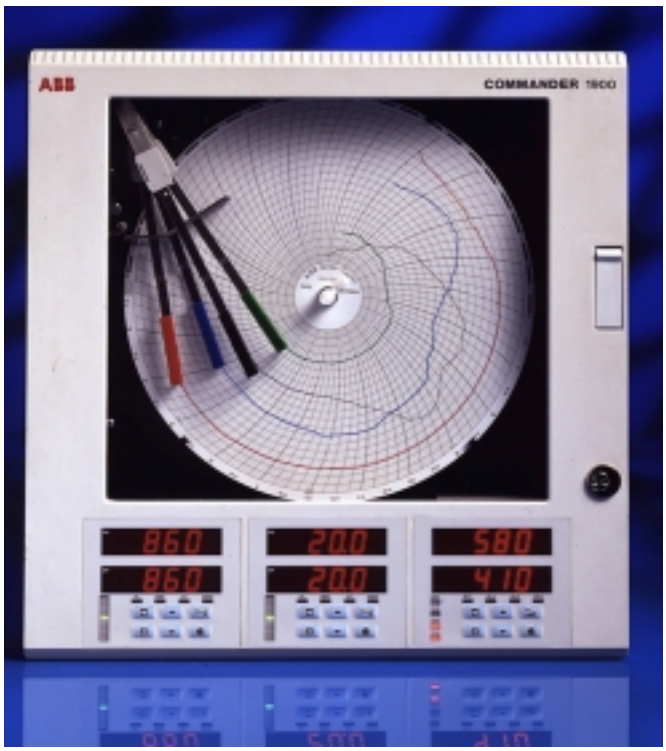
COMMANDER 1900

Circular Chart Recorder/Controller

Specification DataFile

- **1 to 4 pen recording**
  – full application flexibility
- **1 or 2 controllers**
  – integrated control and recording
- **Analog, relay outputs, digital inputs and transmitter power supply as standard**
  – extensive control outputs built in
- **PID autotune on demand**
  – optimum loop control
- **20 programmable ramp/soak profiles**
  – multiple recipe capability
- **NEMA 4X / IP66 construction**
  – hose-down protection
- **0.1% measurement accuracy**
  – precise process information
- **RS485 MODBUS serial communications**
  – open system compatibility



COMMANDER 1900 – dependable recording and full PID control united in a rugged, functional instrument.

ABB Instrumentation

COMMANDER 1900

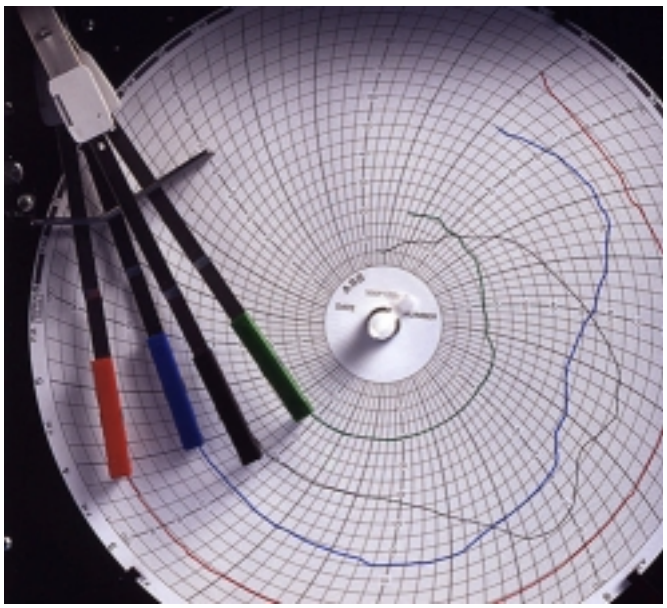
The COMMANDER 1900 is a fully programmable circular chart recorder/controller combining two PID control loops with 4-pen recording. The COMMANDER's straightforward operator controls and robust construction make it suitable for a variety of industrial environments. Excellent standard facilities are complemented 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 LED displays** provide a clear indication of all process signals. Dedicated operator stations for each controller give continuous displays of set points, measured values and high-visibility deviation bargraphs. Active alarms are signalled by flashing LEDs below the main displays.

4-pen Recording

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; 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.



