Raubers Road

Vacuum Pumping Station

Electrical

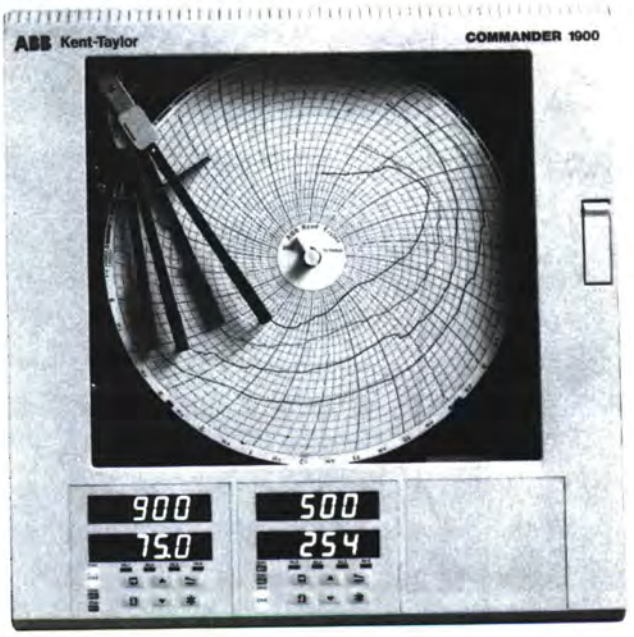
Equipment

Manuals

COMMANDER 1900

Circular Chart Recorder

- **1 to 4 pens –**
  full application flexibility
- **NEMA 4X/IP66 construction –**
  Hose-down protection
- **Multiple 6-digit 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 systems compatibility
- **Totalizers and math functions built-in –**
  fully integrated solutions



COMMANDER 1900 – a rugged, reliable recorder with the full capability to meet your application needs

ABB Kent-Taylor

ABB

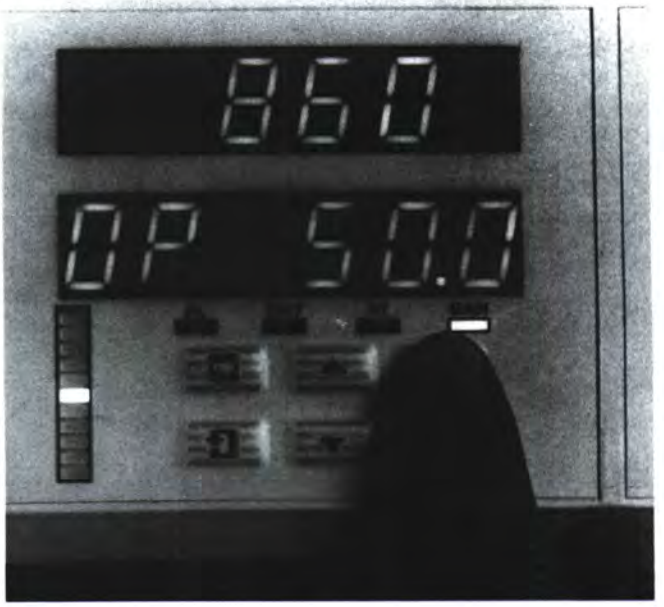
COMMANDER 1900

The COMMANDER 1900 is a fully programmable circular chart recorder for up to four process signals. The COMMANDER'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

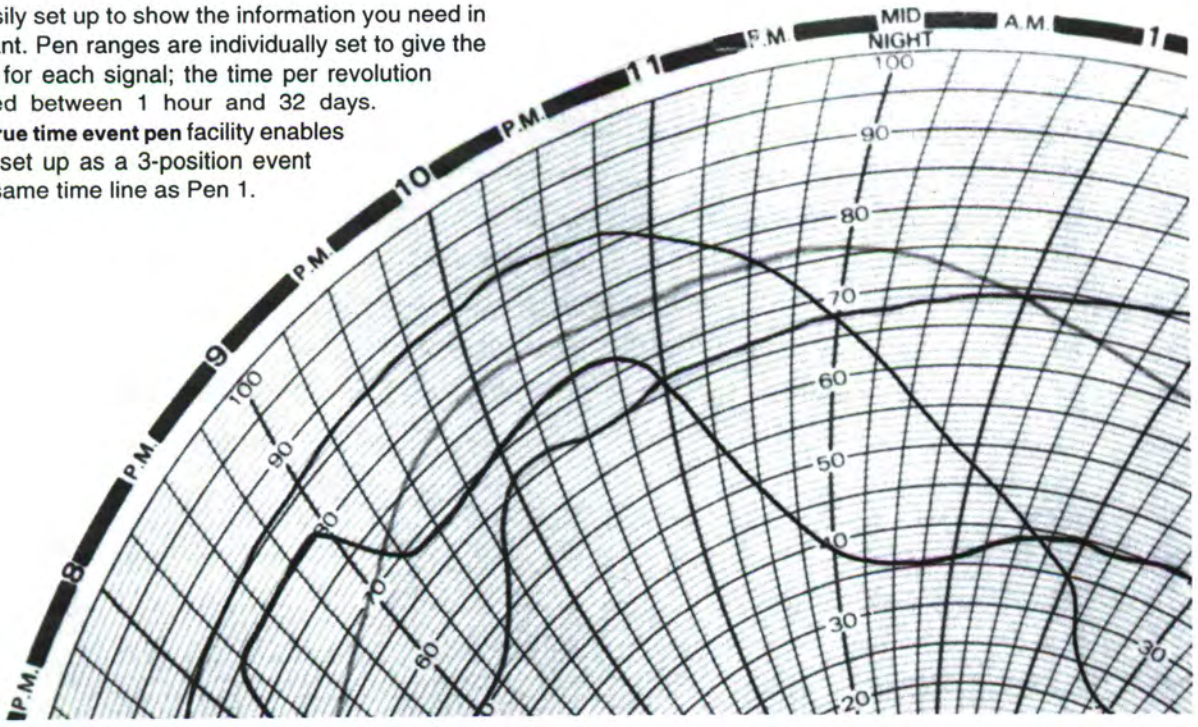
The COMMANDER lets you see the status of your process at a glance: **high visibility 6-digit displays** provide a clear indication of up to four process values simultaneously and active alarms are signalled by flashing LED's below the main display.

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.

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.



Flexibility to Solve Problems

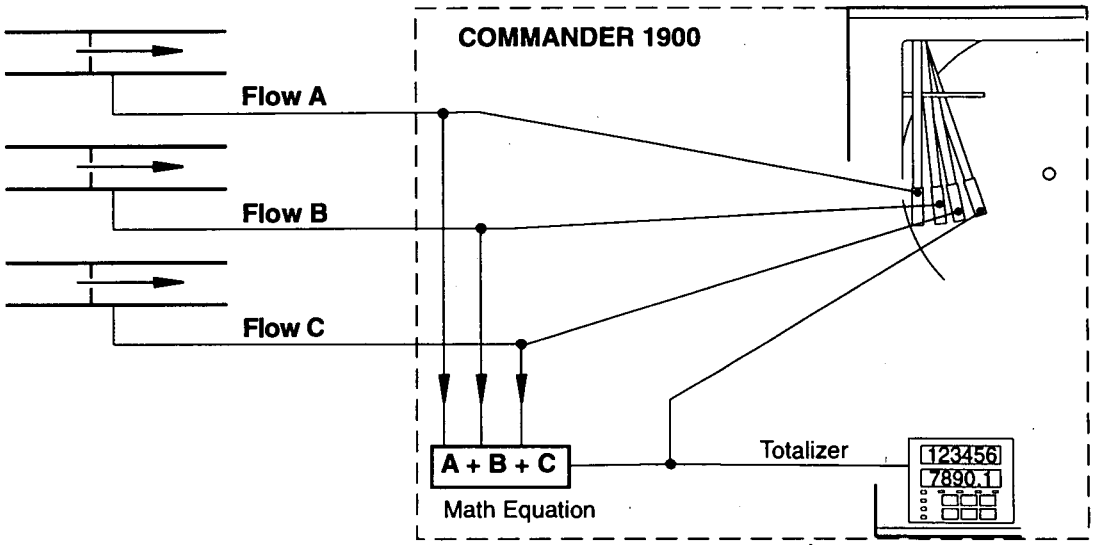
The COMMANDER 1900 offers seamless integration of loop functionality to solve process problems, eliminating the need for auxiliary devices.

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.

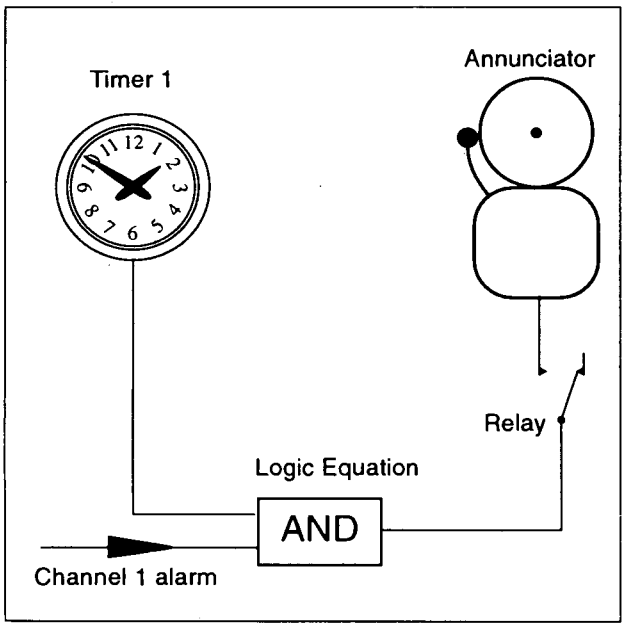
Logic capability allows interlocking and integration of discrete and continuous functions to solve a wide range of process problems.



Summation of Three Flows

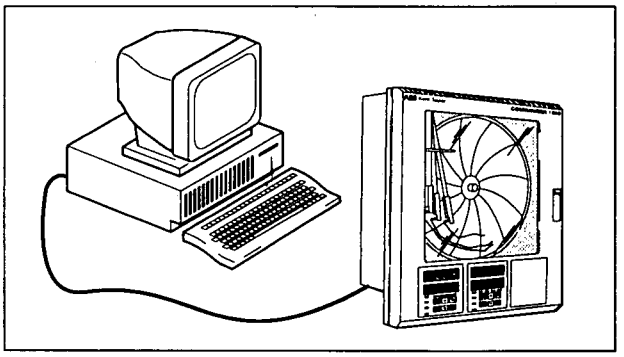
Timers and Clock

The COMMANDER 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 COMMANDER 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 COMMANDER'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**:

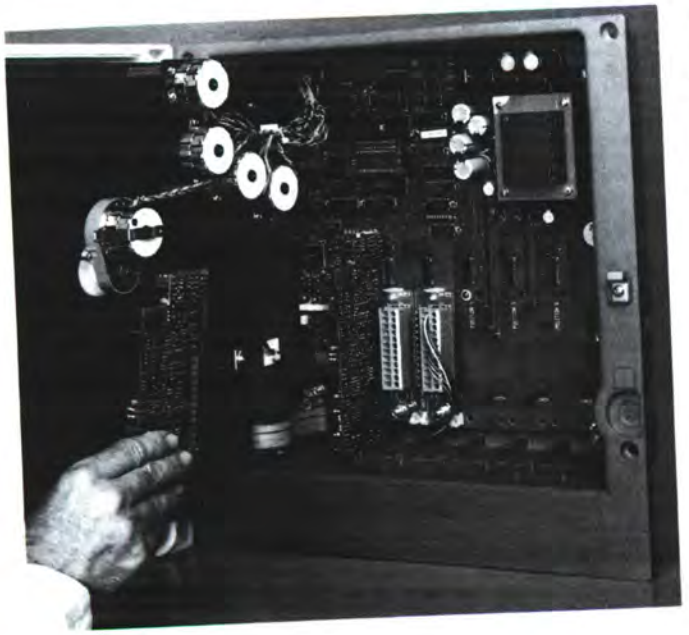
- **Analog input and relay** – for use with math functions
- **Four relays** – channel alarm outputs
- **Eight digital inputs** – linked using logic equations
- **Eight digital outputs** – TTL level alarm outputs
- **MODBUS RS485 communications** – interfaces with P.C.s

Expandable for the Future

The COMMANDER 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.



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.

Designed to Survive

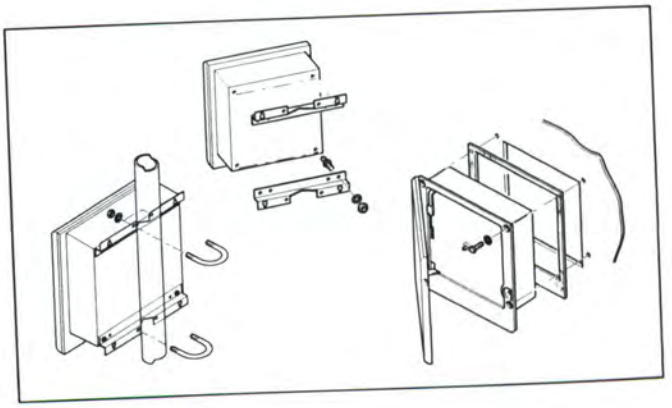
NEMA 4X protection ensures the COMMANDER can survive in the harshest environments and makes the recorder ideal for use in panels which are regularly hosed down. The **tough, acid-resistant case** and secure cable-entry glands maintain the NEMA 4X rating for wall-mounted or pipe-mounted instruments.

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.

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.



Built-in Quality

The COMMANDER 1900 is designed, manufactured and tested to the highest quality standards, including ISO 9001, and is guaranteed by a 2 year parts and labour warranty.

Commander 1900 Performance Specification

Summary

1, 2, 3 or 4 pens
10" Chart size
Standard i/o with each pen includes:
Analog input, analog output, transmitter power supply, relay output and 2 digital inputs.

General

Construction

Size:	15.23" (h) x 15.04" (w) x 5.57" (d) (386.8 x 382.0 x 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:	32° to 130°F (0° to 55°C)
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
Isolation:	500V dc (channel/channel) 2kV dc (channel/ground)
Memory protection:	Nonvolatile EEPROM
Approvals:	CSA (optional) CE (optional)

Power Supply

Voltage:	115/230V ac ±15%, 50/60Hz
Consumption:	< 40 VA (typical for full spec. unit))
Line interruption:	Up to 60ms

Process Inputs and Outputs

General

Noise Rejection:	Common mode > 120dB at 50/60Hz Normal (series) mode > 60dB at 50/60Hz
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 1µV/°C
Long-term drift:	< 0.01% of reading 10µV annually
Input impedance:	> 10 MΩ (mV and V inputs) 100 Ω (mA input)

Analog Inputs

Signal types:	mV, V, mA, Ω
Thermocouple types:	B, E, J, K, N, R, S, T
Resistance Thermometer:	Pt 100
Other linearizations:	$x^{1/2}$, $x^{3/2}$, $x^{5/2}$, linear
Sample interval:	250ms per channel
Isolation:	500Vdc channel/channel
Digital Filter:	0 to 60s programmable

Transmitter Power Supplies

Number:	1 per channel
Voltage:	24Vdc nominal
Drive:	Up to 25mA
Isolation:	500Vdc channel/channel

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 20µV
mA	0	50	1	±0.2% reading or 0.2µA
Ohms (low)	0	750	20	±0.2% reading or 0.1Ω
Ohms (high)	0	10k	400	±0.5% reading or 10Ω

	°C		°F		
Type	Range Lo	Range Hi	Range Lo	Range Hi	Accuracy (excl. CJC)
B	–18	1800	0	3270	±2.0°C (above 200°C)
E	–100	900	–140	1650	±0.5°C
J	–100	900	–140	1650	±0.5°C
K	–100	1300	–140	2350	±0.5°C
N	–200	1300	–325	2350	±0.5°C
R	–18	1700	0	3000	±1.0°C (above 300°)
S	–18	1700	0	3000	±1.0°C (above 200°C)
T	–250	300	–400	550	±0.5°C
PT100	–200	600	–325	1100	±0.5°C

Analogue Outputs

Type:	4 to 20 mA
Accuracy:	±0.1%
Maximum load:	750 Ω
Isolation:	500V dc

Relay Outputs

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

Digital Inputs

Type:	TTL or volt-free
Minimum pulse:	250ms
Isolation:	500Vdc between modules, no isolation within module

Digital Outputs

Type:	5V TTL
Rating:	5mA per output
Isolation:	500Vdc between modules, no isolation within module

Serial Communications

Connections:	RS485, 4 wire
Protocol:	MODBUS RTU

Pneumatic inputs/outputs

Type:	3 to 15 psig I/P, 3 to 15 psig P/I
Mounting:	External DIN rail on rear of unit

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" or 105mm
Chart speed:	1 to 167 hours or 7 to 32 days per revolution

Display and Operator Panels

Displays

Number:	2 (1 or 2 pens) or 4 (3 or 4 pens)
Type:	6-digit red LED, 0.56" (14mm) high
Status indicators:	Indicate channel number on display
Alarm indicators:	Indicate channel 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
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 eqns.:	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

Option Module Types	I/o per module							
	Analog i/p	Analog o/p	Trans. PSU	Relays	Digital i/p	Digital o/p	Comms.	Max. No. per Instrmt
Standardi/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 comms.							1	1
1901J (non-upgradeable)	1							

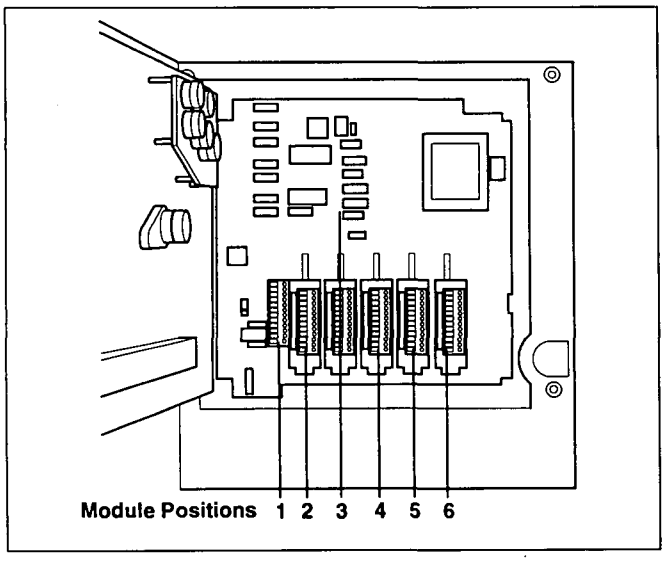
Ordering Guide

PART 1

COMMANDER 1900 Recorder		19XX	X	X	X	X	X	X	X	X	X	X	X	XXX
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		J											
	KPC 105 PX and PXR type charts		K											
	Chessell Brand charts		D											
Electrical Code	Standard			A										
	CSA approval			B										
Option Module	None				0									
	Additional Modules – *Complete PART 2*				A									
Options	None					0								
	Totalizer					3								
	Maths & Timer					A								
	Totalizer, Maths & Timer					B								
Door Lock	Not Fitted						1							
	Fitted						2							
Power Supply	115V A.C.							1						
	230V A.C.							2						
	24V A.C.							3						
	115V A.C. with On/Off Switch							4						
	230V A.C. with On/Off Switch							5						
	24V A.C. with On/Off Switch							6						
Special Settings	Company Standard													STD
	Customer Setting													CUS
	Special													SXX

† 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 Guide

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	0	2	3	4	5	
Module Position 6	0	2	4	5	8		

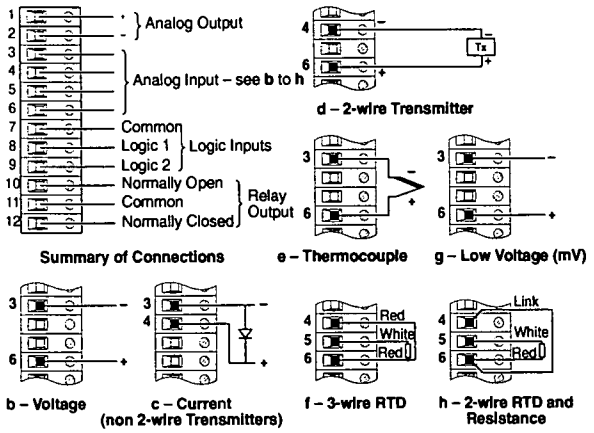


Key to Module Types

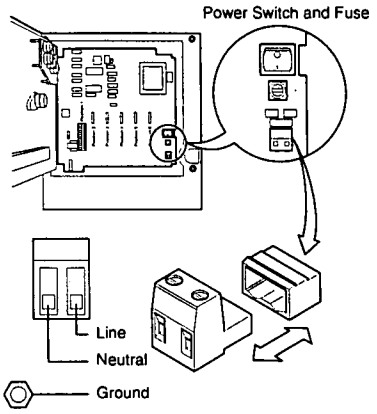
0 No module fitted / Pen input channel *
1 Standard Input/Output
2 Analog Input (Math input) + Relay
3 Four Relays
4 Eight Digital Inputs
5 Eight Digital Outputs
6 True Time Event Pen (Violet)
8 MODBUS RS485 Communications

* 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).

