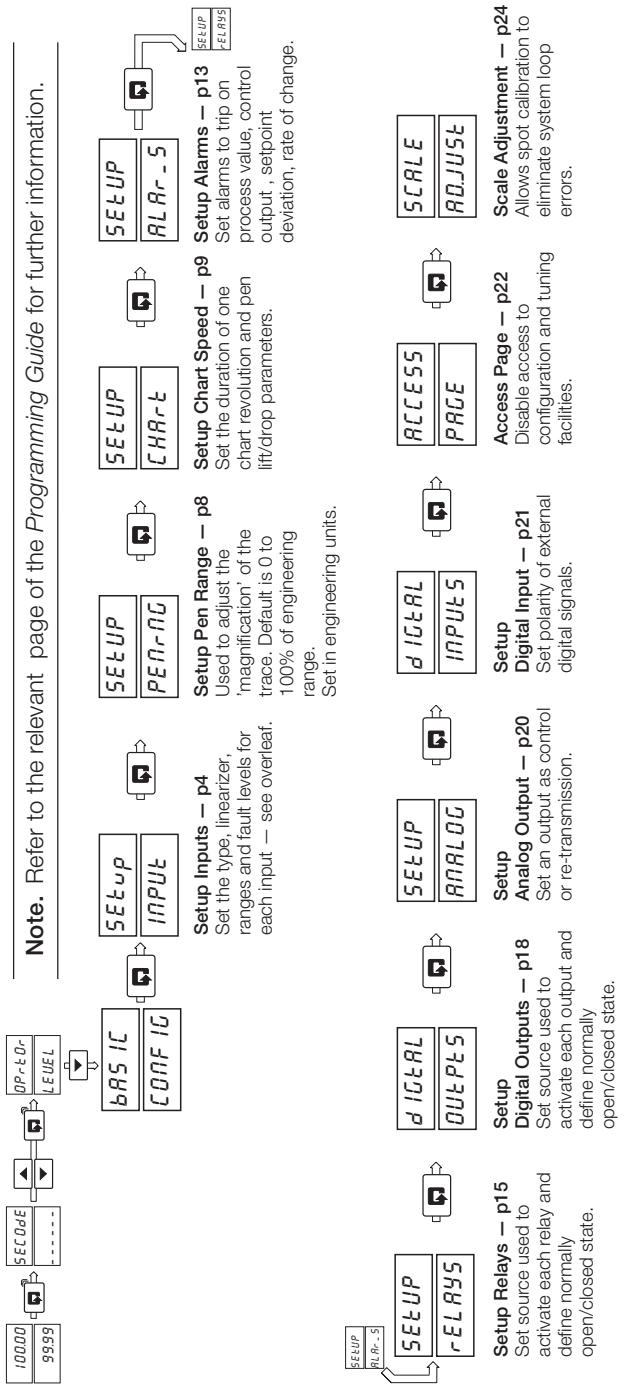
Basic configuration overview



Note. Refer to the relevant page of the *Programming Guide* for further information.

Setup Inputs — p4
Set the type, linearizer, ranges and fault levels for each input — see overleaf.

Setup Pen Range — p8
Used to adjust the 'magnification' of the trace. Default is 0 to 100% of engineering range.
Set in engineering units.

Setup Chart Speed — p9
Set the duration of one chart revolution and pen lift/drop parameters.

Setup Alarms — p13
Set alarms to trip on process value, control output , setpoint deviation, rate of change.

Setup Relays — p15
Set source used to activate each relay and define normally open/closed state.

Setup Digital Outputs — p18
Set source used to activate each output and define normally open/closed state.

Setup Analog Output — p20
Set an output as control or re-transmission.

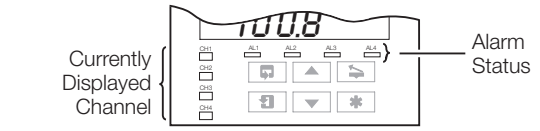
Setup Digital Input — p21
Set polarity of external digital signals.

Access Page — p22
Disable access to configuration and tuning facilities.

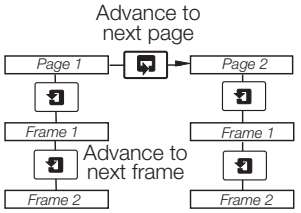
Scale Adjustment — p24
Allows spot calibration to eliminate system loop errors.

Displays and controls

Recorder Faceplate

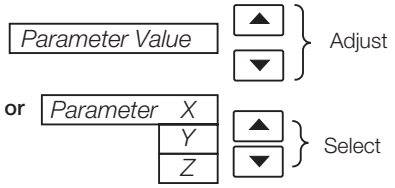


Sideways Scroll



Down Scroll

Raise and Lower



Function Key

'Alarm acknowledge' or 'Home' — See *Programming Guide, 'Advanced Configuration'*

Pen Lift

Raises and lowers the chart pen.

Note. All programming is carried out using the faceplate keys and displays.

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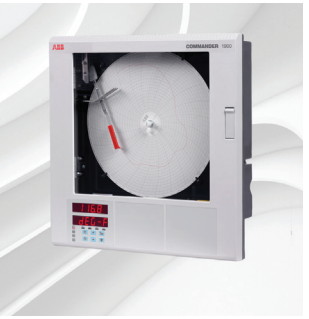
IM/C1900-QR Rev. F 08.2019

C1900 recorder
Quick reference guide



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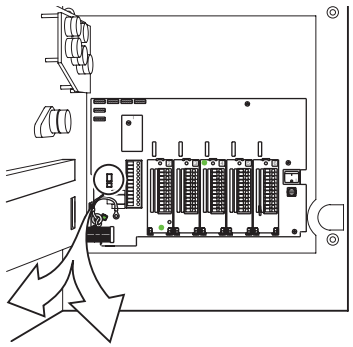
Setting analog input links



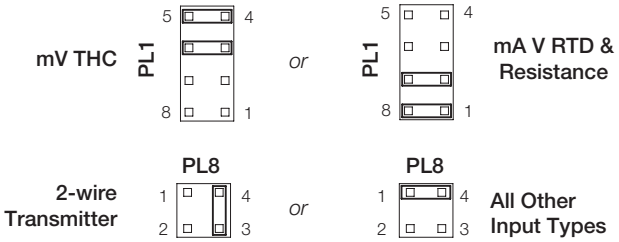
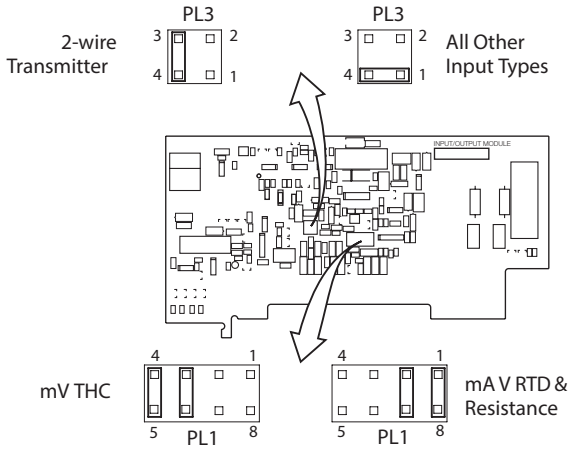


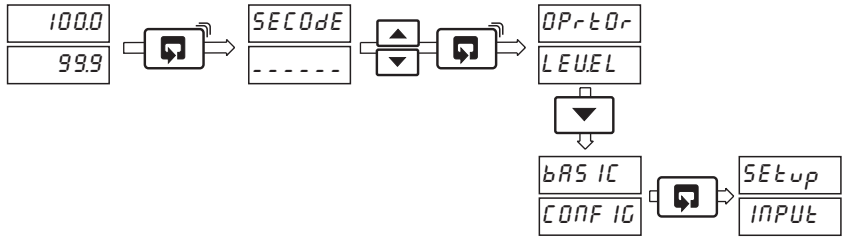
Fig. 1 Input Links – Channel 1



Warning. Ensure that the unit is isolated from all power supplies before removing I/O boards.

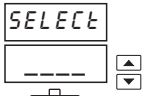
Fig. 2 Input Links – Channels 2 to 4 (If fitted)

Configuring analog inputs



Information. The alphabet used to display page and parameter titles is as follows:

A – A	M – -
B – b	N – n or n
C – C or c	O – O or o
D – d	P – P
E – E	Q – Q
F – F	R – r
G – G	S – S
H – H or h	T – t
I – I	U – U
J – J	V – U
K – K	Y – y
L – L	



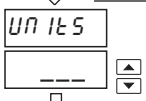
Select Channel – Choose the input channel to be configured

Input type – _A_P (mA), U.OLt (V), _ULt (mV), tCPL (Thermocouple), rtd (RTD) and LO OH (< 750 Ohms) HI OH (> 750 Ohms).

Linearizer: If using a thermocouple set to J, K, B, N, E, T, S, R. Other options are 5/2, 3/2, SQrt, rtd or NONE.

Range High: For a 4 to 20mA current input, set this to 20.00, or for 0 to 5V, set to 5.0. The frame does not appear if tCPL or rtd are used.

Range Low: Set the low end of the electrical input range, e.g. 4.00, for 4 to 20mA, or 0.0 for 0 to 5V.



Units: Select NONE if the input is not temperature, otherwise select dEG F or dEG C.

Engineering Range High: Select the highest engineering value that will be displayed when the input is at its maximum value – e.g. for an engineering range of 0 to 300.0 °F set to 3000.

Decimal Point: Select the decimal point position for the process variable, e.g. 300.0.

Engineering Range Low: Select the lowest engineering value that will be displayed when the input is at its minimum value – e.g. for an engineering range of 0 to 300.0 °F set to 0.0.

Broken Sensor Drive: Determine pen action when the input signal fails: NONE – pen follows failed input; UP – pen driven to full scale; dN – pen driven to zero scale.

Fault Detection Drive: Determine maximum input travel outside engineering range before an error is detected. E.g. for a 0 to 300°F range, a 10% fault level will trigger at 330°F.

Input Filter: Adjust the instrument response time from 0 to 60 seconds in one second increments to reduce pen jump & dampen out noisy signals.

C1900

Circular chart recorder and recorder/controller

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and recorder/controller

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Quick Reference Guide C1900 recorder and recorder/controller	IM/C1900-QC

	Search for or click on
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Programming Guide C1900 Circular chart recorders	IM/C1900-PGR
Operating Guide C1900 Circular chart recorder/controllers	IM/C1900-OGC
Programming Guide C1900 Circular chart recorder/controllers	IM/C1900-PGC

Electrical safety

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

Symbols

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

	Warning – refer to the manual for instructions
	Caution – risk of electric shock
	Protective earth (ground) terminal
	Earth (ground) terminal
	Direct current supply only
	Alternating current supply only
	Both direct and alternating current supply
	The equipment is protected through double insulation

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

Health and safety

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

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

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

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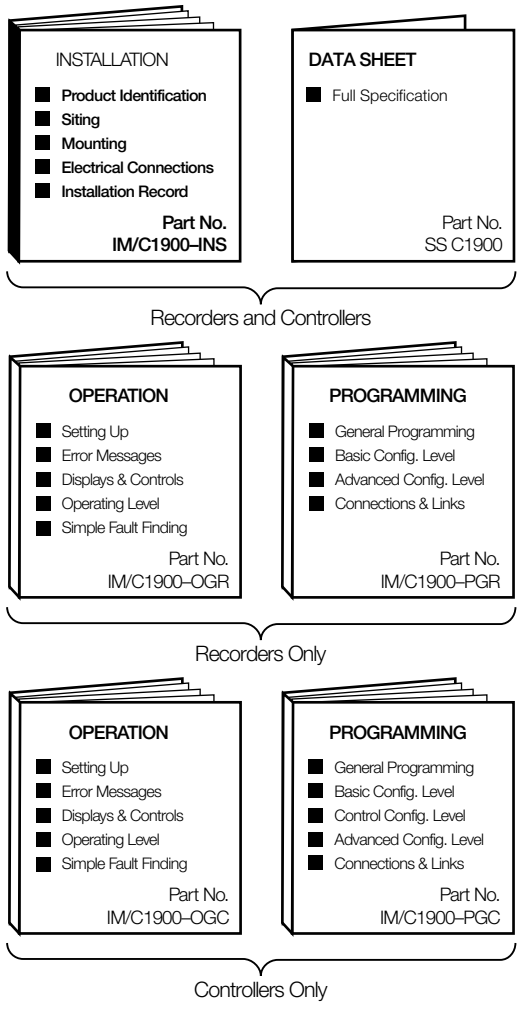
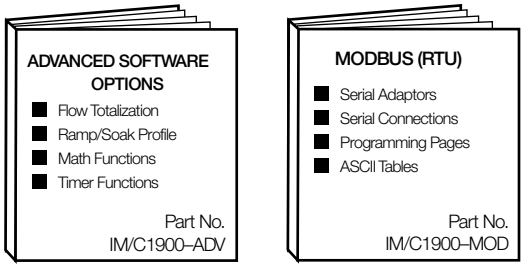
1 INTRODUCTION

The documentation for the C1900 series of circular chart recorders is shown in Fig. 1.1. The **Standard Manuals**, including the data sheet, are supplied with all instruments. The **Supplementary Manuals** supplied depend on the specification of the instrument.

This manual includes an **Installation Record** which should be completed as a log of the electrical installation. The record is useful when carrying out initial instrument programming and can be retained for future reference.



A – Standard Manuals

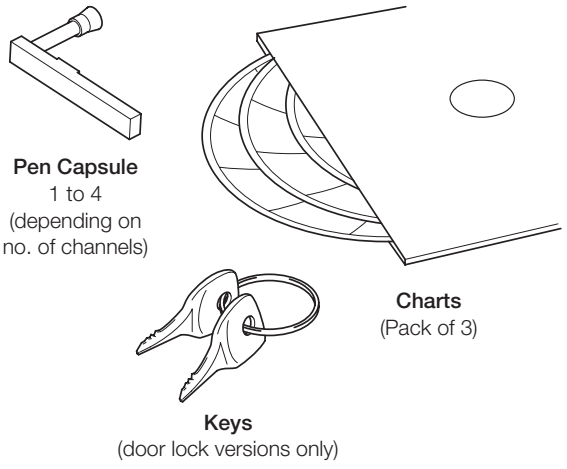


B – Supplementary Manuals

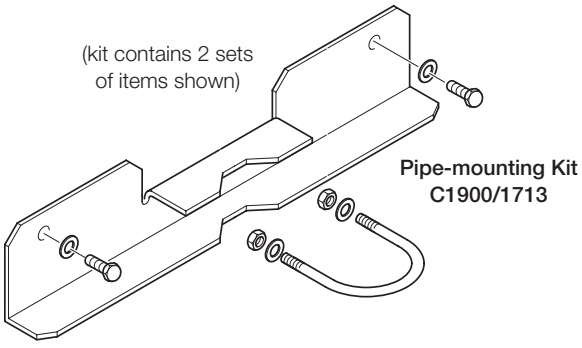
Fig. 1.1 C1900 Documentation

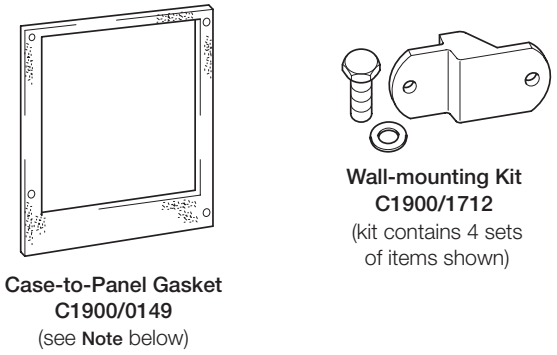
2 PREPARATION

2.1 Accessories – Fig. 2.1



A – Standard Accessories





B – Optional Accessories

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

Fig. 2.1 Accessories

2.2 Checking the Code Number – Fig. 2.2

2.2.1 Non-upgradeable Version

Note. The 1901J is a basic, non-upgradeable single pen recorder. This version is not fitted with an analog output, relay, transmitter power supply unit or digital inputs and no additional modules can be fitted. The full identification code is shown below.

1901J A 0 0 1 1 00000 STD

C1900
single pen recorder
Electrical code – **standard**
Option module – **none**
Options – **none**
Door lock – **not fitted**
Power supply – **115V AC**
Modules fitted in module positions 2 to 6 – **none**
Special Settings – **company standard**

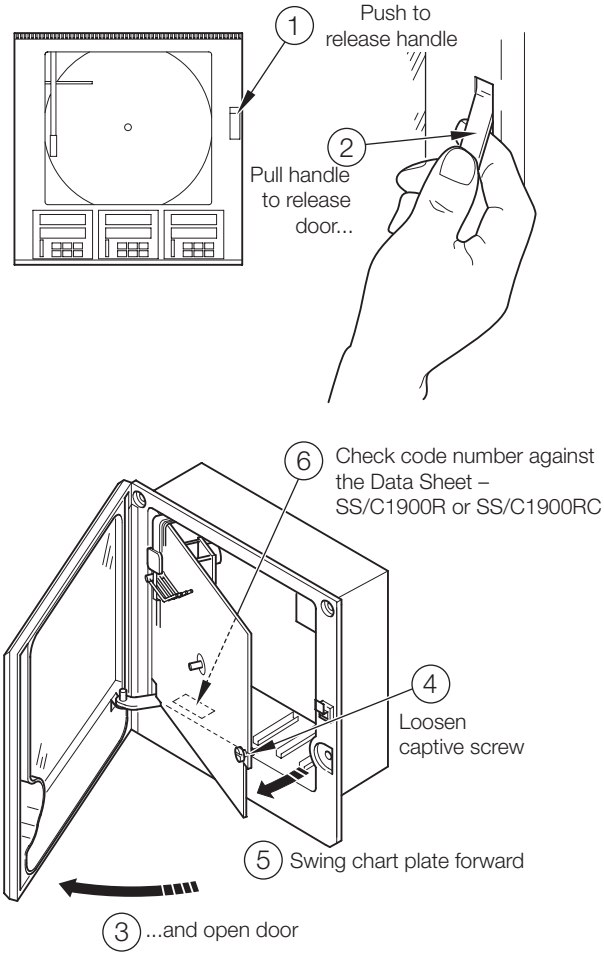
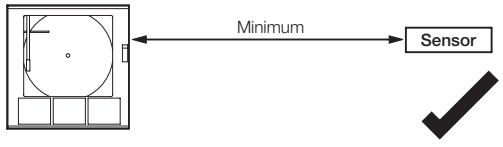


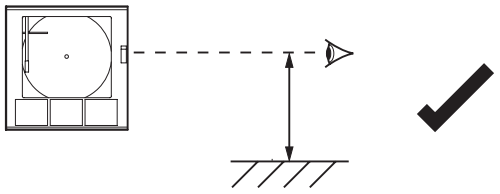
Fig. 2.2 Checking the Code Number

3 MECHANICAL INSTALLATION

3.1 Siting – Figs 3.1 and 3.2



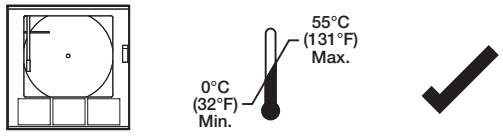
A – Close to Sensor



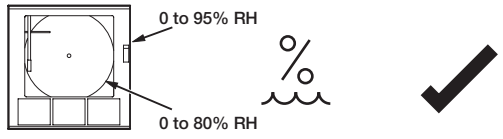
B – At Eye-level Location

C – Avoid Vibration

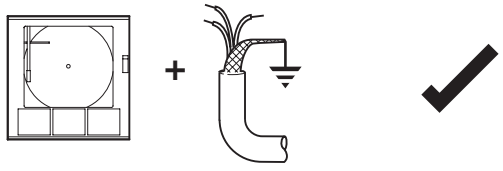
Fig. 3.1 General Requirements



A – Within Temperature Limits



B – Within Humidity Limits



Caution. Select a location away from strong electrical and magnetic fields. If this is not possible, particularly in applications where mobile communications equipment is expected to be used, screened cables within earthed (grounded) metal conduit must be used.

C – Use Screened Cables

Fig. 3.2 Environmental Requirements

3.2 Mounting – Figs. 3.3 to 3.5

Dimensions in inches (mm)

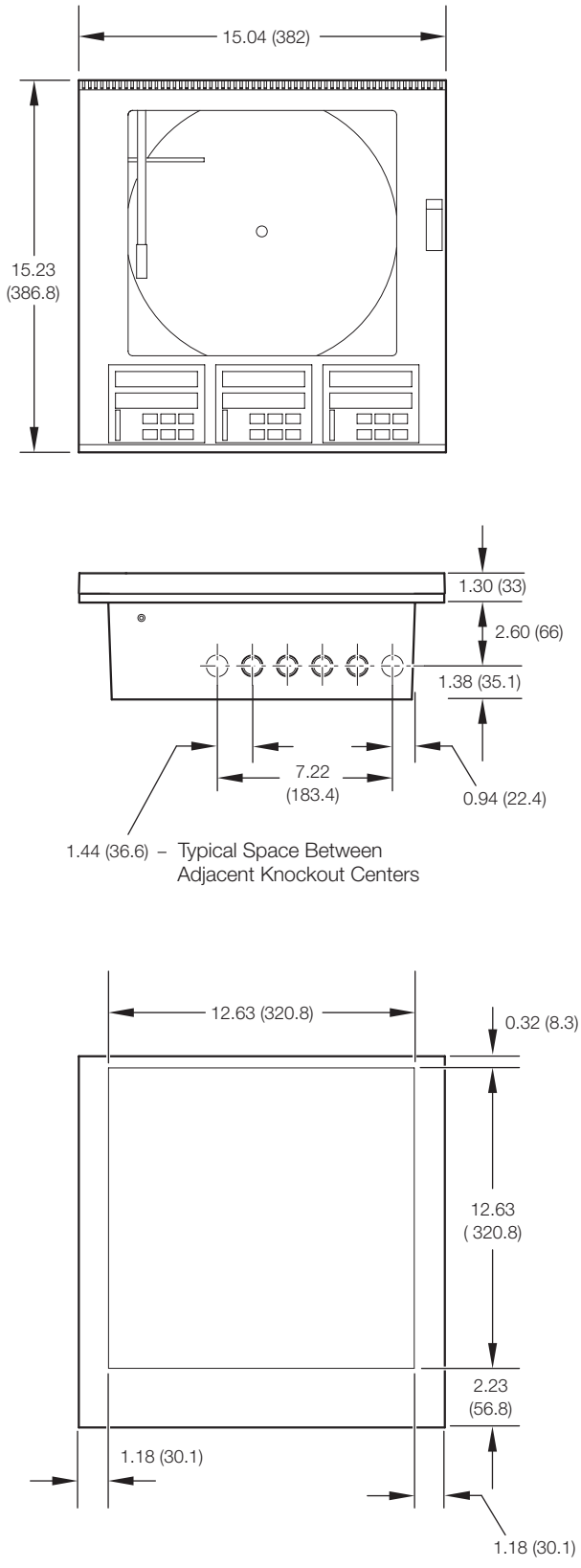
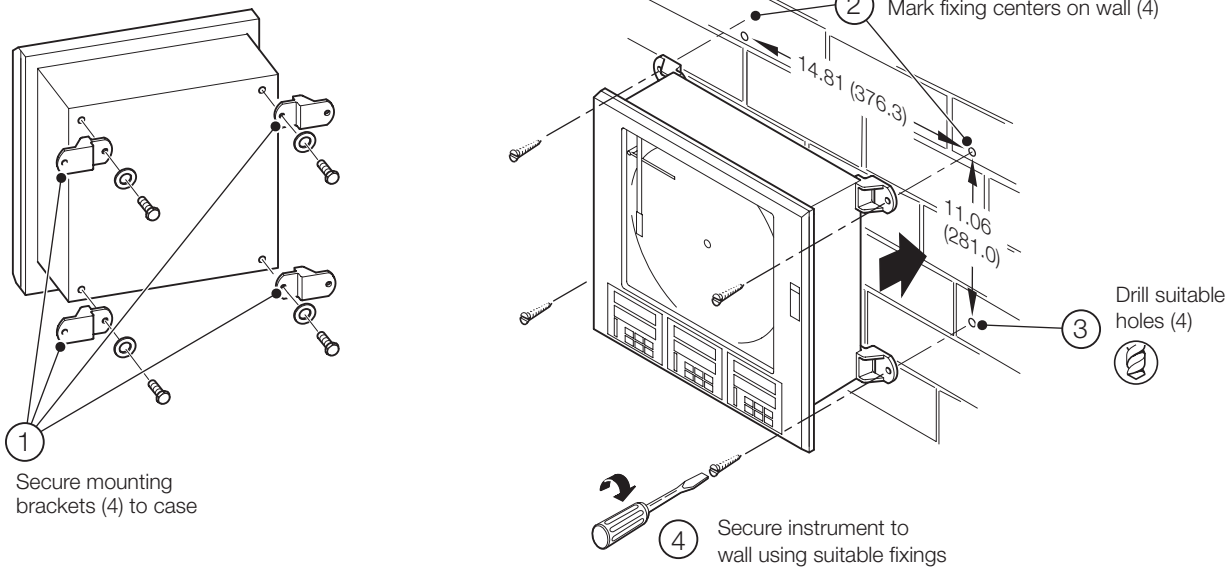
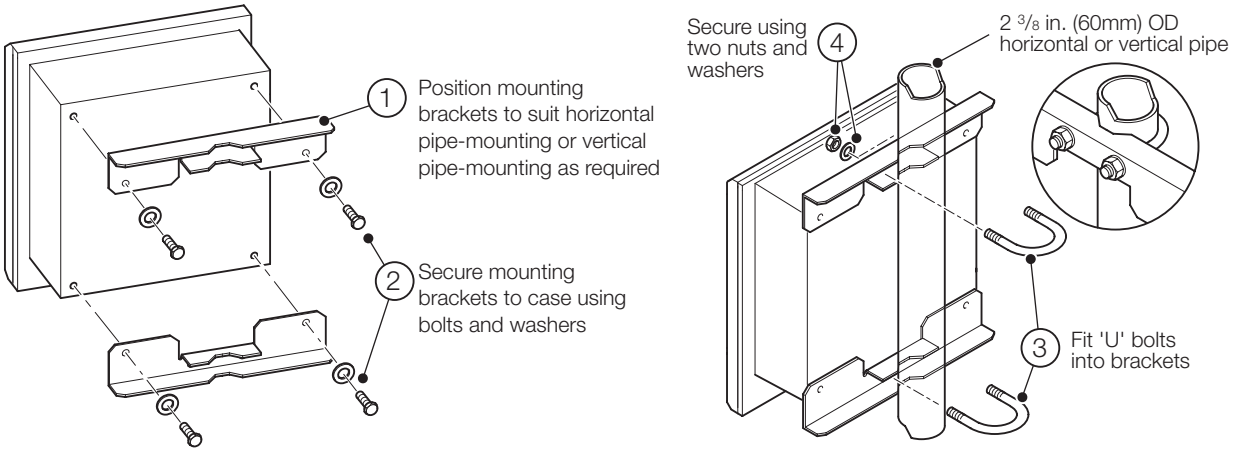


Fig. 3.3 Overall Dimensions

3.2.1 Wall-/Pipe-Mounting – Fig. 3.4



A – Wall-mounting (Optional)

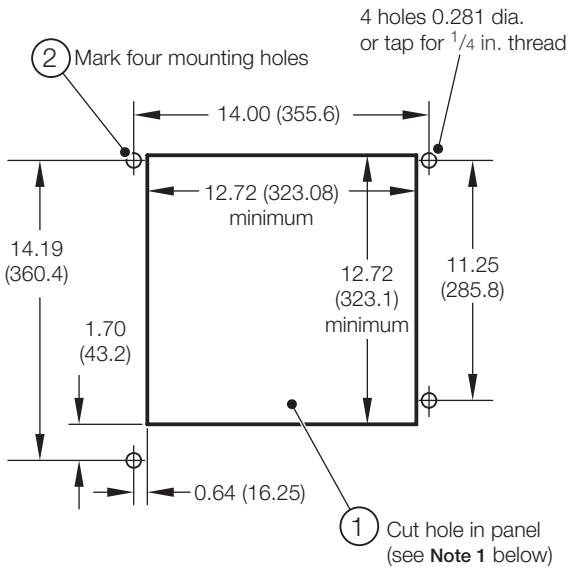


B – Pipe-Mounting (Optional)

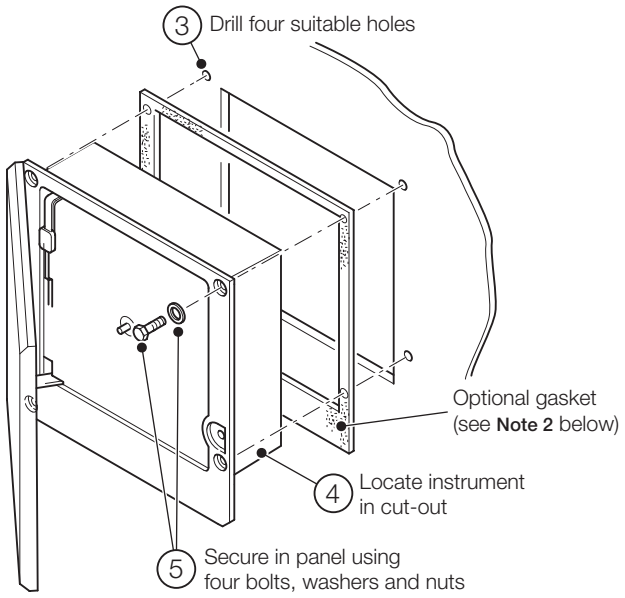
Fig. 3.4 Wall-/Pipe Mounting

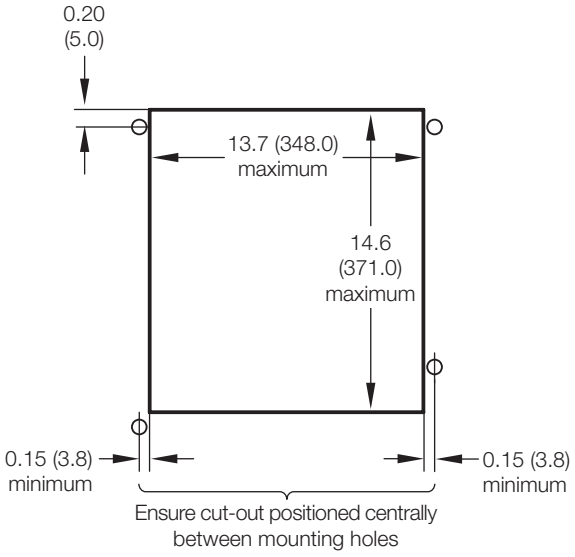
3.2.2 Panel Mounting – Fig. 3.5

Dimensions in inches (mm)



Minimum Cut-out Dimensions





Maximum Cut-out Dimensions

Notes.