Straightforward Operation

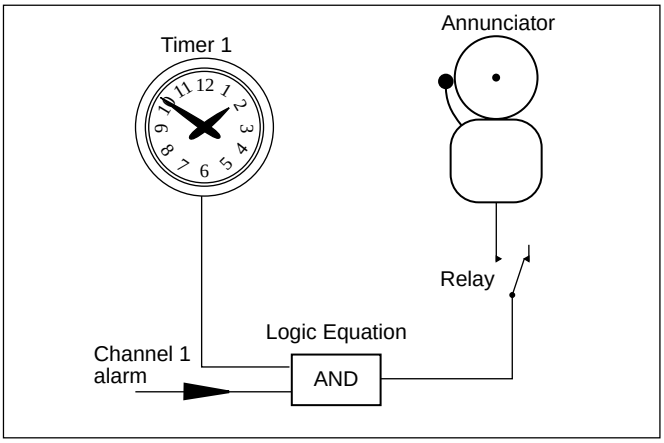
The clearly-labelled **tactile keypads** permit operator adjustments and configuration programming without the need to open the recorder's door. Separate operator panels for each controller provide a direct route for accessing individual control loops. Clear text prompts on the digital displays guide the user around the various menus. A **password-protected security system** prevents unauthorized access to configuration adjustment menus.

Flexibility to Solve Problems

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

Totalizers, Math, Logic and Timers

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.

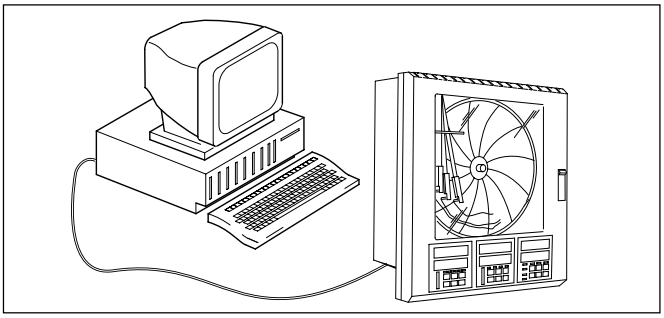


Alarm annunciation enabled during night hours only

User configurable **math functions**, mass flow calculations, RH tables and **logic equations** are all fully supported. The COMMANDER also offers two event timers driven by the recorder's **real-time clock**.

MODBUS RS485 Communications

Communications with PCs or PLCs are achieved via the RS485 serial communications link. 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.



Versatile Process Control

The COMMANDER 1900 provides full PID control of one or two process loops in addition to its powerful recording facilities. The control loops can operate independently or be soft-linked together to implement Cascade or Master/Slave control strategies. Each loop has a dedicated 1/4 DIN-style operator panel for ease of operation and clarity of display.

Analog, Relay or Valve Positioning Output

The control output is selectable to fit any application with a choice of analog, time proportioning or valve positioning relays; use of a **feedback potentiometer** to ensure precise valve control is fully supported. Heat/cool operation is available on both loops.

Autotune

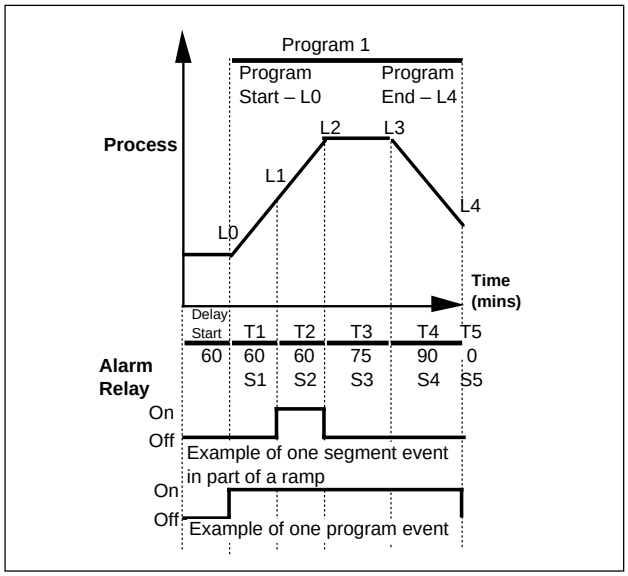
Operation of the autotune function on either loop instigates a tuning routine which allows the COMMANDER to calculate the optimum PID parameters for that particular loop. Following the completion of autotune, the PID values are automatically updated.

Auto/Manual and Local/Remote

Dedicated membrane keys on each operator panel enable one-touch operation for selection between manual and automatic loop control and for switching from local to remote set point.