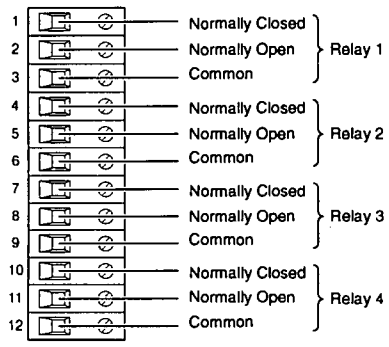
Example 1 9 1 3 J A A 0 1 1 0 0 3 0 8 STD
3 pen
4 relays
Module RS485 communications



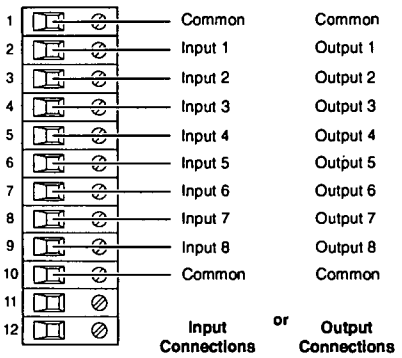
Standard Input/Output Modules



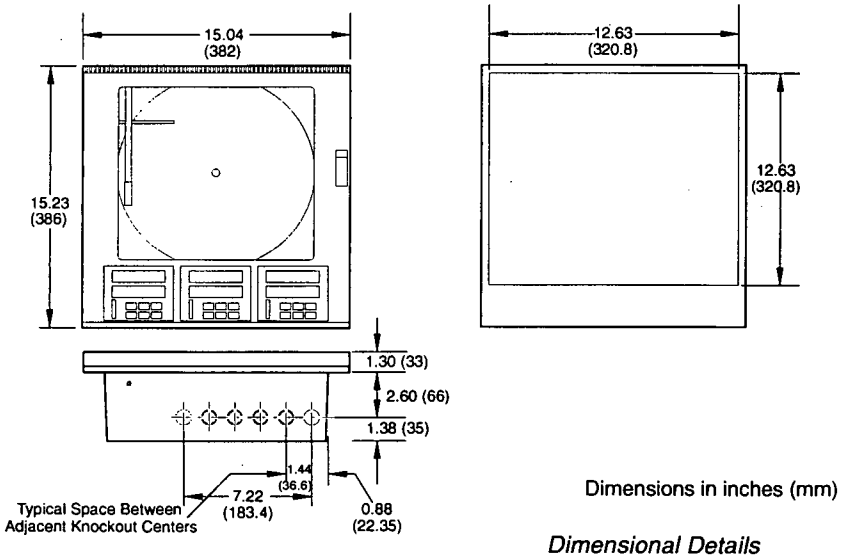
Power Supply Connections



Four Relay Output Module



Digital Input/Output Module



Cut-Out Size

Dimensions in inches (mm)

Dimensional Details

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

SS C/1900R Issue 4

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Indicator Controller

MTIC
MultiTrode
Indicator Controller

MULTITRODE

Continuous level indication and control of up to ten devices. Provides 4-20mA and 0-10V output.

The MTIC was specifically designed for applications requiring continuous liquid level display, pump control and analog output.

The simple installation and operation make this unit one of the easiest retrofit level control devices in the MultiTrode range when upgrading from ball floats. Combining the MTIC with a 10 sensor probe provides the ultimate in low-cost reliability.

- Controls up to 10 devices.
- Ten-segment level indication.
- 10 programmable N/O or N/C outputs.
- Visual indication of set points.
- Four sensitivities.
- Four activation delays.
- 4-20mA and 0-10V DC outputs.
- Panel mounted.
- Power On indication.
- Ideal retrofit for troublesome ball floats.
- Perfect for I.S. application when used with MTISB.

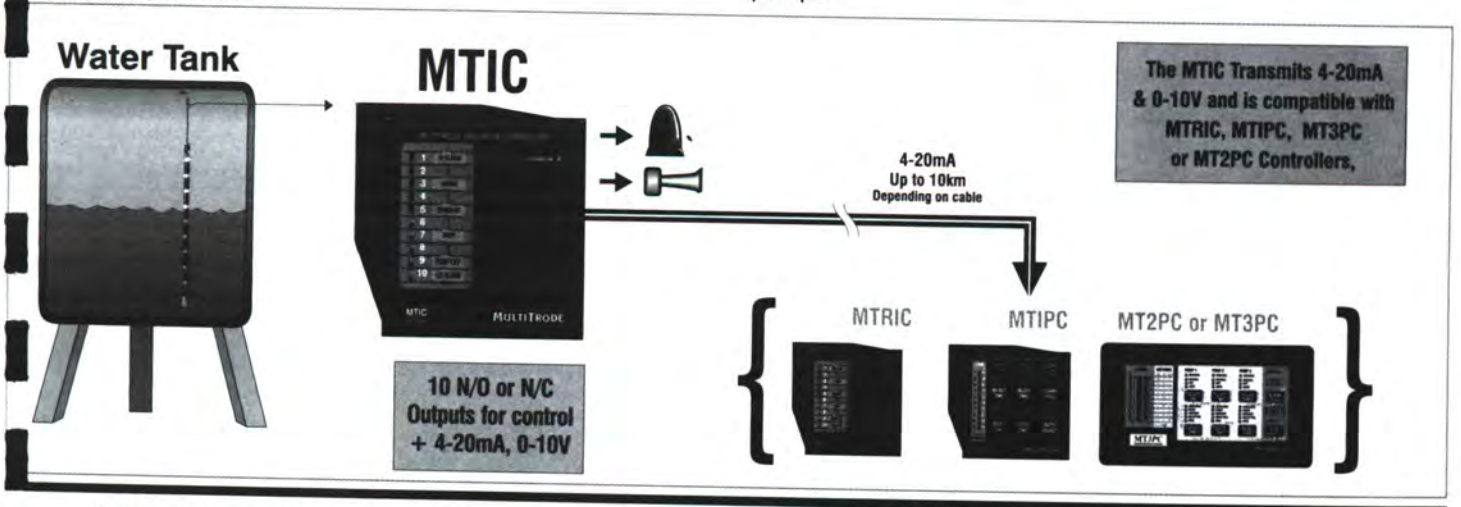
The MTIC is used where level indication or control of multiple pumps and/or alarms is required. The unit's simple operation and mounting allow it to be easily installed. Key MTIC features are: ten separate relay outputs (one per LED) which can be set as N/O or N/C via the DIP switches located on the rear, and the inclusion of 4 - 20mA and 0 - 10V analog outputs.

Local indication at up to four remote sites when utilising the MTRIC can be achieved by adding additional MTRIC units.

The 4 - 20mA and 0 - I0V analog outputs can operate chart recorders, variable speed drives, telemetry or other control devices. The MTIC can be connected to a MultiTrode MTRIC, MTIPC, MT2PC or MT3PC via its 4-20mA output providing full multiple pump control.

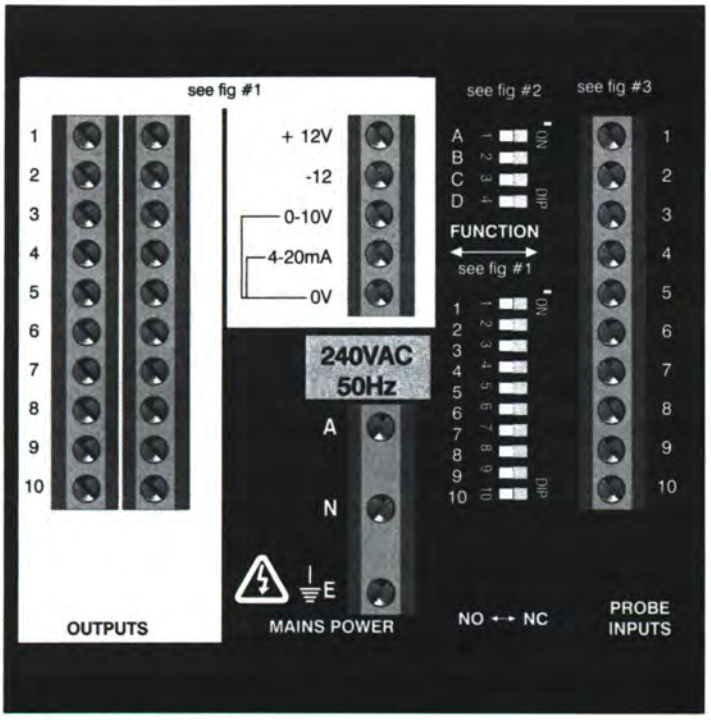
Typical applications are water reservoirs with remote pump stations or water tanks in high-rise buildings, with basement pumps.

Typical Application



All MultiTrode Products carry a full two year warranty

Rear Face



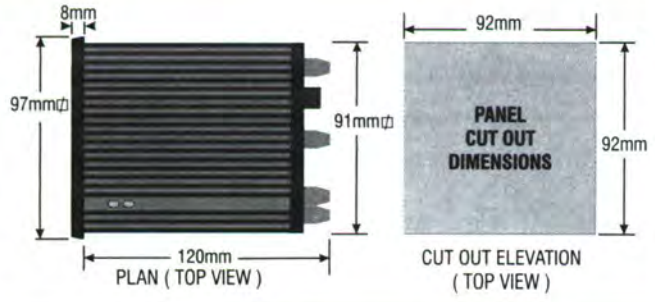
Dip Switch Settings

- Delay time selection: 0, 5, 10, 15 sec
- Sensitivity selection: 1k, 4k, 20k, 80k Ω

Relay outputs 1-10

Each of the relay outputs can be selected as being N/O (Normally Open) or N/C (Normally Closed) at the flick of a switch for optimum flexibility.

Dimensions



Approvals

UL listed 2P27

INDUSTRIAL CONTROL EQUIPMENT LISTED 2P27 c UL

Approved for I.S. applications when installed in conjunction with a MultiTrode **MTISB** Intrinsically Safe Barrier

MTIC Specifications

Mode of Operation

Charge or Discharge (Fill or Empty)

Probe Inputs

Sensor inputs	10
Sensor voltage	12VAC Nominal
Sensor current	0.8mA max. (per sensor)
Sensitivity	1k, 4k, 20k, 80k Ω

Other Inputs

None

Relay Outputs

No of relay outputs	10 N/O **or** N/C
Selectable delays	0, 5, 10, 15 sec
Relay contact rating	250VAC 5A Resistive, 2A Inductive
Relay contact life	10^5 Operations
Terminal size	2 x 2.5mm² #13

Other Outputs

Analog	4-20mA $R_L \leq 500\Omega$ 0-10VDC

Display

LEDs	10 LED bargraph & Power On

Communications

None

Physical Product

Dimensions mm	97H x 97W x 129D
Mounting	Panel mounted through cut-out using brackets supplied.
Enclosure	Extruded aluminium.

Power Supply

Supply Voltage AC	110, 220-240VAC Nominal 50/60Hz
Power Consumption	16VA max.
Supply Voltage DC	10 to 30VDC - 10 Watts max.

Working Temperature Range

-10^0 to $+60^0$ C
$+14^0$ to $+140^0$ F

Ordering Information

AVAILABLE MODELS

MTIC - 2 240VAC
MTIC - 3 110VAC
MTIC - 7 10-30VDC

Ordering Example

e.g. MTIC - 2 (2 = Model Voltage)

This order code is for a 240VAC MTIC.

All MultiTrode Products carry a full two year warranty

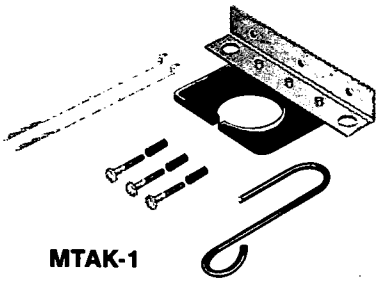
MULTITRODE

Supplied mounting kit

The MTAK-1 mounting bracket is SUPPLIED STANDARD with all multi-sensored probes.

The MTAK-1 mounting bracket has an integral cleaning device.

All metal components are manufactured from #316 stainless steel.



MTAK-1

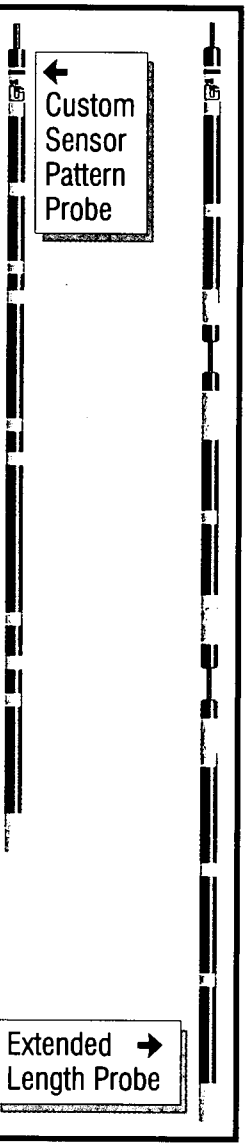
Custom Probes also available

MultiTrode offers a variety of custom probes. Your custom probe is manufactured exactly to your requirements.
(Within the following limits.)

No. of Sensors	25 max
Sensor spacing	85mm min
Section length	3m max
Cable length	500m max

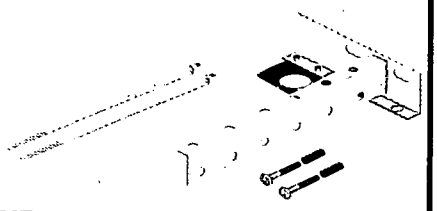
Your assistance with an application drawing, specifying cable lengths and sensor spacings will ensure prompt and accurate service.
Note. **Probes over three metres in length are made in sections.**

Please contact your local MultiTrode representative for a copy of the Custom Probe Order Form.



Mounting Options:

MultiTrode's MTAK-2 Extended mounting bracket provides up to 300mm of extra wall clearance.
(For further details please refer to the MultiTrode accessories section)



MTAK-2

Approvals:

UL listed 2P27

Approved for I.S. applications when installed in conjunction with a MultiTrode **MTISB** Intrinsically Safe Barrier

Probe Specifications

Materials

Sensors:	Avesta 254 SMO High Grade Stainless Steel Alloy
Probe Casing:	uPVC Premium Quality Extruded Tube
Cable:	PVC/PVC Multi-core, Purpose manufactured (see below)

Dimensions

32mm diameter x specified length

Mounting: Via the supplied suspension/ cleaning bracket inside the wet well

Temperature Range

0° to 100° C
32° to 212° F

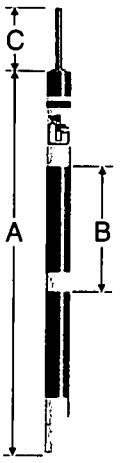
Cable

	Multicore	Three core	Single core
Conductor:			
Conductor Size	0.75 mm²	0.75 mm²	1.0 mm²
Strands	24	24	30
Ω/km	25	25	20
Ω/mile	40	40	32
Oversheath:			
Nom Diameter	12 mm	8 mm	6.9 mm
Colours:	Multi cores	Light blue / white	
	Oversheath	Dark blue/ Light Blue	

Identification: All cores are printed to read 1-ONE-1, 2-TWO-2, etc. Every 200mm.
(Numbering applies to multicore cable only).

Ordering Information - Standard Probes

MODEL A / D - C	Length A	Spacing B	Cable C
	m	mm	m
0.2/ 1 - C	0.2	/ N/A	- 10 or 30m
0.5/ 3 - C	0.5	/ 150	- 10 or 30m
1.0/ 10 - C	1	/ 100	- 10 or 30m
1.5/ 10 - C	1.5	/ 150	- 10 or 30m
2.0/ 10 - C	2	/ 200	- 10 or 30m
2.5/ 10 - C	2.5	/ 250	- 10 or 30m
3.0/ 10 - C	3	/ 300	- 10 or 30m
6.0/ 10 - C	6	/ 600	- 10 or 30m
9.0/ 10 - C	9	/ 900	- 30m



A = Nominal probe length
B = Distance between sensor points
C = Cable length
D = Number of sensors

e.g. 2.5 / 10 - 10 (Probe length / Sensor points - Cable length)

Cable lengths of up to 500m are available

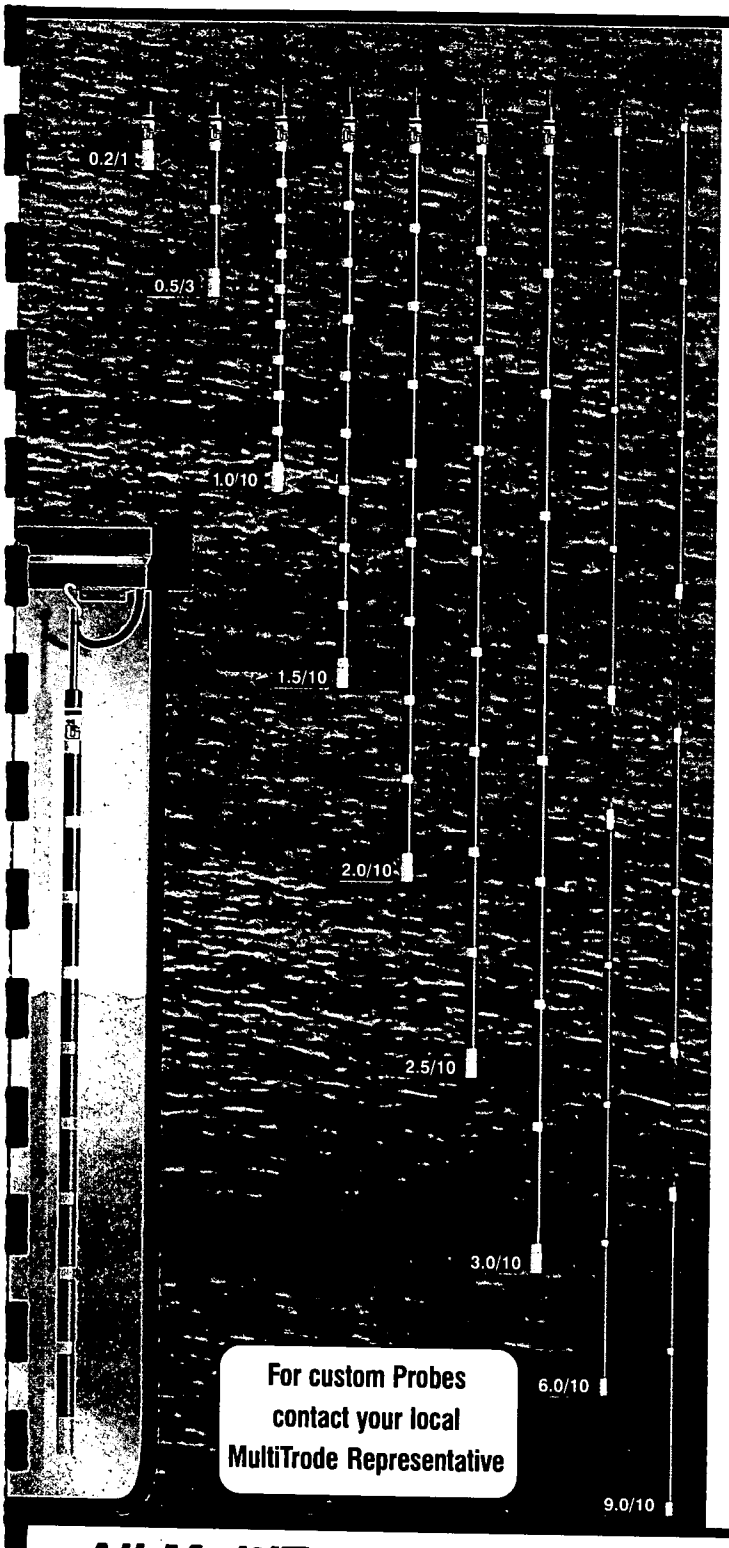
MULTITRODE

Liquid Level Sensing Probe

Probe
Conductive level sensor

MULTITRODE

The Probe is ideal for conductive liquids in aggressive and turbulent applications.