1. The instrument can be inserted into a panel cut-out of any size between the minimum and maximum dimensions illustrated, provided the cut-out is positioned centrally relative to the fixing holes. If the panel cut-out is larger than the maximum, a locally manufactured adaptor plate will be required.
2. If panel-mounting to NEMA 4X hosedown standard is required, a continuous bead of suitable silicon sealant ***must*** be applied beween the case flange and the panel. ***Do not*** use the optional gasket.

Fig. 3.5 Panel Mounting

4 ELECTRICAL INSTALLATION

Warnings.

- To comply with Underwriter Laboratories (UL) and Canadian Standards Association (CSA) certification, route signal leads and power cables in earthed (grounded), flexible metal conduit. Use the Position 1 protective ground stud ⏚ (NOT the terminal module ground stud) to ground the flexible metal conduit.
- Instruments not fitted with the optional internal on/off switch and fuse must have a disconnecting device such as a switch or circuit breaker conforming to local safety standards fitted to the final installation. It must be fitted in close proximity to the instrument within easy reach of the operator and must be marked clearly as the disconnection device for the instrument.
- Remove all power from supply, relay and any powered control circuits and high common mode voltages before accessing or making any connections.
- Use cable appropriate for the load currents. The terminals accept cables up to 14AWG (2.5mm^2).
- The instrument and all inputs and outputs conform to Mains Power Input Insulation Category II.
- All connections to secondary circuits must have basic insulation.
- After installation, there must be no access to live parts e.g. terminals.
- Terminals for external circuits are for use only with equipment with no accessible live parts.
- If the instrument is used in a manner not specified by the Company, the protection provided by the equipment may be impaired.
- All equipment connected to the instrument's terminals must comply with local safety standards (IEC 60950, EN601010-1).

Notes.

- Always route signal leads and power cables separately.
- Use screened cable for signal inputs and relay connections. Connect the screen to the earth (ground) stud – see Fig. 4.10.
- The terminal blocks can be removed from the main PCB when making connections – see Fig. 4.1. Before removing a module, note its position.
- If wall- or pipe-mounting to NEMA 4X hosedown standard is required, suitable cable glands must be used to prevent water ingress.

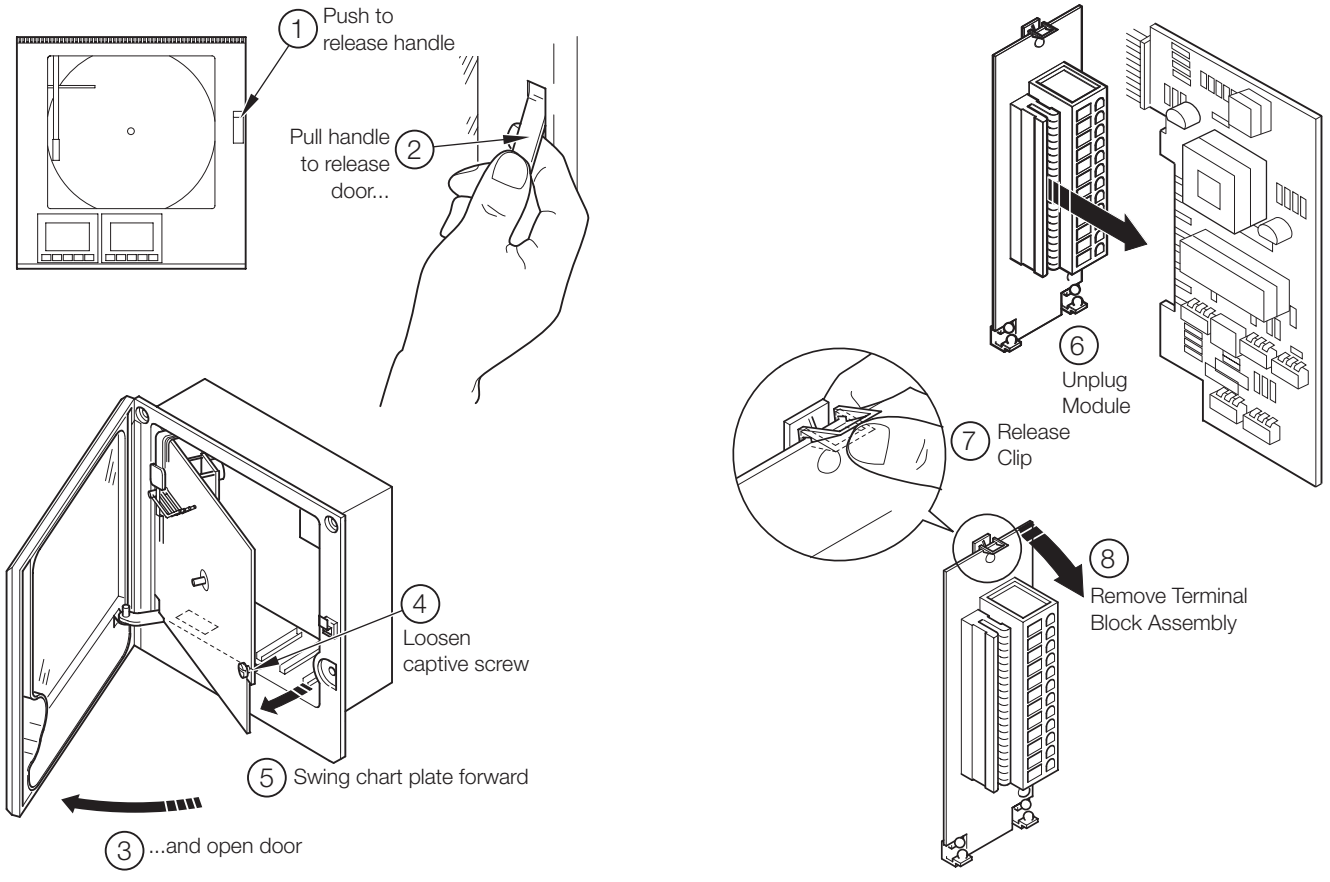


Fig. 4.1 Removing Terminal Block Assembly

4.1 Identifying the Input/Output Modules – Fig. 4.2

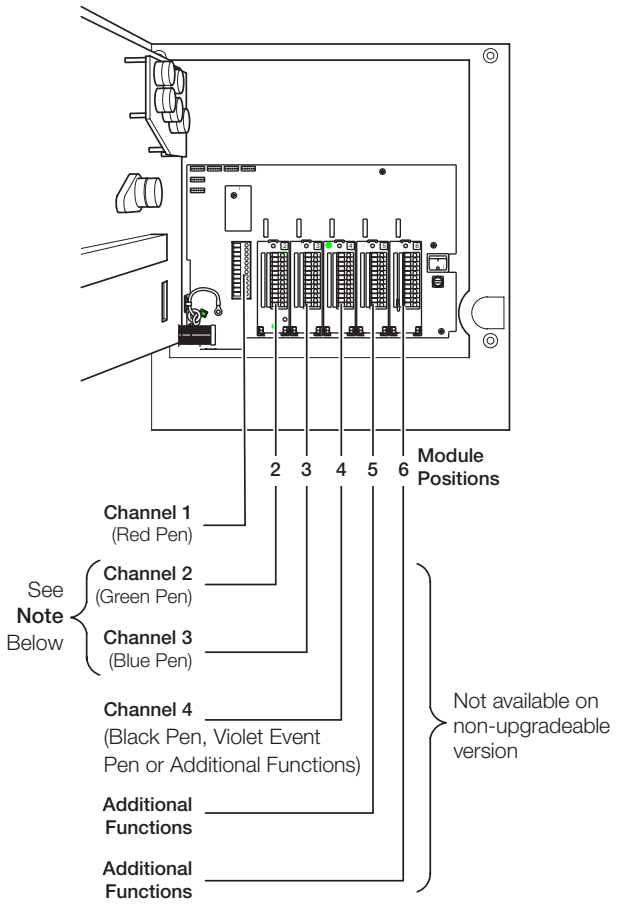
To gain access to the modules, open the door and chassis – see Fig. 2.2. There are six module positions as shown in Fig. 4.2.

4.2 Channel Connections

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

Other Channel connections are made to standard I/O modules, fitted in positions 2, 3 or 4 – see Fig. 4.2.

⚠ **Warning.** The maximum channel to channel voltage (between any 2 channels) must not exceed 500V DC.



Notes.

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

Fig. 4.2 Module Positions and Functions

4.2.1 Selecting the Analog Input Type(s) – Figs. 4.3 and 4.4

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

Channel 1 PL1 & PL8 on the main p.c.b. (Fig. 4.3)

Channels 2 to 4 PL1 & PL3 on the module (Fig. 4.4)

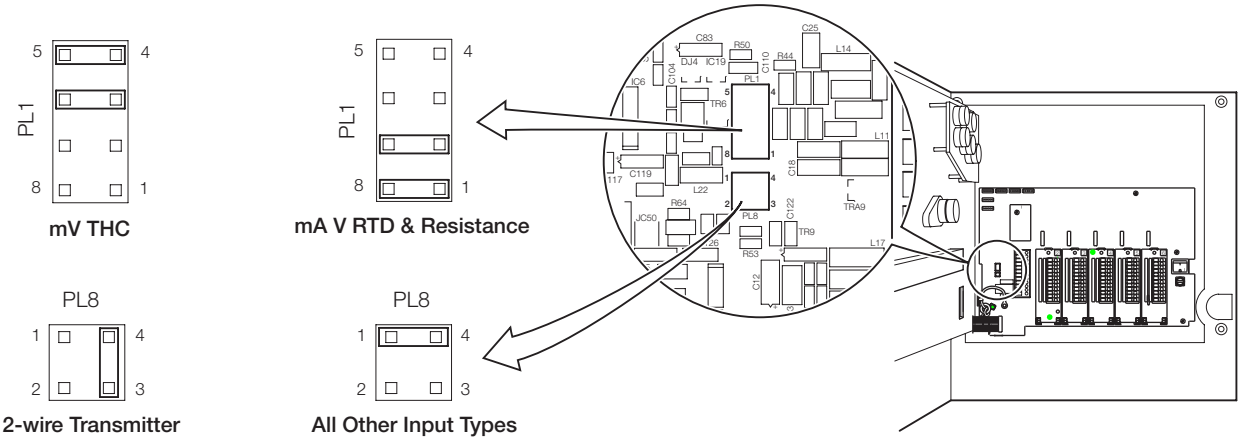


Fig. 4.3 Selecting the Input Type (Main Board)

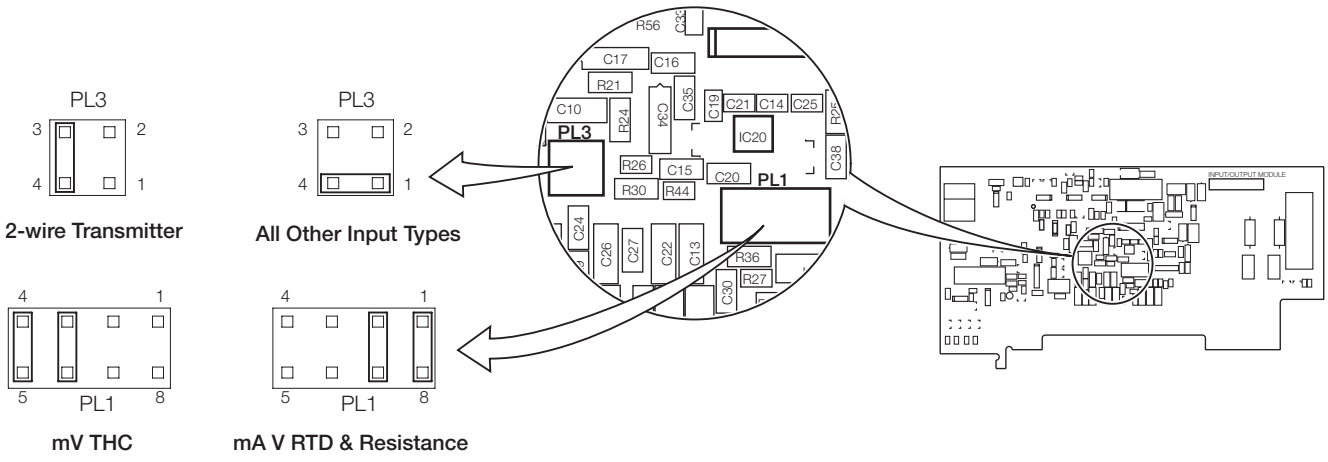


Fig. 4.4 Selecting the Input Type (I/O Modules)

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

Table 4.1 Thermocouple Compensating Cable

4.2.2 Voltage and Current – Fig. 4.5

Input impedances:

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

4.2.3 2-wire Transmitter Input – Fig. 4.5

Power for the transmitter is supplied by terminal 6.

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

4.2.4 Thermocouple – Fig. 4.5

Use correct compensating cable between the thermocouple and the terminals – see Table 4.1 (previous page).

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

4.2.5 Resistance Thermometer (RTD) – Fig. 4.5

If long leads are necessary it is preferable to use a 3-lead resistance thermometer.

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

4.2.6 Logic Inputs – Fig. 4.5

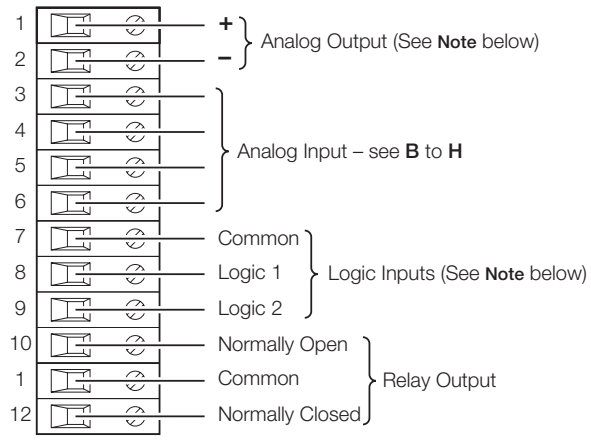
The two logic inputs accept either volt-free (switch) or TTL (5V) input types and can be used for remote switching of many recorder functions, e.g. chart stop/go, alarm acknowledgment, totalizer reset etc. Refer to the **Programming Guide**, IM/C1900–PGR or IM/C1900–PGC.

4.2.7 Analog Output – Fig. 4.5

4.2.8 Relay Output – Fig. 4.5

Relay specification:

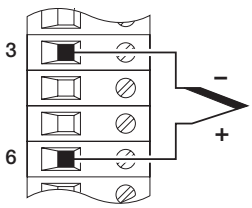
Type	single pole changeover	
Voltage	250V AC	250V DC
Current	5A AC	5A DC
Loading (non inductive)	1250VA	50W
Isolation, contacts to earth	2kV RMS	



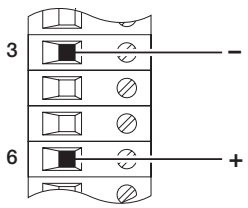
Note. Not applicable on Type 2 Modules.

A – Summary of Connections

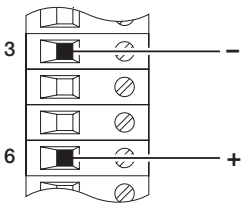
D – 2-wire Transmitter
(not available on non-upgradeable version)



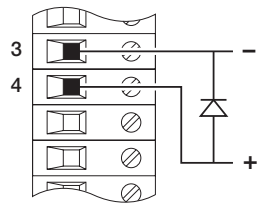
E – Thermocouple



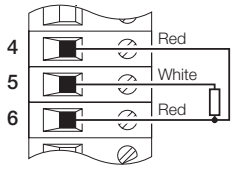
F – Low Voltage (mV)



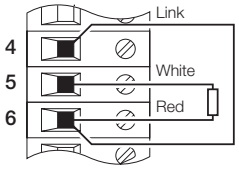
B – Voltage



C – Current
(non 2-wire transmitters) *



G – 3-wire RTD



H – 2-wire RTD & Resistance

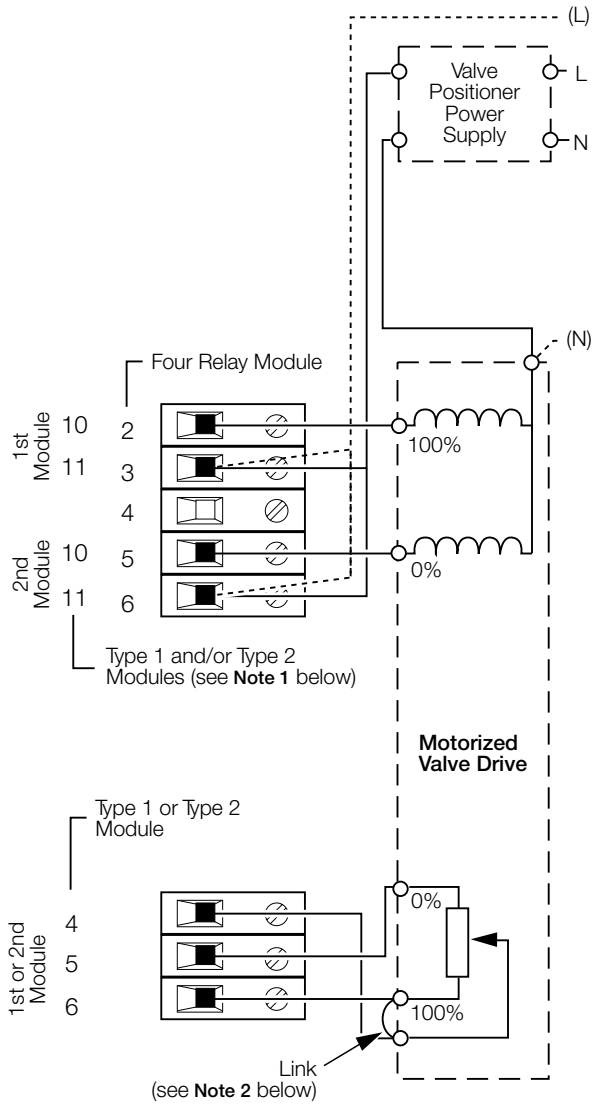
* Recommended diode:
Diode forward voltage > 0.8 V @ 20 mA or use 2 x 1N4001 general purpose diodes in series

Fig. 4.5 Channel Connections

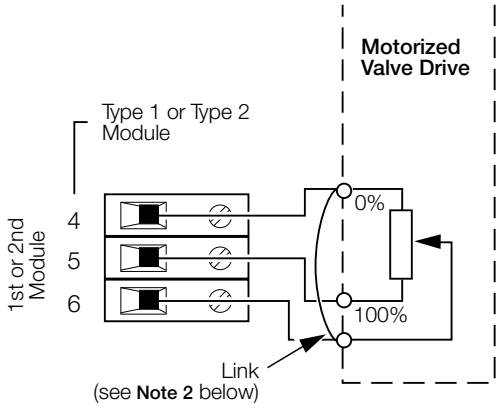
4.2.9 Motorized Valve – Fig. 4.6

A motorized valve with or without feedback requires 2 relays (common and normally open terminals) to drive the valve in either direction. Any two relays can be allocated for this function. Fig. 4.6 A shows two possible combinations.

Note. For valves with position feedback using low voltage (mV), voltage (V) or current (C), refer to Fig. 4.5 B, C and F for connections.



A – Standard Feedback Slidewire Configuration



B – Alternative Feedback Slidewire Configuration

Notes.

1 Type 1 and type 2 modules have one relay output, therefore two modules are required.

2 Link must be connected at valve drive end, not at the controller terminals.

Fig 4.6 Motorized Valve Connections (using feedback slidewire)

4.3 Module Connections

4.3.1 Standard I/O or Analog + Relay (Module Types 1, 2 and 7) – Fig. 4.5

The connections are the same as Channel connections to the main board. Refer to Section 4.2.

4.3.2 Four Relay Module (Module Type 3) – Fig. 4.7

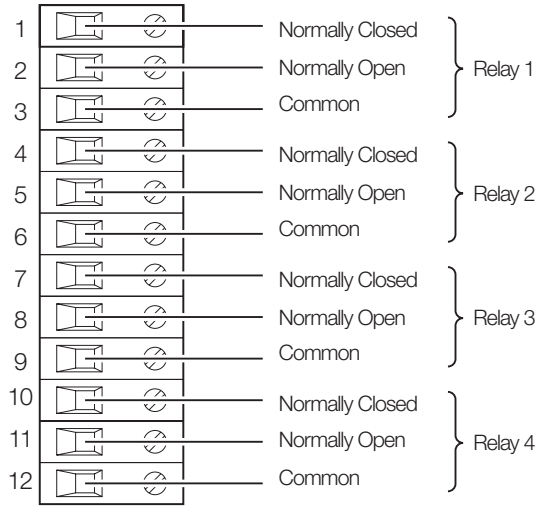


Fig. 4.7 Four Relay Module Connections (Module Type 3)

4.3.3 Eight Digital Inputs or Outputs (Module Types 4 and 5 respectively) – Figs. 4.8 and 4.9

A plug-in link is used to select the board's function; digital inputs or digital outputs – see Fig. 4.8. The maximum current drain from each TTL output must not exceed 5mA.

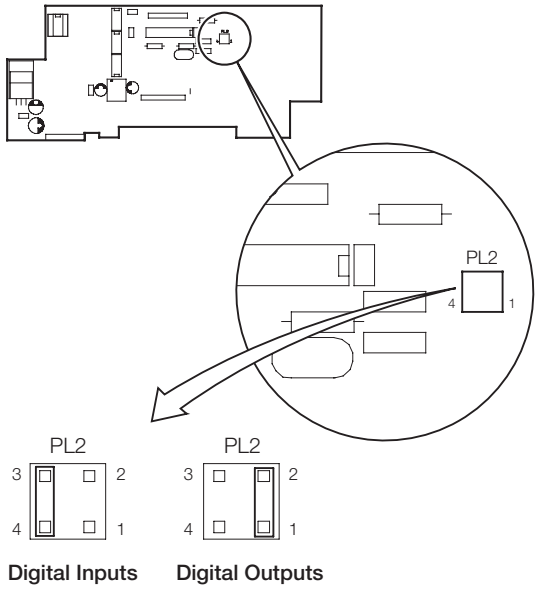


Fig. 4.8 Selecting the Digital Module Function (Module Types 4 and 5)

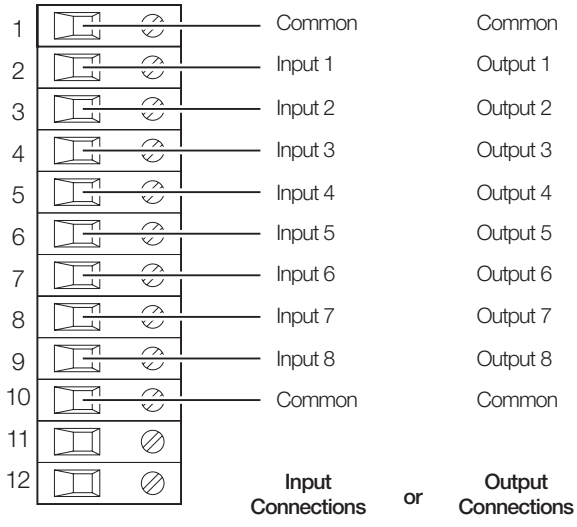
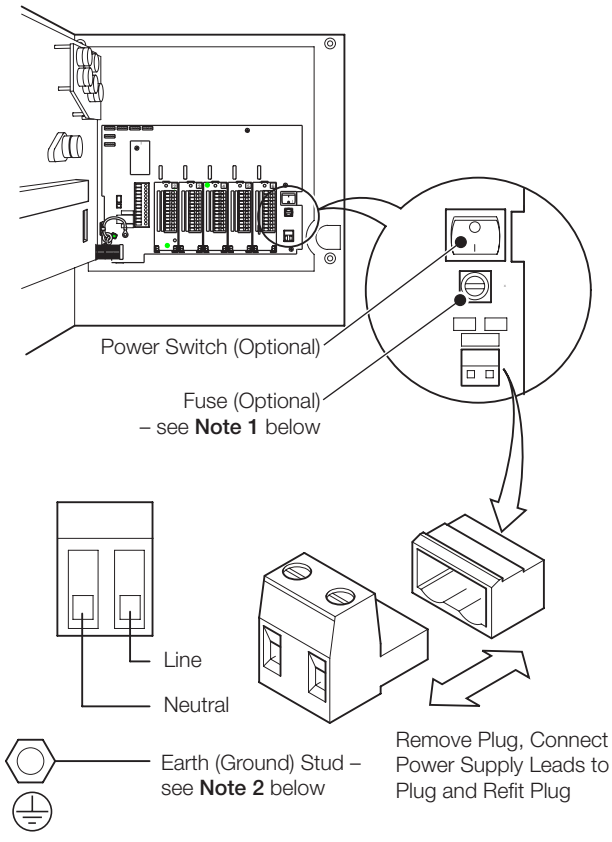
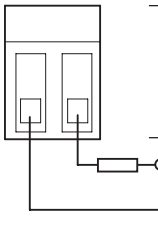


Fig. 4.9 Eight Digital Inputs or Outputs Connections (Module Types 4 and 5)

4.4 Power Supply Connections – Fig. 4.10





Warning. If the optional internal power switch and fuse are not fitted, an external disconnection device and fuse must be fitted – see also **Warnings** on page 6.