Extensive Ramp/Soak Programming

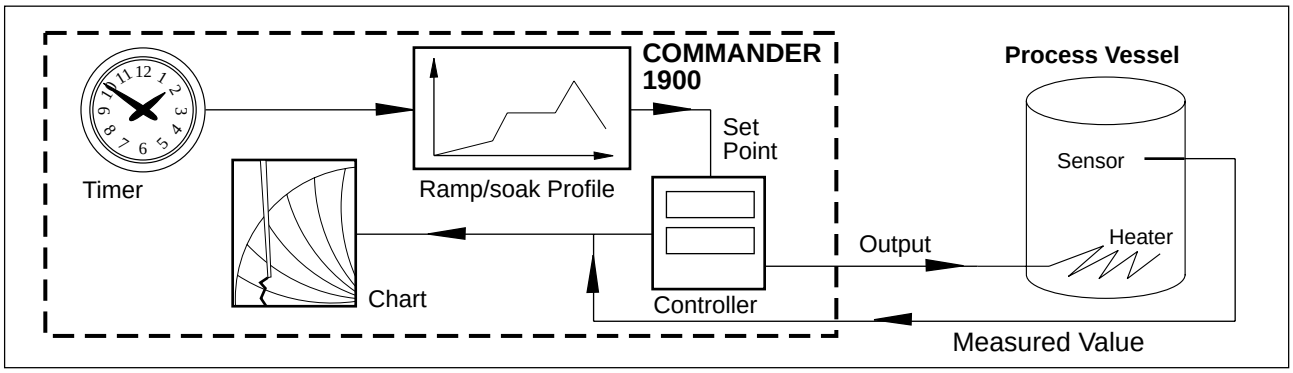
Full control of temperature profiles is provided by 10 program recipes for each controller. A total of **99 ramp/soak segments** are available for allocation to these programs. Segment events can be incorporated into the recipes to perform specific functions (e.g. operate relays) at predefined points within the program.



Ramp/Soak Program with Time Event Relay Sequences

Remote Program Selection

External panel switches can be connected to the COMMANDER's digital inputs to allow remote selection of stored profiles and to initiate ramp/soak programs.



Programmed process warm-up triggered by real-time clock

Built to Meet Your Needs

The COMMANDER's modular architecture gives 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 output and two digital inputs. Further input and output capability is provided by a range of plug-in modules:

- **Analog input and relay** – remote set point
- **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.

Designed to Survive

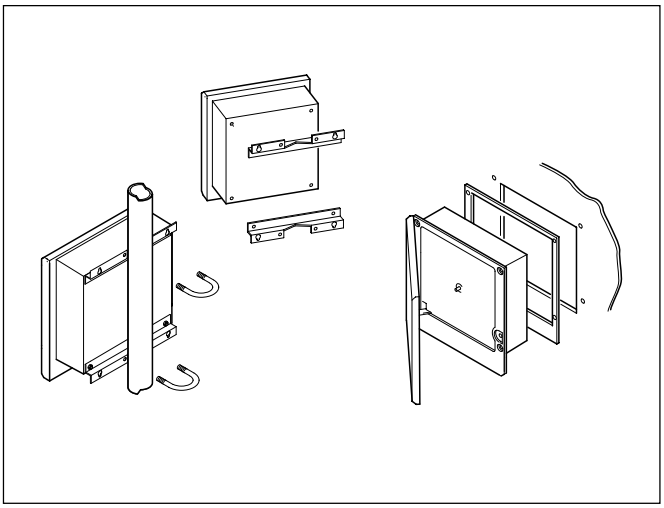
NEMA 4X protection ensures the COMMANDER can survive in the harshest environments and makes the recorder ideal for use in panels which are regularly hosed down. The tough, acid-resistant case and secure cable-entry glands maintain the NEMA 4X rating for wall-mounted or pipe-mounted instruments.

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 an optional power switch within the instrument.



Minimal Maintenance

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

Built-in Quality

The 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.

Specification

Summary

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

General Specification

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

Power Supply

Voltage:	115/230V ac ±15%, 50/60Hz
Consumption:	< 40VA (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 inputs)

Analog Inputs

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

2-Wire Transmitter Power Supply

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

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

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 (high)	0	10k	400	±0.5% reading or 0.1ohm
Ohms (low)	0	10k	400	±0.5% reading or 10ohm

