

COMMANDER 300
Universal
Process Controller

Installation Guide

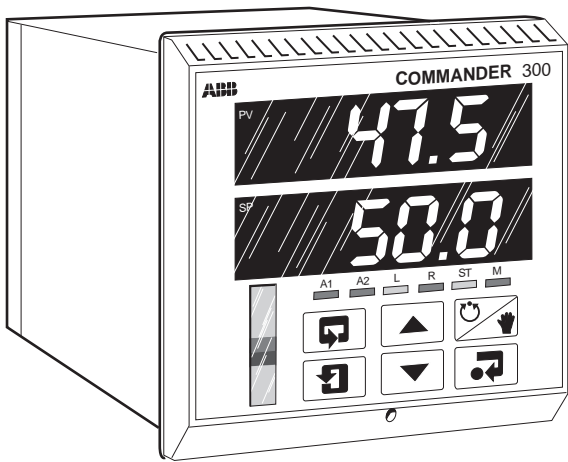


ABB INSTRUMENTATION

The Company

ABB Instrumentation is an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

The NAMAS Calibration Laboratory No. 0255 is just one of the ten flow calibration plants operated by the Company, and is indicative of ABB Instrumentation's dedication to quality and accuracy.

BS EN ISO 9001



St Neots, U.K. – Cert. No. Q5907

Stonehouse, U.K. – Cert. No. FM 21106

EN 29001 (ISO 9001)



Lenno, Italy – Cert. No. 9/90A



Stonehouse, U.K.

Use of Instructions



Warning.

An instruction that draws attention to the risk of injury or death.



Note.

Clarification of an instruction or additional information.

Caution.

An instruction that draws attention to the risk of damage to the product, process or surroundings.



Information.

Further reference for more detailed information or technical details.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

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

Health and Safety

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

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

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

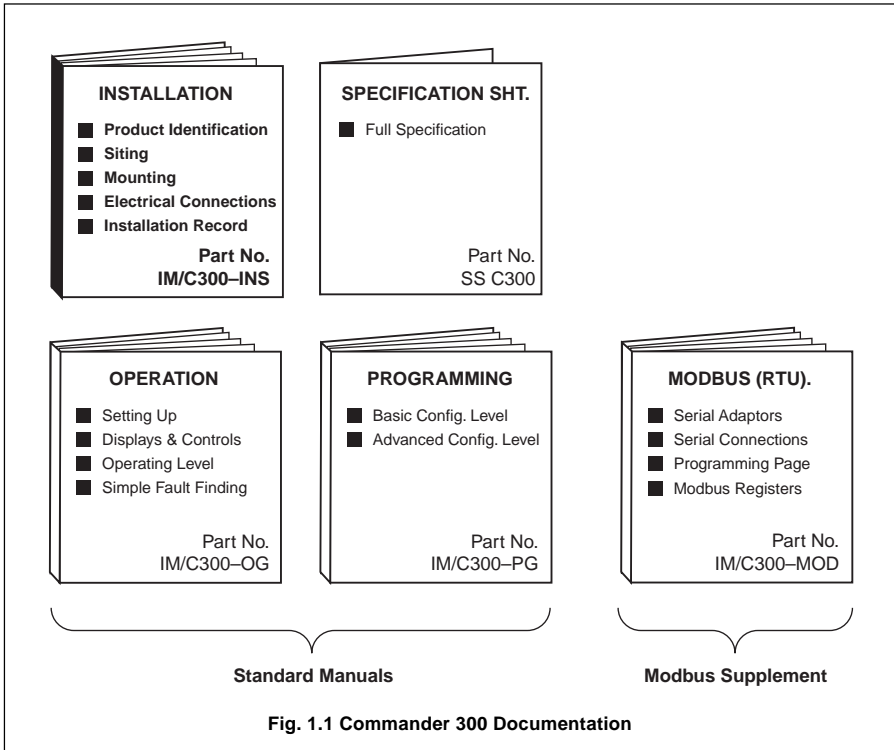
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1 INTRODUCTION