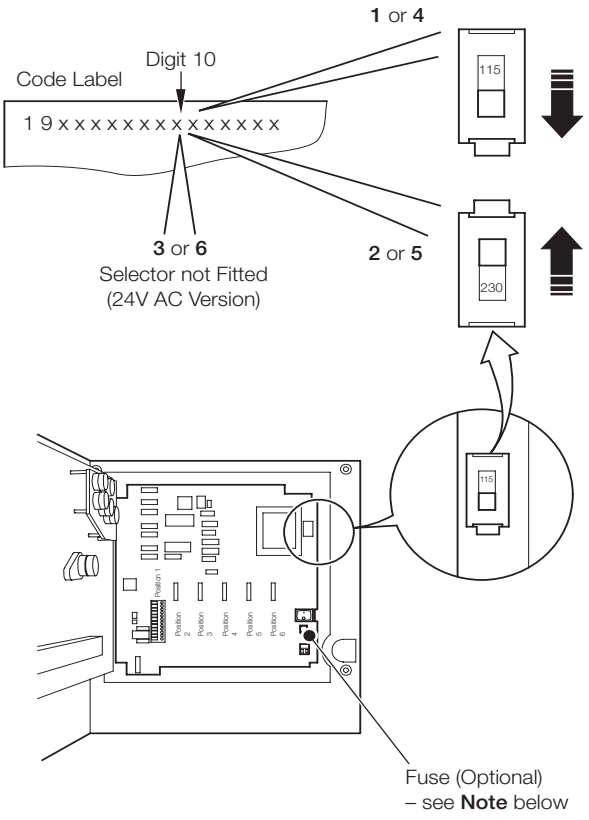
Before making any electrical connections, see Warnings on page 6

Notes.

1. Fuse rating:
   500mA (20 X 5mm) Type T
2. Ensure that the Earth (Ground) lead is longer than the Line and Neutral leads.

Fig. 4.10 Power Supply Connections

Note. Recorders manufactured before June 2005 are fitted with a Mainboard that is not equipped with a universal power supply. Ensure the supply voltage selector switch is set correctly and the appropriate fuse is fitted – see Fig 4.11.



Note. Fuse ratings:

115V Supply	1A (20 x 5mm) Type T
230V Supply	½A (20 x 5mm) Type T
24V Supply	4A (20 x 5mm) Type T

Fig. 4.11 Power Supply Selection
(Recorders Manufactured Before June 2005 Only)

Position 1

Module Type 1 ☑

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

Position 2

Module Type *(Tick Box)* 1 ☐ 2 ☐

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

* Not applicable on Module Type 2

Position 3

Module Type *(Tick Box)* 1 ☐ 2 ☐

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

* Not applicable on Module Type 2

Position 4

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

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

* Not available on Module Type 2

3 ☐

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

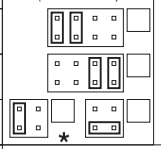
4 ☐ 5 ☐

Logic I/Ps (Type 4) or Logic O/Ps (Type 5)	1	C	
	2	1	
	3	2	
	4	3	
	5	4	
	6	5	
	7	6	
	8	7	
	9	8	
	10	C	

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

Position 5

Module Type *(Tick Box)* 2☐ 3☐ 4☐ 5☐

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

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

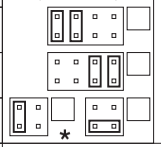
Logic I/Ps (Type 4) or Logic O?ps (Type 5)	1	C	
	2	1	
	3	2	
	4	3	
	5	4	
	6	5	
	7	6	
	8	7	
	9	8	
	10	C	

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

* Not available on Module Type 2

Position 6

Module Type *(Tick Box)* 2☐ 4☐ 5☐

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

Logic I/Ps (Type 4) or Logic O/Ps (Type 5)	1	C	
	2	1	
	3	2	
	4	3	
	5	4	
	6	5	
	7	6	
	8	7	
	9	8	
	10	C	

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

* Not available on Module Type 2

NOTES

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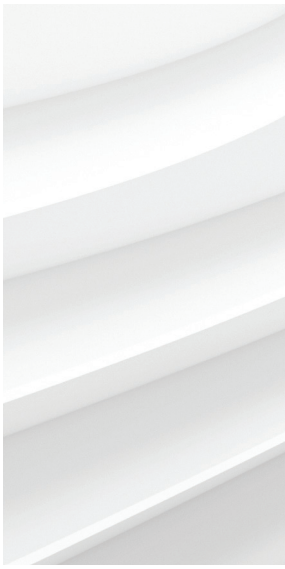

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Operating Instructions C1900 Circular chart recorder and recorder/controller	IM/C1900-MOD
User Guide C1900 Circular chart recorder and recorder/controller	IM/C1900-ADV

Use of instructions

	Warning – an instruction that draws attention to the risk of injury or death.
	Caution – an instruction that draws attention to the risk of damage to the product, process or surroundings.
	Note – clarification of an instruction or additional information. Information.
	Information – further reference for more detailed information or technical details.

It must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all Warning and Caution notices.

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

Health and safety

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

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

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

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2	SETTING UP		2
	2.1	Instrument Power-up	2
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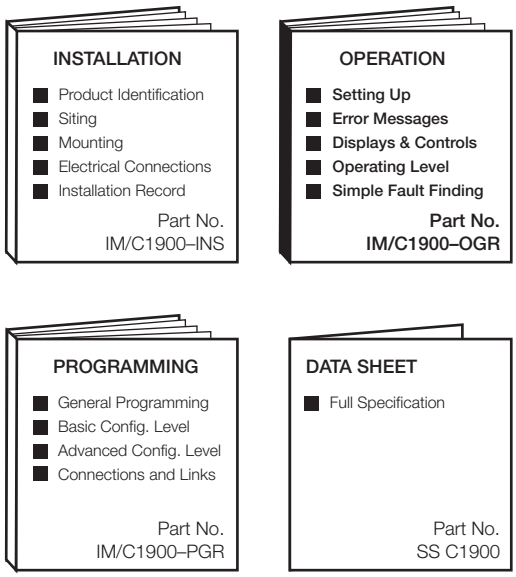
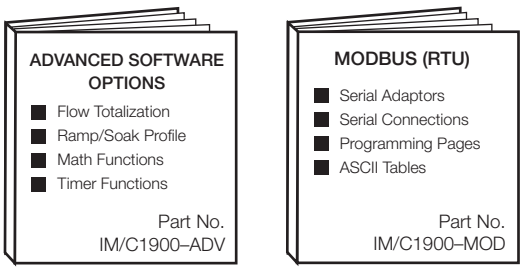
1 INTRODUCTION

The documentation for the C1900 series of circular chart recorders is shown in Fig. 1.1. The **Standard Manuals**, including the data sheet, are supplied with all instruments. The **Supplementary Manuals** supplied depend on the specification of the instrument.



A – Standard Manuals



B – Supplementary Manuals

Fig. 1.1 C1900 Documentation

2 SETTING UP

2.1 Instrument Power-up – Fig. 2.1 and 2.2

Caution. Ensure that all connections, especially to the earth stud, are made correctly.

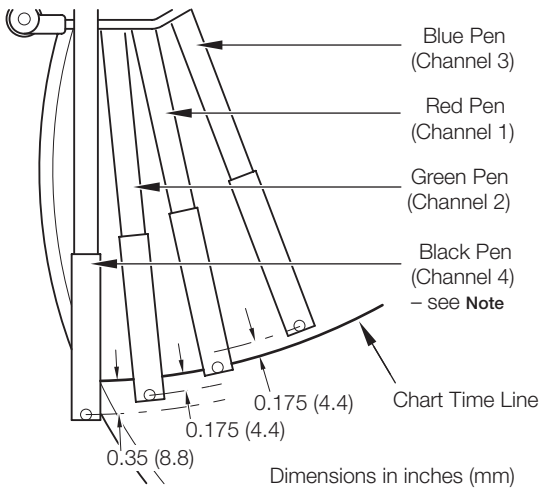
a) Check that the input sensors are installed correctly.

b) Check that the pen(s) are installed correctly – see Fig. 2.1.

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

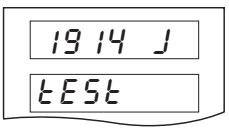
Note. On power-up, the pens are moved to an off-chart position for automatic referencing. Pen chatter may occur on those pens nearest the reference position. **This is a normal function of the instrument.**

d) The start-up sequence shown in Fig. 2.2 is displayed on faceplate 1 when the supply is first switched on.

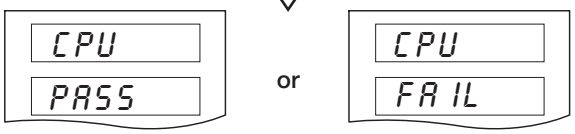


Note. If the true time line event option is fitted, the violet event pen records on the same time line as the red pen, but on the outer edge of the chart.

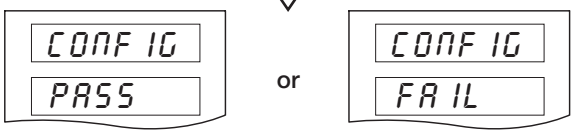
Fig. 2.1 Checking the Pen(s) Installation



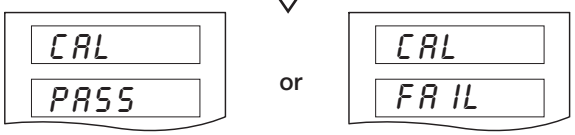
Instrument Test identifies the instrument type, e.g. 1914J – see Table 2.1 in the **Installation Manual**.



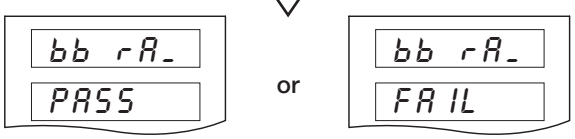
CPU Test carries out check of processor circuitry – see **Error Codes** below.



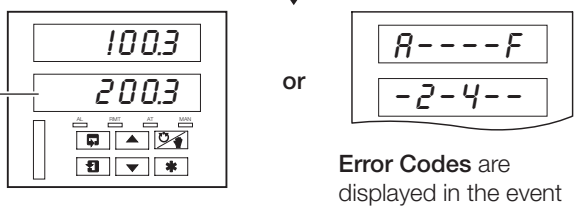
Configuration Test carries out check of non-volatile memories containing the instrument configuration, then indicates pass or fail – see **Error Codes** below.



Calibration Test carries out check of non-volatile memories containing the calibration data for each analog input and output, then indicates pass or fail – see **Error Codes** below.



Battery Back RAM Test carries out check of battery-backed RAM, then indicates pass or fail – see **Error Codes** below.



Normal Display

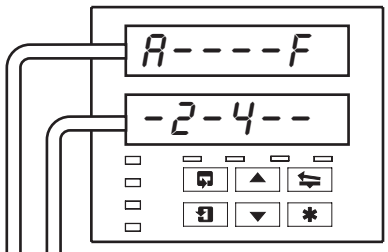
Not applicable on single channel instruments

Error Codes are displayed in the event of a fault – see Section 2.1.1.

Fig. 2.2 Instrument Displays at Start-up

2.1.1 Power-up Error Codes

If any of the power-up tests fail (see Fig. 2.2), error codes are displayed to identify the fault. Refer to Fig. 2.3 for error code interpretations.



Configuration and battery-backed RAM errors

Calibration errors

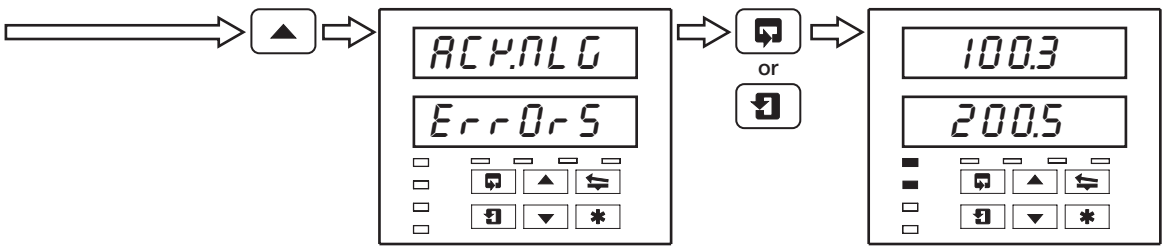
Code	Error	Action
–	No error	None
1	Main board	Power down and then up again. If fault remains, contact the local Service Organisation.
2	Module in position 2	
3	Module in position 3	
4	Module in position 4	
5	Module in position 5	
6	Module in position 6	

Analog input and/or analog output calibration is corrupt

Code	Error	Action
-	No error	None
A	Main program data stored in non-volatile memory on main board is corrupt	Check and correct program data
C	Timer set up stored in battery backed RAM is corrupt	Check and correct data in **Set Up Timer Page***
d	Maths set up stored in battery back RAM is corrupt	Check and correct data in **Set Up Maths Page***
F	Totalizer set up in battery backed RAM has been corrupt	Check and correct data in **Set Up Totals Page***

* Refer to the **Advanced Software Manual**

Acknowledging Error Codes



Note. Acknowledging the Error Code clears the error state but does not rectify the fault. After acknowledging the error, carry out the relevant action detailed in the above tables.

Fig. 2.3 Power-up Error Codes

2.2 Fitting the Chart – Fig. 2.4

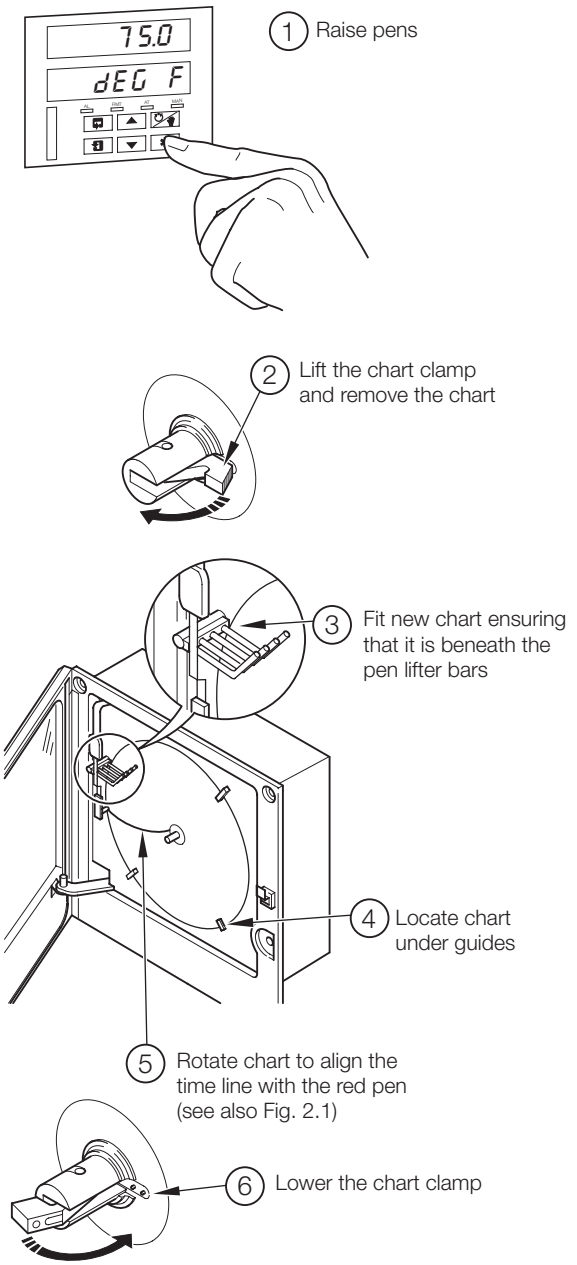
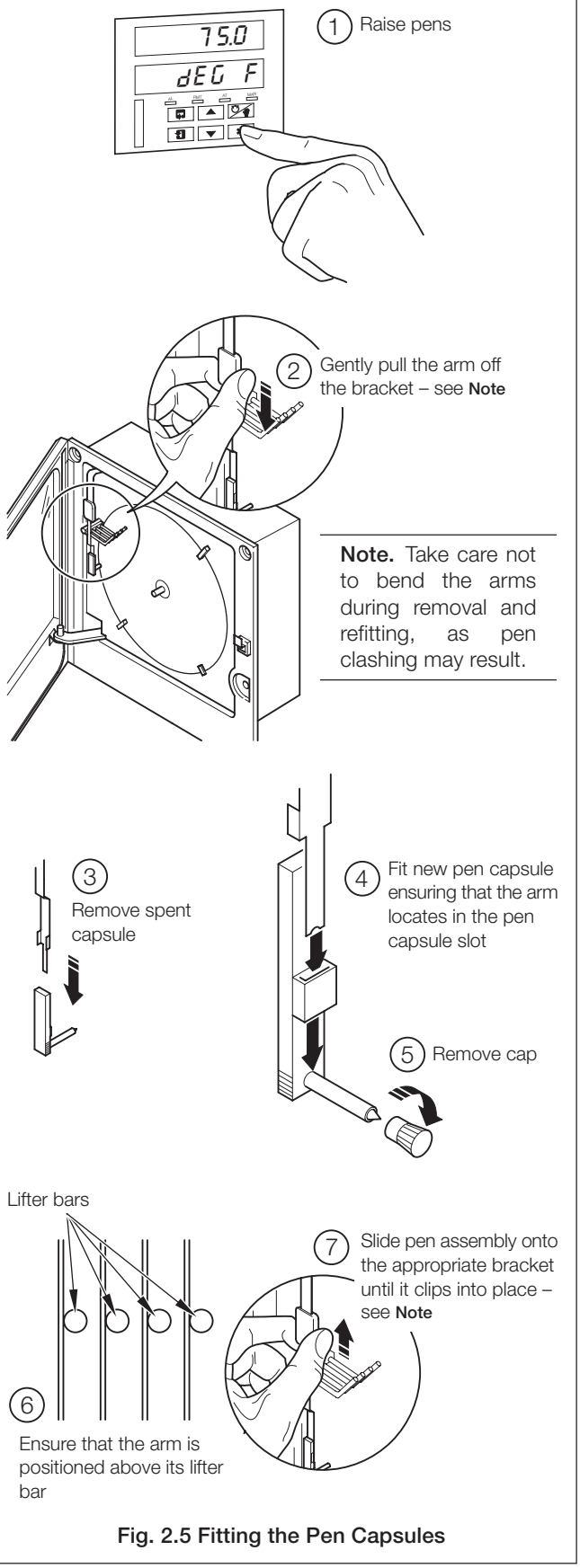


Fig. 2.4 Fitting the Chart

2.3 Fitting the Pen Capsule(s) – Fig. 2.5



Note. Take care not to bend the arms during removal and refitting, as pen clashing may result.

Fig. 2.5 Fitting the Pen Capsules

3 DISPLAYS & CONTROLS

The displays, LED indicators and operation/programming controls are located on the faceplate on the front panel of the instrument – see Fig 3.1.

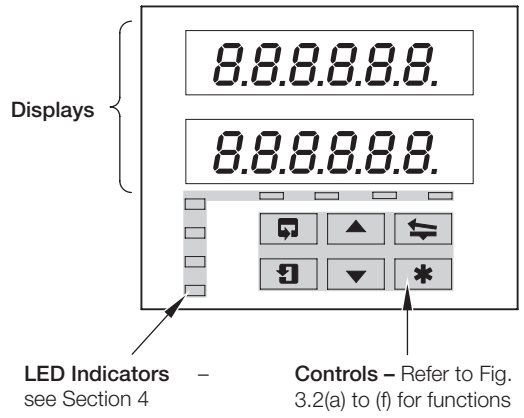
3.1 Displays and LED Indicators – Fig. 3.1

The displays comprise 2 rows of 6 characters.

At the top of each programming page (the page header) both displays are used to describe the particular page selected.

When parameters within the selected page are viewed the upper display shows the parameter and the lower display shows the value or setting for that parameter.

Alarm and Channel states are indicated by separate LEDs on the faceplate of the front panel of the instrument – see Sections 4.1, 4.2 and 4.3.



Information.

AL1 – Channel 1
AL2 – Channel 2
AL3 – Channel 3
AL4 – Channel 4
} Status of process variable alarms

CH1 – Channel 1
CH2 – Channel 2
CH3 – Channel 3
CH4 – Channel 4
} Current channel displayed

Fig. 3.1 Location of Displays, Controls and LED Indicators

A	A			L	L		
B	b			M	-		
C	C	or	c	N	n	or	n
D	d			O	0	or	o
E	E			P	P		
F	F			Q	Q.		
G	G			R	r		
H	H	or	h	S	S		
I	I			T	t		
J	J			U	U		
K	K.			V	U.		
				Y	y		

Table 3.1 Character Set

3.2 Use of Controls – Fig. 3.2(a) to (f)

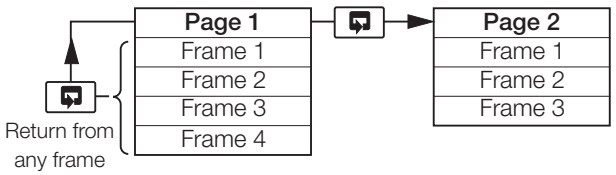


Fig. 3.2(a) Advancing to Next Page

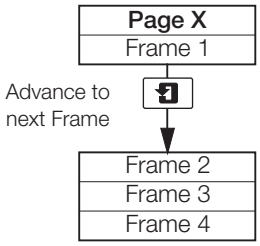
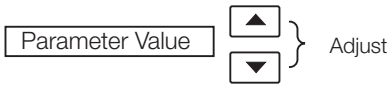
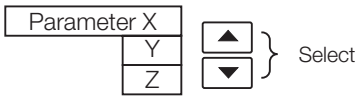


Fig. 3.2(b) Moving Between Parameters



Note. Continued pressure on the ▲ and ▼ keys causes the rate of change of the displayed value to increase. To make small adjustments operate the keys momentarily.

Fig. 3.2(c) Adjusting a Parameter Value



Note. Continued pressure on the ▲ and ▼ keys causes the rate of change of the displayed value to increase. To make small adjustments operate the keys momentarily.

Fig. 3.2(d) Selecting a Parameter Choice

Lift/Lower pen on alternate operations

Notes.

- The ⇆ key can be enabled or disabled in the **Set Up Chart Page**, **BASIC CONFIGURATION LEVEL**.
- If '**Auto Pen Lift Drop**' has been selected in the **Set Up Chart Page**, the pens return automatically to their operating positions after a five minute delay.

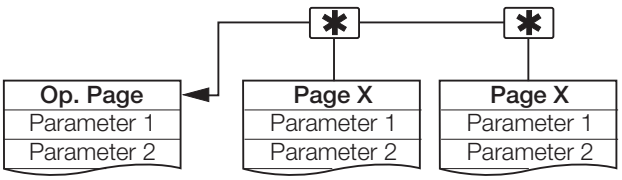
Fig. 3.2(e) Lifting/Lowering the Pens

Information. The ✱ key is programmed in the **Set Up Function Keys Page, ADVANCED CONFIGURATION LEVEL**.

Acknowledge all alarms

or

Return operator to top of **Operating Page**.



Note. The ✱ key returns the instrument display to the start of the operating page only when the display is at the top of any page.

Fig. 3.2(f) Selecting Programmable Functions

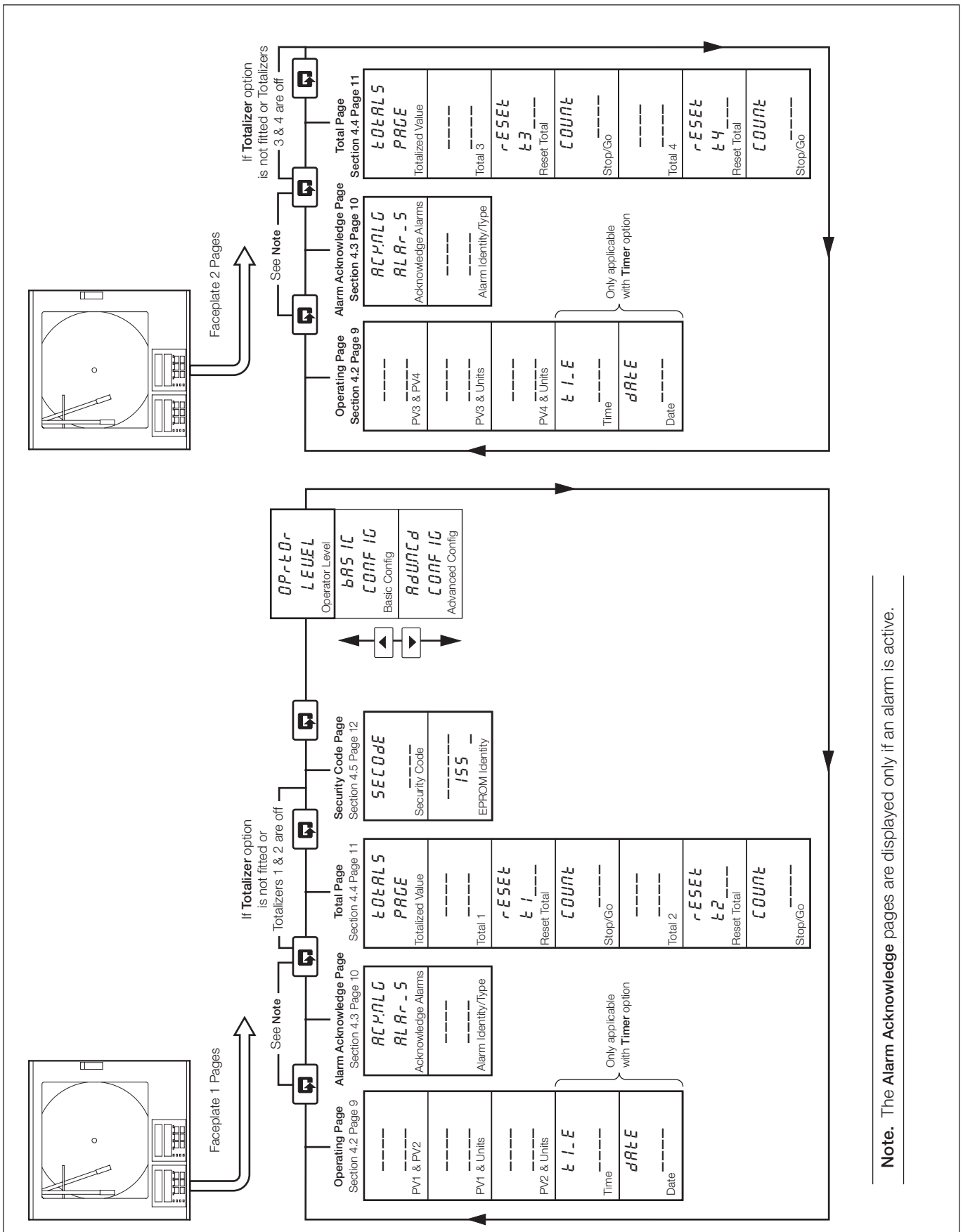


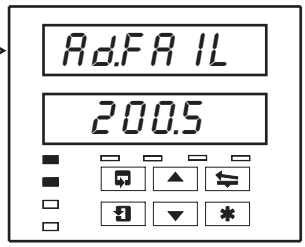
Fig. 4.1 Summary of Operating Level

The instrument has dedicated **Operating Pages** in the **OPERATOR LEVEL** – see Sections. 4.1 to 4.4. These pages are used for general monitoring of the process measurements and are not affected by the security system which inhibits access to the **PROGRAMMING LEVELS** only – see Section 4.5 on page 12.