- ❑ Virtually nil maintenance required.
- ❑ Simple installation from outside of sump.
- ❑ Safe, low sensing voltage.
- ❑ Unaffected by fat, grease, debris and foam.
- ❑ Excellent in turbulent sumps.
- ❑ Positive pump cutout (no overruns).
- ❑ Cost-savings, short and long term.
- ❑ Environmentally friendly.
- ❑ Intrinsically Safe operation using MultiTrode's I.S. Barrier.

MultiTrode has proven to be the most reliable and cost-effective liquid level control system available. MultiTrode Probes were specifically designed for the arduous, turbulent conditions encountered in water, sewage and industrial tanks and sumps.

Installation: Probe installation is easily achieved without the need to enter the wet area. The probe is simply lowered in from the top and suspended by its own cable, using the mounting kit supplied.

Fat, Grease, Debris and Foam: The probe's operation is unaffected by the build-up of fat, grease, debris and foam, which cause systems such as floats, bubblers, pressure and ultrasonic transducers, as well as other conductive probe systems, to fail.

Turbulence: Turbulence does not affect the probes operation, in fact it has a beneficial cleaning effect. The rugged, streamlined construction of the probe eliminates tangling, allows for operation in confined spaces and is a perfect partner for the Flygt mix & flush valve.

Safety: The personal safety of operators and maintenance staff is assured, due to the extra-low sensing voltage. Eliminates the use of dangerous high voltage equipment, and the risk of electric shock.

Positive Pump Cut-Out: The probe ensures your pumps are turned off at the same level every time. This avoids damage due to pump overrun and the cost of additional control equipment.

Cost Savings The low cost of equipment and installation makes MultiTrode one of the most economical systems available. MultiTrode's long life ensures continued cost savings, as compared to alternate forms of level control.

Environmentally Safe
MultiTrode probes do not contain mercury or any other environmentally damaging contaminants.

All MultiTrode Products carry a full two year warranty

Operating instructions

STUART BURNS
0411-425-445
38086518

Kent-Taylor Deltapi K Series® Electronic Transmitters

Model K - GP Pressure Transmitter

Model K-GP is a field mounted electronic transmitter using advanced measurement techniques, including a piezo-resistive sensing element, to provide accurate, reliable measurement of gauge and absolute pressure in the most difficult and hazardous industrial environments.

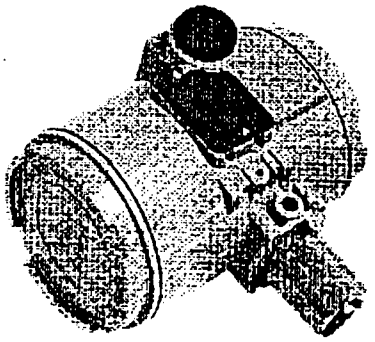


Table of Contents

Transport

After final calibration, the instrument is packed in a carton (*) that protects it from physical damage.

(*) Type 2 to ANSI/ASME N45.2.2-1978

Handling

The instrument does not require any particular caution during handling.

Storage

The instrument does not require any special treatment if stored as despatched and remains within the ambient conditions specified under Transportation and Storage conditions in the Specification Sheet and/or in the Specification in the last page of this publication. There is no limit to the storage period, although the terms of guarantee remain as agreed with Company and as given in the order acknowledgement.

Use of DANGER, WARNING, CAUTION and NOTE

This Publication includes **DANGER, WARNING, CAUTION** and **NOTE** information where appropriate to point out safety related or other important information.

DANGER - Hazards which will result in severe personal injury or death.

WARNING - Hazards which could result in personal injury.

CAUTION - Hazards which could result in equipment or property damage.

NOTE - Alerts user to pertinent facts and conditions.

Although **DANGER** and **WARNING** hazards are related to personal injury, and **CAUTION** hazards are associated with equipment or property damage, it should 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 **DANGER, WARNING** and **CAUTION** recommendations.

ABB Kent-Taylor

Product identification

The instrument is identified by some plates as shown in the figure below.

The Nameplate (ref. A), indicates the technical characteristic such as Code number, maximum working pressure, range and span limit, power supply and output signal. For details on code see page.

The Serial Number plate (ref. B) shows the transmitter serial number: please always refer to this number when making enquiries.

The Safety Marking plate (ref. C) fitted when the transmitter is required with a safety protection mode.

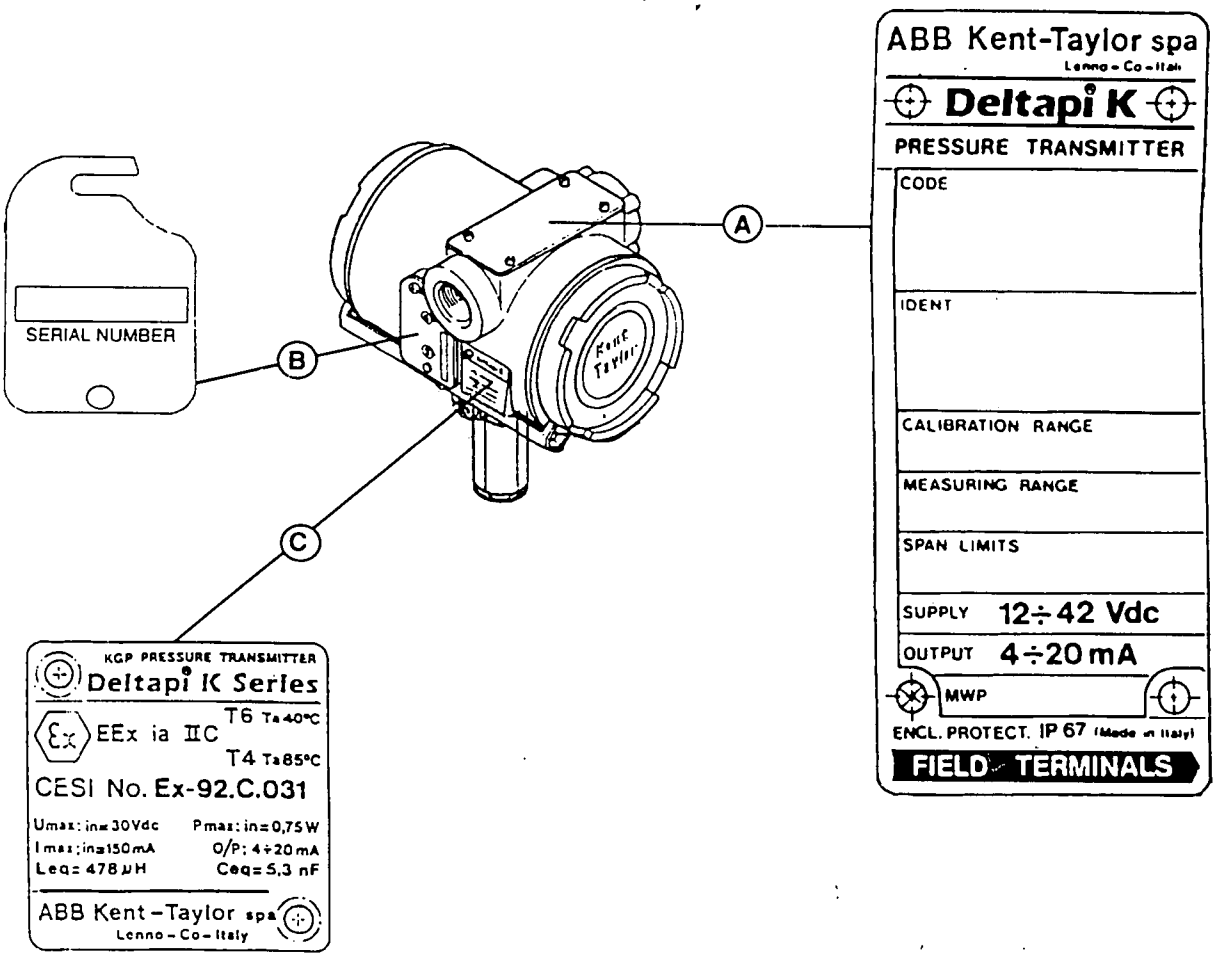
Principle of operation

The process fluid (liquid, gas or vapours) transmits, via a separation diaphragm and a filling fluid, the measured pressure to a piezo-resistive measuring diaphragm.

The other side of this diaphragm is either open to the atmosphere for low pressure measurement, or sealed for high pressure measurement or evacuated for absolute pressure measurement.

The deflection of the measuring diaphragm changes the resistances of a Wheatstone bridge: these, in turn, are fed to the electronics module which gives an output signal of 4 to 20 mA that is proportional to the amount of pressure applied to the transmitter.

Zero and span adiustements are provided to adjust, within the sensor specified limits, the transmitter calibration to the requested value.



IMPORTANT
The instrument serial number must always be given when making enquiries.

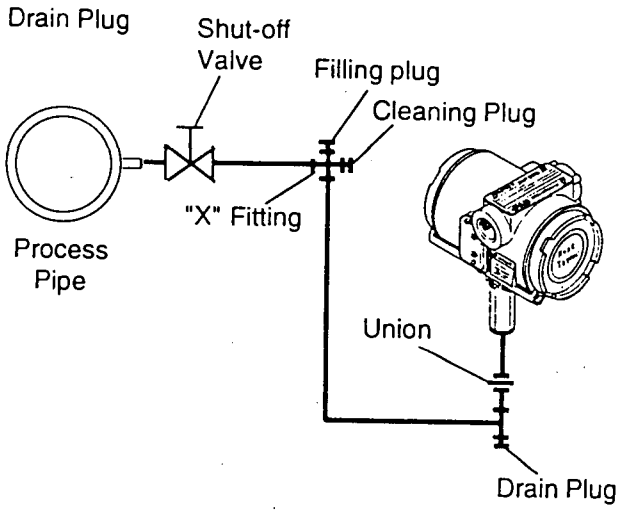
Installation

WARNING - In order to ensure operator and plant safety it is essential that installation is carried out by suitably trained personnel and according to the technical data given in the specification.

The transmitter should be mounted, by means of the supplied mounting bracket, to a wall or to a 2 inch pipe support. The process connection should be done using 1/2 inch piping for the connecting line: an union and a shut-off valve should be installed for maintenance.

For gas service the transmitter should be installed above the elevation of the process connection so that possible condensate will drain back to the process.

For steam or vapours the transmitter should be installed below the process connection: a T or a X pipe fitting should be provided in order to fill the connection, before the startup, with water or other suitable filling liquid.The seal liquid prevents overheating of the sensor element by live steam and ensures a constant liquid head to the transmitter process connection (see figure below).



For liquid service the transmitter can be installed at any convenient elevation w.r.t. the process connection: although the positive or negative head pressures due to the different elevations of the transmitter and pressure tap should be considered during the calibration.

Electrical connections

DANGER - Do not make electrical connections, in areas classified as HAZARDOUS LOCATIONS, unless the safety code designation shown on the transmitter safety marking plate agrees with the area classification. Can result in hazard of FIRE and EXPLOSIONS.

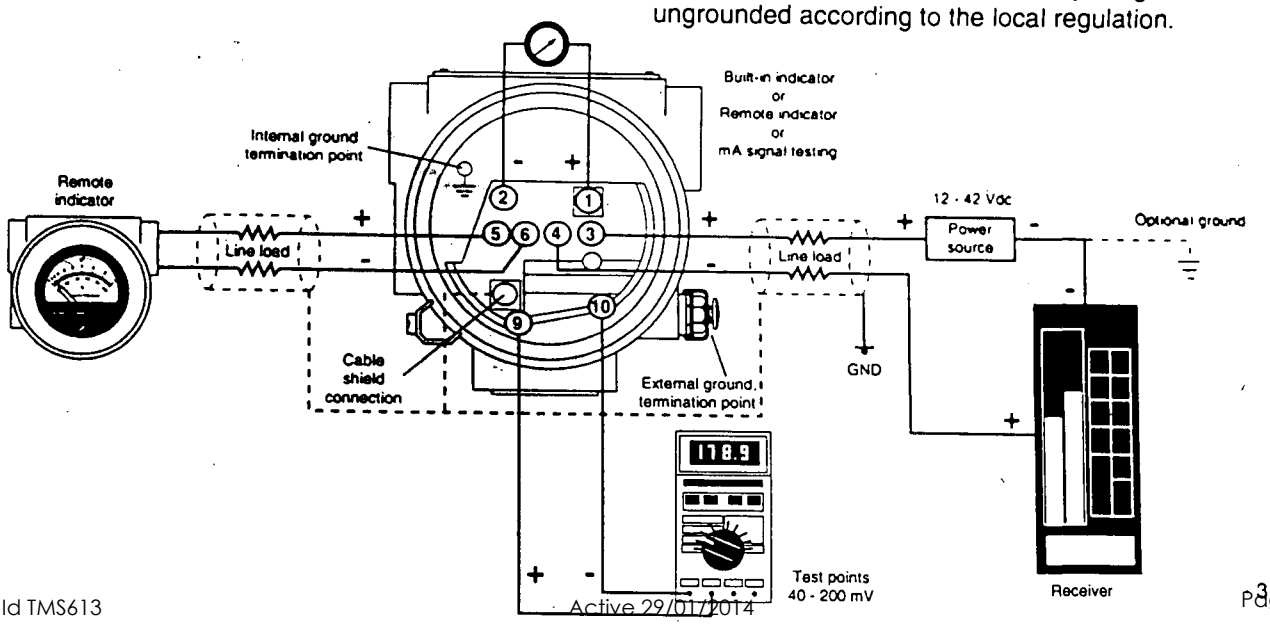
Signal terminals are located in a separate compartment of the electronics housing. On the top works of the transmitter two connection ports for cable glands or conduit fittings are provided. The connection ports are protected with a plastic plug for transport purposes: after the installation, the unused port should be adequately plugged. Connections can be made by removing the cover on the side designated as "FIELD TERMINALS" on the top plate.

CAUTION - Unless it's necessary avoid the removal on site of the protective cover which gives access to the electronic circuitry. Although the electronics is fully tropicalized it should not be subjected to humidity for long periods.

Make the connections to the terminal block as indicated in the figure: note that the standard terminal block does not include the terminals for the remote indicator (5 & 6) and those for test points (9 & 10). The internal output meter, when required, can be mounted simply by plugging it into the appropriate socket, after the removal of the short circuit link fitted between the terminal 1 & 2. The power to the transmitter is supplied over the signal wiring and no additional wiring is required. The signal wiring does not need to be shielded but the use of a twisted pair is highly recommended.

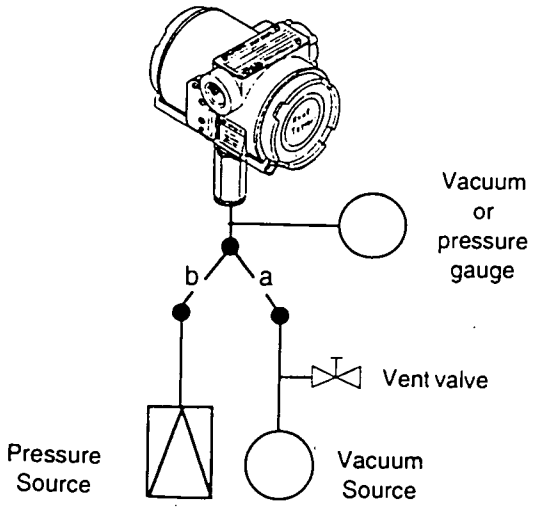
CAUTION - Do not connect the powered signal wiring to the mA signal testing terminals (1 & 2). Power could damage the by-pass diode fitted through the test connections.

Do not run the signal wiring in close proximity to power cables or high power equipment: use dedicated conduits or cable trays for signal wiring. Signal wiring may be ungrounded (floating) or grounded at any place in the signal loop. however if intrinsic safety is used the wiring and grounding must follow the specific rules for this technique. The transmitter case may be grounded or ungrounded according to the local regulation.



Unless otherwise specified the instrument is factory calibrated at maximum span. Instruments adjusted and tagged for a specific range will not require recalibration; however recommended procedures are outlined below.

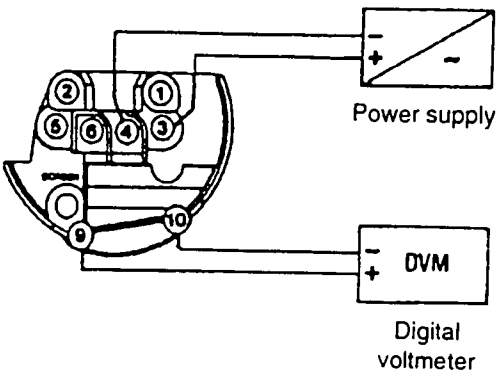
Set a test rig as appropriate and in accordance with the figure below. Remove the cover opposite to the electrical connection to access the zero and span trimmer.



Note:

a) the calibration accuracy is stricly related to the accuracy of the test equipment used.
b) for instrument with standard terminal block version (without test point) calibrate by connecting a milliammeter between the terminal 1 and 2 after the removal of the short circuit link. Values of 4 and 20 mA should be read for zero and span calibration respectively.

Electrical connections



Zero and Span Calibration (Zero based range)

Absolute Pressure Measurement

- Make "a" connection
- Switch on the power supply
- Close valve V
- Operate the vacuum source P until the best possible vacuum, read on M, is achieved
- The value read on the DVM should be 40 mV (or 4 mA): if it is not adjust the zero trimmer (see figure) to obtain this value
- If the value of calibration span is less than the atmospheric pressure allow, via valve V, the pressure in the system to rise to the value of the upper range value
  Close the valve V when this value is achieved
  The value read on the DVM should be 200 mV (or 20 mA): if it is not adjust the span trimmer to obtain this value
- If the value of the calibration span is greater than the atmospheric pressure, remove "a" connection and make "b" connection.
  By means of G1 generate a pressure, read on M1, equal to thevalue of the upper range value. The value read on the DVM should be 200 mV (or 20 mA): if it is not adjust the span trimmer to obtain this value.

Gauge Pressure Measurement

- Switch on the power supply
- With no pressure applied the value read on the DVM should be 40 mV (or 4 mA): if it is not adjust the zero trimmer (see figure) to obtain this value
- Make "b" connection
- By means of G1 generate a pressure, read on M1, equal to the value of the upper range value. The value read on the DVM should be 200 mV (or 20 mA): if it is not adjust the span trimmer to obtain this value.

Zero and Span calibration (zero suppressed range)

Absolute Pressure Measurement

- Make connession "a".
- Switch on the power supply.
- Close the valve V and operate the vacuum source until M reads the value of the pressure to be suppressed.
  The value read on the DVM should be 40 mV (or 4 mA): if it is not adjust the zero trimmer (see figure) to obtain this value.
- By means of P or G1(after having made connection "b") generate a pressure equal to the upper range value (sum of the pressure to be suppressed and the calibration span) of the instrument.
- The value read on the DVM should be 200 mV (or 20 mA): if it is not adjust the span trimmer to obtain this value.
- Return to the desired suppressed value and check that the DVM reads 40 mV (or 4 mA).