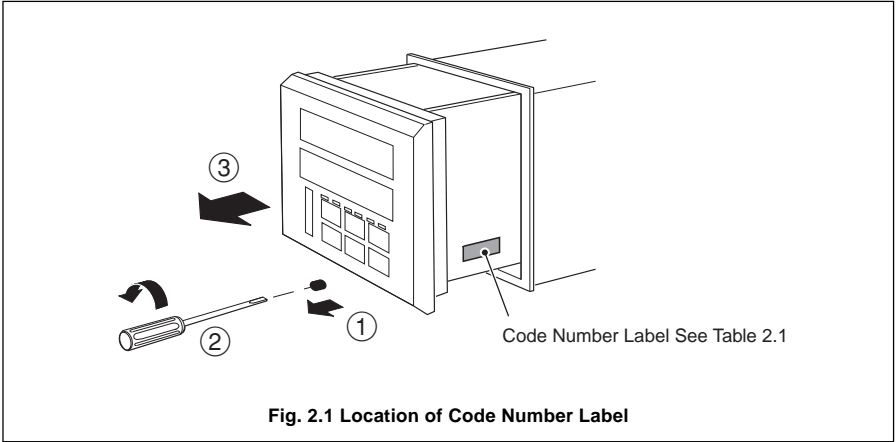
The COMMANDER 300 Series documentation is shown in Fig. 1.1. The **Standard Manuals**, including the specification sheet, are supplied with all instruments. The **Modbus Supplement** is supplied with instruments configured for Modbus Serial Communication.

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



2 PREPARATION

2.1 Checking the Code Number – Fig. 2.1



C300 Universal Process Controller		C30X/	0X	X	X	/XXXX
Basic Type and Function	COMMANDER 300 Indicator Controller	0				
	COMMANDER 300 Indicator Controller with 20 Point Custom Linearizer	1				
Option Board	None		0			
	2 Relay O/P + 2 Logic I/P		2			
	RS485 Modbus Serial Comms. + 2 Relay O/P + 2 Logic I/P		3			
Power Supply	115V AC			1		
	230V AC			2		
	24V AC			3		
	12V DC			4		
	24V DC			5		
Build	Standard				0	
	CSA Approved				1	
	UL Approved				2	
Configuration Special Features	Configured to Factory Standards Configured to Customers Details Agreed Special Feature					STD CUS SPXX

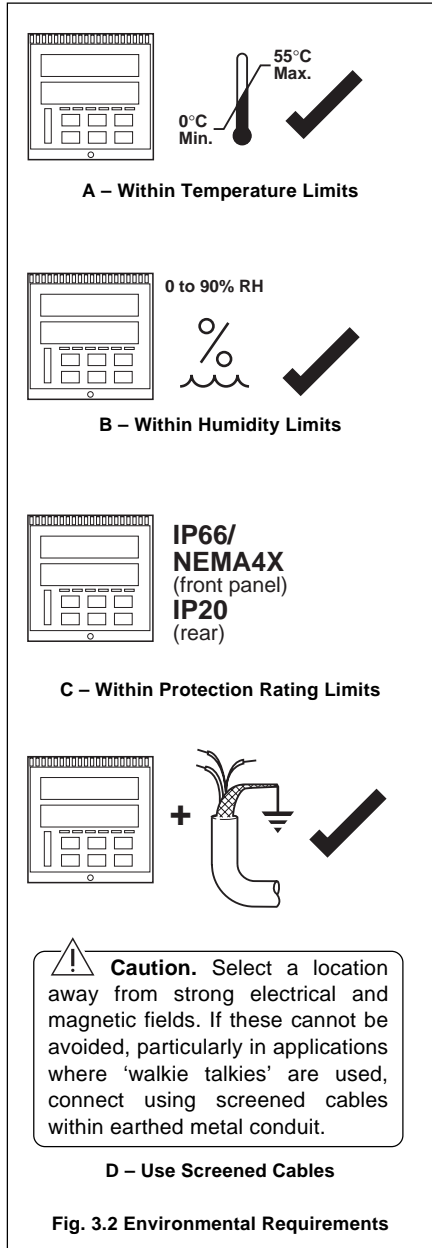
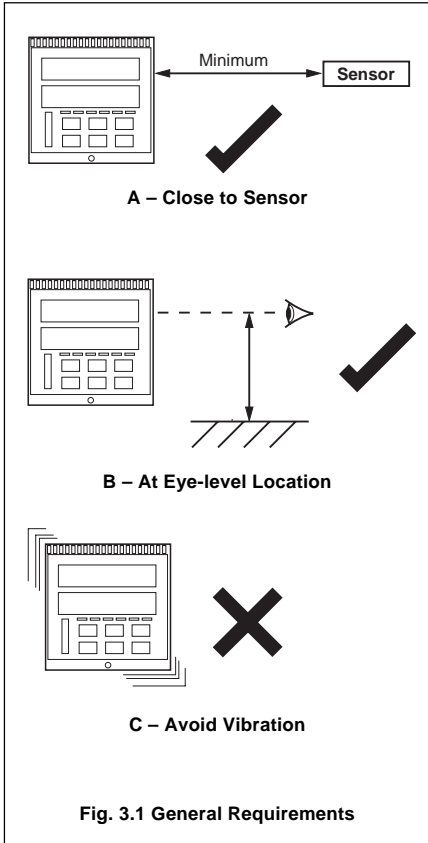
Table 2.1 Identification of Instrument Code Number