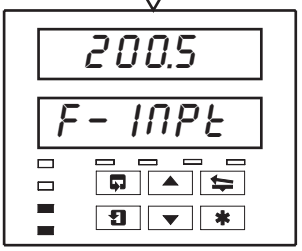
4.1 Input Error Messages – Fig. 4.2

Message	Reason	Action
Ad.FA IL	Internal analog to digital converter system hardware has failed	• Check that the input/output board is located correctly in its socket. • Power down and up If the 'Ad.FA IL' message is still present, contact the local service organization
F- INPt	Input is above or below fault detection level. **or** Input exceeds the limits for the linearizer selected	• Check input source for possible broken sensor • Check input connections • Check input link position • Check input configuration in **Set Up Input Page**

Examples



Hardware failure on Process Variable 1

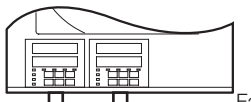


Input out of range on Process Variable 4

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

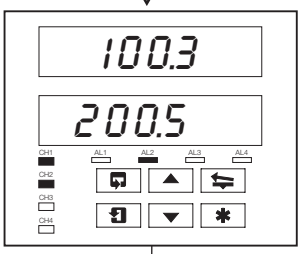
Fig. 4.2 Input Error Messages Displayed in the Operating Page

4.2 Operating Page Displays



Faceplate 1 for channels 1 and 2

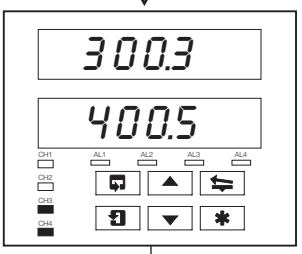
Faceplate 2 for channels 3 and 4



Process Variable 1 (PV1)

Process Variable 2 (PV2)*

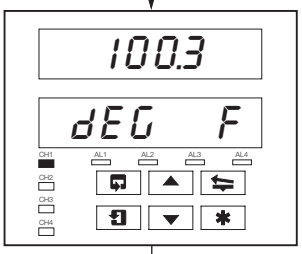
*Not displayed on single pen recorder.



Process Variable 3 (PV3)

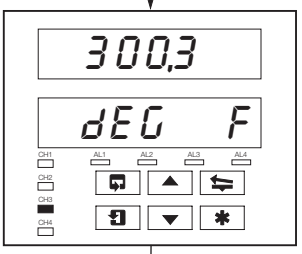
Process Variable 4 (PV4)*

* Not displayed on three pen recorders.



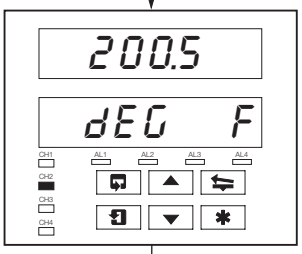
Process Variable 1 (PV1)

Temperature Units for PV1 as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*nONE*' is selected.



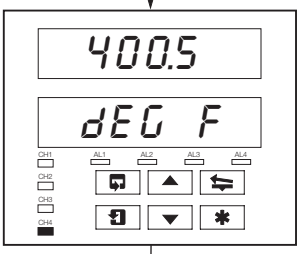
Process Variable 3 (PV3)

Temperature Units for PV3 as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*nONE*' is selected.



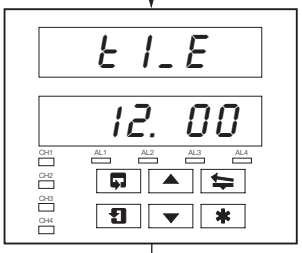
Process Variable 2 (PV2)

Temperature Units for PV2 as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*nONE*' is selected.



Process Variable 4 (PV4)

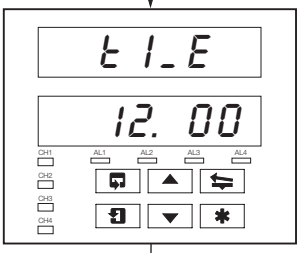
Temperature Units for PV4 as set in the **BASIC CONFIGURATION LEVEL**. Display is blank if '*nONE*' is selected.



Current Time*

Time* (displayed using 24hr clock)

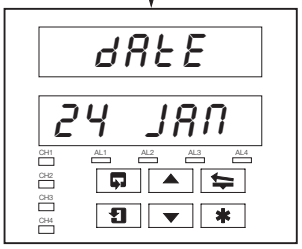
*Displayed only when timer option is fitted.



Current Time*

Time* (displayed using 24hr clock)

*Displayed only when timer option is fitted.



Current Date*

Day and Month*

*Displayed only when timer option is fitted.

Current Date*

Day and Month*

*Displayed only when timer option is fitted.

4.3 Alarm Acknowledge Page

4.3.1 Alarm Indications – Fig. 4.3

The definitions for alarm states (on, off or flashing) are detailed in Fig. 4.3.

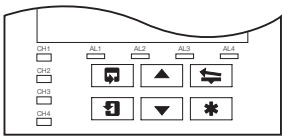
4.3.2 Acknowledging Alarms

Note. Channel 1 and 2 alarms can be acknowledged only from faceplate 1. Channel 3 and 4 alarms (if applicable) can be acknowledged only from faceplate 2.

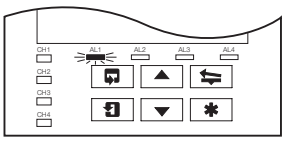
Unacknowledged alarms can be acknowledged from the faceplate controls on the front panel in two ways:

In the **OPERATING LEVEL** – by pressing the ✱ key at any frame (providing the key is programmed for this function – see Section 4.1 in the **Programming Manual**).

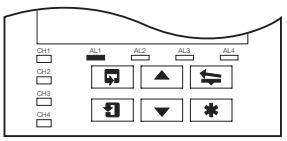
In the **Alarm Acknowledge Page** – by pressing the ▲ key – see Section 4.3.3 following.



No LED illuminated indicates no alarms active.
The **Alarm Acknowledge Page** is not displayed in the **OPERATOR LEVEL**.



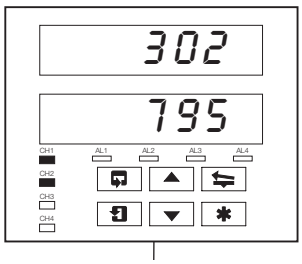
A flashing LED indicates an unacknowledged alarm on that channel. For example, a flashing **AL1** LED indicates an unacknowledged alarm on channel 1.
The **Alarm Acknowledge Page** is now displayed in the **OPERATOR LEVEL**.



A constant LED indicates that all active alarms have been acknowledged on that channel.
The **Alarm Acknowledge Page** remains in the **OPERATOR LEVEL** until all alarm conditions are cleared on that channel.

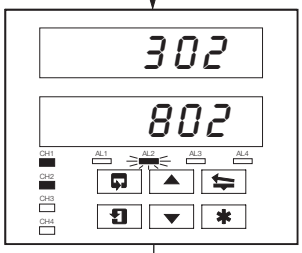
Fig. 4.3 Alarm LED Indications

4.3.3 Using the Alarm Acknowledge Page



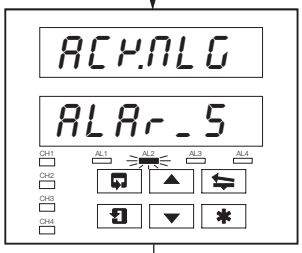
No Alarm Active
No LED indicators illuminated.

Alarm Activated

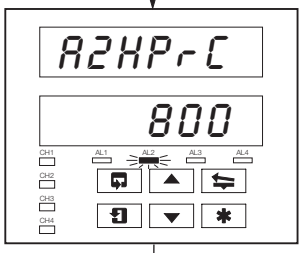


Alarm Active
AL2 LED indicator flashing, indicating active alarm on channel 2.

Use ◙ key to go to top of **Alarm Acknowledge Page**.

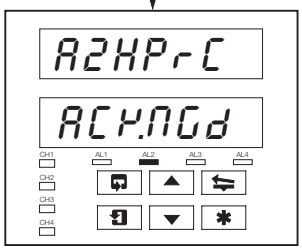


Alarm Acknowledge Page
Use ◨ key to advance to next frame



Alarm Identity
Upper display: shows the alarm identity and type.

Lower Display: shows the trip level of the alarm identified in the upper display.



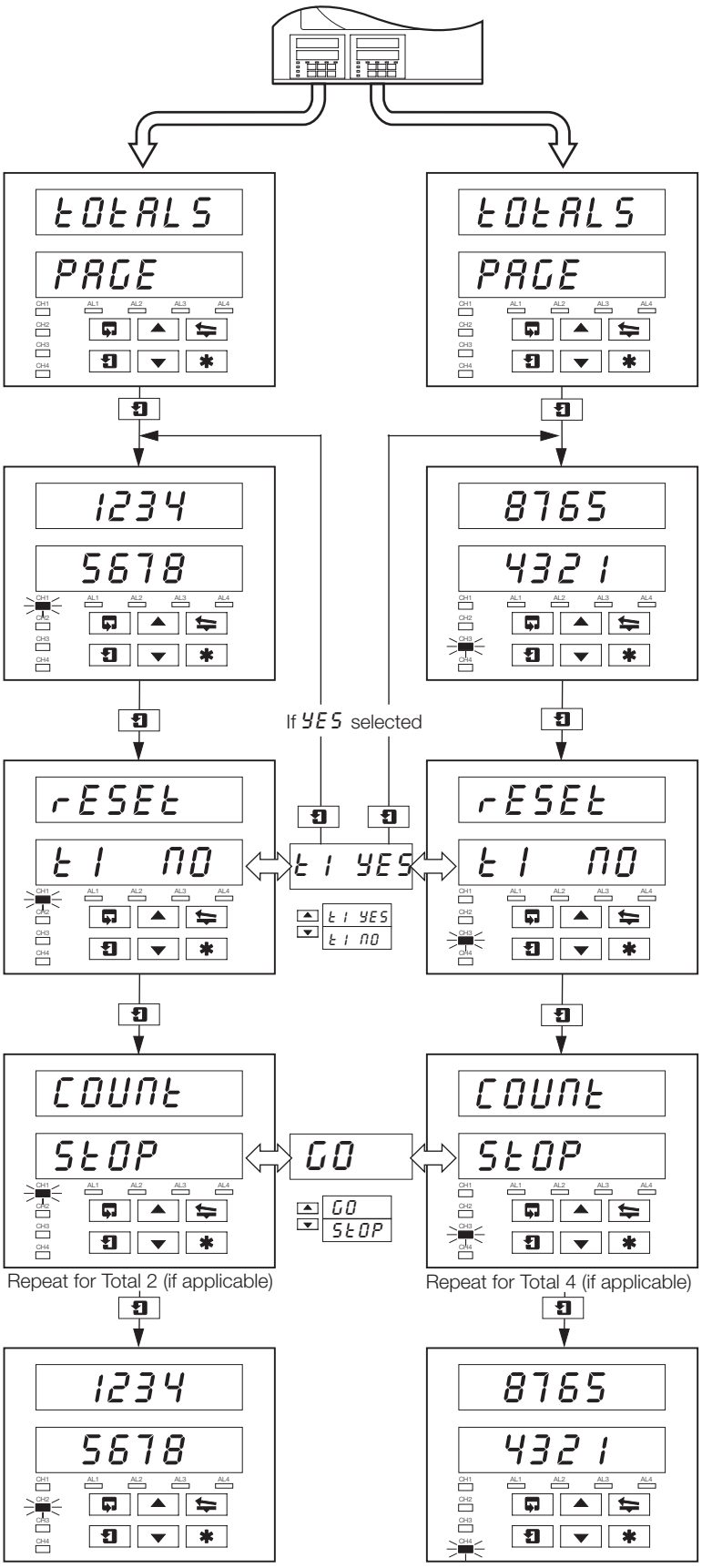
Acknowledge Alarm
Use ▲ key to acknowledge the alarm (see). When the alarm is acknowledged, '`ACK.NGd`' is displayed and a constant LED indicates the acknowledged alarm.

If there are more active alarms on channel 2 the LED continues to flash until all alarms for that channel have been acknowledged.

Note. The ✱ key or a digital input can also be used to acknowledge alarm, if programmed.

4.4 Totals Page Displays

This page is omitted from both faceplates if the **Totalizer Option** is not fitted. The page is also omitted from faceplate 1 if both Totals 1 and 2 are set to *OFF* and from faceplate 2 if both Totals 3 and 4 are set to *OFF* – refer to the **Set Up Totals Page** in the **Advanced Software Options Manual**.



Front Panel (Batch) Flow Total 1 (3)
The batch flow total is calculated from process variable 1 (3). The flow total can be reset if **Reset Enable** in **Set Up Totals Page** is set to '*EnbL-Y*'.

The flashing channel LED indicates the flow total displayed.

For example, a flashing channel 1 LED indicates **Flow Total 1** parameters displayed.

Counter Reset
The Front (Batch) Flow Total can be reset to the **Preset Value** in **Set Up Totals Page** if required.

Select '*t1 YES*' to reset the counter ('*t1*' indicates **Flow Total 1**).

Note. If the Counter Reset is disabled in **Set Up Totals Page**, the counter reset frame is omitted.

Counter Stop/Go
Select '*GO*' to start the counter or '*StOP*' to stop it.

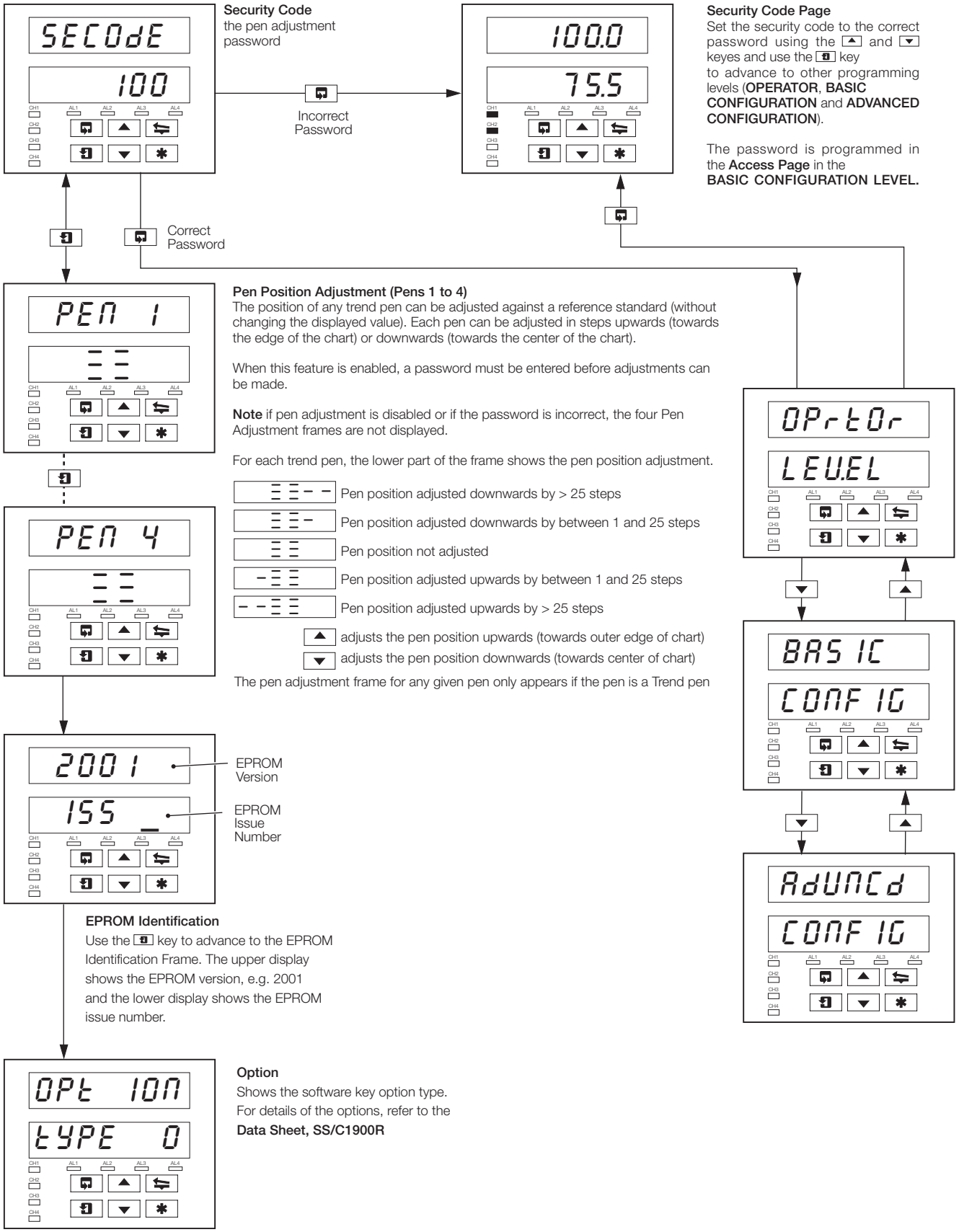
Note. If the Counter Stop/Go is disabled in **Set Up Totals Page**, the frame can be viewed but not altered. If a digital signal is assigned to the **Totalizer Stop/Go**, an active digital signal sets the counter to *GO* and the Counter cannot be stopped from the front panel.

Front Panel (Batch) Flow Total 2 (4)
Repeat the above procedure for **Flow Total** 2 (4).

Note. The number of totalizers is dependent on the number of pens fitted to the instrument e.g. a 3 pen instrument has 3 totalizers.

4.5 Access to Configuration Levels

A security system is used to prevent tampering with the programmed parameters by utilizing a password giving access to all programming pages – refer to the **Programming Manual**.



5 SIMPLE FAULT FINDING

Symptom	Possible Cause	Action
Does not power up	a) Internal fuse (if fitted) is blown b) Internal power switch (if fitted) is OFF c) Power supply connections are incorrect	a) Check wiring, rectify fault and replace fuse b) Turn power switch ON c) Check connections
Chart does not appear to move	a) Very slow chart speed selected b) Chart stop function enabled	a) Select required chart speed in **Set Up Chart Page** b) De-activate source being used to stop chart – see **Set Up Chart Page**
Pens in recording position but do not drop onto paper	Chart stop function enabled	De-activate source used to stop chart – see **Set Up Chart Page**
Red pen does not move beyond 94% position on chart	When real time event pen is fitted the red pen cannot go beyond 94% to prevent pens clashing	Use chart range which prevents the need to go beyond 94% of maximum on chart
Pen lift switch on front panel does not work	Pen lift switch is disabled	Enable pen-lift switch in **Set Up Chart Page**
Pens do not remain lifted when pen lift key is used	Auto pen drop feature is enabled	Disable auto pen drop in **Set Up Chart Page** if this is not required
Analog inputs are slow to respond	A large filter time has is set	Set digital filter value to give required response in **Set Up Inputs**
Time or date incorrect	Not set for correct local time	Set correct time and date in **Set Up Clock Page** – refer to **Advanced Software Manual**
Totalizers cannot be set to STOP or GO	Operator STOP/GO selection is not enabled in the **OPERATOR LEVEL**	Enable counter STOP/GO in the **Set Up Totals Page**
Totalizer cannot be set to STOP	Digital signal assigned to the total STOP/GO function is active	De-activate digital signal assigned to total STOP/GO function
External relays connected to relays in instrument fail to de-energize	Arc suppression capacitors are provided across the relay contacts and capacitor leakage current may be sufficient to prevent an external relay from de-energizing	Remove the arc suppression components – IC4 and IC5 on mainboard IC6 and IC7 on standard I/O and analog relay IC3 to IC10 on 4 relay module

6 SPARES LIST

Item	Part No.
Pen Capsules (pack of 3)	
Black	C1900/0119
Blue	C1900/0120
Red	C1900/0121
Green	C1900/0122
Violet*	C1900/0123
Pen Arm Assemblies	
ER/C Type Chart (J or R in Code Number) – Standard Pen	C1900/0076
ER/C Type Chart (J or R in Code Number) – Event Pen	C1900/0078
PX105 and PXR105 Type Chart (K or S in Code Number) – Standard Pen	C1900/0075
PX105 and PXR105 Type Chart (K or S in Code Number) – Event Pen	C1900/0077
Fuses	
24V	B11071 (4A)
115V	B11070 (1A)
230V	B11069 (500mA)

*True time line event option only.

NOTES

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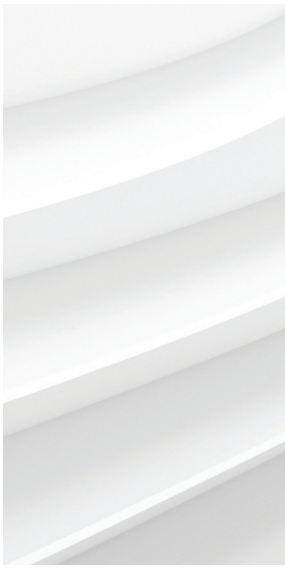

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C1900
Circular chart recorder

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Use of instructions

	Warning – an instruction that draws attention to the risk of injury or death.
	Caution – an instruction that draws attention to the risk of damage to the product, process or surroundings.
	Note – clarification of an instruction or additional information. Information.
	Information – further reference for more detailed information or technical details.

It must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all Warning and Caution notices.

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

Health and safety

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

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

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

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3	BASIC CONFIGURATION LEVEL	3
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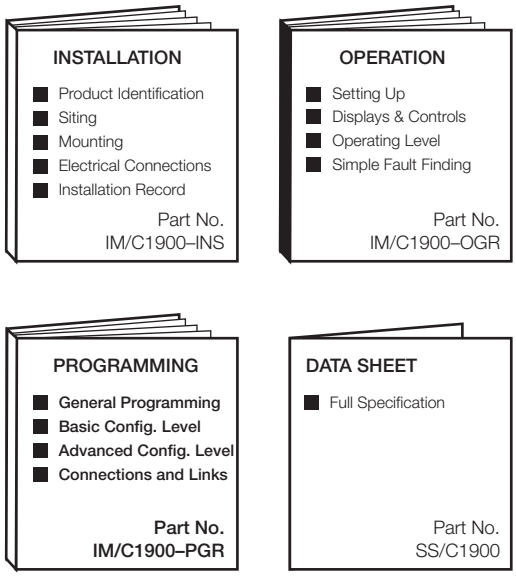
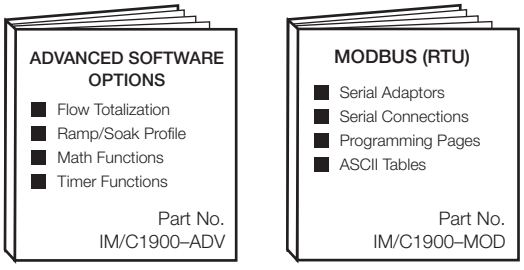
1 INTRODUCTION

The documentation for the C1900 series of circular chart recorders is shown in Fig. 1.1. The **Standard Manuals**, including the data sheet, are supplied with all instruments. The **Supplementary Manuals** supplied depend on the specification of the instrument.



A – Standard Manuals



B – Supplementary Manuals

Fig. 1.1 C1900 Documentation

2 GENERAL PROGRAMMING

The programming procedures are used to make changes to the operating parameter values and for scale adjustment.

The programming of all channels is performed using faceplate 1 – see Fig. 2.1.

When changing the input type it may be necessary to reposition the input selector links accordingly – see Section 5, **CONNECTIONS & LINKS**.

2.1 Preparation for Changes to the Parameters

Isolate all external alarm/control circuits to prevent inadvertent operation during programming.

Changes to the operating parameters are implemented using the ▲ or ▼ keys – see Section 3 of the **Operating Guide**.

> **Note.** The recorder responds instantly to parameter changes which are saved automatically when leaving the current frame.

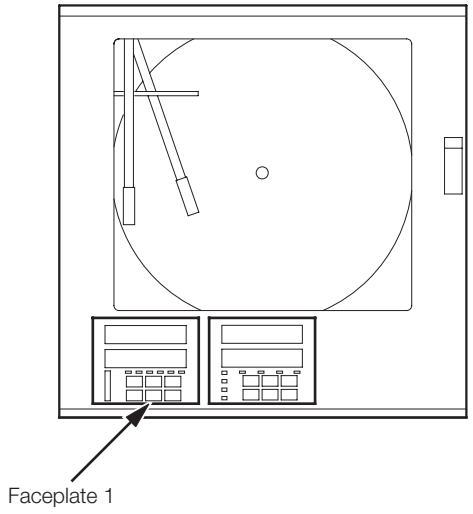


Fig. 2.1 Location of Faceplate 1

2.2 Security System

A security system is used to prevent tampering with the programmed parameters by restricting access to programming levels, other than the **OPERATOR LEVEL**; all users have access to this level.

A security password is used to give access to the programming pages. The password can be set to any value from 0 to 9999. The recorder is despatched with the password set to '0' – see Section 4.5 of **Operating Guide**.