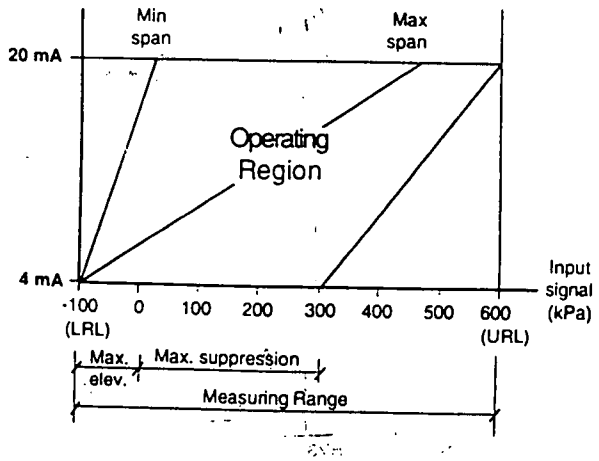
This procedure with proper considerations may be followed for gauge pressure measurements with zero elevation.

Gauge Pressure measurement

- Switch on the power supply
- Make the "b" connection
- By means of G1 generate a pressure, read on M1, equal to the value of the desired suppression. The value read on the DVM should be 40 mV (or 4 mA): if it is not adjust the zero trimmer to obtain this value.
- By means of G1 generate a pressure equal to the upper range value sum of the pressure to be suppressed and the calibration span of the instrument.
- The value read on the DVM should be 200 mV (or 20 mA): if it is not adjust the span trimmer to obtain this value.
- Return to the desired suppressed value and check that the DVM reads 40 mV (or 4 mA).

The following example shows the operating region available with sensor code 3

- Measuring range limits: 0 abs - 600 kPa (6 bar; 87 psig)
- Span limits: 120 and 600 kPa (1.2 and 6 bar; 17.4 and 87 psi)
- Max zero suppression: 300 kPa (3 bar; 43.5 psi) = 250% of minimum span
- Max zero elevation : 100 kPa (1 bar; 14.5 psi) = up to vacuum



Simple Fault Finding

If the transmitter does not appear to be working satisfactorily, carry out the following fault finding checks before contacting your nearest ABB Kent-Taylor Service Center.

If the instrument is to be returned for repair, ensure that it is adequately cleaned and decontaminated. Use for packing the original polystyrene box or high density chip foam.

WARNING - If the transmitter forms part of a control loop, the plant must placed under manual control while the instrument is examined or taken out of service.

Equipment needed : 3 1/2 digits DVM, solvent contact cleaner

NOTE :

Unless otherwise specified all checks on test points must be carried out with negative reference terminal on TP2

Fault : No Output

Start (power on)

Check the transmitter power supply — Faulty → Repair or replace

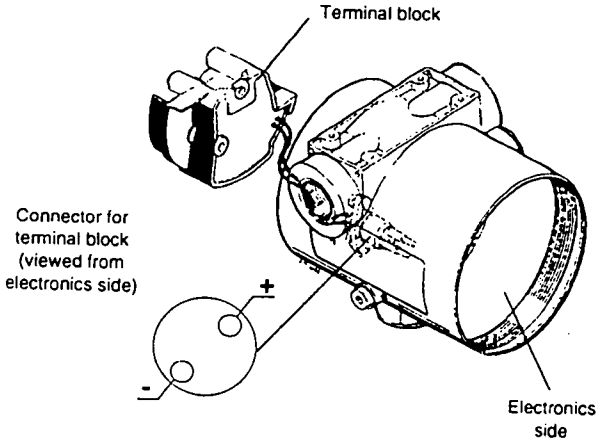
OK

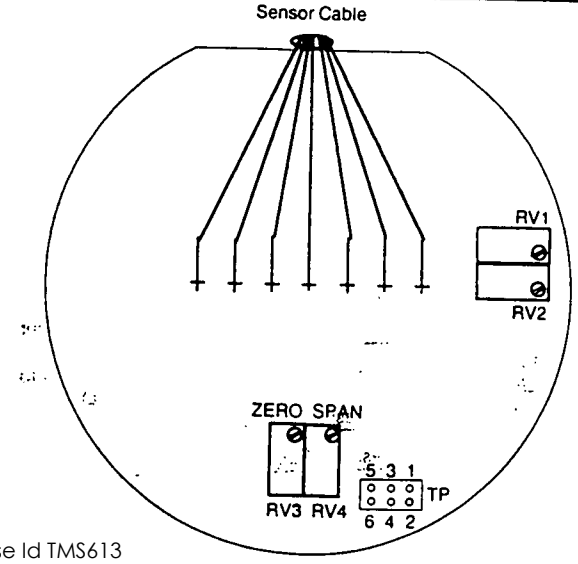
Remove the electronics. Check the power supply value on the electronics side of terminal block connector (see figure below) — No power → Remove the terminal block and check rear connection. If necessary replace terminal block

OK

Clean electronics connector, reassemble and check instrument operation — Faulty → Replace the instrument

OK - Stop





Fault : High, Low or Irregular Output

Start (power on)

Check the transmitter power supply — Faulty → Repair or replace

OK

Check for trapped gas in liquid line or liquid in dry line — Present → Remove

OK

Check for sediment in process flange — Present → Clean out

OK

Check the following:

TP4 = -2.5 V. ± 0.1
TP6 = + 2.5 V. ± 0.1

— Faulty → Replace the instrument

OK

Connect a pressure source to the transmitter and checkTP5. It should show a change of about 600 mV. when the applied pressure ranges from 0 and the Upper Range Limit. — Not OK → Replace the instrument

OK

Check that the voltage measured on TP5 is ± 200 mV. with no pressure applied. Is the value within the limits? — YES → Trim RV2 to read exactly 0. Apply the URL pressure and trim RV1 to read 600mV Repeat the operation twice. Is transmitter's output OK ?

YES → STOP

NO → Replace the instrument

NO

Using a soldering iron unsolder the sensor's connections from the terminal board. Connect the (-) lead of the DVM to the sensor's Black connection and check the following:
Red and Blue : 3 KΩ ± 1
Yellow and White : 6 KΩ ± 1
Between the Green : 2 KΩ ± 0.3

— OK → Replace the instrument

Not OK

Replace the instrument

Dismantling and reassembly

CAUTION - Dismantling and reassembly should not be carried out on site because the risk of damage to components and printed circuits as a result of adverse ambient conditions (e.g. humidity, dust, etc.). The dismantling and reassembly procedures given below should be carried out in the listed order to avoid instrument damage.

Equipment required

Small Phillips screwdriver
Small screwdriver
Small soldering iron

• Output meter, surge protector and terminal block

Dismantling

a) Unscrew and remove the cover (1)
b) If fitted, pull out the output meter (2)
c) If the meter is not fitted, remove, unscrewing the relevant screws, the shorting link (3)
d) If the surge protector is fitted, remove it unscrewing the fixing screws
e) Unscrew the terminal block fixing screws (4)
f) Unsold the terminal block wires
g) Unscrew the ground connection (5) and remove the terminal block

Reassembly

Proceed as above but do the operation in the reverse order. Care should be taken on the polarity of the connection: the negative wire (black) should be soldered to the outer pin. Do not pinch the wires while fitting the terminal block. Before screwing the cover, check that the "O" ring is not damaged.

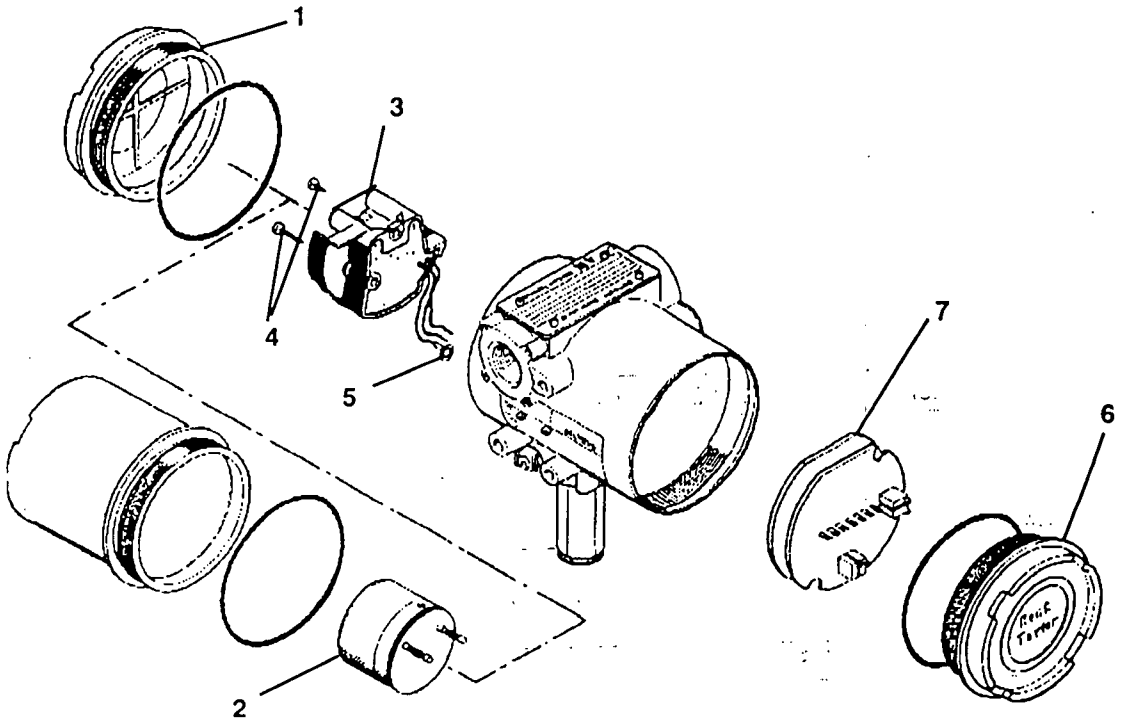
• Electronics

Dismantling

a) Unscrew and remove the cover (6)
b) Using the soldering iron remove the sensor connections from the terminal pins
c) Unscrew the two Phillips screws that hold in place the electronics
d) Pulling on the two black plastic pillars remove the electronics (7) paying attention to not damage the sensor cable.

Reassembly

a) Holding the electronics by the two black plastic pillar fit it in place, paying attention that the flat part of the printed circuits is parallel to the top of the housing, in order to allow the correct passage for the sensor cable and the correct electrical connection. When the electronics is in place push it gently down to plug into the connector
b) Screw down the two Phillips screws that fix the electronics to the housing
c) Using the soldering iron solder the sensor wires in the printed circuit terminal pins, paying attention that the colors of the wires fit with the colors indicated on the printed circuit
d) Make the pressure and electrical connections as indicated in page 4 and power up the transmitter
e) Connect a DVM between TP2 (-) and TP5 (+), see Fig. on page 5. With no pressure applied trim RV2 to read exactly 0 V.
Apply the URL pressure and trim RV1 to read exactly 600mV. Repeat these operations twice.
f) Proceed with the Zero and Span Calibration procedures as explained at page 4
g) Fit the cover in place.



SPECIFICATIONS

FUNCTIONAL SPECIFICATIONS

Overrange limit

- Sensor 2 : 0.3 MPa, 3 bar, 43.5 psi
- Sensor 3 : 0.9 MPa, 9 bar , 130 psi
- Sensor 4 : 2.4 MPa, 24 bar, 348 psi
- Sensor 5 : 6 MPa, 60 bar, 870 psi
- Sensor 6 : 15 MPa, 150 bar, 2175 psi
- Sensor 7 : 37.5 MPa, 375 bar, 5435 psi
- Sensor 8 : 90 MPa, 900 bar, 13050 psi

Normal operating pressure limits operates within specifications between line pressures of 2 kPa abs, 20 mbar abs or 0.29 psia and the Upper Range Limits, for gauge measurement version and between 0 kPa abs, 0 mbar abs or 0 psia and the Upper Range Limit for absolute measurement version.

Power supply (at the transmitter terminals)

The transmitter operates on 12 to 42 Vdc with no load and is protected against reverse polarity connection.

Minimum operating voltages:

- 12 Vdc without options
- 13.5 Vdc with surge protection
- 14 Vdc with optional LCD meter
- 12.2 Vdc with optional analog meter
- 15.5 Vdc with all options

Optional surge protection

Up to 2.5 kV (5 kA discharge current) of 8 µs rise time/20 µs decay to half value.

Volumetric displacement

< 0.5 mm^3 for max span.

Power-up time

Operation within specification in less than 1 sec. with minimum damping.

Insulation resistance

> 100 MΩ @ 500 Vdc (1000 Vdc option)

Output signal

Two-wire 4 to 20 mA dc.

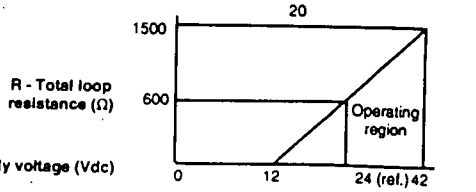
Ripple content on the output

less than 2% at 33.4 kHz

Load limitations - total loop resistance including optional remote indicator line: see figure below

Line resistance to remote indicator : 15 Ω max

$$R\ (k\Omega) = \frac{\text{Supply voltage - min. operating voltage (Vdc)}}{20}$$



Operating conditions

	Temperature (§) °C (°F) Process (1)	Temperature (§) °C (°F) Ambient	Ambient pressure (absolute)	Relative Humidity (%)	Vibration (IEC 654-3)	EMI/RFI (SAMA PMC 33.1)	Supply voltage Vdc (2)	Output load Ω (3)
Reference	Any value between +15 and +35 ± 2 K (+59 and +95 ± 3)		96 kPa ±10% 960 mbar ±10% 720 mmHg ±10%	60 ± 25%	None	None	24±0.5	600
Normal	-25 to + 85 (-13 to +185)	-25 to +85 (◊) (-13 to +185)	Atmospheric pressure	0 and 100 condens. permissible	Severity class: steady state •f = 1 to 10 Hz displ. 1.5 mm-acc. 0.5g •f = 10 to 60 Hz displ. 0.15 mm •f = 60 to 500 Hz-acc. 2g	Class 2-abc Field strengths up to 10 V/m (5)	12 and 42	0 and 1500
Operative limits with Silicone oil or inert fill fluid (4)	-43 and +120 (-45 and +248)	-43 and +85 (-45 and +185)				Class 3-abc Field strengths up to 30 V/m (5)		
Transport. & storage limits (4)	Not applicable	-50 and +120 (-58 and +248)			Severity class: unusual •Velocity = 300 mm/s •f = 1 to 150 Hz	Not applicable		

(1) Process temperature above 85 °C (185 °F) require derating the ambient limits by 1.5 : 1 ratio. (2) Refer to "power supply" requirements.
(3) Refer to external loop "load limitations". (4) No damage. (5) Frequency range: 20 to 1000MHz.
(§) Note that if male fitting is used, the lower process temperature limit is -10° C (14° F).
(◊) Normal operating temperature limits for LCD output meter : -20 and +80°C (-4 and +176°F).

PERFORMANCE SPECIFICATIONS

Unless otherwise stated performance specifications are given at reference operating conditions and zero based range for transmitter with isolating diaphragm in AISI 316 L ss and Silicone oil fill. Test procedures and operating influences are in accordance with relevant IEC and SAMA standards. **Unless otherwise modified, all errors are quoted as percentages of output span. Total effect is the maximum effect (zero and span shifts) at any point in the calibrated range.**

Accuracy

Accuracy rating (*) :

- ± 0.25% of calibrated span (for sensors 2 to 7 with calibrated span up to 75% of max span)
- ± 0.50% of calibrated span (for sensors 2 to 7 with calibrated span above 75% of max span and for sensor 8).

(*) Includes combined effects of terminal based linearity, hysteresis and repeatability. • For effects of operating influence refer to K-GP specification sheet.

ABB

M.15.1Z3 / E Rev. D

The Company's policy is one of continuous product improvement and the right is reserved to modify the specifications contained herein without notice.

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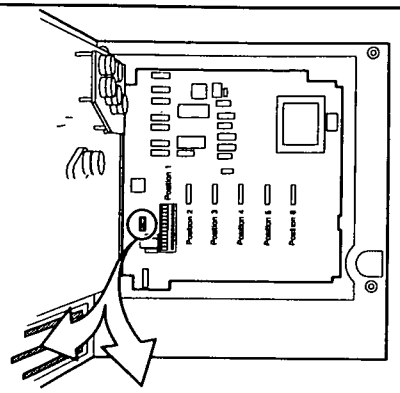
Setting Analog Input Links



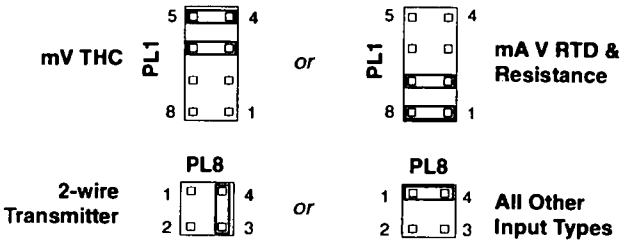
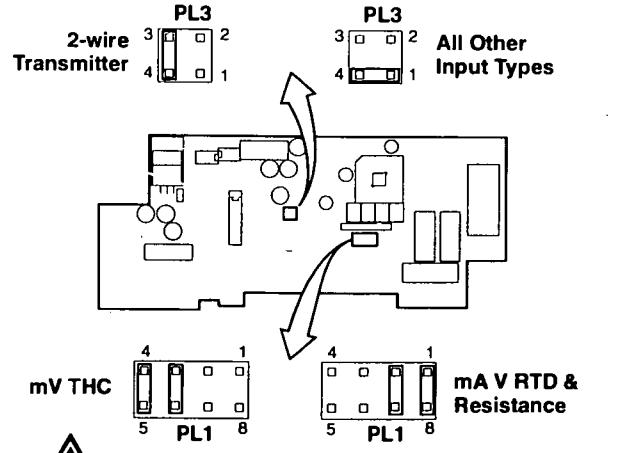


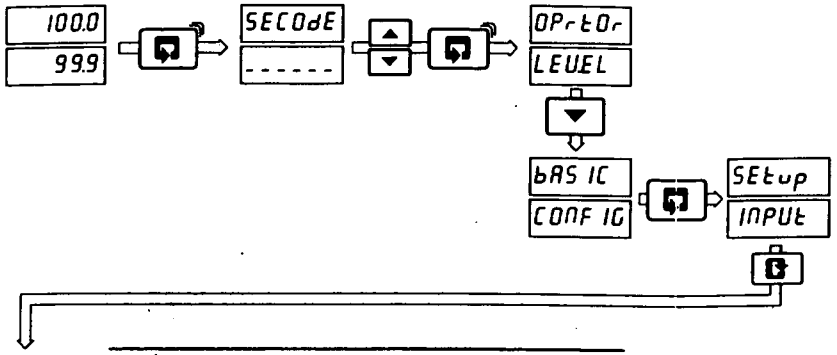
Fig. 1 Input Links – Channel 1



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 ∩
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 – V
K – K	Y – y
L – L	

Select Channel – Choose the input channel to be configured

Input type – _A_P (mA), VOLt (V), _U.Lt (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.