Type	°C			°F			Accuracy (excl. CJC)
	Range Lo	Range Hi	Min. Span	Range Lo	Range Hi	Min. Span	
B	–18	1800	1278	0	3270	710	±2.0°C (above 200°C)
E	–100	900	81	–140	1650	45	±0.5°C
J	–100	900	90	–140	1650	50	±0.5°C
K	–100	1300	117	–140	2350	65	±0.5°C
N	–200	1300	162	–325	2350	90	±0.5°C
R	–18	1700	576	0	3000	320	±1.0°C (above 300°)
S	–18	1700	576	0	3000	320	±1.0°C (above 200°C)
T	–250	300	108	–400	550	60	±0.5°C
PT100	–200	600	45	–325	1100	25	±0.5°C

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 to15 psig I/P, 3 to15 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:	Dual display for process value and set point for each controller, plus individual display for each record-only channel
Type:	6-digit red LED, 0.56" (14mm) high
Status indicators:	Indicate channel number on display (on record-only chan.) Indicate remote set point, autotune or manual operation
Alarm indicators:	Indicate channels with active alarms

Panel keys

Function:	Programming access, increment/ decrement, auto/manual, pen lift and user-defined function key.

Alarms and Logic

Alarms

Number:	4 per channel
Type:	High/low process, fast/slow rate of change, deviation high/low, output high/ low
Adjustments:	Hysteresis, time delay

Logic Equations

Number:	8
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

PID Control

No. of loops:	1 or 2
Control outputs:	Relay, logic or dc analog
Control types:	Time-proportioning, analog
Control action:	PID, on/off, motorised valve position, boundless
Autotune:	On demand, at start-up or at set point

Option Modules

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

General

All modules isolated form each other 500V d.c.

Module specific

Analog O/P isolated from all other I/Ps and O/Ps
Common of digital I/Ps not isolated from –ve of PV I/P.

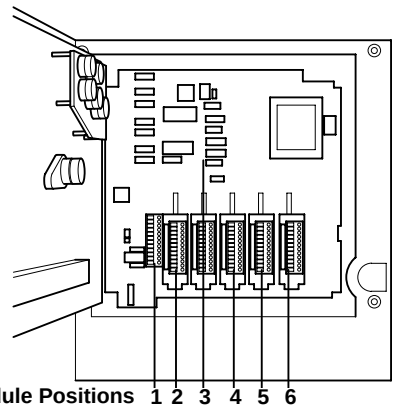
Option Module Types	i/o per module							Max. No. per instrmt
	Analog i/p	Analog o/p	Trans. PSU	Relays	Digital i/p	Digital o/p	Comms.	
Standardi/o	1	1	1	1	2			3
Analog i/p + relay	1			1				5
4 relays				4				2
8 digital i/p					8			3
8 digital o/p						8		3
RS485 comms.							1	1

Ordering Guide

PART 1																
COMMANDER 1900 Recorder/Controller		**19 XX**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**XXX**
Recorder/ Controllers †	One Control Unit, One Pen (Red)	**11**													
	One Control Unit, Two Pens (Red & Green)	**12**													
	One Control Unit, Three Pens (Red, Green, Blue)	**13**													
	One Control Unit, Four Pens (Red, Green, Blue, Black)	**14**													
	Two Control Units, Two Pens (Red & Green)	**22**													
	Two Control Units, Three Pens (Red, Green, Blue)	**23**													
	Two Control Units, Four Pens (Red, Green, Blue, Black)	**24**													
Chart Type	Standard (Recorder/Controller)		**R**												
	KPC105 PX and PXR type charts		**S**												
	Chessell Brand charts		**D**												
Electrical Code	Standard			**A**											
	CSA approved			**B**											
	UL approved			**U**											
	CSA/FM Class 2 Div. 2			**F**											
Option Module	None				**0**										
	Additional Modules – *Complete PART 2*				**A**										
Options	None					**0**									
	Totalizer					**3**									
	Ramp/Soak Profile					**5**									
	Maths & Timer					**A**									
	Totalizer, Maths & Timer					**B**									
	Totalizer, Ramp/Soak, Profile, Maths & Timer					**C**									
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**			