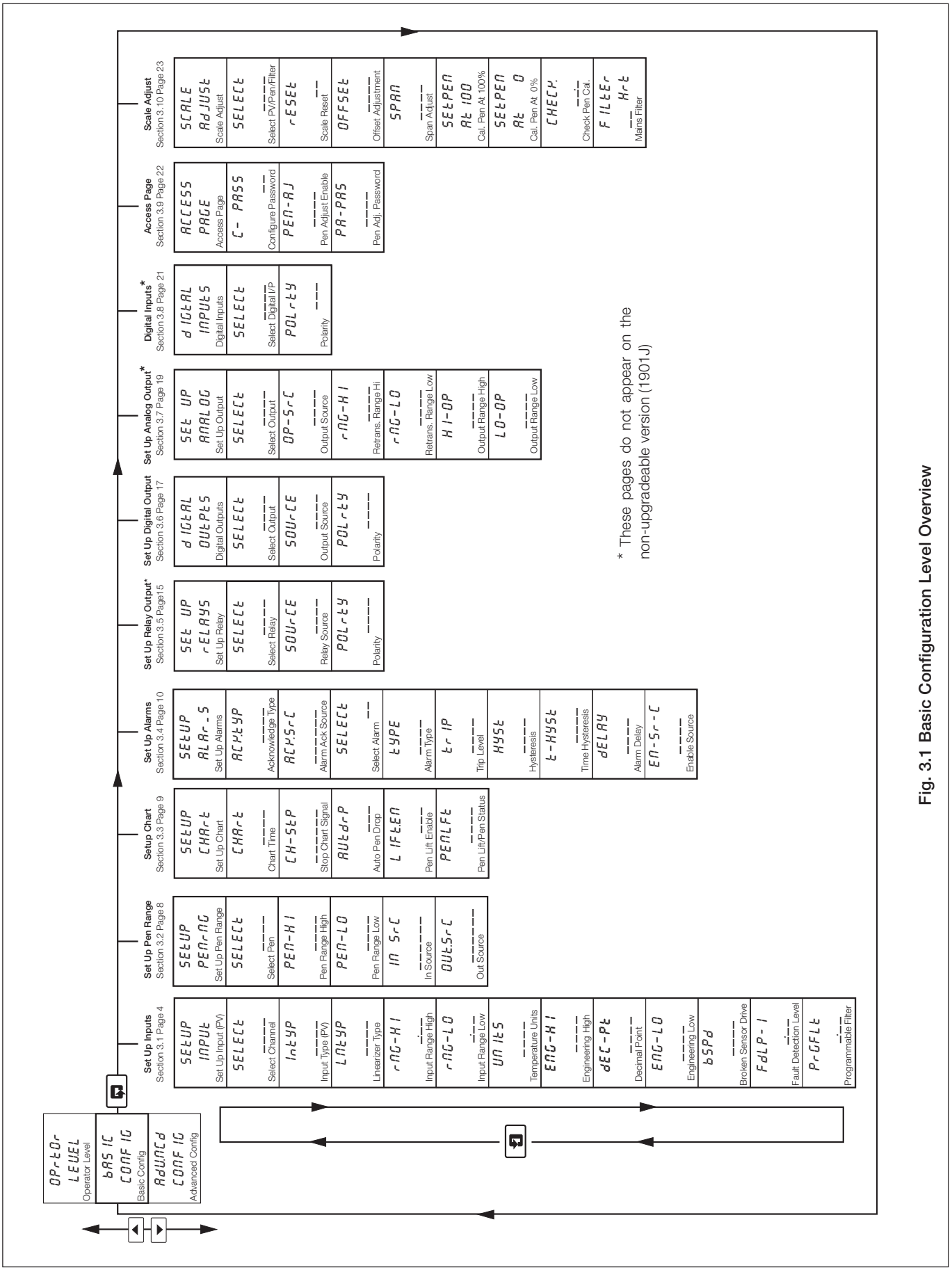
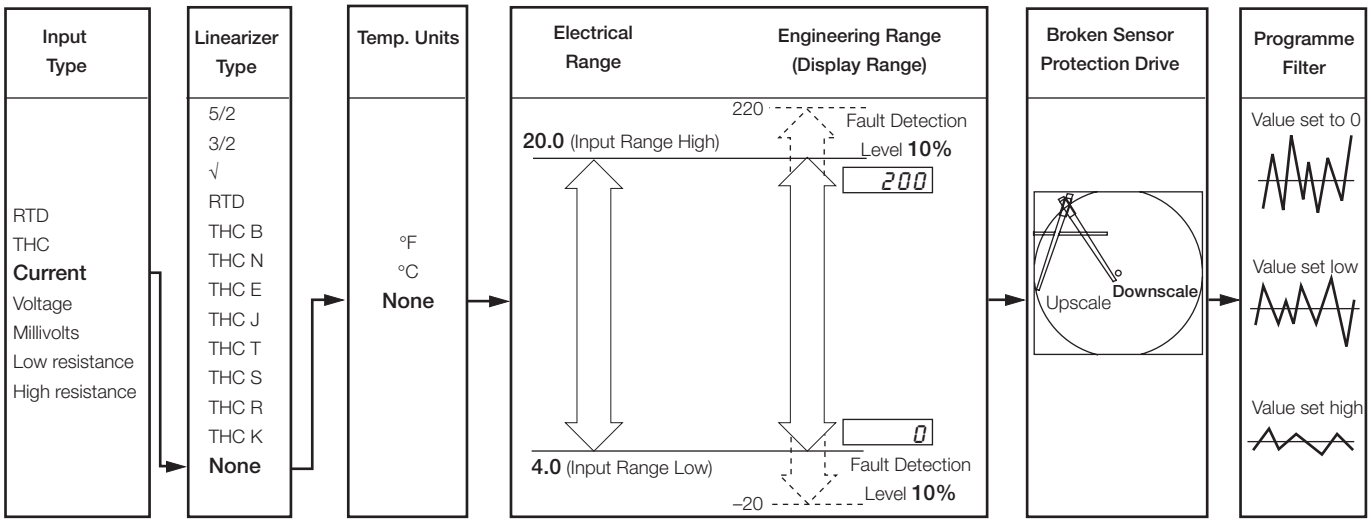


Fig. 3.1 Basic Configuration Level Overview

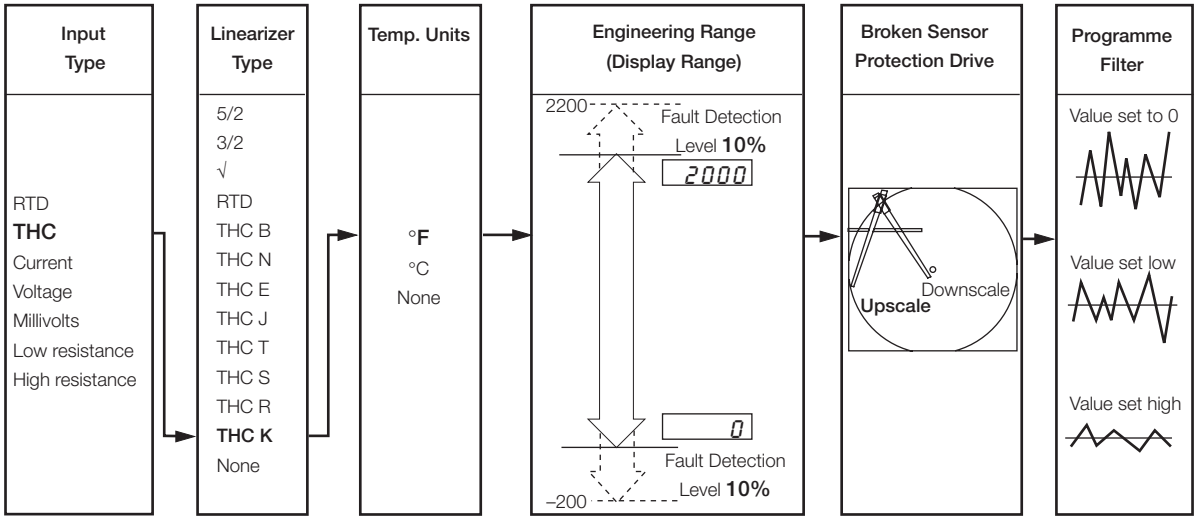
3.1 Set Up Input (Process Variable)

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

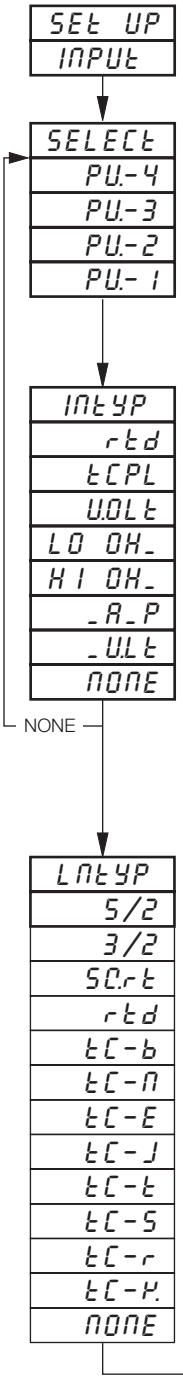
Example A – setting up:
- a current input of 4 to 20mA
- displaying a range of 0 to 200psi
- a fault detection level 10% above 200psi (engineering/display range) and 10% below 0psi (engineering/display range)
- in the event of a fault being detected and/or the fault detection level being exceeded the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



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



...3.1 Set Up Input (Process Variable)



Page Header – **Set Up Input (Process Variable)**

To advance to **Set Up Pen Range Page** press the ⏎ key.

Select Channel

Select the channel to be programmed:

PU.- 1	–	Channel 1
PU.- 2	–	Channel 2
PU.- 3	–	Channel 3
PU.- 4	–	Channel 4

Note. In the remaining frames press the ✱ key to view the channel selected.

Input Type (Process Variable)

Caution. Ensure the correct input link positions are selected and the input is wired correctly – see Section 5, **CONNECTIONS & LINKS**.

Select the input type required:

rtd	–	Resistance thermometer
tCPL	–	Thermocouple
U.OLt	–	Voltage
LO OH_	–	Low resistance (≤750Ω)
HI OH_	–	High resistance (>750Ω)
_A_P	–	Current
_ULt	–	Millivolt (≤150mV)
NONE	–	None

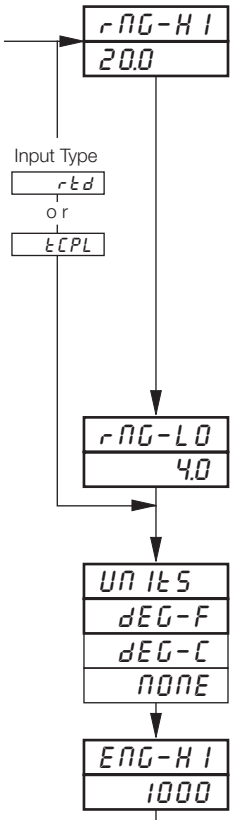
Linearizer Type

Select the linearizer type required:

5/2	– $x^{5/2}$	Open channel flow applications
3/2	– $x^{3/2}$	
SQ.rt	–	Square Root
rtd	–	Resistance thermometer
tC-b	–	Type B thermocouple
tC-N	–	Type N thermocouple
tC-E	–	Type E thermocouple
tC-J	–	Type J thermocouple
tC-t	–	Type T thermocouple
tC-S	–	Type S thermocouple
tC-r	–	Type R thermocouple
tC-K.	–	Type K thermocouple
NONE	–	No linearizer

Continued on next page.

…3.1 Set Up Input (Process Variable)



Input Range High
Set the maximum electrical input value required (in electrical units).

Note. The value set must be within the limits detailed in the table below.

Input Type	Range Low Min.	Range High Max.	Min. Range (Low to High)
Millivolts	0	150	5.0
Volts	0	5	0.1
Milliamps	0	50	1.0
Resistance Low	0	750	20
Resistance High	0	9999	400

Input Range Low
Set the minimum electrical input value required (in electrical units).

Note. The value set must be within the limits detailed in the above table.

Temperature Units
Select units required.

Engineering Range High
Set the maximum engineering (display) value required.

Note. The value set must be within the limits detailed in the tables below.

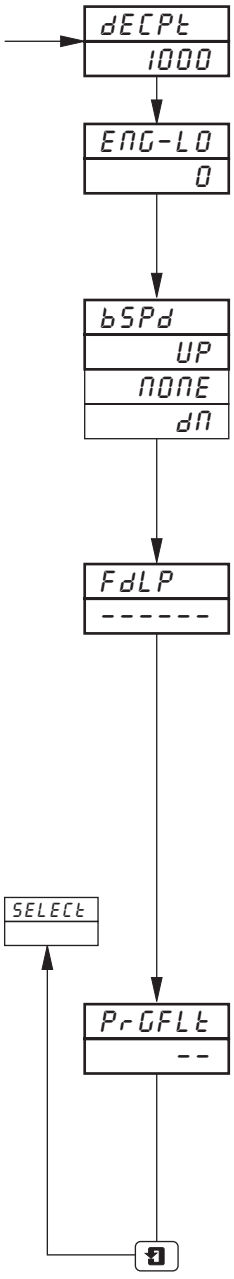
Linearizer Type	Degrees Fahrenheit			Degrees Celsius		
	Min.	Max.	Min. Span	Min.	Max.	Min. Span
Type B	0	3272	1278	–18	1800	710
Type E	–148	1652	81	–100	900	45
Type J	–148	1652	90	–100	900	50
Type K	–148	2372	117	–100	1300	65
Type N	–328	2372	162	–200	1300	90
Type R & S	0	3092	576	–18	1700	320
Type T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

Performance accuracy is not guaranteed below 725°F/400°C for types B, R and S thermocouples.
Minimum span below zero Type T 126°F/70°C
Minimum span below zero Type N 189°F/105°C
THC standard DIN 4730 IEC 584
RTD standard DIN 43760 IEC 751

Linearizer Type	Engineering Range High and Low	
	Min.	Max.
5/2	–9999	+9999
3/2		
Square Root		
None		

Continued on next page.

...3.1 Set Up Input (Process Variable)



Decimal Point
Set the decimal point position required for **both** the engineering range high and engineering range low values.

Engineering Range Low
Set the minimum engineering (display) value required,

Note. The value set must be within the limits detailed in **Engineering Range High** tables opposite.

Broken Sensor Protection Drive
In the event of a fault being detected on the input and/or if the **Fault Detection Level Percentage** is exceeded (see next frame), the process variable is driven in the direction of the drive selected.

Select the broken sensor drive required:
- NONE – No drive
- UP – Upscale drive
- dN – Downscale drive.

Fault Detection Level Percentage
A fault level percentage can be set to detect a deviation above or below the display limits.

For example, if FdLP is set at 10.0%, a fault is detected if an input goes more than 10% above **Engineering Range High** or more than 10% below **Engineering Range Low**.

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

Set the level required, between 0.0 and 100.0% of engineering span (range low to high) in 0.1% increments.

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

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

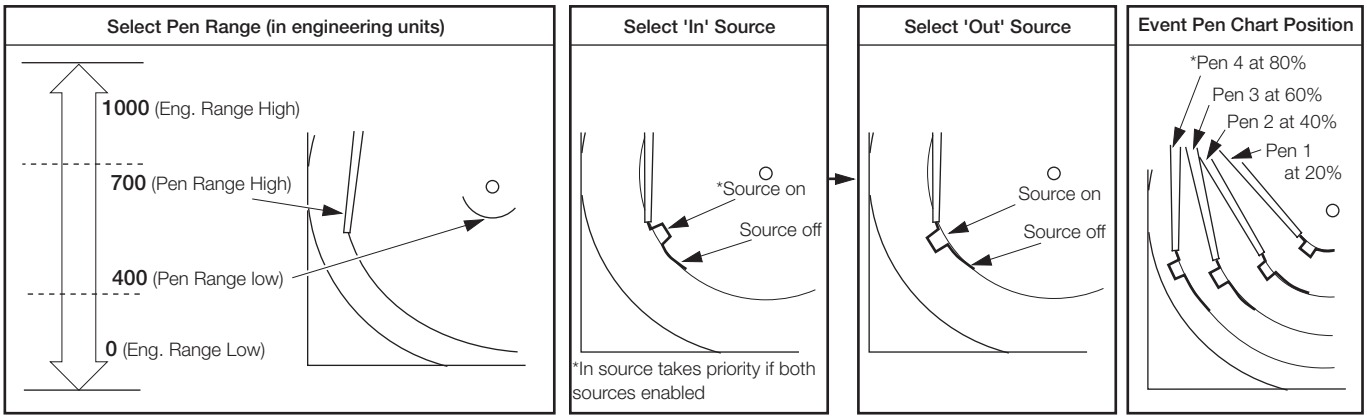
Set the value required, between 0 and 60 in 1 second increments.

Return to **Select Channel** frame.

3.2 Set Up Pen Range/Event Source

Information.

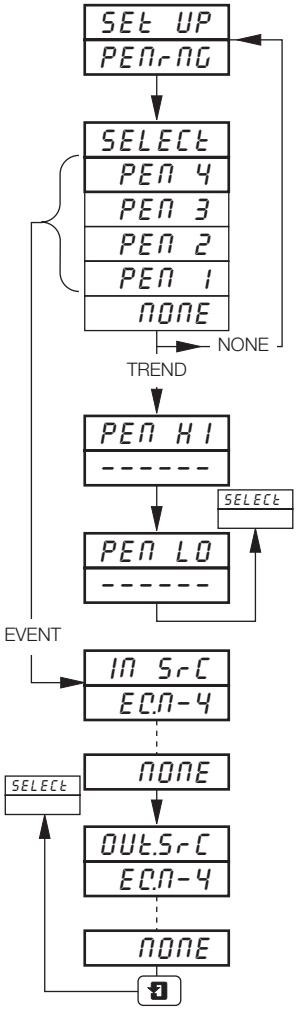
- **Trend pens** – have an independent chart range allowing a selected part of the engineering (display) range to be used for extra resolution on the chart.
- **Three position event pen function** – can be driven by digital inputs, alarms, logic equation results and real time events (when timer option is fitted).



Record Function

Event Function

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



Page Header – **Set Up Pen Range**

To advance to **Set Up Chart Page** press the ⮌ key.

Select Pen
Select the pen to be programmed

Note.

- In the remaining frames press the ✱ key to view the pen selected.
- Record (trend) or event pen function is set in the **ADVANCED CONFIGURATION LEVEL** (if True Time Event Pen option is selected, the fourth pen is fitted with a special pen arm and is set automatically for event pen function) – see Section 4.3, **Set Up Pen Functions**.

Pen Range High
Set the maximum value required on the chart, in engineering units (the value must be within the engineering range set in **Set Up Input Page** – see Section 3.1).

Pen Range Low
Set the minimum value required on the chart, in engineering units (the value must be within the engineering range set in **Set Up Input Page**).

In Source
Select a source to move the pen inwards on the chart.

For a description of sources – see **Table 3.1** on page 16.

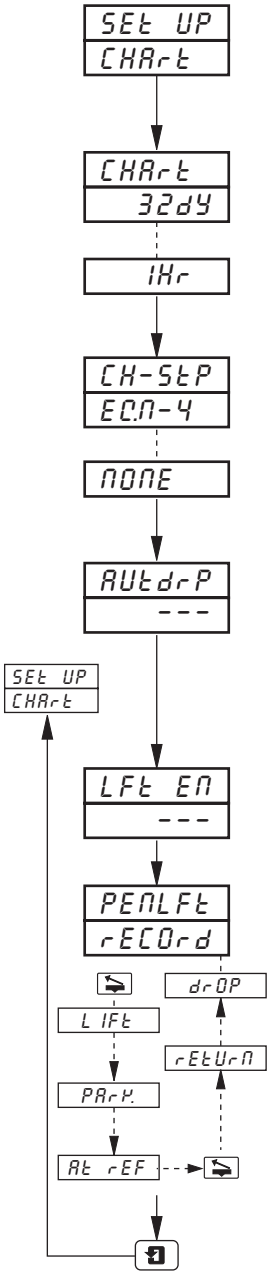
Out Source
Select a source to move the pen outwards on the chart.

For a description of sources – see **Table 3.1** on page 16.

Return to **Select Pen** frame.

3.3 Set Up Chart

Information.
- **Programmable chart duration** – between 1 and 167 hours or 7 and 32 days.
- **Chart stop function** – the chart can be stopped by an alarm, digital input, logic equation result or a real time event (if timer option is fitted).
- **Auto pen drop** – automatically drops the pen(s) onto the chart after a 5 minute delay to ensure recording is not left disabled inadvertently.



Page Header – **Set Up Chart**

To advance to **Set Up Alarms Page** press the ⏎ key.

Chart Duration
Select the chart duration required per revolution of the chart; between 1 and 167 hours or 7 and 32 days.

Stop Chart Source
Select the source required for stopping the chart.

For a description of sources – see **Table 3.1** on page 16.

Auto Pen Drop
Select '*YES*' to enable or '*nO*' to disable.

If '*YES*' selected, pen(s) drop automatically onto the chart 5 minutes after they are lifted.

If '*nO*' selected, the pen(s) remain lifted until they are manually dropped by the operator.

Pen Lift Enable/Disable
The ⇆ key can be disabled if required. Select '*YES*' to enable or '*nO*' to disable.

Pen Lift/Pen Status
To raise pen(s) press ⇆ key. The following status displays are shown:
- *rECOrd* – pen records on chart
- *LIFt* – pen lifts off chart
- *PArK.* – pen moves to park position
- *At rEF* – pen at reference position

To lower pen(s) press ⇆ key. The following status displays are shown:
- *rEtUrn* – pen returns to record position
- *drOP* – drops (lowers) onto chart
- *rECOrd* – pen records on chart

Return to top of **Set Up Chart Page**.

3.4 Set Up Alarms

Information.

- **Four alarms per channel** – identified A1 to D1 (for channel 1) up to A4 to D4 (for channel 4).
- **Three operator acknowledge options**.
- **Global alarm acknowledgment** – by digital input, alarm, logic equation result or real time event (if option fitted).
- **High/low process alarms**.
- **Delayed high/low process alarms**.
- **Fast/slow rate of change** – of process variable alarms.
- **Adjustable hysteresis value** – to prevent oscillation of alarm state.
- **Time hysteresis** – to allow delayed triggering of alarms.

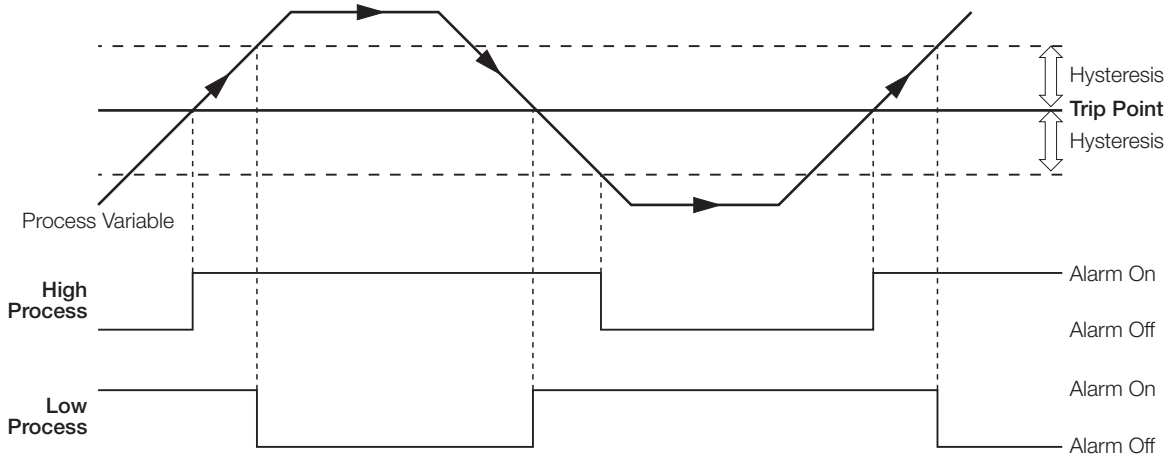
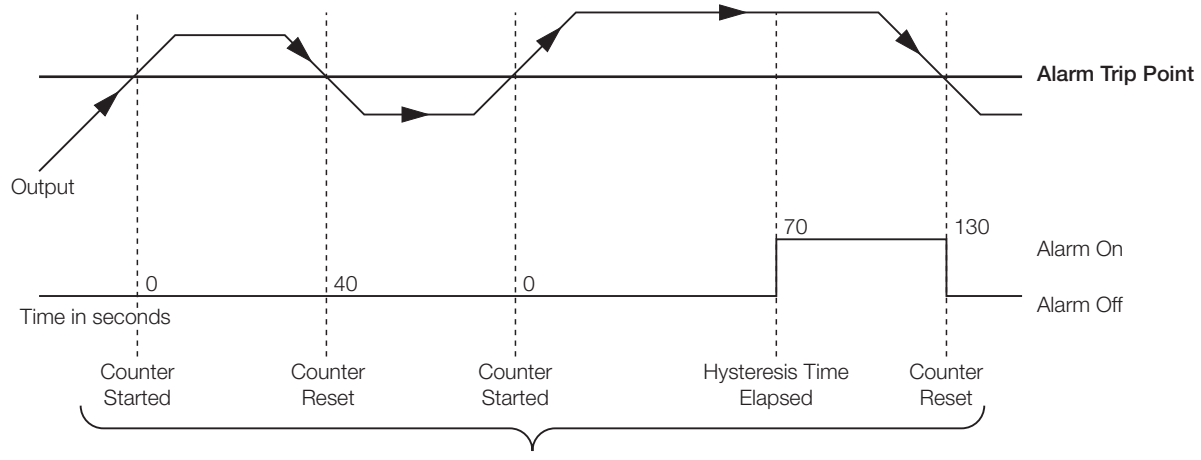


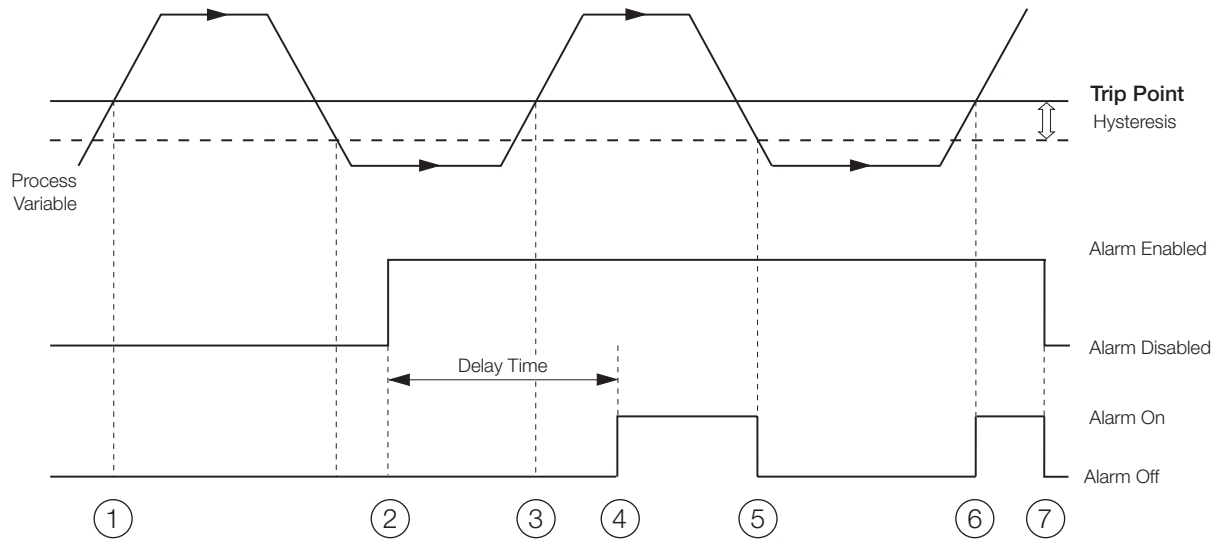
Fig. 3.2 High and Low Process Alarm with Hysteresis



Example shows time hysteresis set to 70 seconds used with a high process alarm

Fig. 3.3 Time Hysteresis Alarm

...3.4 Set Up Alarms



The operation of a delayed high/low process alarm is identical to that of the standard high/low process alarm but the alarm can be enabled/disabled by use of a digital signal.

The alarm state is held off whilst the enable signal is off and continues to be held off for a pre-configured period of time after the enable signal is switched ON (irrespective of the process variable value). Once the pre-configured alarm delay time has expired then the alarm operates in the same manner as a standard high/low process alarm.

(1) Process variable goes above trip point but alarm is not activated because enable signal is low (Alarm Disable).

(2) Alarm Enable signal is switched On. Alarm delay timer started.

(3) Process variable goes above trip point but alarm is not activated because alarm delay time has not expired.

(4) Alarm delay timer expires, alarm is now enabled. Alarm is activated because process variable is above trip point.

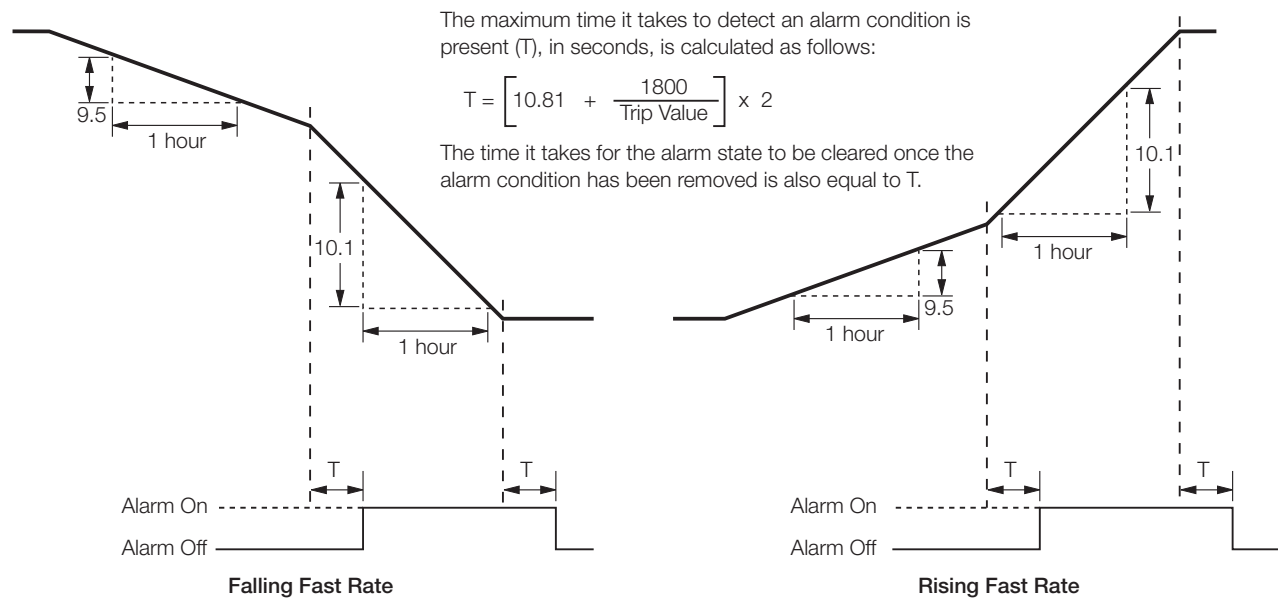
(5) Process variable goes below trip (hysteresis) point therefore alarm is de-activated.