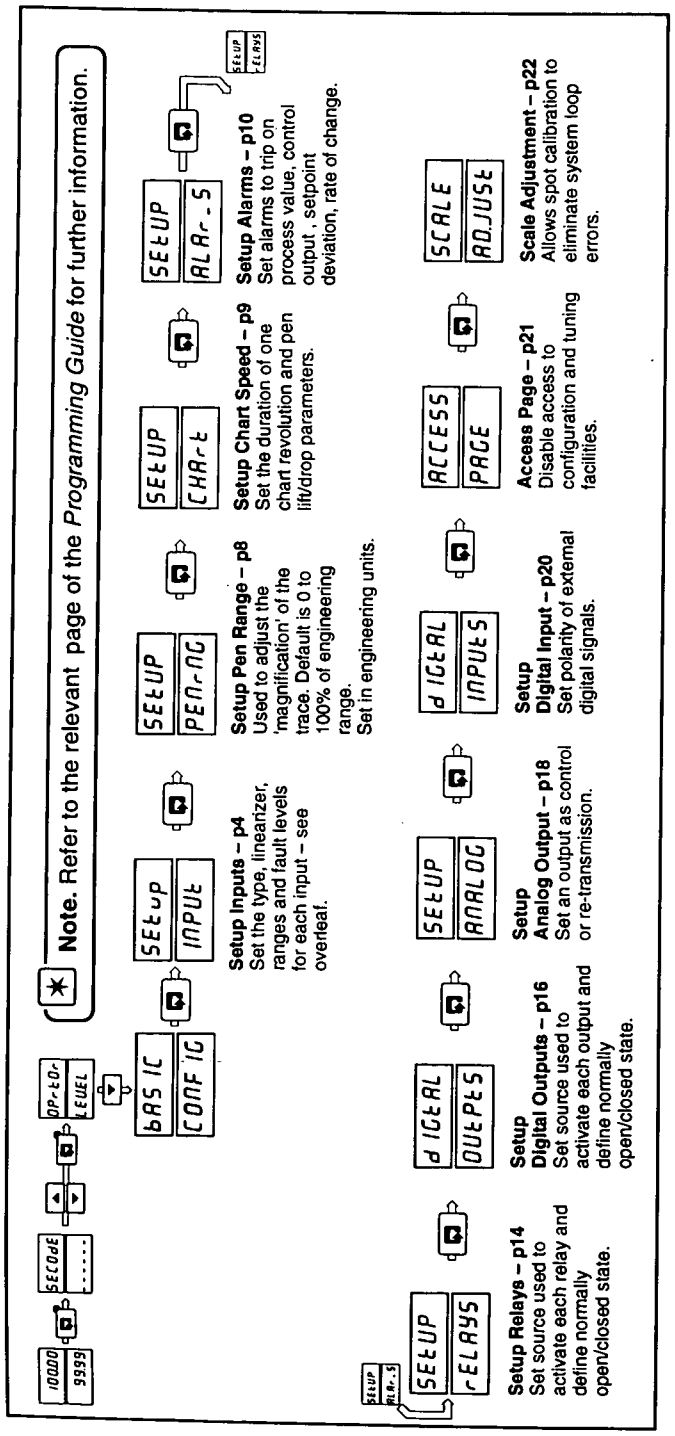
Engineering Range Low: Select the lowest engineering value that will be displayed when the input is at its minimum value – e.g. for an engineering range of 0 to 300.0 °F set to 0.0.

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.

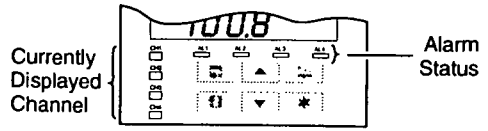
Input Filter: Adjust the instrument response time from 0 to 60 seconds in one second increments to reduce pen jump & dampen out noisy signals.

Basic Configuration – Overview



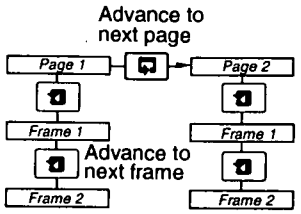
Displays and Controls

Recorder Faceplate

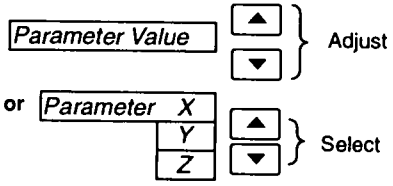


Sideways Scroll

Down Scroll



Raise and Lower



Function Key

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

Pen Lift

Raises and lowers the chart pen on successive operations.

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

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IM/C1900–QR Issue 1

COMMANDER 1900 Recorder Quick Reference Guide

OGR

Operating Guide

Programming Guid

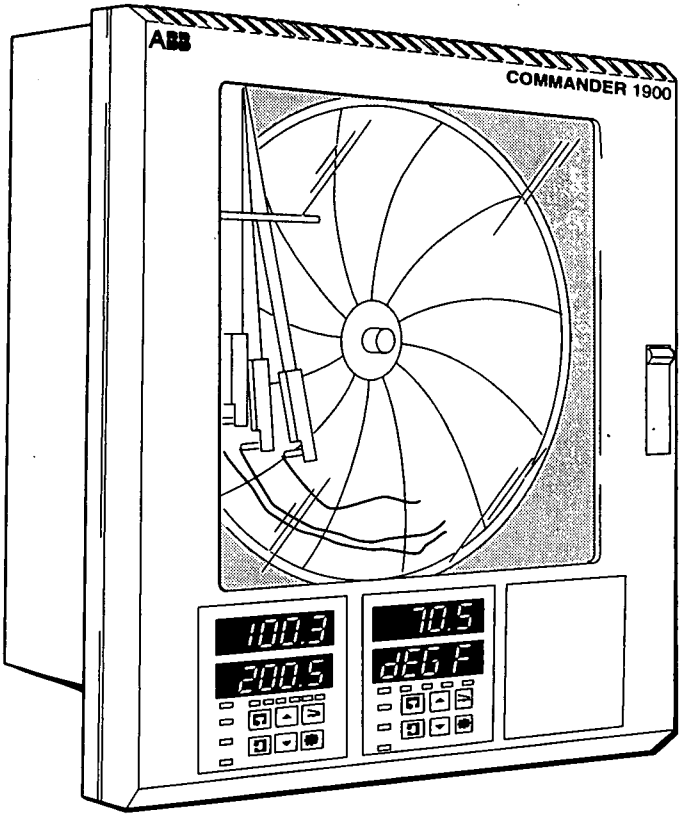
Installation Guide

ABB Instrumentation

COMMANDER 1900 Series Circular Chart Recorders

Programming Guide

Recorder Versions



25

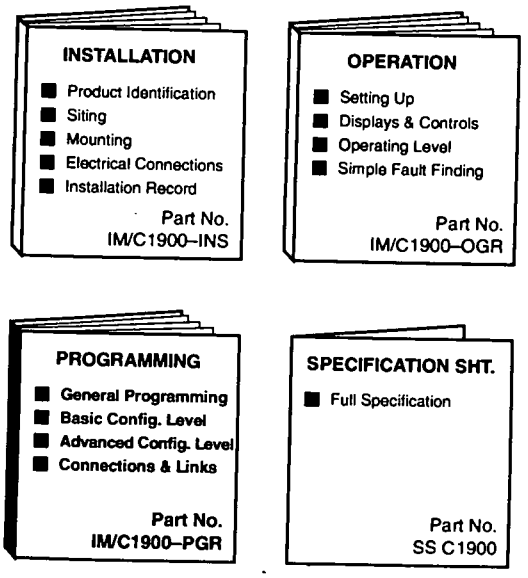
ABB Instrumentation

CONTENTS

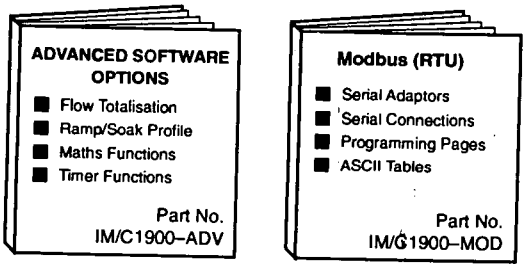
Section

1 INTRODUCTION

The COMMANDER 1900 series of documentation is shown in Fig. 1.1. The **Standard Manuals**, including the specification 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 COMMANDER 1900 Documentation

2 GENERAL PROGRAMMING

The programming procedures are used to make changes to the operating parameter values and for scale adjustment – see Fig. 3.2.

The programming of all channels is performed using faceplate 1 – see Fig. 3.1

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

Ensure that the external alarm/control circuits are isolated if inadvertent operation during programming is undesirable.

Any change to the operating parameters are implemented using the ▲ or ▼ switches – see Section 3 of the **Operating Guide**.

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

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 instrument is despatched with the password set to '0' – see Section 4.5 of **Operating Guide**.

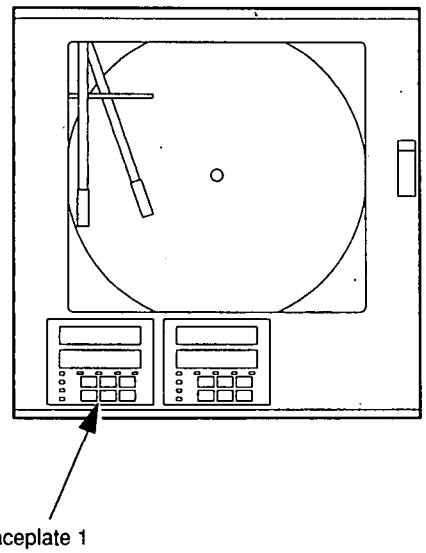


Fig. 3.1 Location of Faceplate 1

3 BASIC CONFIGURATION LEVEL

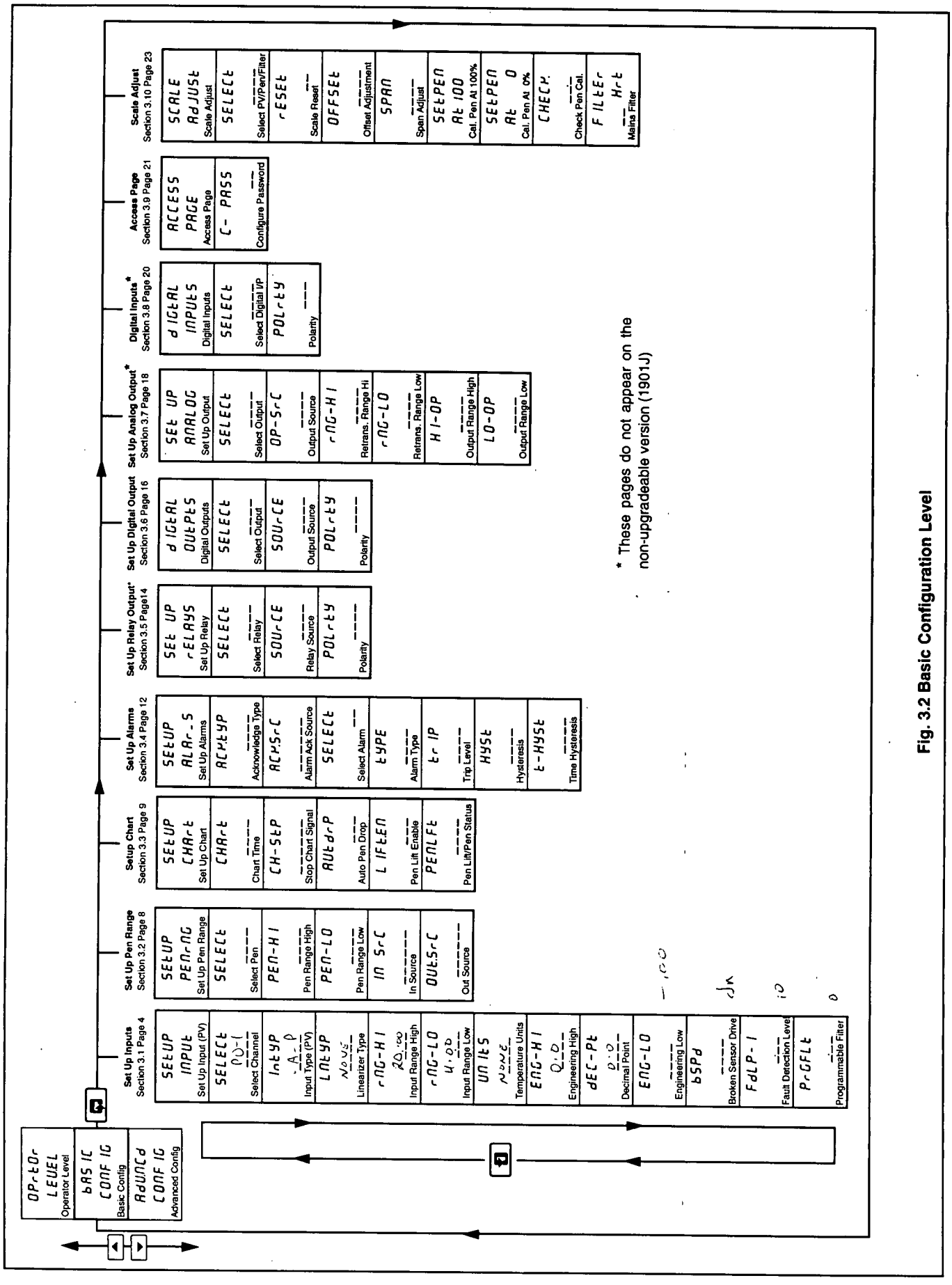


Fig. 3.2 Basic Configuration Level

...3 BASIC CONFIGURATION LEVEL

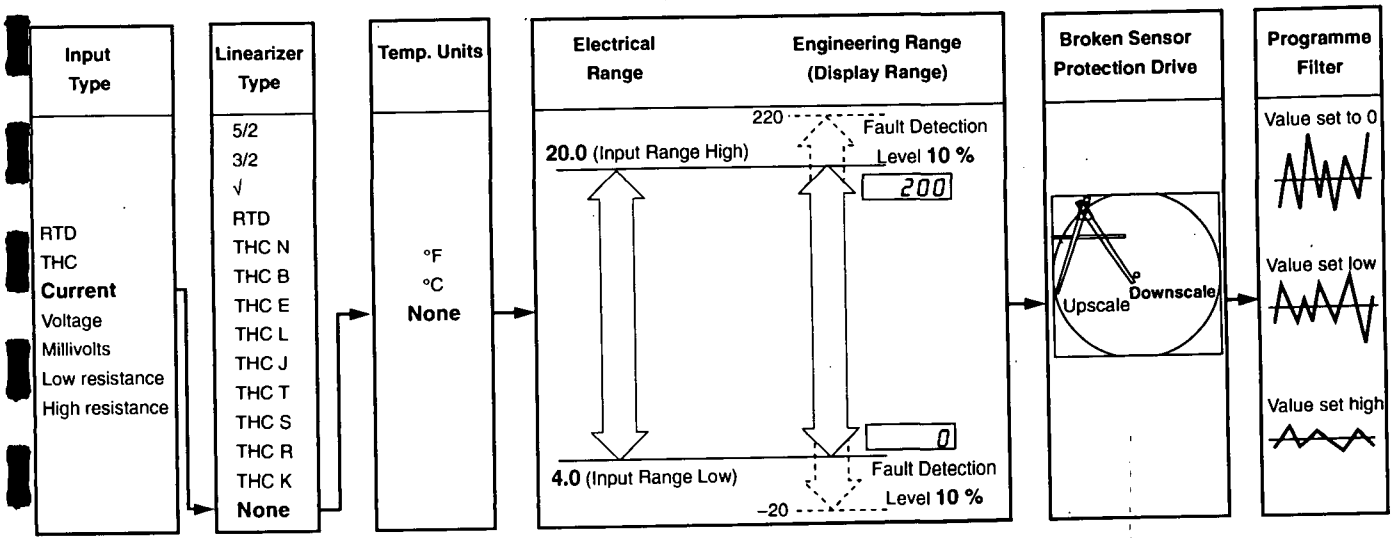
3.1 Set Up Input (Process Variable)

i **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 reduces the effect of noise on inputs.

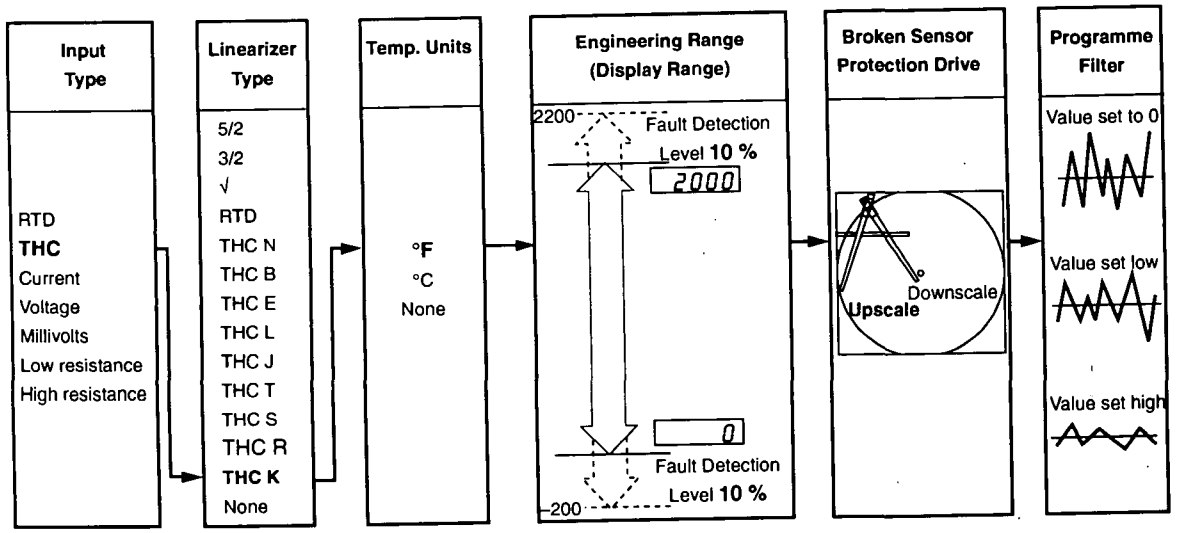
Example A – setting up:

- a current input of 4 to 20 mA
- 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.



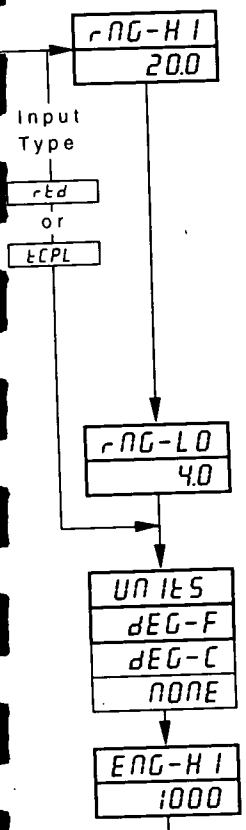
Example B – setting up:

- 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 BASIC CONFIGURATION LEVEL

.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.

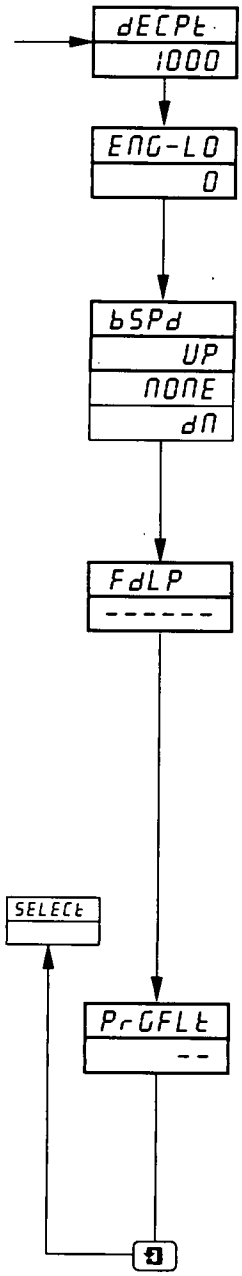
Linearizer Type	Degrees Fahrenheit			Degrees Celsius		
	Min.	Max.	Min. Span	Min.	Max.	Min. Span
Type B	0	3272	1278	– 18	1800	710
Type E	– 148	1652	81	– 100	900	45
Type J	– 148	1652	90	– 100	900	50
Type K	– 148	2372	117	– 100	1300	65
Type N	– 328	2372	162	– 200	1300	90
Type R & S	0	3092	576	– 18	1700	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 set at 10.0%, then if an input goes more than 10% above **Engineering Range High** or more than 10% below **Engineering Range Low**, a fault is detected.

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.

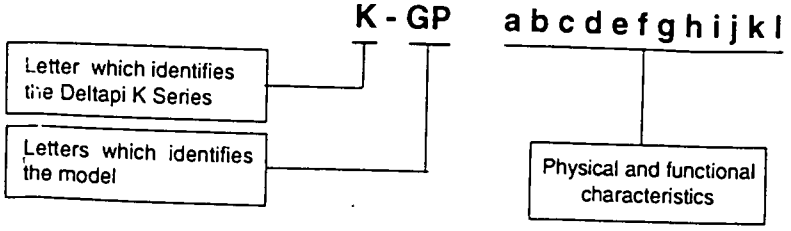
Programmable Filter
Filters the process variable input, i.e. if the input is stepped it smooths the transition between steps and may also be used for some degree of cleaning of noisy inputs. The filter time represents the time a step in the input takes to change the displayed process variable from 10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

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

Return to **Select Channel** frame.