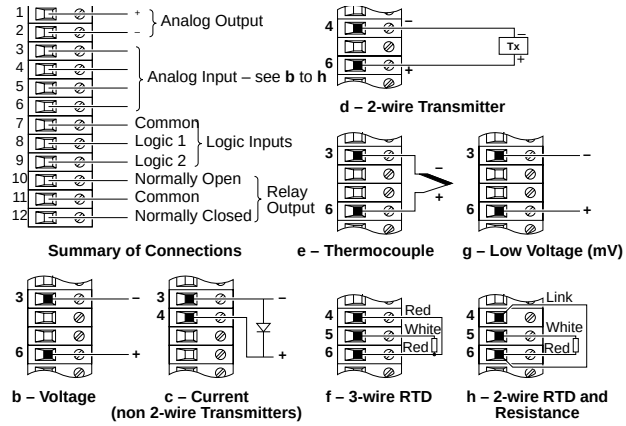
Module Positions 1 2 3 4 5 6

Key to Module Types

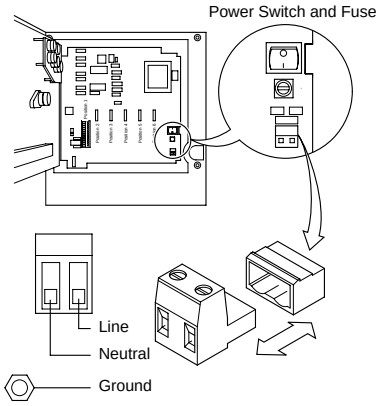
0 No module fitted / Pen input channel *
1 Standard Input/Output
2 Analog Input (Remote set point)+ Relay
3 Four Relays
4 Eight Digital Inputs
5 Eight Digital Outputs
6 True Time Event Pen (Violet)
8 MODBUS RS485 Communications

* 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).

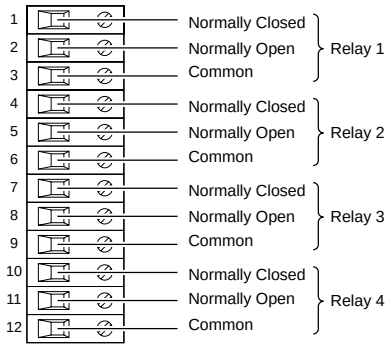
Example 1 9 2 2 R A A 0 1 1 0 2 3 0 0 STD
2 control, 2 pen
Remote set point input
4 relays



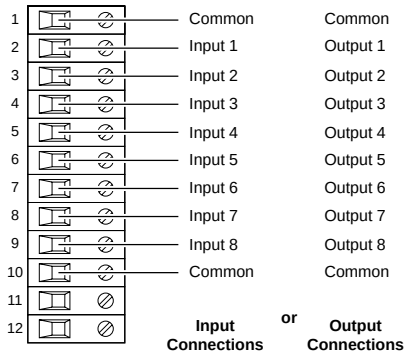
Standard Input/Output Modules



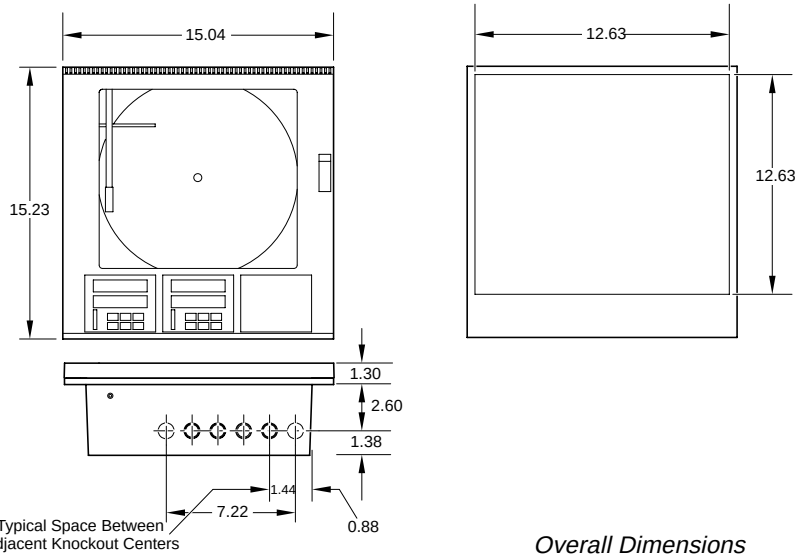
Power Supply Connections



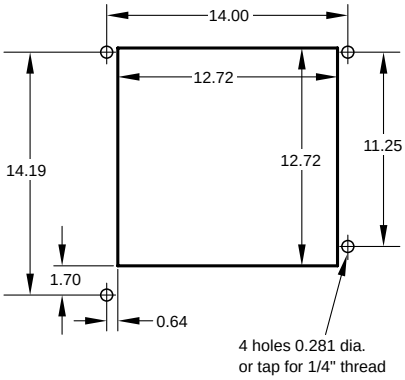
Four Relay Output Module



Digital Input/Output Module



Overall Dimensions



Cut-Out Size

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