(6) Process variable goes above trip point, alarm is activated (alarm is enabled and delay time has expired).

(7) Alarm Enable signal is switched Off. Alarm is disabled immediately. Alarm de-activates.

Fig. 3.4 Delayed High Process Alarm

...3.4 Set Up Alarms



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

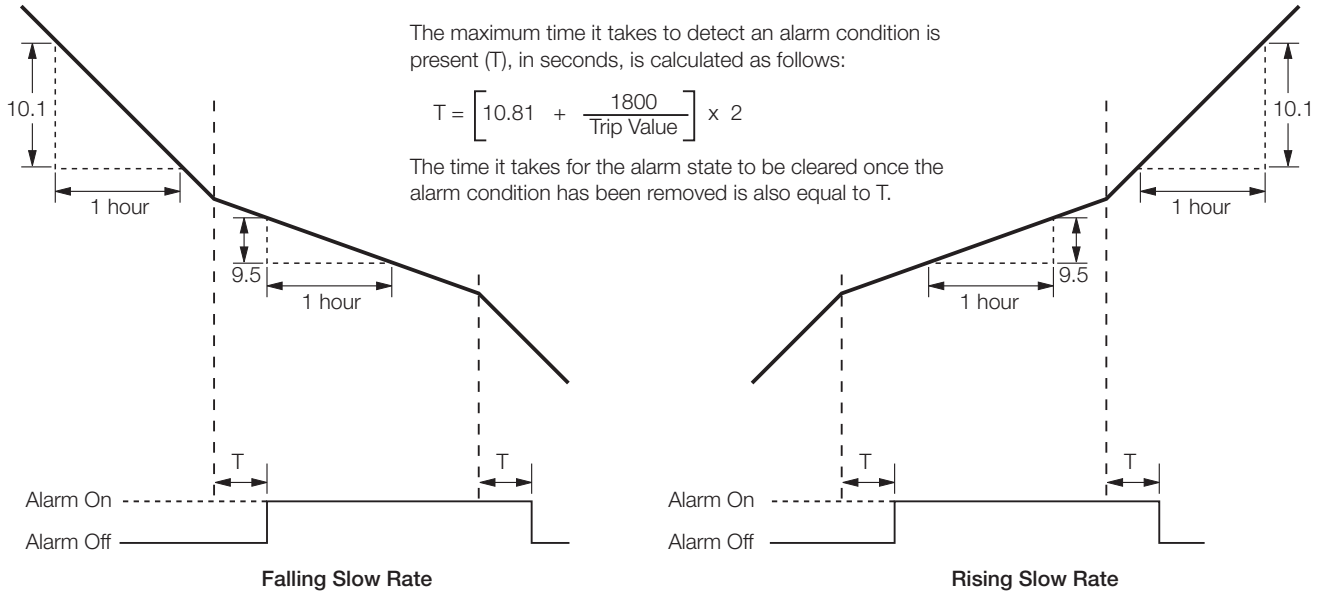
$$T = \left[10.81 + \frac{1800}{\text{Trip Value}}\right] \times 2$$

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

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

$$T = \left[10.81 + \frac{1800}{10}\right] \times 2 \qquad T = 382 \text{ seconds}$$

Fig. 3.5 Slow Rate Alarms with Hysteresis



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

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

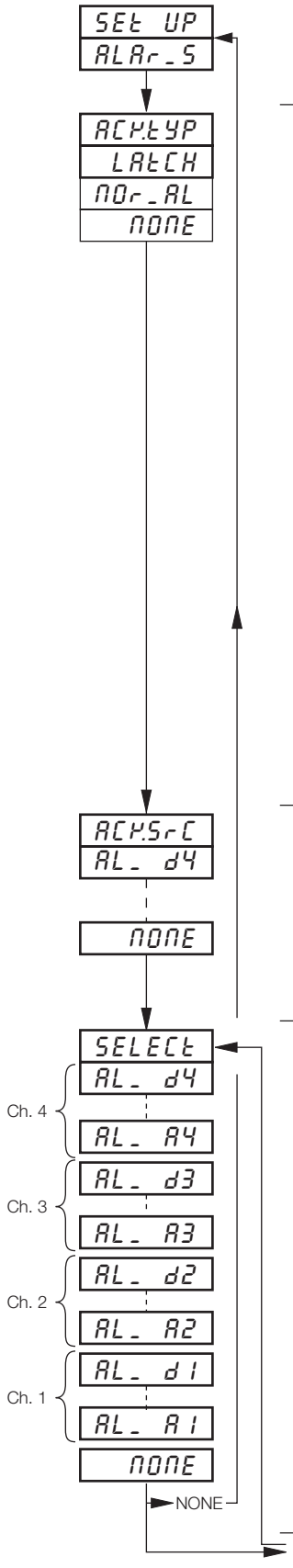
The time it takes for the alarm state to be cleared once the alarm condition has been removed is also equal to T.

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

$$T = \left[10.81 + \frac{1800}{10}\right] \times 2 \qquad T = 382 \text{ seconds}$$

Fig. 3.6 Fast Rate Alarms with Hysteresis

...3.4 Set Up Alarms



Page Header – **Set Up Alarms**

To advance to **Set Up Relay Output** page press the [↵] key.

Alarm Acknowledge Type
Alarms may be acknowledged while they are displayed.
Select the alarm acknowledge type:

nONE – no acknowledge facility. If the cause of the alarm no longer exists, the alarm state and display are cleared automatically.

Alarm cause	LED	Alarm State
Present	Flashing	Active
Not Present	Off	Inactive

nOr_AL and *LAtCH* – if the cause of the alarm no longer exists, the alarm display remains until it has been acknowledged.

Alarm cause	Acknowledge	LED	Alarm State
Present	No	Flashing	Active
Present	Yes	Steady	Active
Not Present	Previously acknowledged	Off	Inactive
Present	No	Flashing	Active
Not Present	No	Flashing	Active/Inactive*
Not Present	Yes	Off	Inactive

*Alarm state is active if *LAtCH* is selected or inactive if *nOr_AL* is selected.

Global Alarm Acknowledge Source
Select the alarm acknowledgment source required.

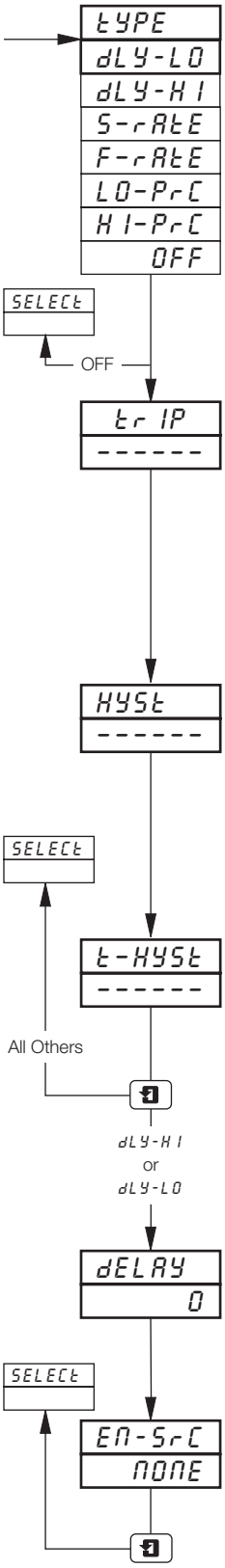
For a description of sources – see **Table 3.1** on page 16.

Select Alarm
Select the alarm to be programmed.

Note. In the remaining frames press the [✱] key to view the alarm selected.

Continued on next page.

…3.4 Set Up Alarms



Alarm Type
Select the alarm type required for the alarm selected.

dLY-LO	–	delayed low process
dLY-HI	–	delayed high process
HI-PrC	–	high process
LO-PrC	–	low process
F-rtE	–	fast rate (rate of change of process variable)
S-rtE	–	slow rate (rate of change of process variable)
OFF	–	alarm off

Trip Level
Set the trip value required for the alarm selected.

The following are displayed in engineering units:
HPrC, LPrC.

The following are displayed as a percentage of the engineering span (engineering range high – engineering range low) per hour between ±0.5 and ±500%:
FrtE and SrtE.

Hysteresis
Hysteresis is operational when the alarm is active.

Set the hysteresis value required for high/low process, in engineering units (within the engineering range) or in 0.1% increments for rate alarms. The alarm is activated at the trip level but is only turned off after the alarm variable has moved into the safe region by an amount equal to the hysteresis value. For rate alarms this setting is a percentage of the trip rate – see '**FrtE**' and '**SrtE**' in previous frame.

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

Note. The alarm condition must be present continually for the time set, before the alarm becomes active. If a hysteresis level is also set, the alarm condition remains active until the process variable moves outside the hysteresis band. When the alarm condition no longer exists the alarm becomes inactive, i.e. time hysteresis does not affect turning off of alarm states.

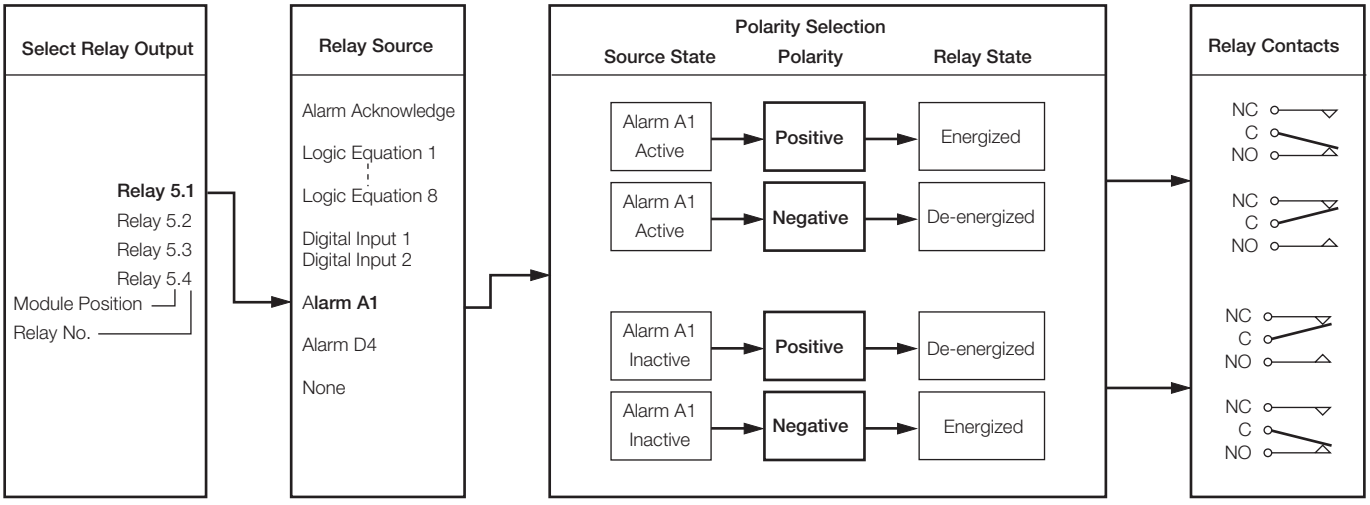
Alarm Delay
After a transition of the enable signal from disabled to enabled, the alarm remains disabled for this period of time.
Set 0 to 250 minutes.

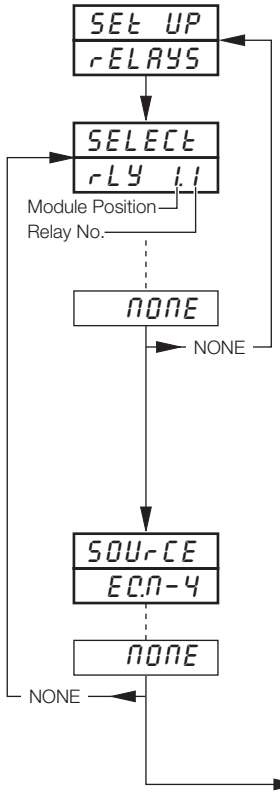
Enable Source
Any digital signal can be assigned as the signal to enable/disable the alarm.

Return to **Select Alarm** frame.

3.5 Set Up Relay Output

Information.
- **Relay Output** – not applicable to 1901J (non-upgradeable version).
- **Relays** – can be energized by alarms, logic equation results, digital inputs, real time events (timer option) and totalizer wrap signal (totalizer option).
- **External Totalizer count function** – external counter can only be driven by module type 3 (4 relays module) fitted in module positions 4, 5 and 6.
- **Polarity** – to allow failsafe settings.





Page Header – **Set Up Relays**

To advance to **Set Up Digital Output Page** press the ↵ key.

Select Relay Output
Select the output to be programmed. The selections in this frame relate to the number of fitted modules with relays and their relative module positions.

Example – for a type 3 (four relays) module fitted in position five the following selections are also programmable:
- rELAY 5.1 (position 5, relay 1)
- rELAY 5.2 (position 5, relay 2)
- rELAY 5.3 (position 5, relay 3)
- rELAY 5.4 (position 5, relay 4)

Note. In the remaining frames press the ✱ key to view the relay selected.

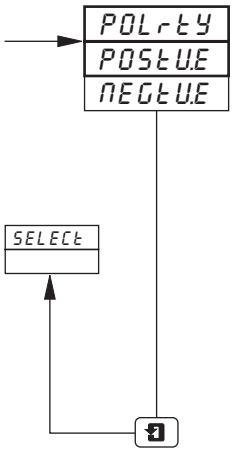
Relay Source
Select the source required to activate the selected relay.

For a description of sources – see **Table 3.1** on page 16.

Note. To drive an external counter COUNt.x must be selected.

Continued on next page

…3.5 Set Up Relay Output



Polarity
The polarity selection is used to invert the effect of the digital source state on the relay state as shown in the following table:

Source State	Polarity	Relay State
Active	Positive Negative	Energized De-energized
Non-active	Positive Negative	De-energized Energized

Select the polarity required

Caution. Check connections before operating – see Section 5, **CONNECTIONS & LINKS**.

Return to **Select Relay Output** frame.

Source	Description
AL_ACK.	Alarm Acknowledge – Unacknowledged process alarm anywhere in the unit
t1_Er.2 t1_Er.1	Real time event 2 Real time event 1 } Real time events (available only if timer option fitted – see **Advanced Software Options Manual**).
ECn-4 ECn-3 ECn-2 ECn-1	Programmable logic equation 4 Programmable logic equation 3 Programmable logic equation 2 Programmable logic equation 1 } Programmable logic equations – see Section 4.2, **Set Up Logic**
rAP-4 *COUNt. 4 rAP-1 *COUNt.1	Wrap around on total 4 Total 4 external counter drive Wrap around on total 1 Total 1 external counter drive } Wrap around and count (available only if totalizer option fitted)
dIG-6.8 dIG-1.1	Digital Input 6.8 Digital input 1.1 **Digital Input number** **Module number**
AL-d4 AL-C4 AL-b4 AL-A4	Alarm D Alarm C Alarm B Alarm A } Channel 4 Alarms (if applicable)
AL-d3 AL-C3 AL-b3 AL-A3	Alarm D Alarm C Alarm B Alarm A } Channel 3 Alarms (if applicable)
AL-d2 AL-C2 AL-b2 AL-A2	Alarm D Alarm C Alarm B Alarm A } Channel 2 Alarms (if applicable)
AL-d1 AL-C1 AL-b1 AL-A1	Alarm D Alarm C Alarm B Alarm A } Channel 1 Alarms
NONE	No source required

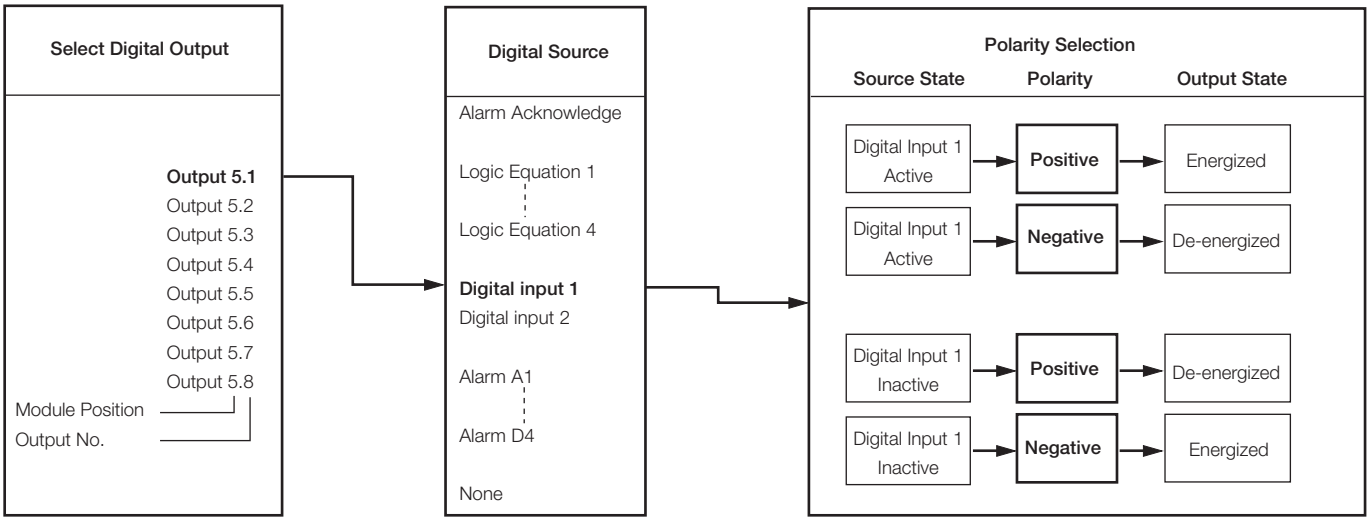
* Available only on 4-relay and 8-digital output modules (types 3 and 5), fitted in module positions 4,5 and 6.

Table 3.1 Description of Sources

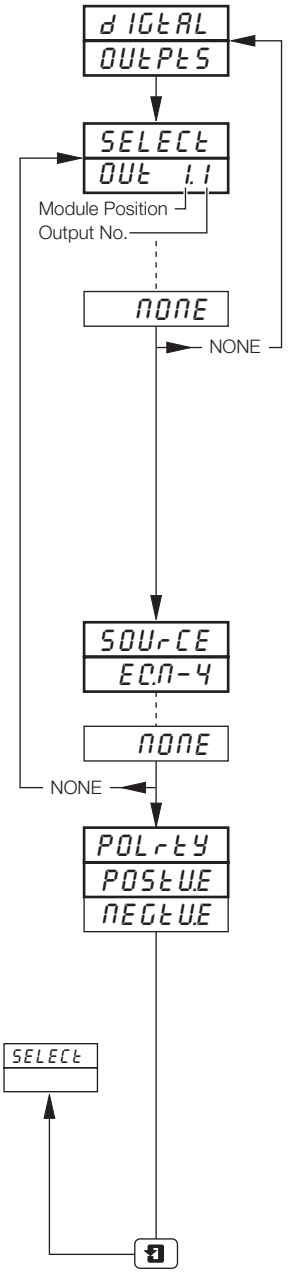
3.6 Set Up Digital Output

Information.

- **This page is displayed only if digital outputs are fitted.**
- **Up to 24 digital outputs are available** – depending on the module types fitted.
- **Digital outputs** – can be energized by alarms, logic equations results, digital inputs, real time events (timer option) and totalizer wrap signal (totalizer option).
- **External Totalizer count function** – external counter can only be driven by module type 5 (8 digital outputs module) fitted in module positions 4, 5 and 6.
- **Polarity** – inverts the effect of the selected source on the output state.



…3.6 Set Up Digital Output



Page Header – **Set Up Digital Outputs**

to advance to **Set Up Analog Output** page press the ⏎ key.

Select Digital Output
Select the output to be programmed – the selections in this frame relate to the number of fitted digital output modules and their relative module positions.

Example – for a type 5 (eight digital outputs) module fitted in position five the following selections are also programmable:

- OUt 5.1 (position 5, output 1)
- OUt 5.2 (position 5, output 2)
- OUt 5.3 (position 5, output 3)
- OUt 5.4 (position 5, output 4)
- OUt 5.5 (position 5, output 5)
- OUt 5.6 (position 5, output 6)
- OUt 5.7 (position 5, output 7)
- OUt 5.8 (position 5, output 8)

Note. In the remaining frames press the ✱ key to view the output selected.

Output Source
Select the source required to activate the selected digital output.

For a description of sources – see **Table 3.1** on page 16.

Note. To drive an external counter COUNt.x must be selected.

Polarity
The polarity selection is used to invert the effect of the source state on the output as shown in the following table:

Source State	Polarity	Output State
Active	Positive Negative	Energized De-energized
Non-active	Positive Negative	De-energized Energized

Select the polarity required.

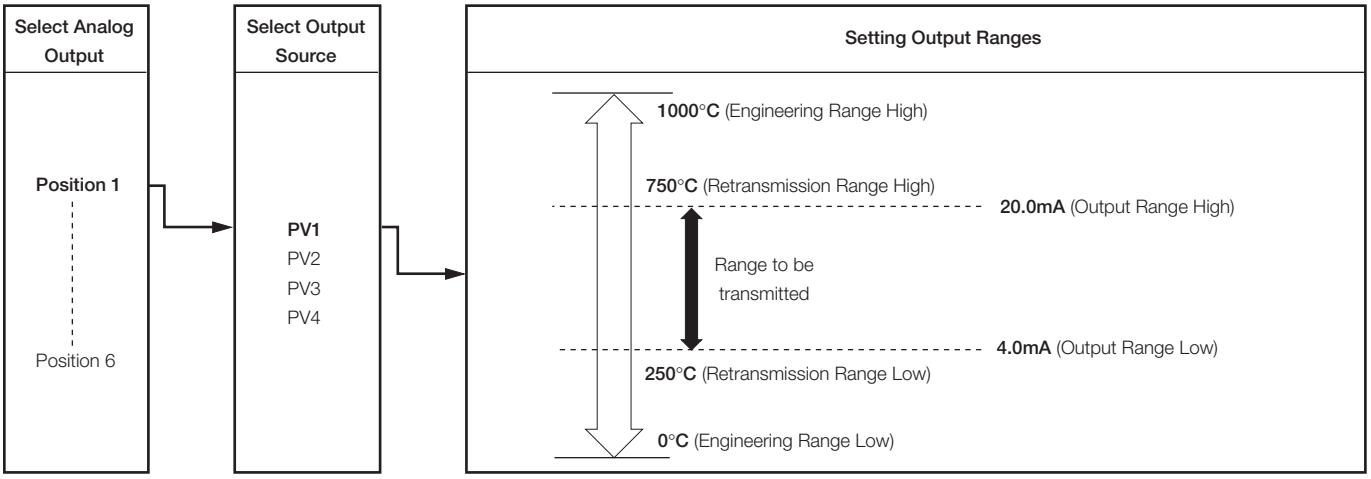
Caution. Check connections before operating – see Section 5, **CONNECTIONS & LINKS**.

Return to **Select Digital Output** frame.

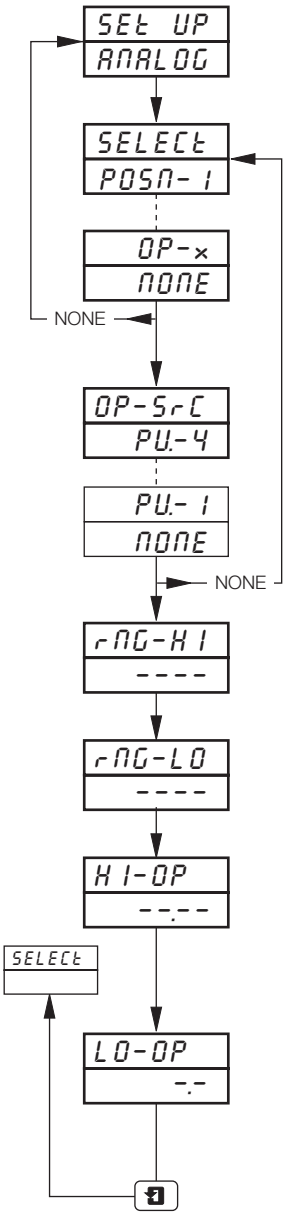
3.7 Set Up Analog Output

Information.
- **Analog Output** – not applicable to 1901J (non-upgradeable version).
- **Fitted analog outputs** – assignable to retransmit any process variable.
- **Selectable retransmission range** – allows maximum resolution on range of interest.
- **Adjustable output range** – for non-standard and reversed outputs.

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



…3.7 Set Up Analog Output



Page Header – **Set Up Analog Output**

To advance to **Digital Inputs Page** press the ▣ key.

Select Analog Output
Select the analog output position to be programmed. The selections in this frame relate to the number of fitted modules with analog output.

Example – Output 1 is the analog output in position 1 (fitted on the main board), output 3 is the analog output fitted in module position 3.

Note. In the remaining frames press the ✱ key to view the analog output selected.

Output Source
Select output source required. The selections in this frame correspond to the channels on the recorder (as available) – PV1 (channel 1), PV2 (channel 2) etc.

Retransmission Range High
Set the engineering range value (in engineering units) at which maximum output is required.

Retransmission Range Low
Set the engineering range value (in engineering units) at which minimum output is required.

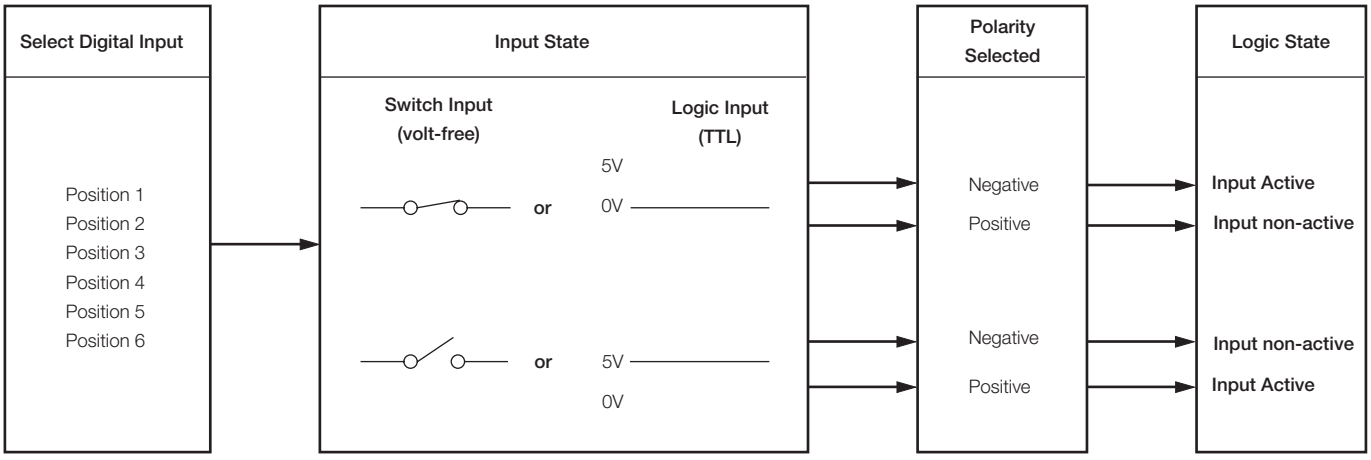
Output Range High
Set the maximum current output required for the **Retransmission Range** programmed between 2.0 and 20.0mA.