Coding

The physical and functional characteristics of this transmitter of the Deltapi K Series are summarized into specific document named "code list". Basis catalogue and sequential identification number are as follows:



ab VERSION

	Code
Gauge pressure transmitter	GN
Absolute pressure transmitter	AN

c CERTIFICATION

General Purpose	2
Intrinsic Safety [EEx ia] to CENELEC EN50020	3
Type "N" (Ex N) to BS 6941 : 1988	7

SENSOR

d Span limits (adjustable between)

40 and 200 kPa	0.4 and 2 bar	5.8 and 29 psi	2
120 and 600 kPa	1.2 and 6 bar	17.4 and 87 psi	3
320 and 1600 kPa	3.2 and 16 bar	46.4 and 232 psi	4
800 and 4000 kPa	8 and 40 bar	116 and 580 psi	5
2000 and 10000 kPa	20 and 100 bar	290 and 1450 psi	6
5000 and 25000 kPa	50 and 250 bar	725 and 3625 psi	7
12000 and 60000 kPa	120 and 600 bar	1740 and 8700 psi	8

e Preparation

None	2
Special degreasing	3
Cleaning for O2 Service (not applicable sensor code 7 or 8 at position "d")	4

f

Use code	V

g Process connection

DIN 16288 - Form B - G 1/2 A Male	M
1/2 NPT Female	F

TOP WORKS

h Housing material	Electrical connections	
Aluminium alloy	1/2 NPT	B
	M 20	C
	1/2 GK	D
	PG 13.5	E
AISI 316 L ss	1/2 NPT	2
	M 20	3
	1/2 GK	4
	PG 13.5	5

i Output meter

None	1
Analog 36 mm. (90°) linear scale	2
Analog 36 mm. (90°) special scale	8
Digital LCD standard scale (0 to 100% linear)	6
Digital LCD special calibration	S

j Surge protection

None	3
Yes	4

k MOUNTING BRACKET AND NUTS (Supplied loose)

None	1
Carbon steel	2
AISI 304 ss	A

l Calibration

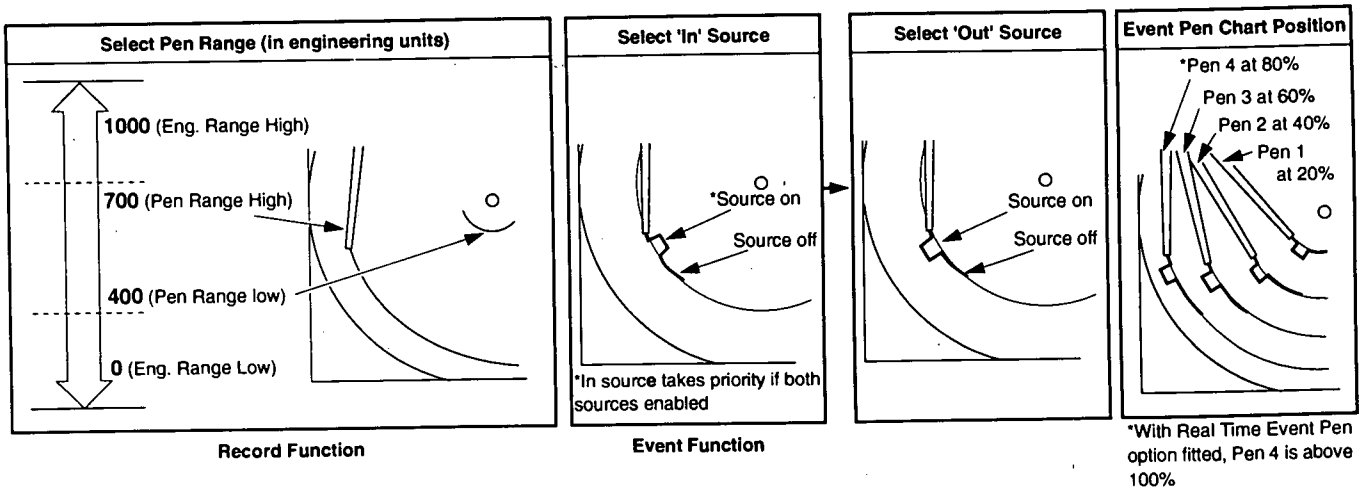
	Calibration certificate	
Standard (0 - max. span)	No	2
At specified range and reference conditions (maximum zero suppression = 250% of minimum span)	No	4
	Yes	5
At specified operating temperature	Yes	6

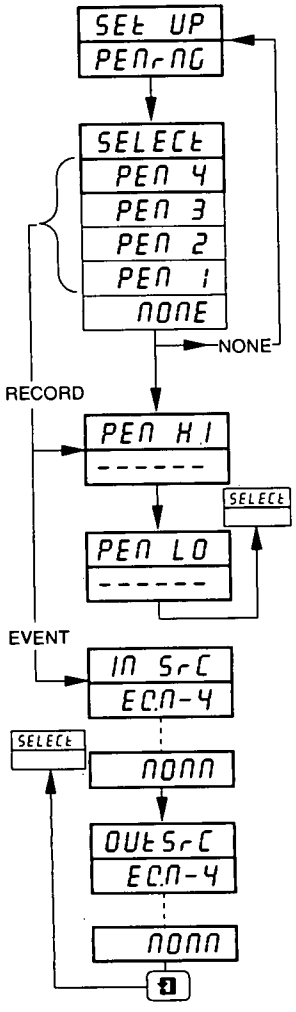
...3 BASIC CONFIGURATION LEVEL

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).





Page Header – **Set Up Pen Range**

To advance to **Set Up Chart Page** press the [⊡] switch.

Select Pen
Select the pen to be programmed

Note.

- In the remaining frames press the [✱] switch 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 15.

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

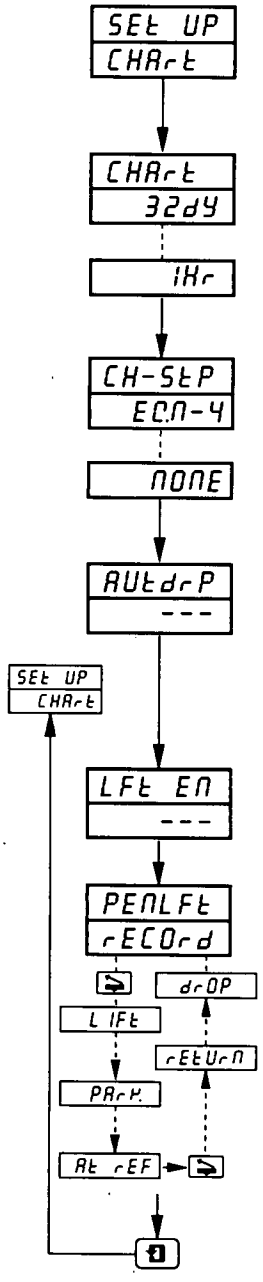
For a description of sources – see **Table 3.1** on page 15.

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 ⇨ switch.

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 15.

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 ⇦ switch can be disabled if required. Select '*YES*' to enable or '*nO*' to disable.

Pen Lift/Pen Status
To raise pen(s) press ⇦ switch. The following status displays are shown:

rECOrd	–	pen records on chart
L IFt	–	pen lifts off chart
PArK.	–	pen moves to park position
At rEF	–	pen at reference position

To lower pen(s) press ⇦ switch. 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 BASIC CONFIGURATION LEVEL

3.4 Set Up Alarms

i **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.**
- **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.

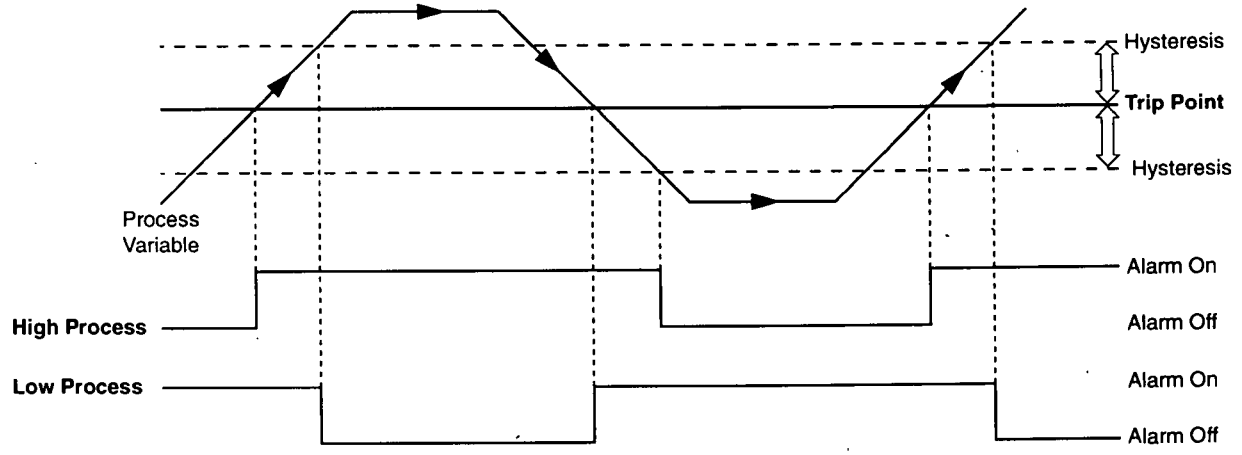
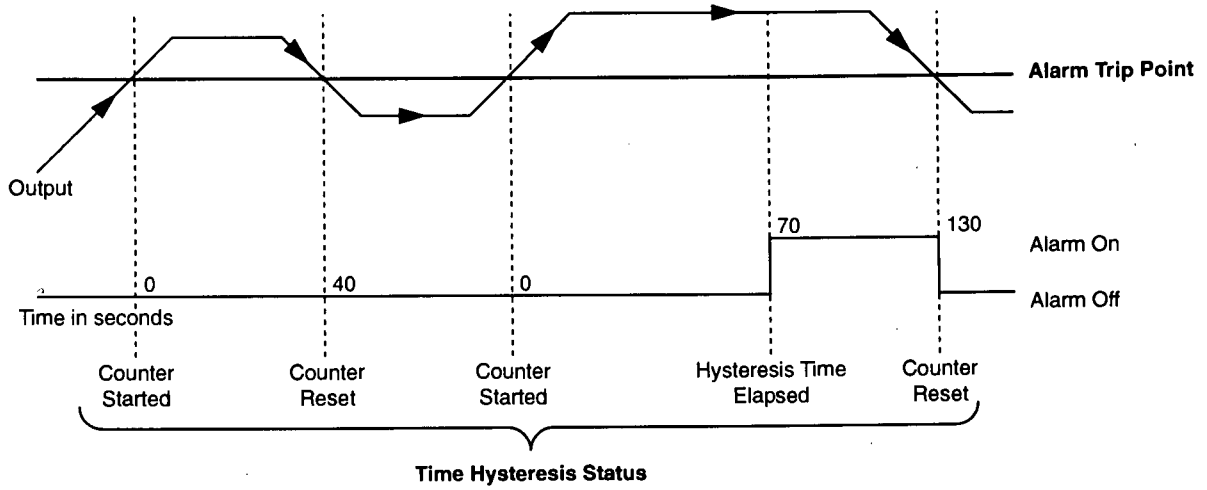


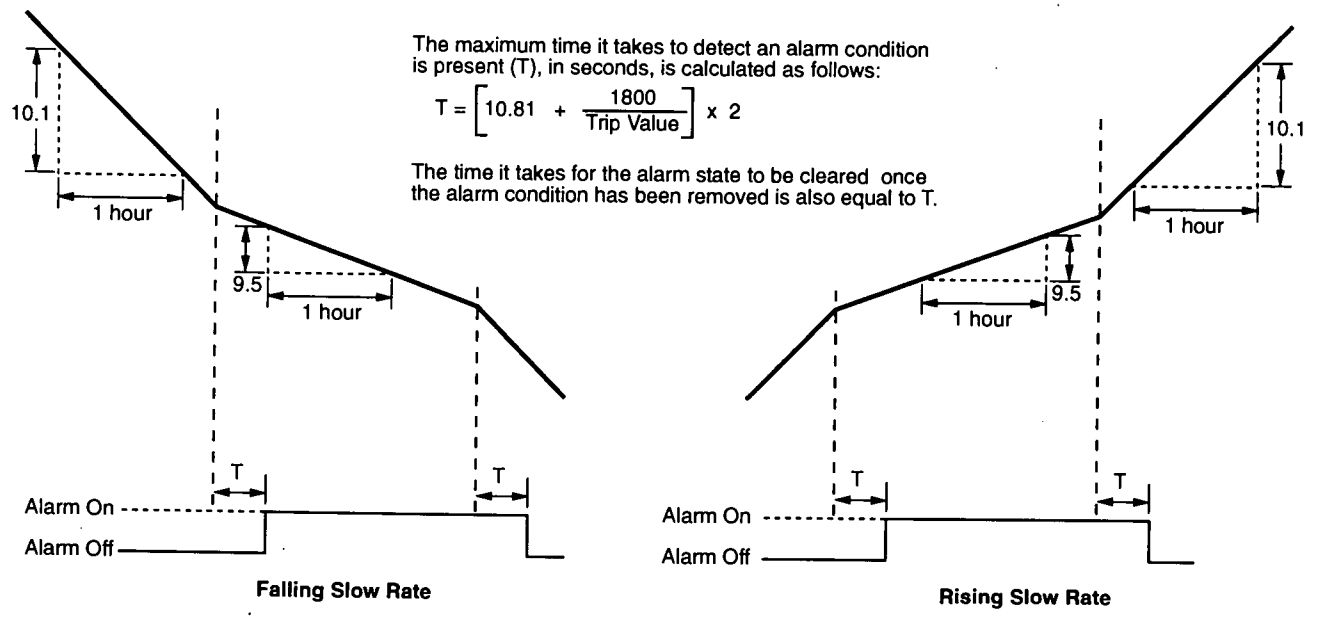
Fig. 3.3 High and Low Process with Hysteresis



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

Fig. 3.4 Time Hysteresis 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:

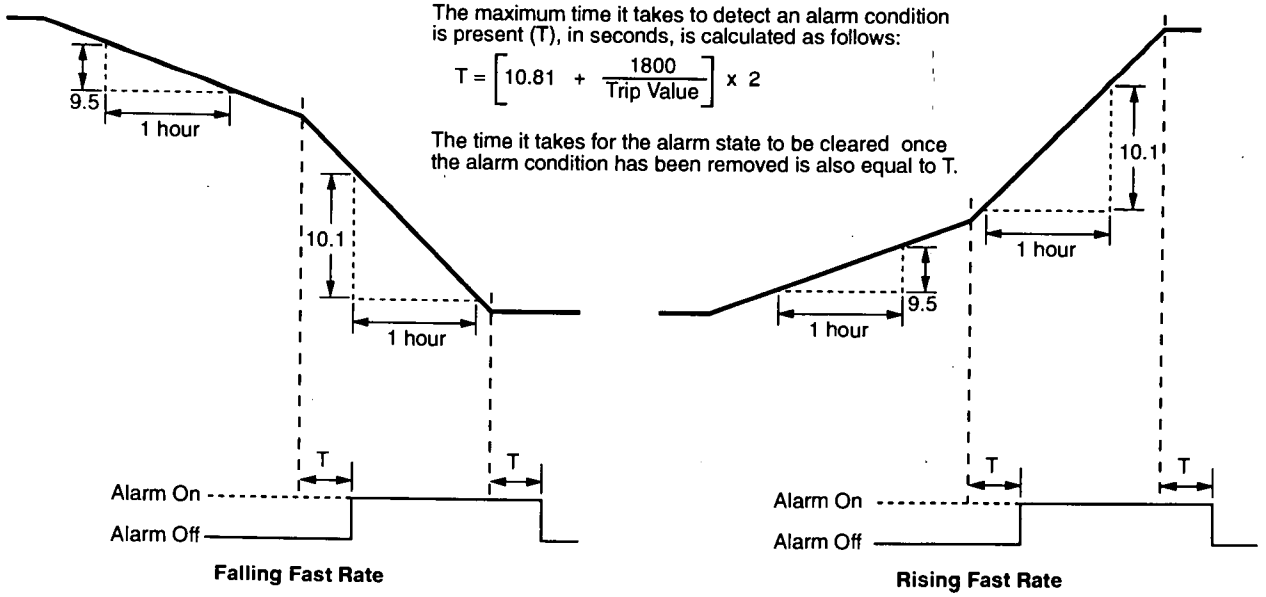
$$T = \left[10.81 + \frac{1800}{\text{Trip Value}}\right] \times 2$$

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.

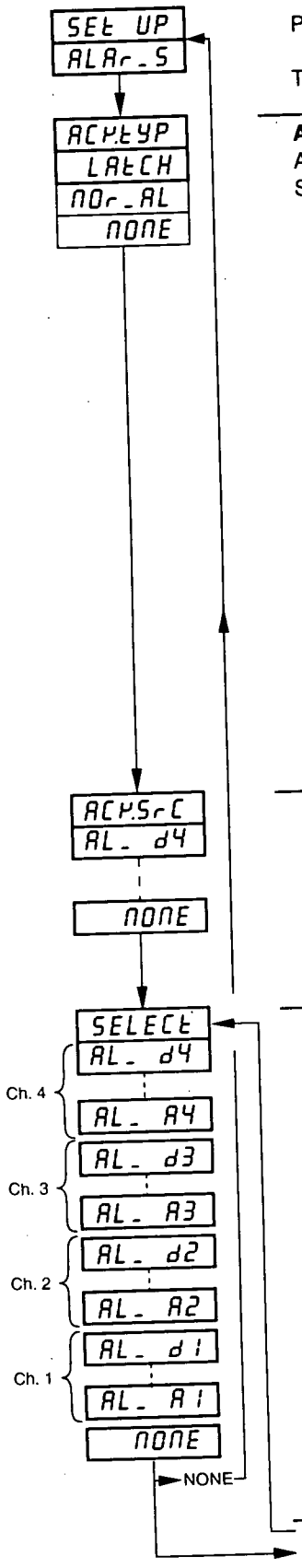
Examples shown are for a trip value of 10%/hour on a PV engineering range of 0.0 to 100.0

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

Fig. 3.6 Fast Rate Alarms with Hysteresis

...3 BASIC CONFIGURATION LEVEL

...3.4 Set Up Alarms



Page Header – **Set Up Alarms**

To advance to **Set Up Relay Output** page press the [⇄] switch.

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	L.E.D.	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	L.E.D.	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.

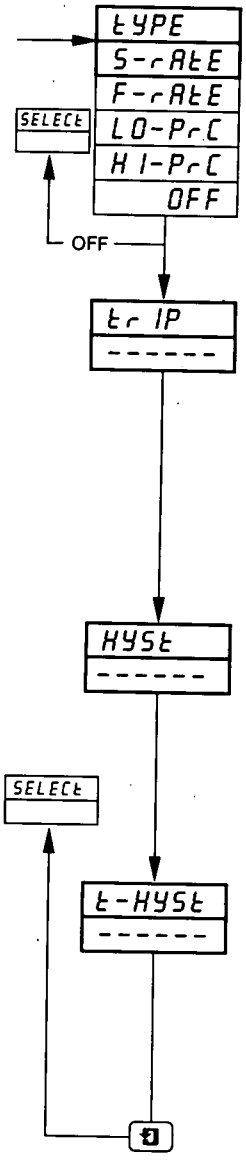
For a description of sources – see **Table 3.1** on page 15.

Select Alarm
Select the alarm to be programmed.

[✱] **Note.** In the remaining frames press the [✱] switch 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.

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.