3 MECHANICAL INSTALLATION

EC Directive 89/336/EEC

In order to meet the requirements of the EC Directive 89/336/EEC for EMC regulations, this product must not be used in a non-industrial environment.

3.1 Siting – Figs. 3.1 and 3.2

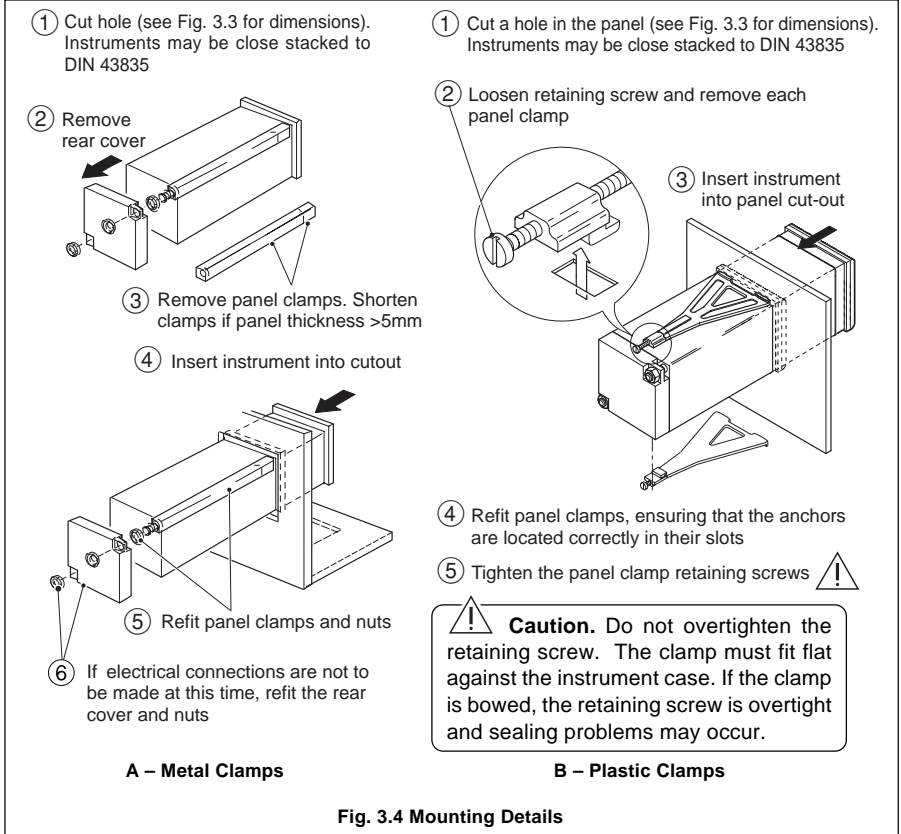
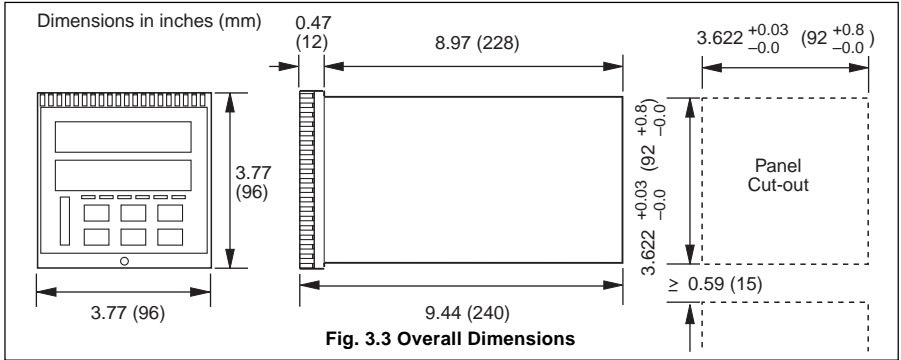


