENT ALARMS AND SELF DIAGNOSTICS

8.1 INSTRUMENT ALARMS

Instrument alarms are annunciated by the flashing inverse I character in the Instrument Status field, which appears in all displays. See section 6.3.

Instrument alarms are detected by the Product Controller when a breakdown in communication occurs between the Product Controller and the Input and Output cards in the card cage.

The reason for the alarms and the rectification procedures are listed below.

Wrong Card Type	Check the entries in the Instrument Slot Configuration page (Section 6.8) to see that they correspond with the actual card types fitted.
Missing Card	Check the entries in the Instrument Slot Configuration page (Section 6.8). Set any Slot that is not occupied, to "EMPTY".
Faulty Card	If the above two checks do not cancel the alarm, a card is faulty. Start by setting all but one of the slots in the Slot Configuration page, to "EMPTY". If the alarm disappears that card is healthy, and all cards should be progressively enabled until the alarm reappears, to identify the faulty card. If the alarm does not disappear the first card was faulty.

User servicing of the Input and Output cards is not practicable if the fault is anything to do with the analogue circuitry, as individual channel calibrations are contained in the card firmware. Contact the nearest service base, listed on the rear cover of this manual, for an exchange card.

Inter-Company sales and service locations

Australia
Eurotherm Pty. Limited.
Box 11,
Waverley Gardens Post Office,
Mulgrave,
Victoria 3170.
Telephone: 61 3 9574 8888
Fax: 61 3 9574 8868

Eurotherm Pty. Limited
P.O.Box 1605,
Hornsby,
Northgate,
New South Wales 1635
Telephone: 61 2 9477 7022
Fax: 61 2 9477 7756
Email: eurotherm@eurotherm.com.au
Website:www.eurotherm.com.au

Austria
Eurotherm Meß-und Regeltechnik GmbH
Geiereckstraße 18/1,
A1110 Wien,
Telephone: 43 1 798 76 01-04
Fax: 43 1 798 76 05

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I-22070 Guanzate,
Como.
Telephone: 39 31 975111
Telex: 380893
Fax: 39 31 977512

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Eurotherm (Japan) Limited.
Matsuo Building 2nd Floor,
3-14-3 Honmachi,
Shibuya-Ku,
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Fax: 81 3 3370 2960

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Fax: 46 40 38 45 45

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Fax: 41 55 415 44 15

United States of America
Eurotherm Recorders Inc.
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Newtown PA 18940.
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Fax: 1 215 968 0662

EUROTHERM
CHESSELL

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Dominion Way, Worthing, West Sussex, BN14 8QL
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