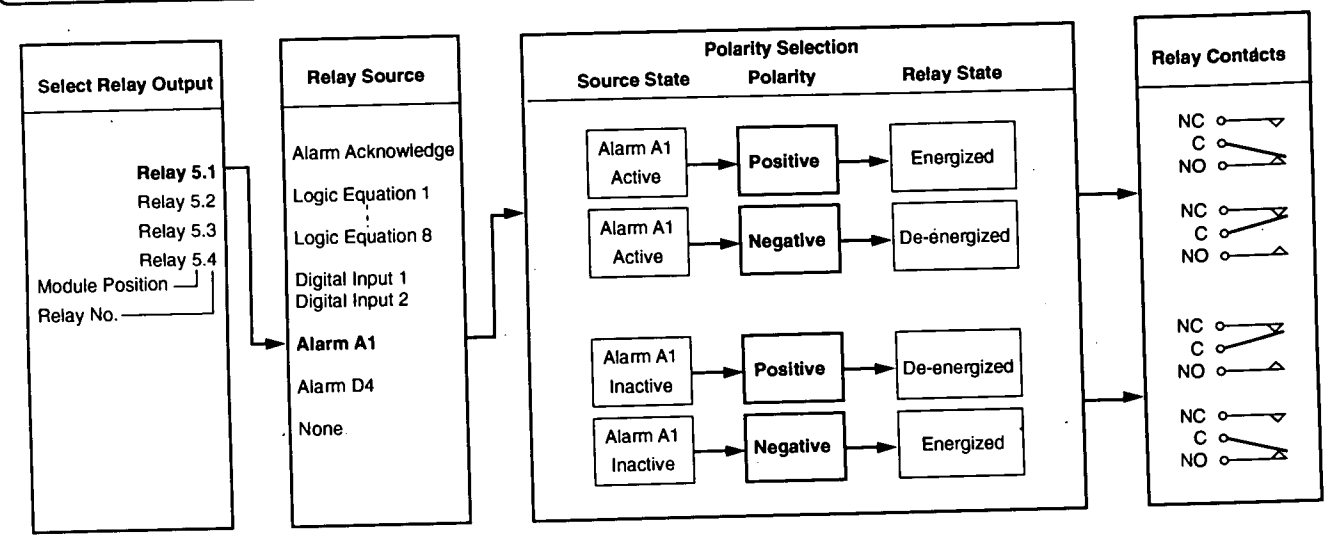
Return to **Select Alarm** frame.

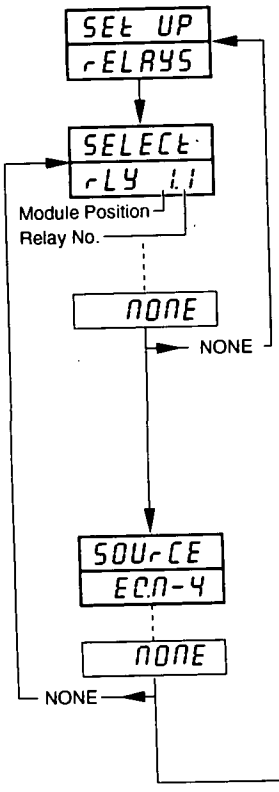
...3 BASIC CONFIGURATION LEVEL

3.5 Set Up Relay Output

Information.

- **Relay Output** – omitted on 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 [▭] switch.

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 [✱] switch to view the relay selected.

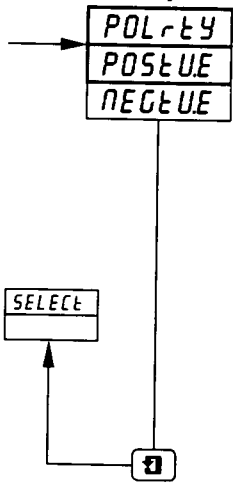
Relay Source
Select the source required to activate the selected relay.

For a description of sources – see **Table 3.1** on page 15.

[✶] **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 (only available 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 (only available 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

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

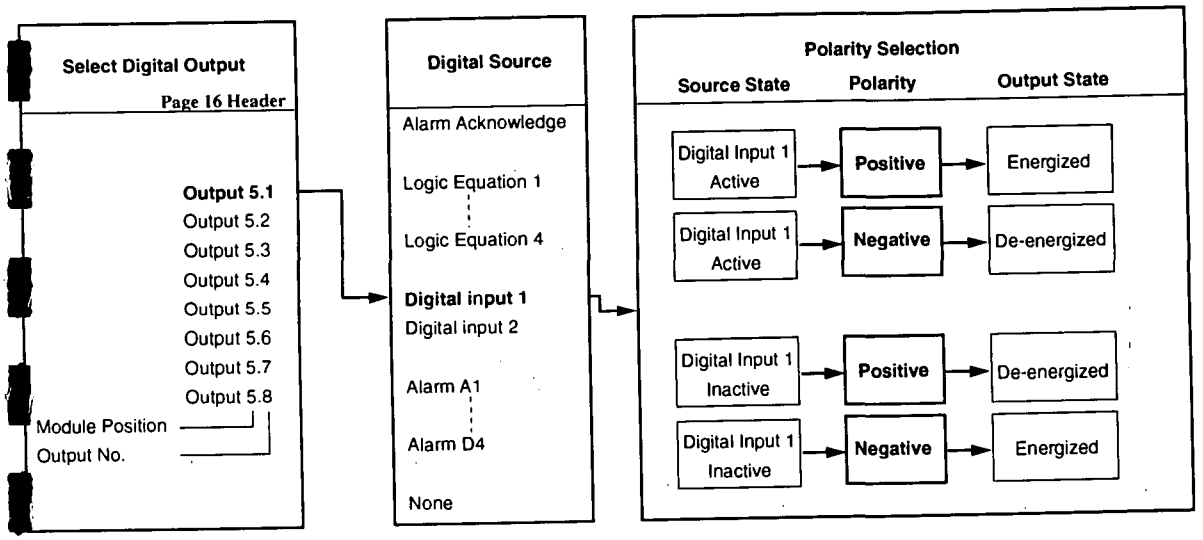
Table 3.1 Description of Sources

...3 BASIC CONFIGURATION LEVEL

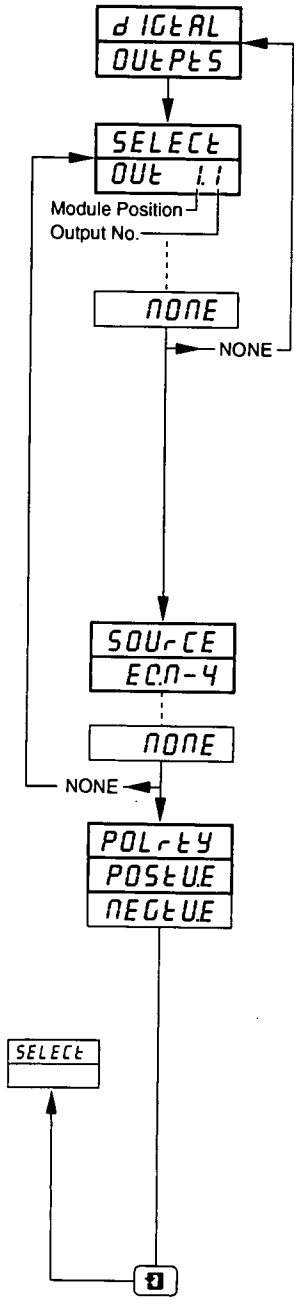
6 Set Up Digital Output

i **Information.**

- **This page is not displayed if there are no digital outputs 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 [⇨] switch.

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 [✱] switch 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 15.

[✱] **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	Energized
	Negative	De-energized
Non-active	Positive	De-energized
	Negative	Energized

Select the polarity required

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

Return to **Select Digital Output** frame.

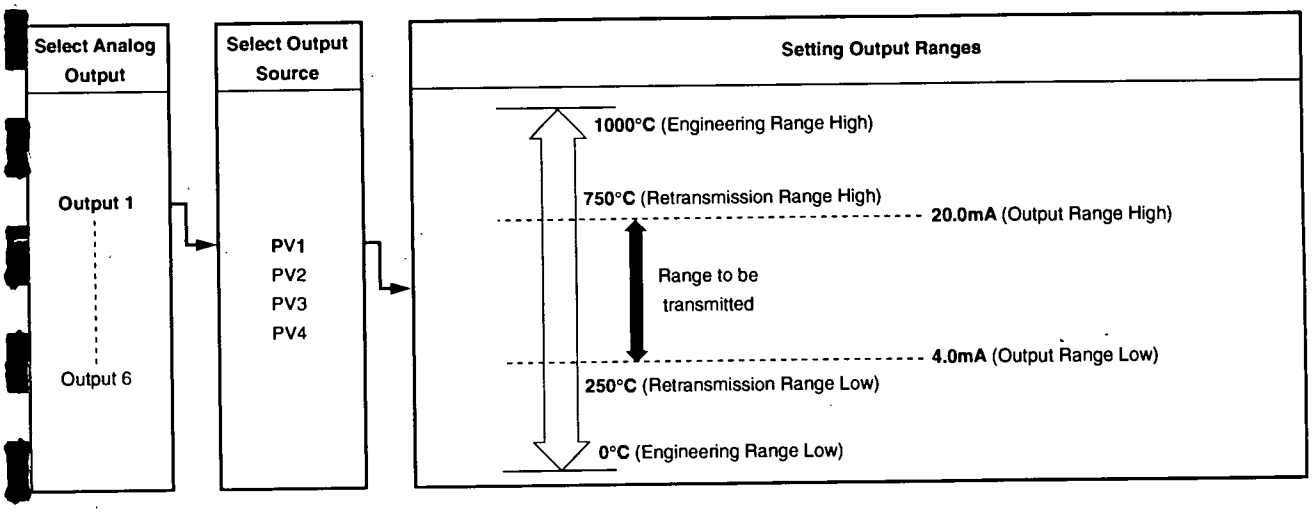
...3 BASIC CONFIGURATION LEVEL

3.7 Set Up Analog Output

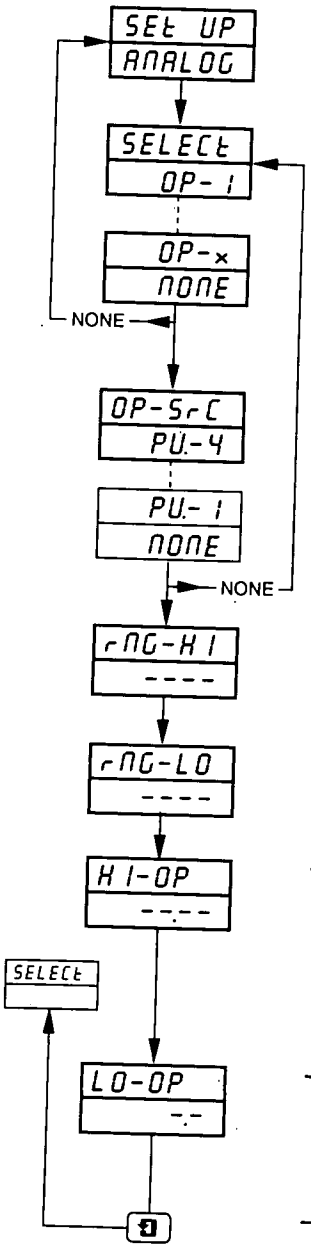
Information.

- **Analog Output** – omitted on 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 [⊡] switch.

Select Analog Output
Select the analog output 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 [✱] switch to view the analog output selected.

Output Source
Select output source required. The selections in this frame correspond to the channels on the instrument (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.

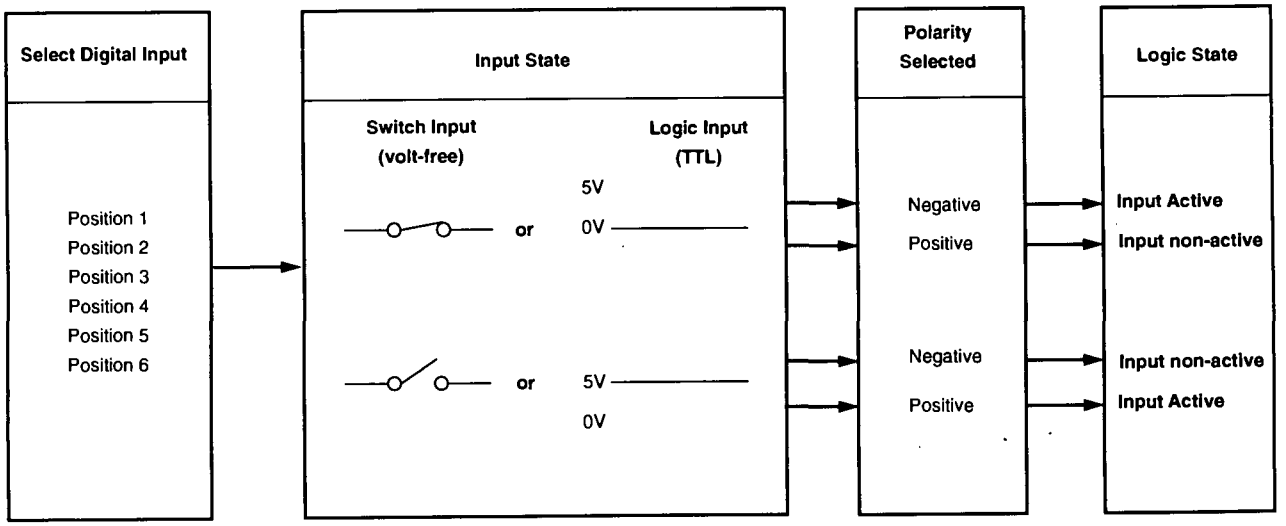
Return to **Select Analog Output** frame.

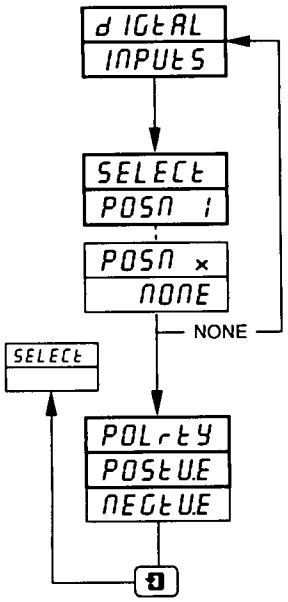
...3 BASIC CONFIGURATION LEVEL

3.8 Digital Inputs

Information.

- **Digital Input** – omitted on 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 ⊡ switch.

Select Digital Input

Select digital module position to be programmed.

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

Polarity

Select the polarity required for the module position selected above:

POStUE – logic input state unchanged

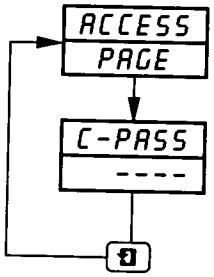
nEGtUE – logic input state inverted

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 ⊡ switch.

Configuration Password
Prevents access to the **Programming Pages.**
Set the required password, between 0 and 9999.

Return to top of **Access Page.**

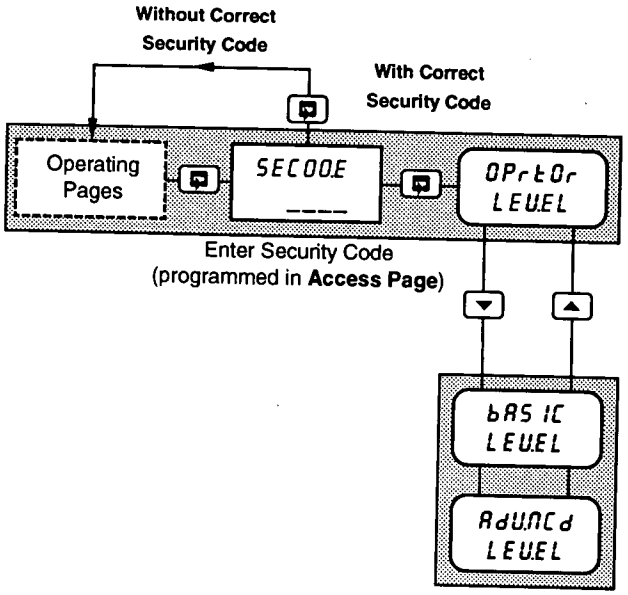


Fig. 3.7 Use of Security Code in Operator Level

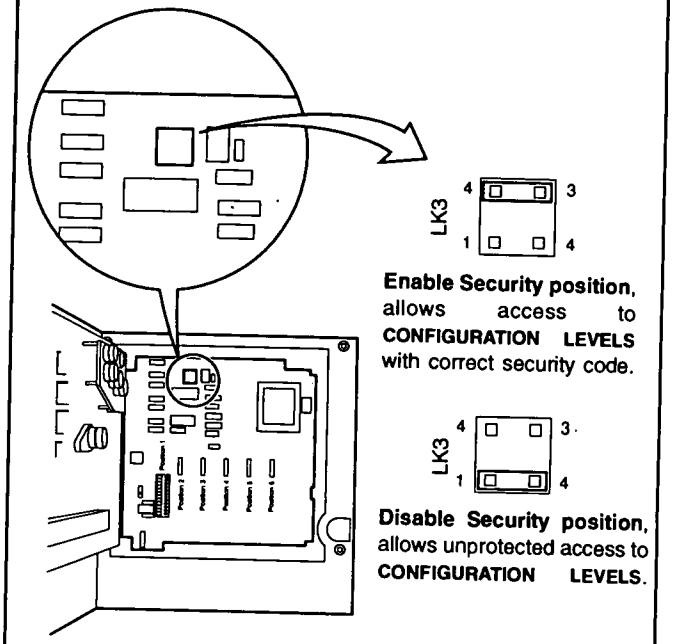


Fig. 3.8 Location of Security Link

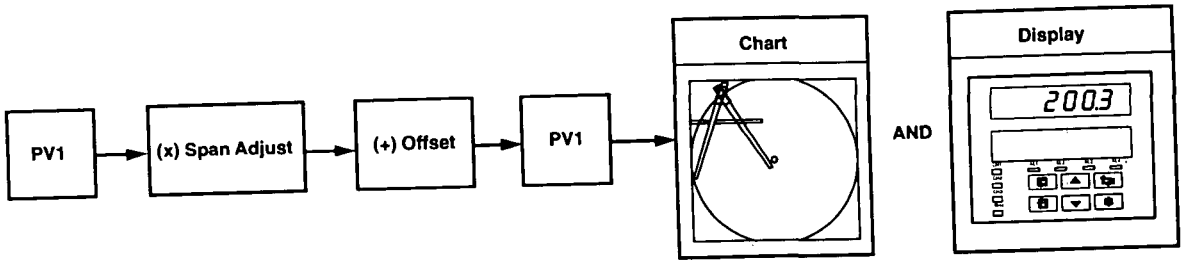
...3 BASIC CONFIGURATION LEVEL

3.10 Scale Adjust

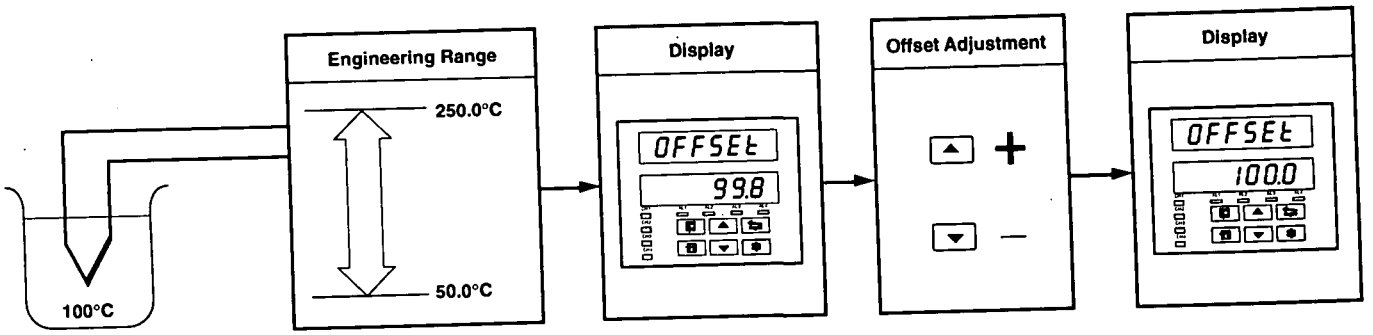
Information.

- **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.