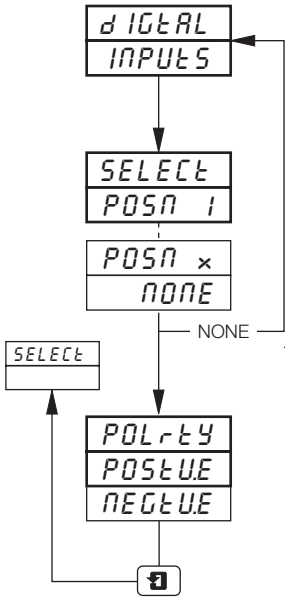
Output Range Low
Set the minimum current output required for the **Retransmission Range** programmed between 2.0 and 20.0mA.

Return to **Select Analog Output** frame.

3.8 Digital Inputs

Information.
- **Digital Input** – not applicable to 1901J (non-upgradeable version).
- **Up to 30 digital inputs are available** – depending on the module types fitted.
- **Volt-free contacts or TTL levels**.
- **Polarity** – sets the logic state (unchanged or inverted) for the module position(s).





Page Header – **Digital Inputs**

To advance to **Access Page** press the ⏎ key.

Select Digital Input
Select digital module position to be programmed.

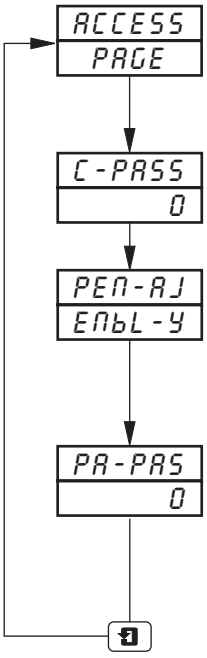
Note. In the remaining frames press the ✱ key to view the module selected.

Polarity
Select the polarity required for the module position selected above:
- POStUE – logic input state unchanged
- NEGtUE – logic input state inverted

Return to **Select Digital Input** frame.

3.9 Access Page

Information.
- **Configurable password protection** – of **PROGRAMMING LEVELS**.
- **Internal security link** – enable/disable password protection.



Page Header – **Access Page**.

To advance to **Scale Adjust Page** press the ⏎ key.

Configuration Password
Prevents access to the **Programming Pages**.

Pen Adjust Enable
Enables / Disables the pen adjustment feature.
This allows the position of any trend to be adjusted for checking against a reference standard. The displayed value is not changed.

Pen Adjust Password
Prevents access to the pen adjustment.

Set the required password, between 0 and 9999.

Return to top of **Access Page**.

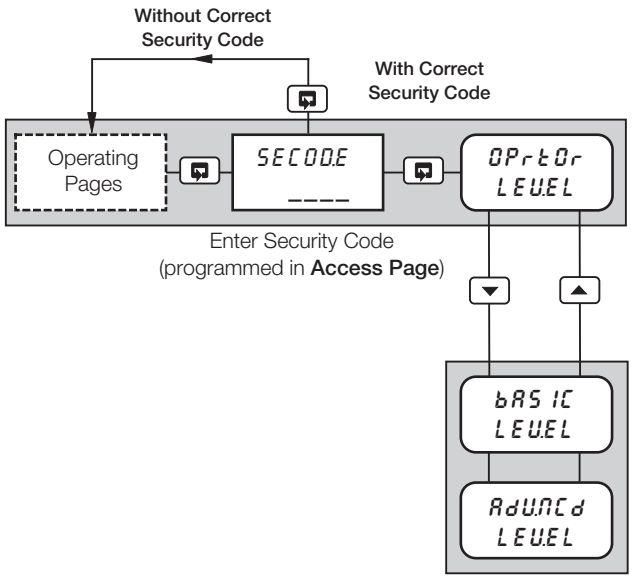


Fig. 3.7 Use of Security Code in Operator Level

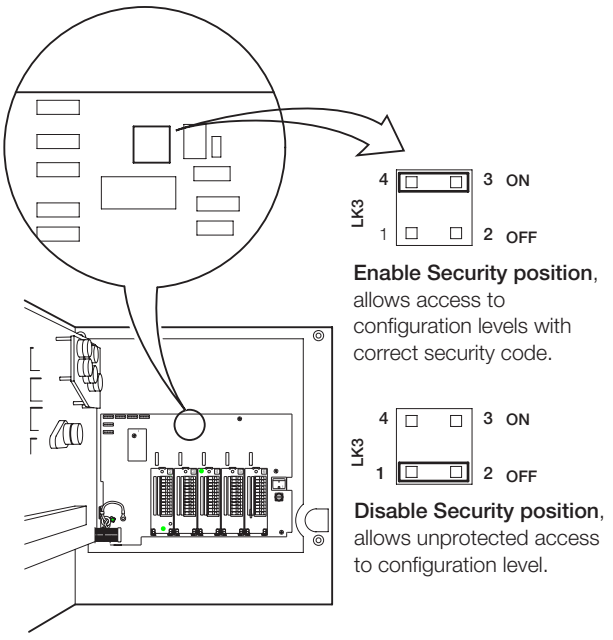
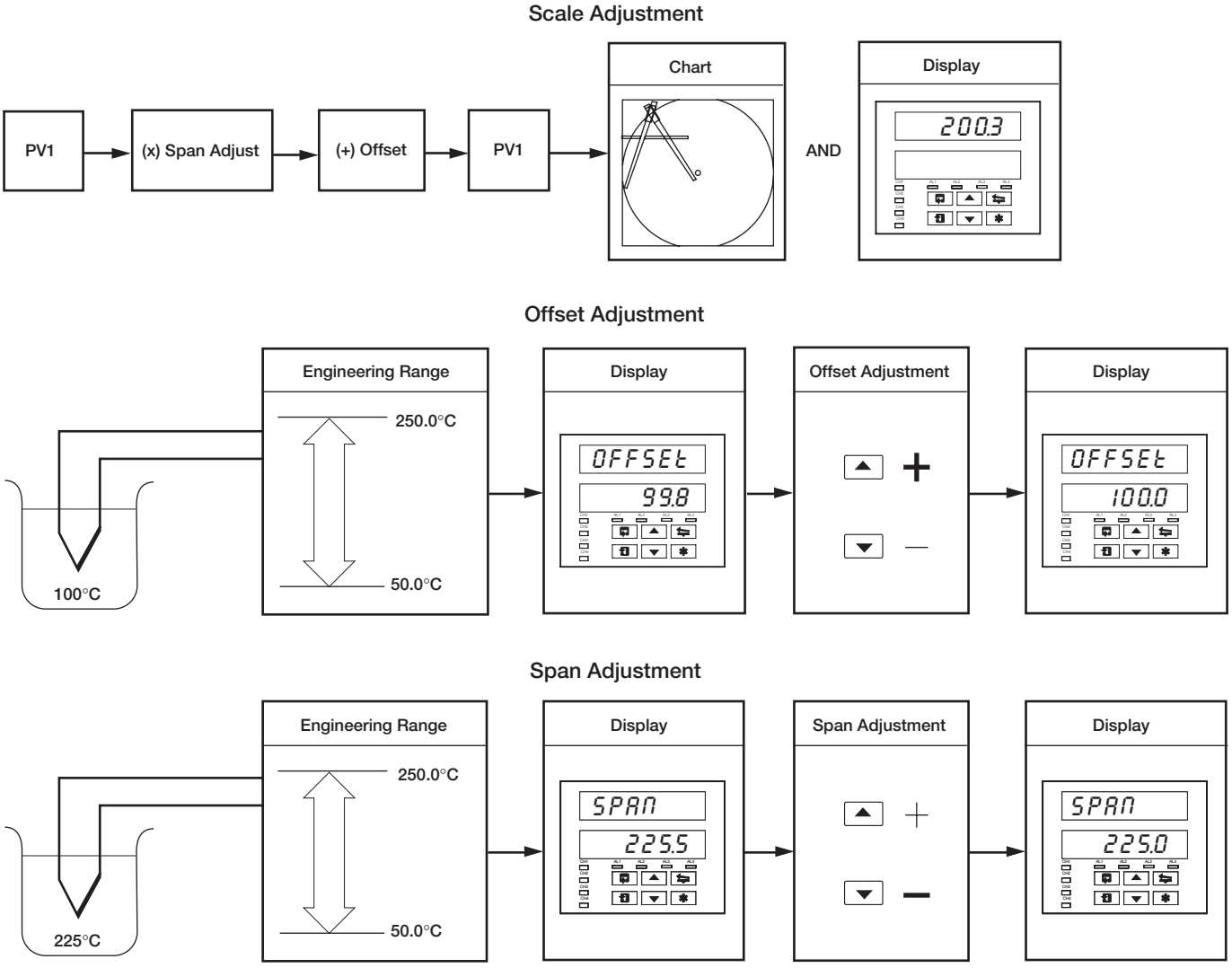


Fig. 3.8 Location of Security Link

3.10 Scale Adjust

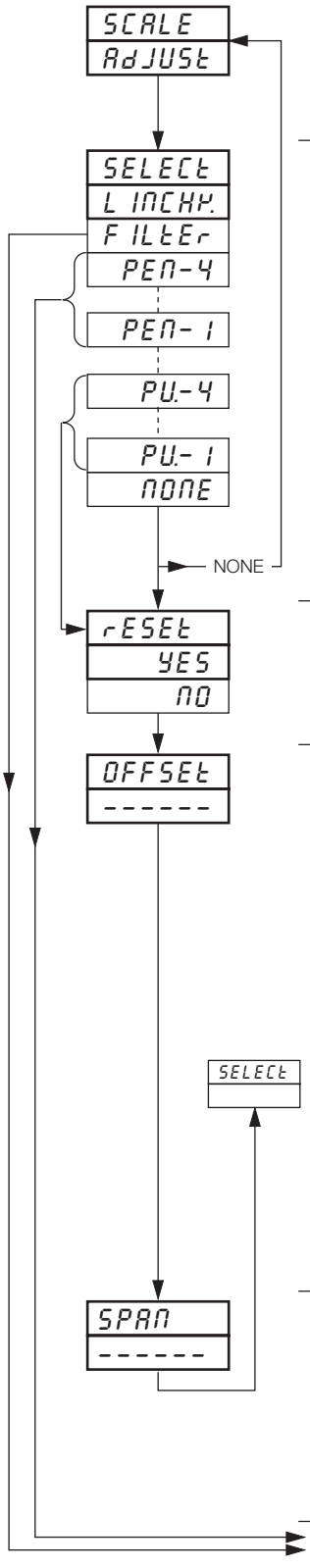
Information.

- **Analog Inputs** – do not require re-calibrating when the input type or range is changed.
- **Process variable adjust reset** – removes any previously programmed offset or scale adjustment settings.
- **System offsets errors** – can be removed using process variable scale offset adjustment.
- **System scale errors –** can be removed using process variable span adjustment.
- **Process variable offset/span adjustment** – can be used to perform spot calibration
- **Pen(s)** – can be independently calibrated and checked across the full range of the chart.
- **Mains filter** – selectable for maximum noise rejection.
- **Pen Linearity Check** – automatically draws a pen linearity test pattern.



Note. As a general rule:
use **Offset** adjustment for spot calibration at **<50%** of engineering range span.
use **Span** adjustment for spot calibration at **>50%** of engineering range span.

…3.10 Scale Adjust



Page Header – **Scale Adjust**

To advance to **BASIC CONFIGURATION LEVEL** frame use the [↩] key.

Select Process Variable/Pen

Select linearity check, process variable or pen required:

- L INCHK. – the pens automatically draw a test pattern to check pen linearity. dONE is displayed on completion
- FILtEr – mains frequency filter
- PEn × – pens 1 to 4
- PU.-4 – process variable on channel 4
- PU.-3 – process variable on channel 3
- PU.-2 – process variable on channel 2
- PU.-1 – process variable on channel 1
- nONE – None

Note. In the remaining frames press the [✱] key to view the process variable or pen selected.

Process Variable Scale Adjustment Reset

Set YES to reset the process variable offset and span values to their nominal values (values are reset when frame is exited).

Process Variable Offset Adjustment

Electrical and resistance thermometer inputs: apply the correct input for the spot calibration required.

RTD inputs: use resistance values obtained from standard tables.

Thermocouple Inputs: measure the ambient temperature at the output terminals of the signal source (calibrator). From thermocouple tables obtain the millivolt equivalent of this temperature (a) and that for the spot calibration temperature (b). Subtract (a) from (b) and set the signal source to the resultant value. (The voltage is negative if the spot calibration temperature is below the measured ambient temperature).

Note. The displayed units are engineering units.

Set the value required. The decimal point position is set automatically.

Example – If the display range is 50.0 to 250.0 and a spot calibration is required at 100 and 225, inject a signal equivalent to 100 and set the display to 100.0 using the [▲] and [▼] keys.

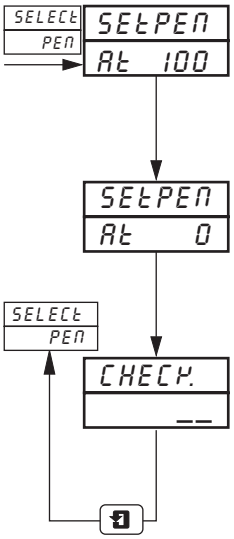
Span Adjust

Proceed as for **Offset Adjustment** above and apply the correct input for the spot calibration required. The displayed units are engineering units. Set the value required. The decimal point is set automatically.

For the example above, inject a signal equivalent to 225 and set the display to 225.0.

Continued on next page.

...3.10 Scale Adjust



Calibrate Pen At 100%
Drives the pen automatically to the full scale position on the chart.

Use the ▲ and ▼ keys to set pen to 100% on the chart.

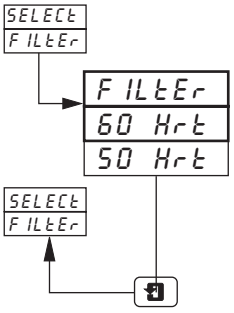
Calibrate Pen At 0%
Drives the pen automatically to the zero position on the chart.

Use the ▲ and ▼ keys to set pen to 0% on the chart.

Check Pen Calibration
The pen calibration can be checked at any point on the chart.

Use the ▲ and ▼ keys to move the selected pen from the zero point up to the 100% position on the chart.

Note. If the true time event option is fitted the red pen does not move beyond the 94% position on the chart.



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

Return to **Select Process Variable/Pen** frame.

4 ADVANCED CONFIGURATION LEVEL

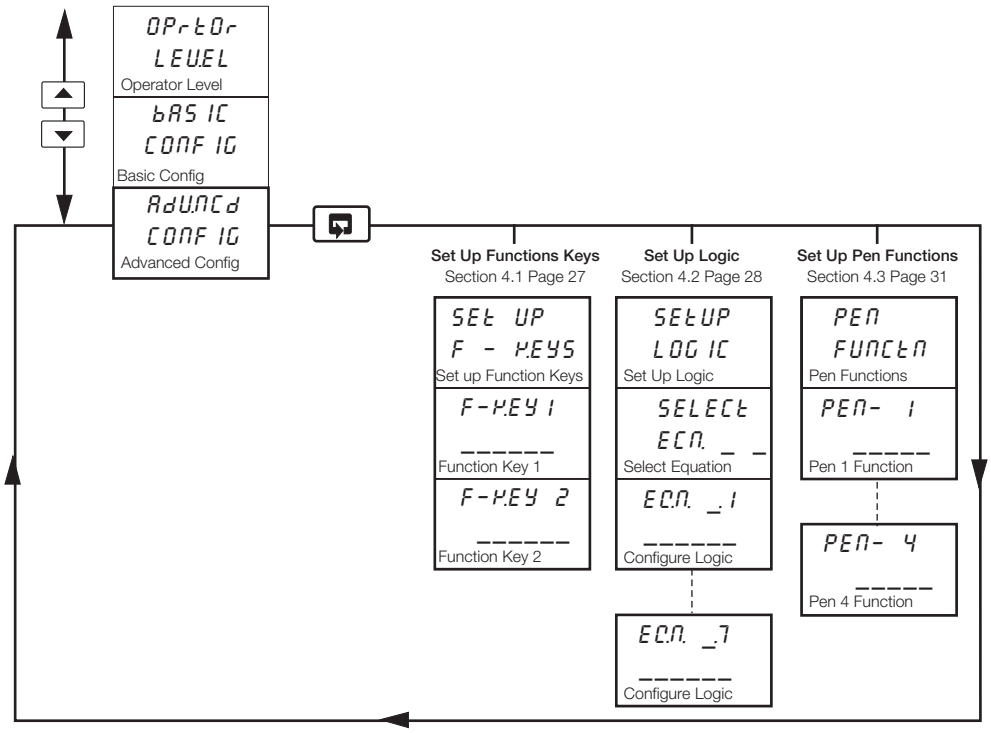
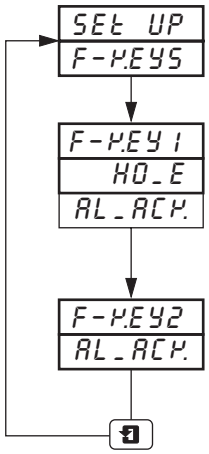


Fig. 4.1 Advanced Configuration Level Overview

4.1 Set Up Function Keys

Information.
- **Programmable function key** – on each faceplate
- **Home function** – returns the instrument display to the start of the operating page when at the top of any page.
- **Global alarm acknowledge function** – acknowledges any unacknowledged alarms on all channels.



Page Header – **Set Up Function Keys**

To advance to the **Set Up Logic** press the ↵ key.

Function Key 1
Select function required.
- HO_E – Home (return to **Operating Page** in **OPERATING LEVEL**)
- AL_ACK. – Acknowledge alarm

Function Key 2
Select function required (if applicable).

Return to **Set Up Function Keys** frame.

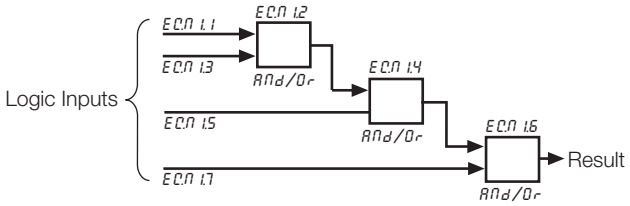
4.2 Set Up Logic

Information.
- **4 logic equations**
- **7 elements per equation**
- **OR/AND operators**
- **Can combine internal and external digital signals** – i.e. alarms, digital inputs, other logic equation results and real time events (timer option).

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

Logic inputs must be set to one of the digital sources listed in Table 3.1 on page 16.

Logic gates must be set to *And*, *Or* or *End*. Setting an element to *End* terminates the equation.

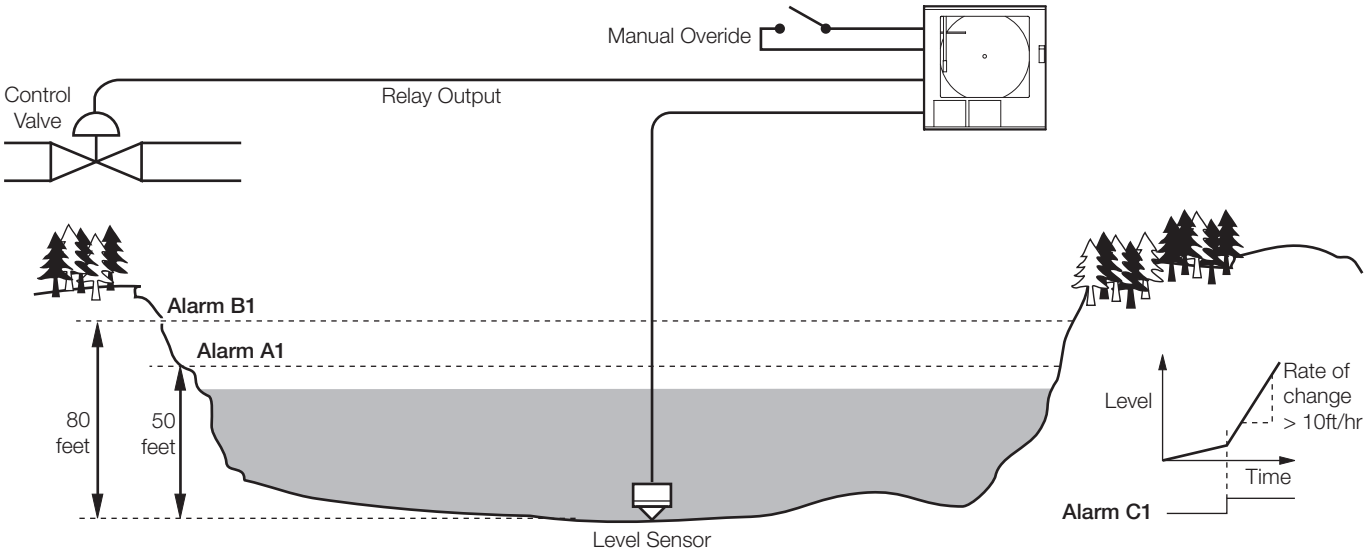


Note. Elements on each equation are calculated sequentially, i.e. elements 1, 2 and 3 are evaluated first and this result is then combined with elements 4 and 5. Similarly, this resultant is then combined with elements 6 and 7 to give the logic equation result.

...4.2 Set Up Logic

Example – Reservoir level monitoring using:

- process variable 1 with an engineering range 0 to 100 feet
- logic equation 1 result assigned to relay 1.1 which is used to operate the control valve.

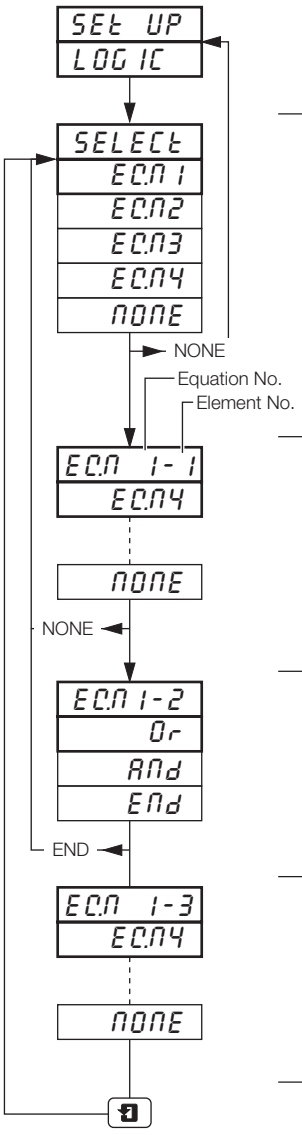


Flow Conditions
Close reservoir control valve if: • Reservoir level >50 feet AND rate of change >10 ft/hr OR • Reservoir level >80 ft OR • Manual override switch operated

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

Entering the Logic Equation
E.Cn 1.1 ⇨ AL-A1 E.Cn 1.2 ⇨ And E.Cn 1.3 ⇨ AL-C1 E.Cn 1.4 ⇨ Or E.Cn 1.5 ⇨ AL-B1 E.Cn 1.6 ⇨ Or E.Cn 1.7 ⇨ d IG- 1.1

...4.2 Set Up Logic



Page Header – **Set Up Logic**

To advance to **Set Up Pen Functions Page** press the ⊡ key.

Select Equation
Select equation to be constructed.

In the remaining frames press the ✱ key to view the equation selected.

Equation n/Element 1
Select the source required for element 1.

For a description of sources – see **Table 3.1** on page 16.

Equation n/Element 2
Select the operator required to combine elements 1 and 3:

- Or – Or
- AND – And
- END – Ends equation

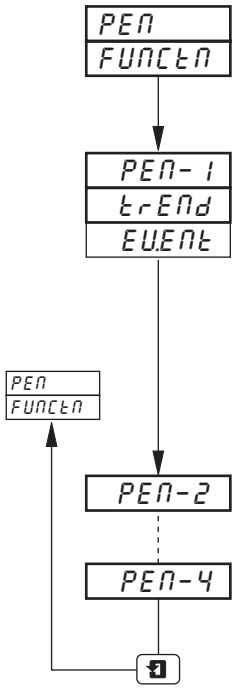
Equation n/Element 3
Repeat previous two steps for elements 3 to 7.

Odd numbered elements = sources
Even numbered elements = operators

Return to **Select Equation** frame.

4.3 Set Up Pen Functions

Information. Any fitted pen can be assigned to a trend or an event function.



Page Header – **Pen Functions**

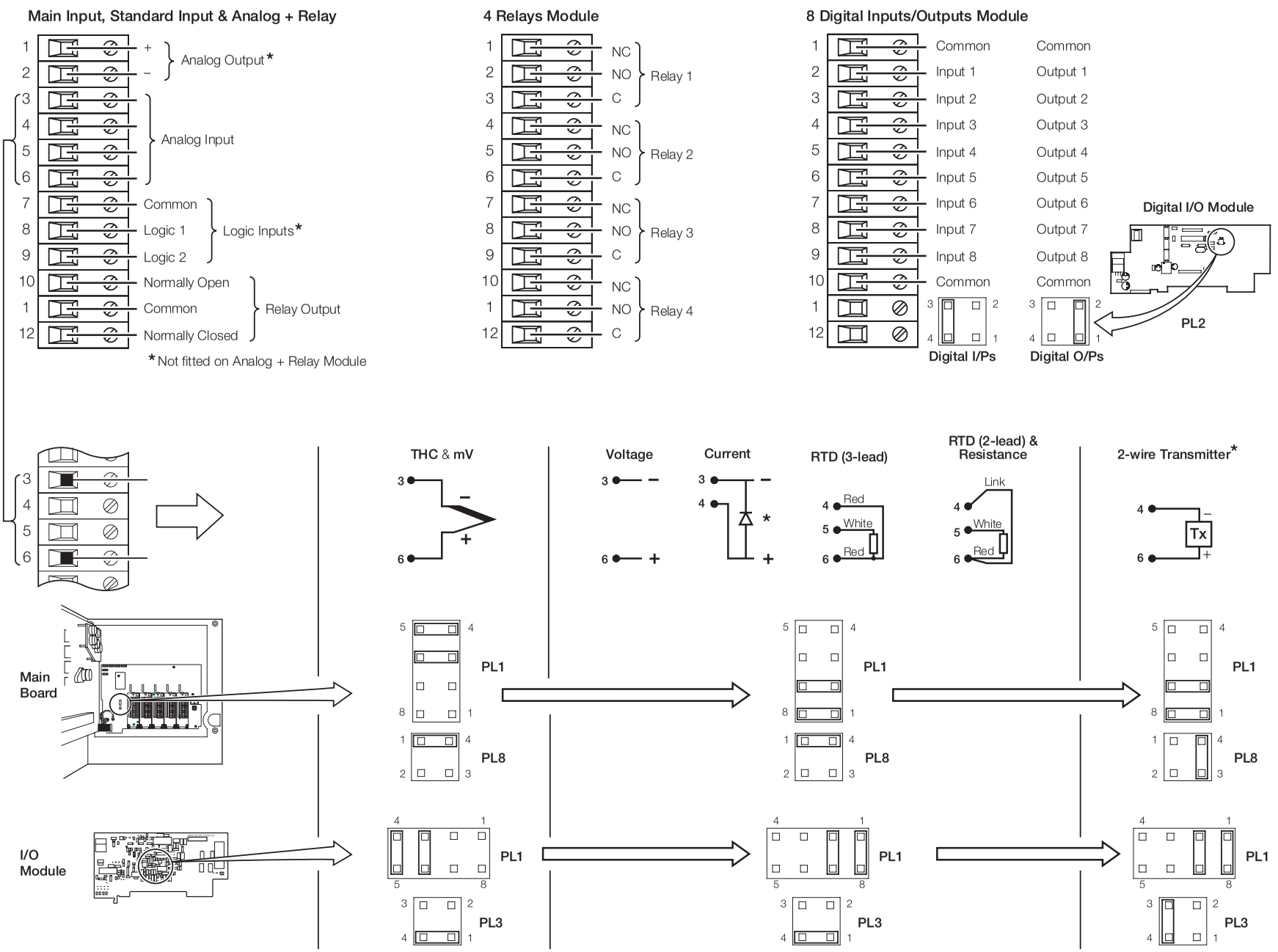
To advance to **Advanced Configuration** frame press the ⏎ key.