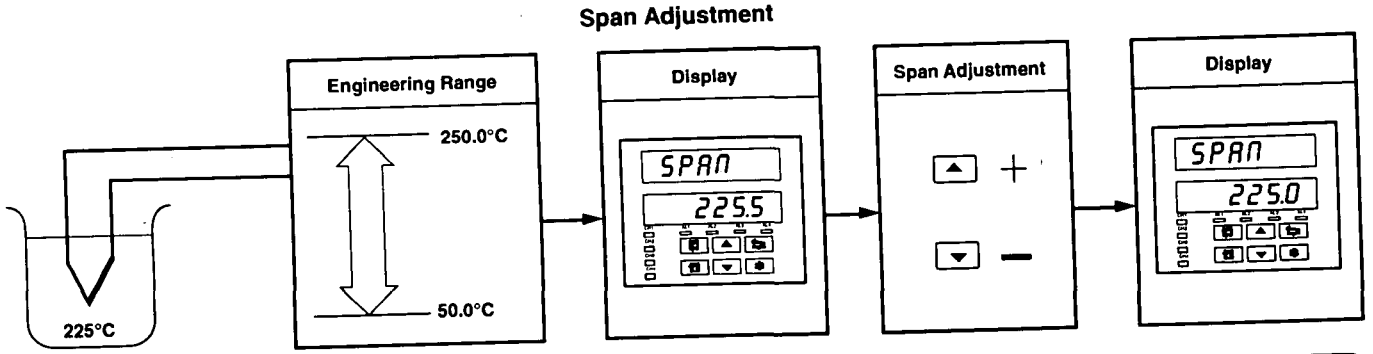
Scale Adjustment



Offset Adjustment



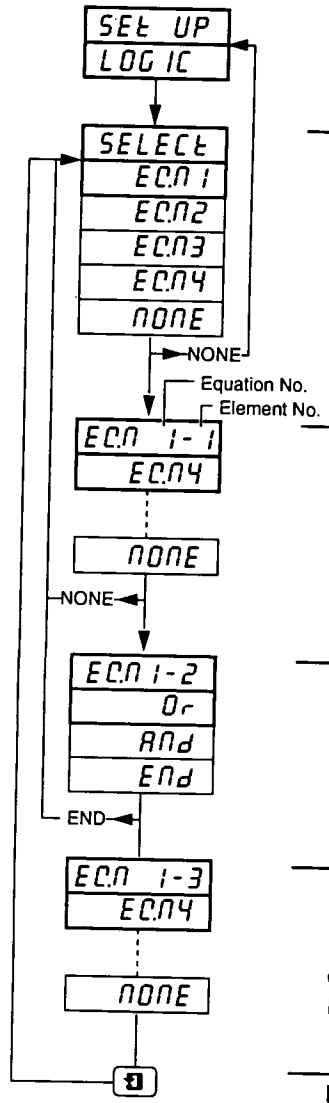
Span Adjustment



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.

4 ADVANCED CONFIGURATION LEVEL...

...4.2 Set Up Logic



Page Header – **Set Up Logic**

To advance to **Set Up Pen Functions Page** press the [⊡] switch.

Select Equation
Select equation to be constructed.

In the remaining frames press the [✱] switch 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 15.

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

Or	–	Or
And	–	And
End	–	Ends equation

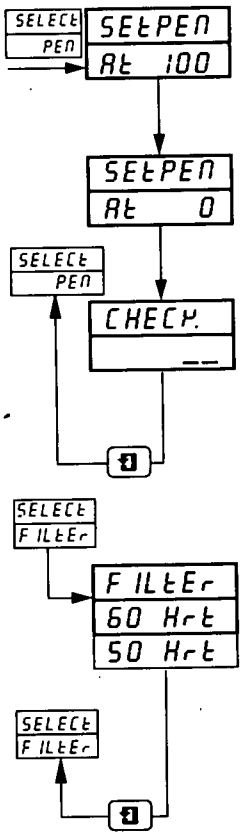
Equation n/Element 3
Repeat previous two steps for elements 3 to 7.

Odd numbered elements = sources
Even numbered elements = operators

Return to **Select Equation** frame.

...3 BASIC CONFIGURATION LEVEL

...3.10 Scale Adjust



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

Use the ▲ and ▼ switches 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 ▼ switches 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 ▼ switches 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

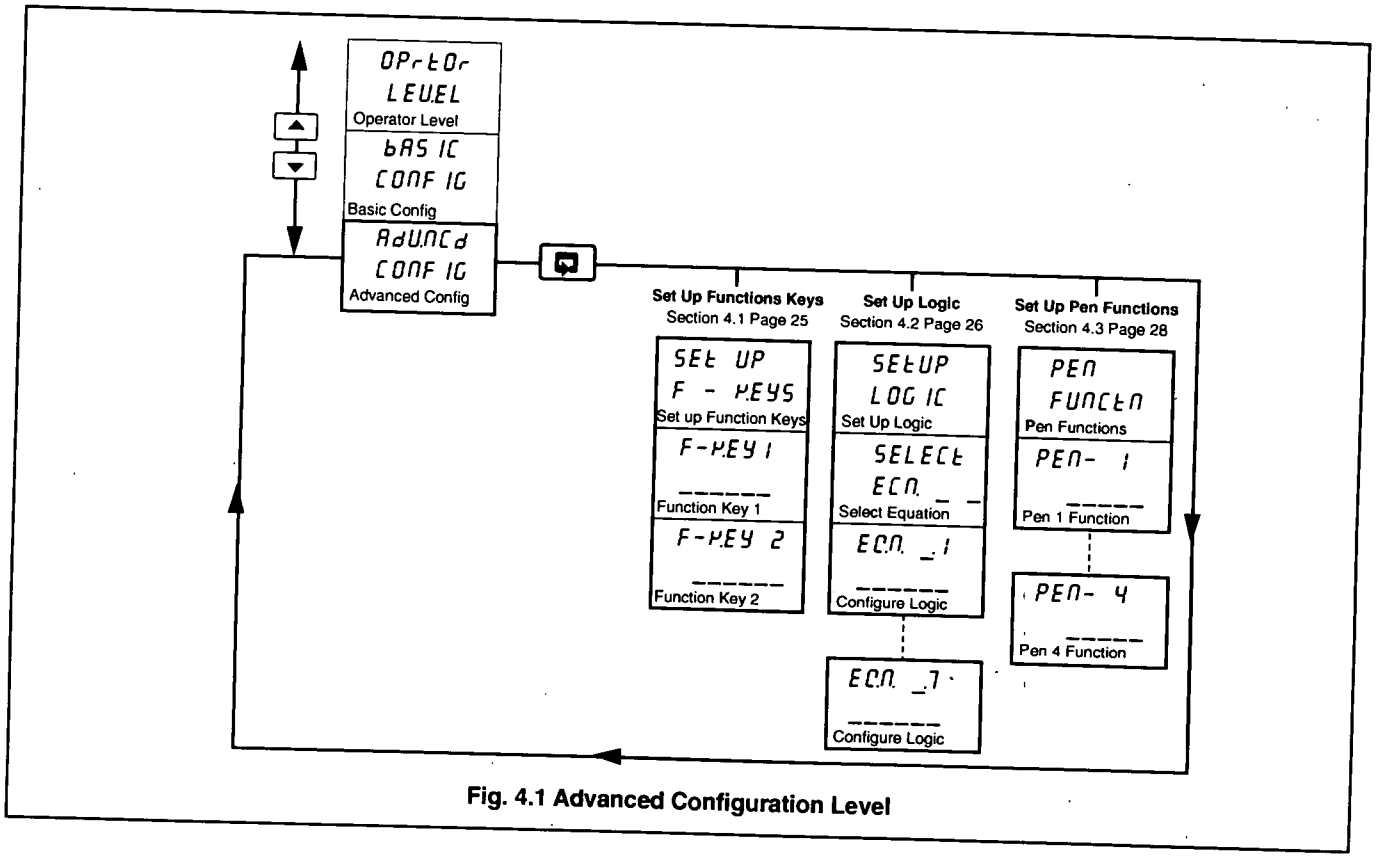
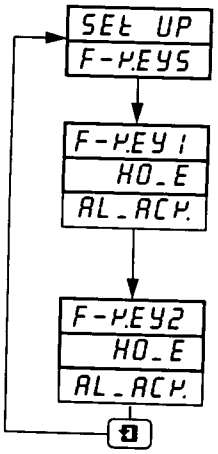


Fig. 4.1 Advanced Configuration Level

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 ⇨ switch.

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 ADVANCED CONFIGURATION LEVEL

4.2 Set Up Logic

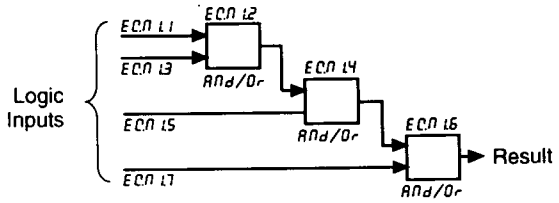
Information.

- **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 15.

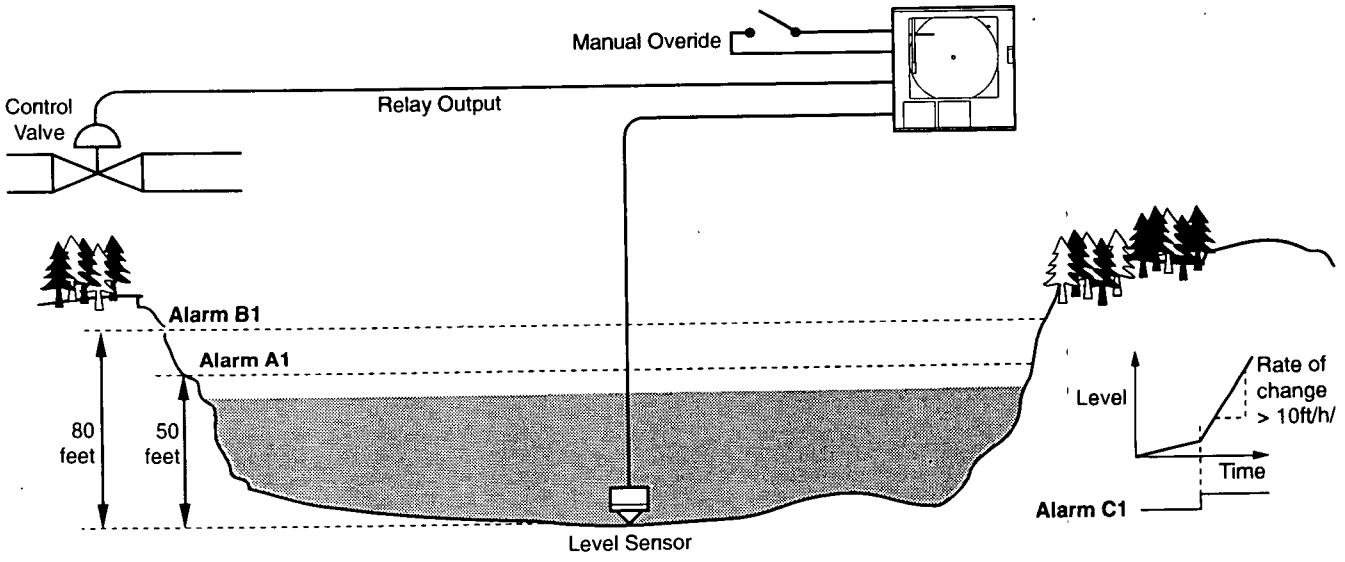
Logic gates must be set to *And*, *Or* or *End*. Setting an element to *End* terminates the equation.

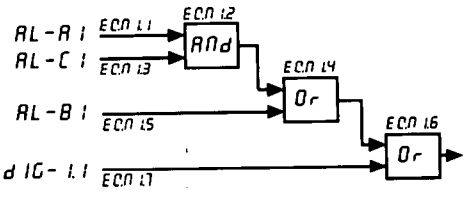


Note. Elements on each equation are calculated sequentially, i.e. elements 1, 2 and 3 are evaluated first and this result is then combined with elements 4 and 5. Similarly, this resultant is then combined with elements 6 and 7 to give the logic equation result.

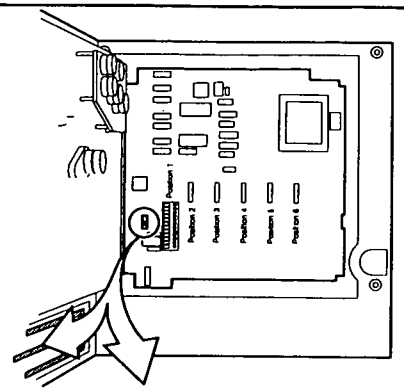
Example – Reservoir level monitoring using:

- 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	Input Elements	Entering the Logic Equation
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	• **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	

Setting Analog Input Links



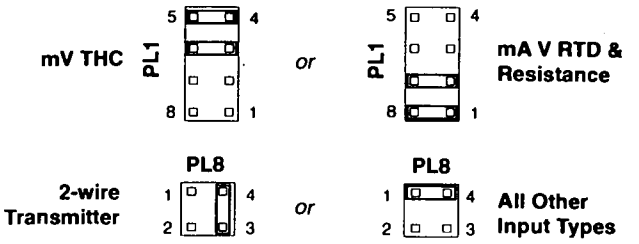
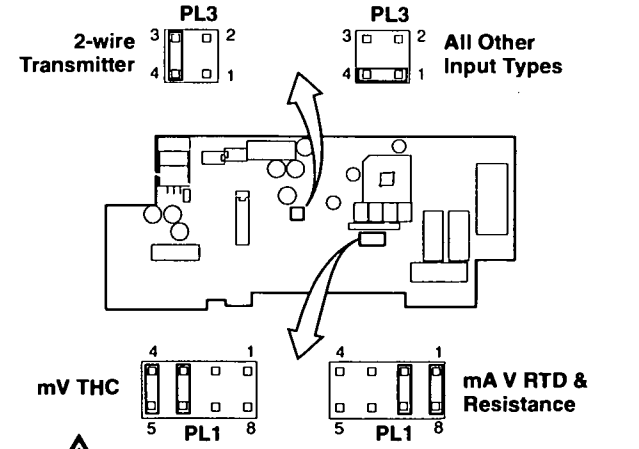


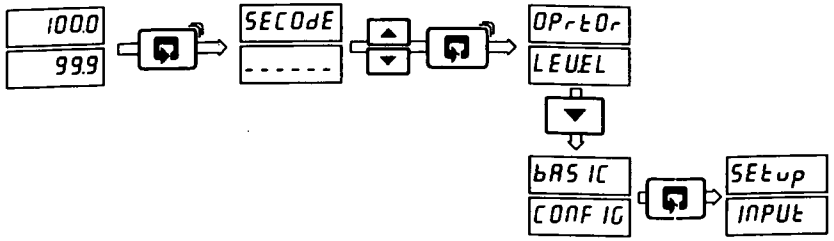
Fig. 1 Input Links – Channel 1



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 – M
B – b	N – n or ∩
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 – V
K – K	Y – y
L – L	

Select Channel – Choose the input channel to be configured

Input type – _A_P (mA), VOLt (V), _U.Lt (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.

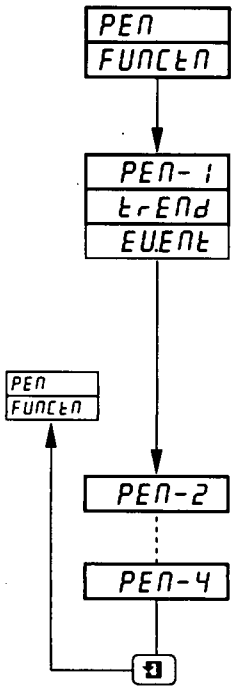
Fault Detection Drive: Determine maximum input travel outside engineering range before an error is detected. E.g. for a 0 to 300°F range, a 10% fault level will trigger at 330°F.

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

...4 ADVANCED CONFIGURATION LEVEL

4.3 Set Up Pen Functions

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



Page Header – **Pen Functions**

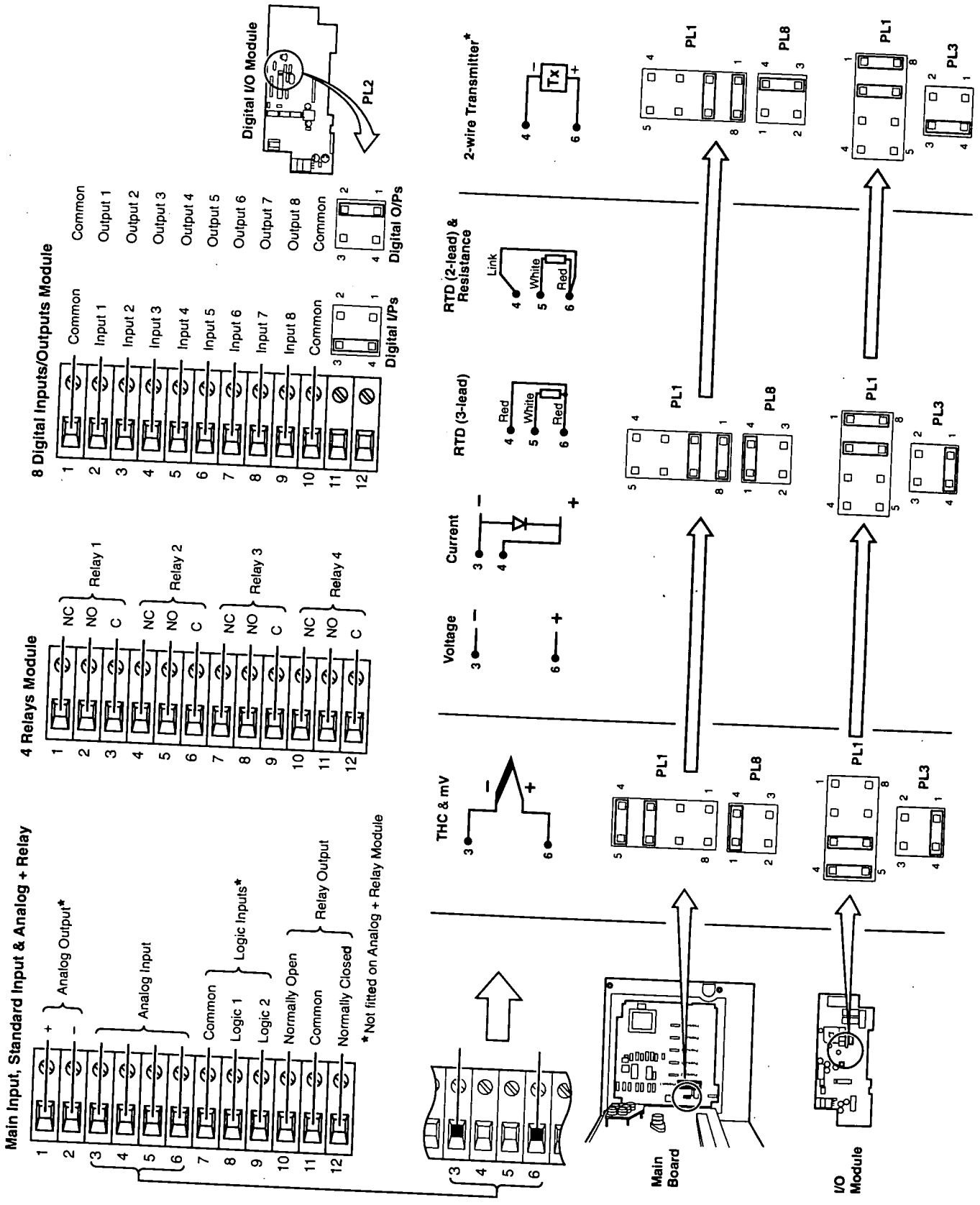
To advance to **Advanced Configuration** frame press the [ ] switch.

Pen 1
Select pen function required:
trEND – Trend pen
EUENT – 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.**


Digital I/O Module
PL2
8 Digital Inputs/Outputs Module
Common
Output 1
Output 2
Output 3
Output 4
Output 5
Output 6
Output 7
Output 8
Common
Digital O/Ps
Common
Input 1
Input 2
Input 3
Input 4
Input 5
Input 6
Input 7
Input 8
Common
Digital I/Ps
4 Relays Module
NC
NO
C
Relay 1
Relay 2
Relay 3
Relay 4
Main Input, Standard Input & Analog + Relay
+
–
Analog Output*
Analog Input
Common
Logic 1
Logic 2
Logic Inputs*
Normally Open
Common
Normally Closed
Relay Output
*Not fitted on Analog + Relay Module
THC & mV
Voltage
Current
RTD (3-lead)
Red
White
Red
RTD (2-lead) & Resistance
Link
White
Red
2-wire Transmitter*
Tx
PL1
PL8
PL3
Main Board
I/O Module