Pen 1
Select pen function required:
- trEND – Trend pen
- EU.ENT – Event pen

Note. The event pen and true time line event pen are separate functions and only the event pen can be selected in this page. The true time line event pen option allows event marking on the same time line as the red pen and requires a special pen arm and motor assembly. Refer to the order code in the **Specification Sheet**.

Pen 2 to 4
Repeat as for **Pen 1** (if applicable).

Return to top of **Set Up Pen Functions Page**.



*** Recommended diode:** Diode forward voltage > 0.8 V @ 20 mA or use 2 x 1N4001 general purpose diodes in series.

Sales

Service

Software

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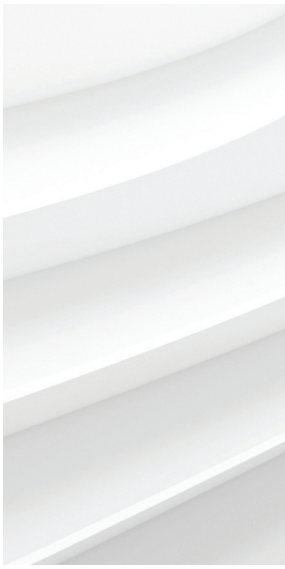

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IM/C1900-PGR Rev. M 09.2018

ABB MEASUREMENT & ANALYTICS | DATA SHEET

C1900 series

Circular chart recorder

Measurement made easy

A rugged, reliable recorder with the full capability to meet your needs

1 to 4 pen recording
- full application flexibility

NEMA 4X/IP66 construction
- hose-down protection

Analog, relay outputs, digital inputs and transmitter power supply as standard
- range of inputs and outputs built-in

Multiple indicator panels
- continuous display of all signal values

0.1% measurement accuracy
- precise process information

High noise immunity
- robust, dependable operation

RS485 Modbus serial communications
- open system compatibility

Totalizers and math functions built-in
- fully integrated solutions

C1900

The C1900 is a fully programmable circular chart recorder for up to four process signals. The C1900's straightforward operator controls and robust construction make it suitable for a variety of industrial environments. Excellent standard facilities are complemented by a powerful range of options to give the flexibility to match your application.

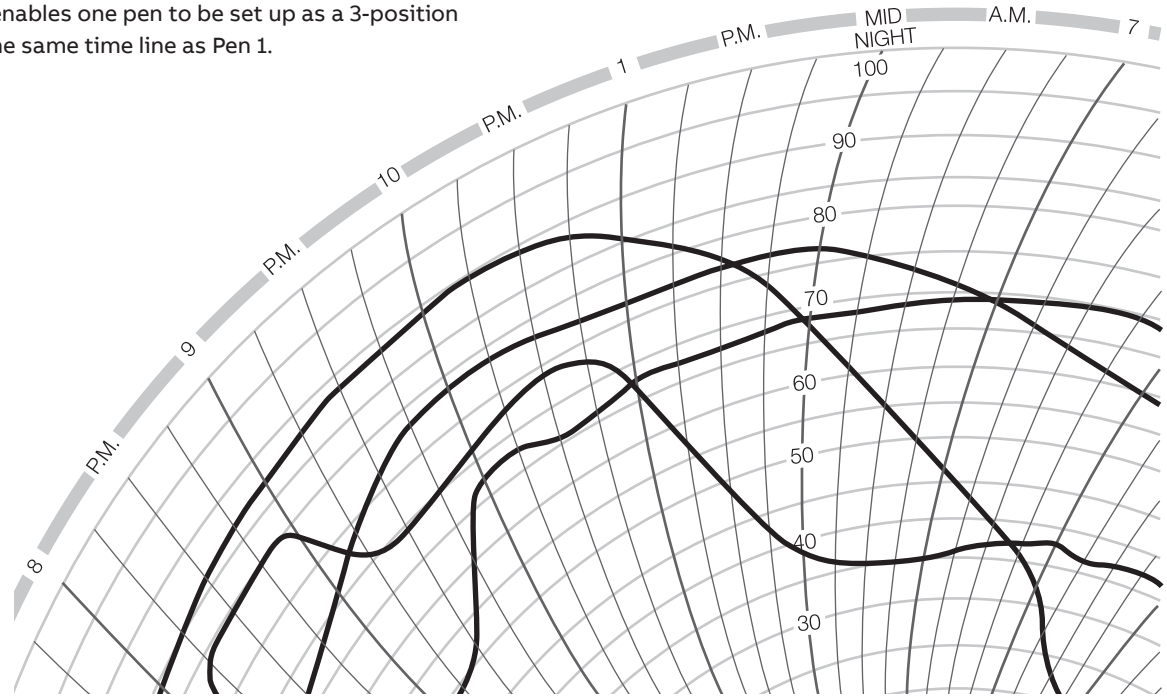
Comprehensive Process Information

The C1900 lets you see the status of your process at a glance: high visibility 6-digit displays provide a clear indication of up to four process values simultaneously and active alarms are signalled by flashing LEDs below the main display.

The chart is easily set up to show the information you need in the way you want. Pen ranges are individually set to give the best resolution for each signal; the time per revolution can be selected between 1 hour and 32 days. Additionally a true time event pen facility enables one pen to be set up as a 3-position event marker on the same time line as Pen 1.

Simple Operation

The clearly-labelled tactile keypad gives direct access for operator adjustments and configuration programming, without the need to open the recorder's door. Clear text prompts on the digital displays guide the user around the various menus. A password-protected security system prevents unauthorized access to configuration adjustment menus.

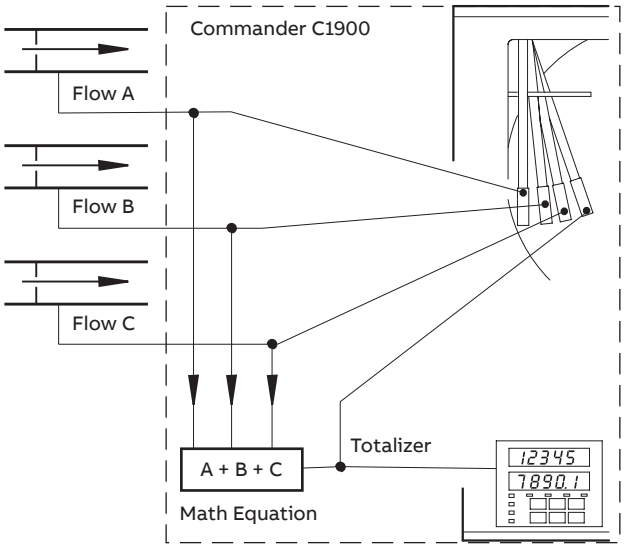


Flexibility to Solve Problems

The C1900 offers seamless integration of loop functionality to solve process problems, eliminating the need for auxiliary devices.

Totalizers, Math And Logic

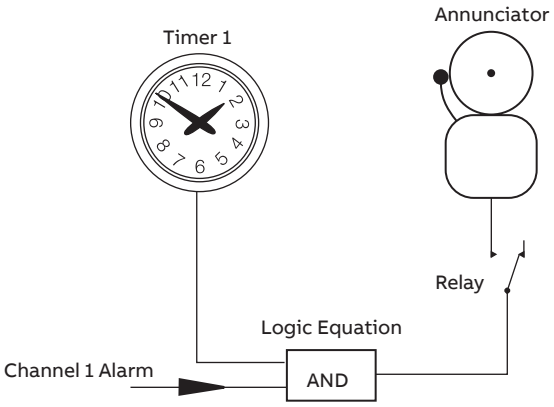
Integrating fluid flow to calculate total volume is performed by the built-in totalizers available for each channel. Relays can be assigned to increment or reset external counters to match the recorder's totalizer values.
User configurable math functions, mass flow calculations and RH tables are all fully supported.
Logic capability allows interlocking and integration of discrete and continuous functions to solve a wide range of process problems.



Summation of Three Flows

Timers and Clock

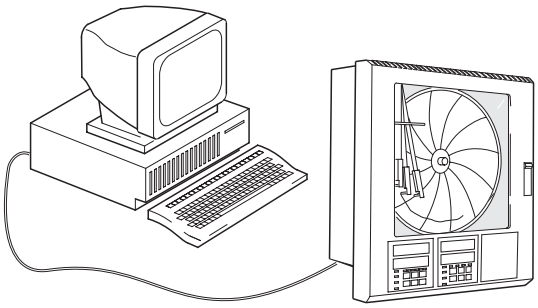
The C1900 offers two event timers driven by the recorder's real-time clock. The timers can be configured to operate relays, start/stop the chart or trigger other actions within the recorder.



Alarm annunciation enabled during night hours only

Modbus RS485 Communications

Communications with PCs or PLCs are achieved via the RS485 serial communications link, enabling the C1900 to serve as the front end of plant-wide data acquisition systems. Using Modbus RTU protocol all process inputs and other variables can be continuously read by a host PC running any of a wide variety of standard SCADA packages.



Built to Meet Your Needs

The C1900's modular architecture gives rise to a high level of hardware choice: up to five I/O modules can be added to the basic instrument.

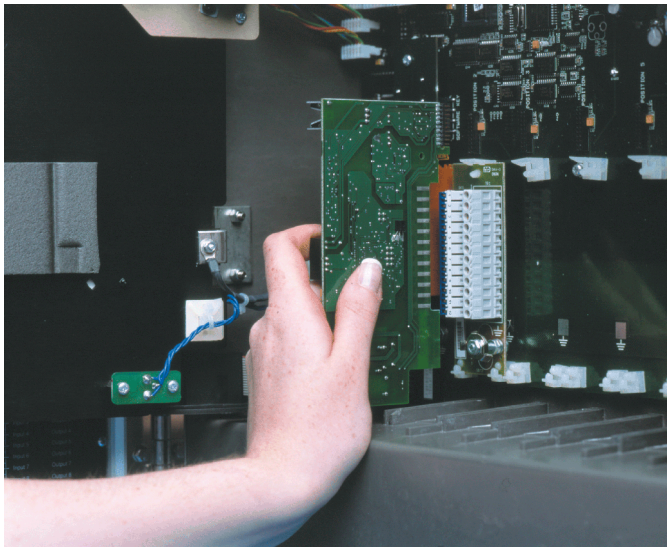
The standard input/output module supplied with every pen comes complete with a fully isolated analog input, a relay output, transmitter power supply, isolated analog retransmission and two digital inputs.

Further input and output capability is provided by a range of plug-in modules:

- Analog input and relay – for use with math functions
- Four relays – channel alarm outputs
- Eight digital inputs – linked using logic equations
- Eight digital outputs – TTL level alarm outputs
- Modbus RS485 communications – interfaces with PCs

Expandable for the Future

The C1900 may be quickly upgraded to meet your changing process requirements.
Additional recording channels, math capability or input and output functions can be retrofitted on-site using plug-in cards and easily fitted pen arms. Input calibration data is stored on each card, allowing quick changes to input cards without the need for recalibration.
Changes to input sensors or recording procedures are accommodated by reconfiguration using the main keypad.



Designed to Survive

NEMA 4X protection ensures the C1900 can survive in the harshest environments and makes the recorder ideal for use in panels which are regularly hosed down. The tough, acid-resistant case and secure cable-entry glands maintain the NEMA 4X rating for wall-mounted or pipe-mounted instruments.

Noise Immunity

Recording accuracy is maintained in noisy industrial environments due to the advanced EMC shielding within the recorder. The power supply has been designed to give excellent protection from power spikes and brownouts and all configuration and status information is held in nonvolatile memory to ensure rapid recovery after a power failure.

Minimal Maintenance

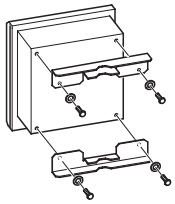
Excellent long-term stability keeps recalibration to a minimum, cutting the costs of ownership. User-selectable chart speeds and long-life pens combine to limit usage of consumables.

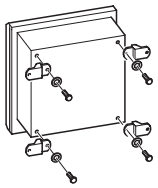
Built-in Quality

The C1900 is designed, manufactured and tested to the highest quality standards, including ISO 9001.

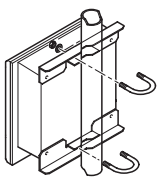
Easy to Install

A choice of mounting options enables simple installation of the recorder in a panel, on a wall or on a pipe. Detachable terminal blocks allow for trouble-free connection of input and output wiring, with mains isolation provided by a power switch within the instrument.

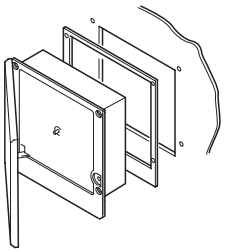




Wall-mounting



Pipe-mounting



Panel-mounting

Summary

1, 2, 3 or 4 pens

10 in. chart size

Standard I/O with each pen includes:

- Analog input, analog output, transmitter power supply, relay output and 2 digital inputs.

Specification

General

Construction

Size	15.23 in. (h) × 15.04 in. (w) × 5.57 in. (d) (386.8 × 382.0 × 141.5mm)
Weight	18lb (8.2kg)
Case material	Glassfiber-filled reinforced polyester
Window material	Polycarbonate
Door latch	High-compression with optional lock

Environmental

Operational temperature range	0° to 55°C (32° to 130°F)
Operational humidity range	5 to 95%RH (non-condensing) 5 to 80%RH (chart only)
Case sealing	NEMA 4X (IP66)
Fast transients	IEC 801-4 Level 3

Installation

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

Operation and Configuration

Programming method	Via front panel keys
Security	Password-protected menus

Safety

General safety	IEC348
Dielectric	500V DC (channel/channel) 2kV DC (channel/ground)
Memory protection	Nonvolatile EEPROM
Approvals	CSA UL CSA/FM Class 1 Div. 2 CE

Power Supply

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

Process Inputs And Outputs

General

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

Analog Inputs

Signal types	mV, V, mA, Ω
Thermocouple types	B, E, J, K, N, R, S, T
Resistance Thermometer	Pt100
Other linearizations	$x^{1/2}$, $x^{3/2}$, $x^{5/2}$, linear
Sample interval	250ms per channel
Dielectric	500V DC channel/channel
Digital filter	0 to 60s programmable

2-Wire Transmitter Power Supply

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

Analog Outputs

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

Relay Outputs

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

Digital Inputs

Type	TTL or volt-free
Minimum pulse	250 ms
Dielectric	50V DC between modules, no isolation within module

Digital Outputs

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

Serial Communications

Connections	RS485, 4-wire
Protocol	Modbus RTU

Analog input performance

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

	°C		°F		
Type	Range Lo	Range Hi	Range Lo	Range Hi	Accuracy (excl. CJC)
B	–18	1800	0	3270	± 2 °C (above 200 °C) (3.6 °F above 434 °F)
E	–100	900	–140	1650	± 0.5 °C (± 0.9 °F)
J	–100	900	–140	1650	± 0.5 °C (± 0.9 °F)
K	–100	1300	–140	2350	± 0.5 °C (± 0.9 °F)
N	–200	1300	–325	2350	± 0.5 °C (± 0.9 °F)
R	–18	1700	0	3000	± 1 °C (above 300 °C) (1.8 °F above 572 °F)
S	–18	1700	0	3000	± 1 °C (above 200 °C) 1.8 °F above 572 °F)
T	–250	300	–400	550	± 0.5 °C (± 0.9 °F)
PT100	–200	600	–325	1100	± 0.5 °C (± 0.9 °F)

...Specification

Recording System

Pens

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

Event Pens

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

Chart

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

Display and Operator Panels

Displays

Number	2 (1 or 2 pens) or 4 (3 or 4 pens)
Type	6-digit red LED, 0.56 in. (14mm) high
Status indicators	Indicate channel number on display
Alarm indicators	Indicate channels with active alarms

Panel keys

Function	Programming access, increment/decrement, pen lift and user-defined function key

Alarms and Logic

Alarms

Number	4 per channel
Type	High/Low process, fast/slow rate of change, time delay
Adjustments	Hysteresis, time delay

Logic Equations

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

Advanced Software Functions

Totalizers

Number	1 per pen
Size	99,999,999 max.
Output	External counter driver, 'wrap' pulse signal

Math

Number of equations	4
Type	+, –, x, ÷, low & high select, max., min., average, mass flow, RH

Timers

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

Option Module*

Number	5 plus 1 x standard input/output module
Connection	Plug-in cards with detachable connection blocks

EMC

Design & Manufacturing standards

CSA General Safety	Approved
UL General Safety	Approved
CSA/FM Class 1 Div. 2	Approved

Emissions and Immunity

Meets requirements of:

- EN 50081-2
- EN 50082-2
- IEC 61326 for an Industrial Environment
- CE Mark

Option Module Types

	I/O per module							Max. no. per instrument
Option module types	**Analog I/P**	**Analog O/P**	**Trans. PSU**	**Relays**	**Digital I/P**	**Digital O/P**	**Comms.**	
Standard I/O	1	1	1	1	2			3
Analog I/P + relay	1			1				5
4 relays				4				2
8 digital I/P					8			3
8 digital O/P						8		3
RS485 communications							1	1
1901J (non-upgradeable)	1							

Ordering Information

PART 1

C1900 recorder		**19XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**XXX**	**OPT**
Recorders *	One Pen (Red)	11												
	Two Pens (Red & Green)	12												
	Three Pens (Red, Green, Blue)	13												
	Four Pens (Red, Green, Blue, Black)	14												
Chart Type	Standard (Recorder/Controller)		J											
	KPC 105 PX and PXR type charts		K											
	Chessell Brand charts		C											
Electrical Code	Standard			A										
	CSA approval			B										
	UL approval			U										
	CSA/FM Class 1 Div. 2			F										
Option Module	None				0									
	Additional Modules – Complete PART 2				A									
Options	None					0								
	Totalizer					3								
	Math & Timer					A								
	Totalizer, Math & Timer					B								
Door Lock	Not Fitted						1							
	Fitted						2							
Power Supply	115 V AC							1						
	230 V AC							2						
	115 V AC with On/Off Switch							4						
	230 V AC with On/Off Switch							5						

PART 2 – Additional Modules	**Module Type**								
Module Position 2 / Channel 2 Input*	0	1	2						
Module Position 3 / Channel 3 Input*	0	1	2						
Module Position 4 / Channel 4 Input*	0	1	2	3	4	5	6		
Module Position 5	0		2	3	4	5			
Module Position 6	0	2	4	5	8				

Special Settings	Company Standard	STD
	Custom configuration (customer to complete and supply C1900R custom configuration sheet – INF08/032)	CUS
	Special	SXX
	Engineered configuration (customer to supply configuration details required)	ENG
**Calibration certificate ** **		C1

* Each pen fitted has an associated standard input/output module comprising Analog Input, Analog Output, Relay, Transmitter Power Supply and Two Digital Inputs.
Additional Input/Output modules may be fitted in the unused module positions as required. These additional modules should be specified in PART 2 of the ordering information.

** When a calibration certificate is ordered it is performed according to the specified configuration type:
CUS/ENG – Inputs and outputs calibrated according to the customer supplied configuration details and ranges.
STD – Inputs and outputs calibrated according to the instrument factory standard configuration and ranges.

Accessories

Case-to-panel gasket	C1900/0149
Wall-mount kit	C1900/1712
Pipe-mount kit	C1900/0713
Pack of red pens	C1900/0121
Pack of green pens	C1900/0122
Pack of blue pens	C1900/0120
Pack of black pens	C1900/0119
Pack of purple pens	C1900/0123
After-sales engineered configuration service	ENG/REC

Key to module types

0	No module fitted / Pen input channel *
1	Standard Input/Output
2	Analog input (Math input) + Relay
3	Four Relays
4	Eight Digital Inputs
5	Eight Digital Outputs
6	True Time Event Pen (Violet)
8	Modbus RS485 Communications

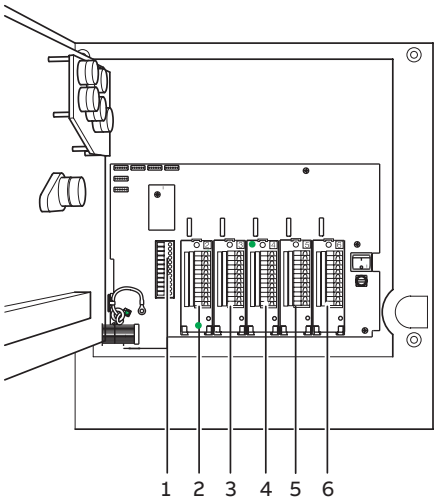
* On 2, 3 or 4 pen instruments a standard I/O module is always fitted in the corresponding module position (enter '0' in the corresponding order code field).

Example. 1 9 1 3 J A A 0 1 1 0 0 3 0 8 STD

3 pens

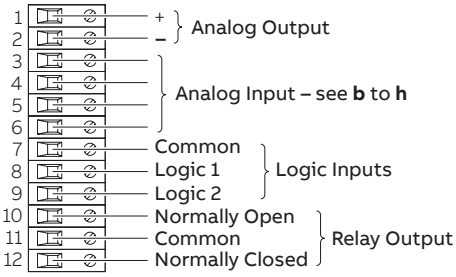
4 relays

Modbus RS485 Communications

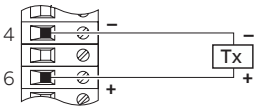


Module Positions

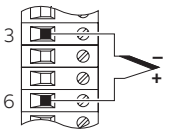
Electrical Connections



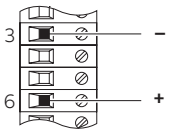
Summary of Connections



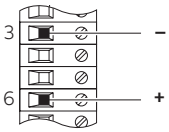
d – 2-wire Transmitter



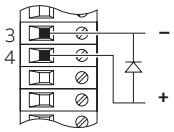
e – Thermocouple



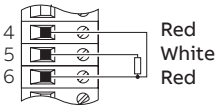
g – Low Voltage (mV)



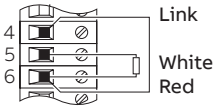
b – Voltage



c – Current (non 2-wire Transmitters

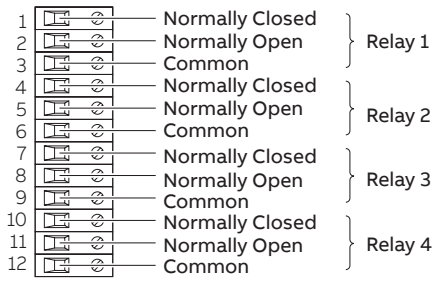


f – 3-wire RTD

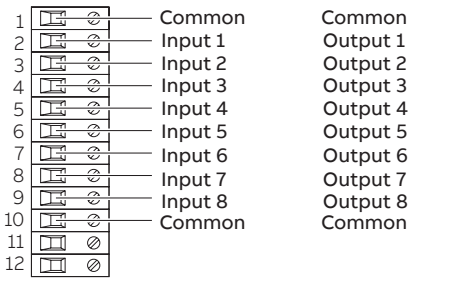


h – 2-wire RTD and Resistance

Standard Input/Output Modules

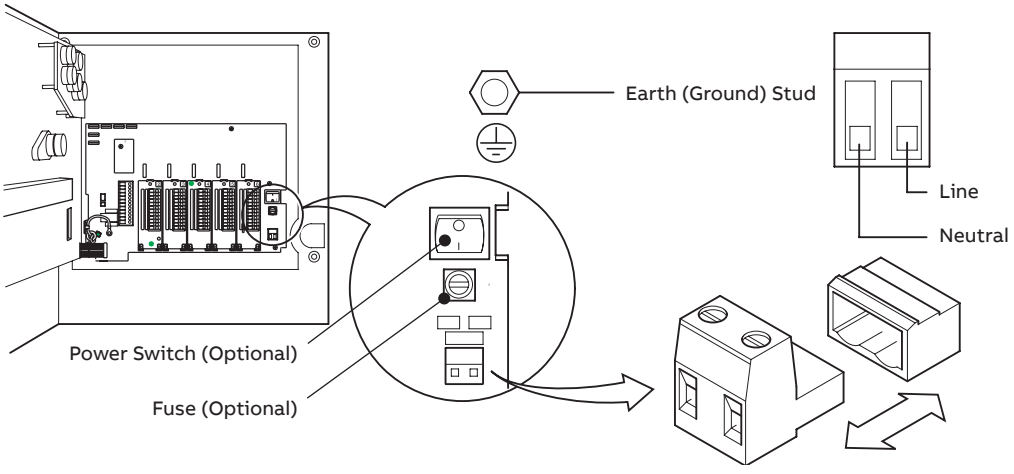


Four-Relay Output Module



Input Connections or **Output Connections**

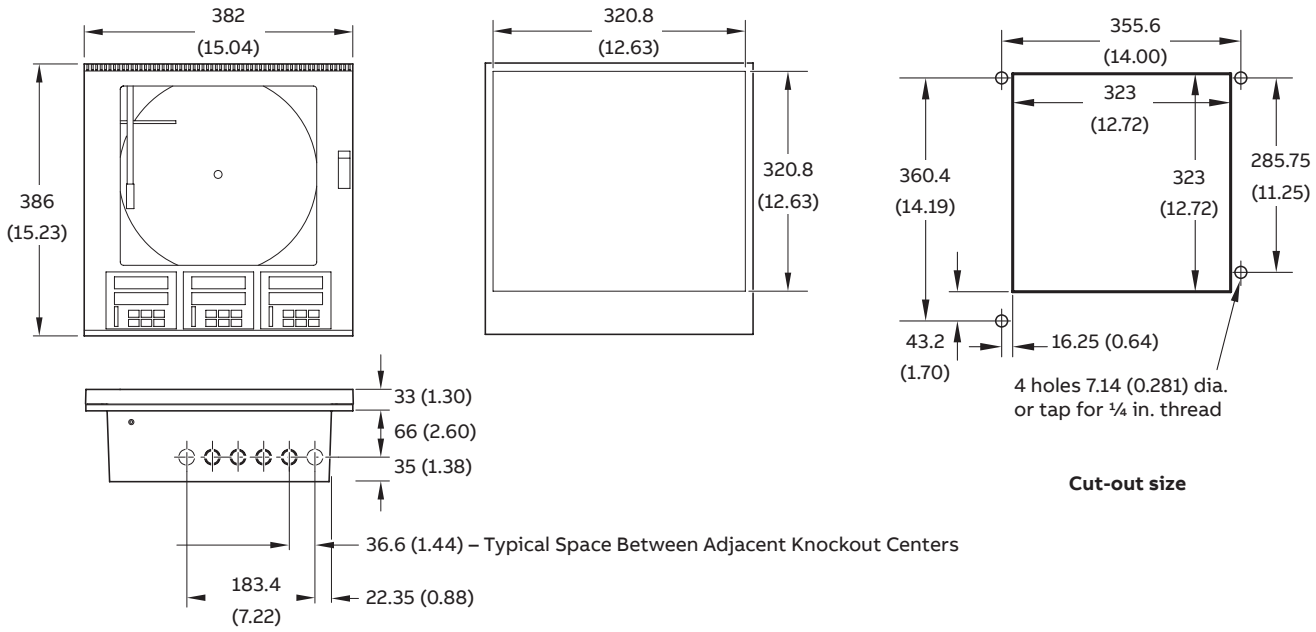
Digital input/output module



Power Supply Connections

Overall dimensions

Dimensions in mm (in.)



Cut-out size

Notes

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