Caution. Select a location away from strong electrical and magnetic fields. If these cannot be avoided, particularly in applications where 'walkie talkies' are used, connect using screened cables within earthed metal conduit.

3.2 Mounting – Figs. 3.3 and 3.4

The instrument is designed for panel mounting (Fig. 3.4). Overall dimensions are shown in Fig. 3.3.

* **Note.** For NEMA4X protection, a minimum panel thickness of 2.5mm is recommended.



4 ELECTRICAL INSTALLATION



Warning. Before making any connections, ensure that the power supply, any high voltage-operated control circuits and high common mode voltages are switched off.



Note.

- Always route signal leads and power cables separately, preferably in earthed metal conduit.
- It is strongly recommended that screened cable is used for signal inputs and relay connections. Connect the screen to the ground stud.
- The terminal blocks can be removed from the main p.c.b. when making connections. Before removing any module note its position – see Fig. 4.1.



Information. Use cable appropriate for the load currents. The terminals accept cables up to 14AWG (2.5mm²).

4.1 Access to Terminals

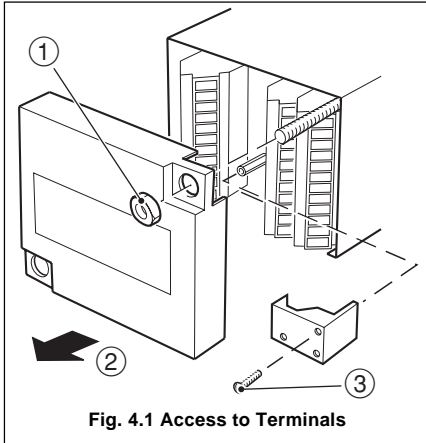


Fig. 4.1 Access to Terminals

4.2 Setting the Input Selector Links – Fig. 4.2

Plug-in links on the microprocessor p.c.b. are positioned according to the type of Process Variable Input, Remote Set Point Input and Valve Position Feedback Inputs used.

Remove the instrument from case – see Fig. 2.1.

Referring to Fig. 4.2, set the link positions for the input type required.

4.3 Setting the Isolated Output Link – Fig. 4.3A

On versions using an a.c. supply, the plug-in link (PL1) on the power supply p.c.b. must be positioned according to the isolated output type required: current positioning control output (programmable in range 0 to 20mA), or 12V logic output (minimum load 400Ω).

Referring to Fig. 4.3A – steps ① and ②, set the link positions for the output type required.

To use a 12V logic output, the control type must be set to Time Proportioning Control – see Fig. 3.1 of the Programming Guide.

4.4 Setting the Relay Contact Links

Relays 1 and 2 can have their contacts set to be either normally open or closed. If an option board is fitted, the contacts on relays 3 and 4 can also be set.

Remove the instrument from case – see Fig. 2.1.

4.4.1 Relays 1 and 2 – Fig. 4.3A

Referring to Fig. 4.3A – steps ③ and ④, set the links for the relay contact action required:

Relay 1	–	LK1
Relay 2	–	LK2.

4.4.2 Relays 3 and 4 – Fig. 4.3B

Referring to Fig. 4.3B – steps ① and ②, set the links for the relay contact action required:

Relay 3	–	LK3
Relay 4	–	LK4.

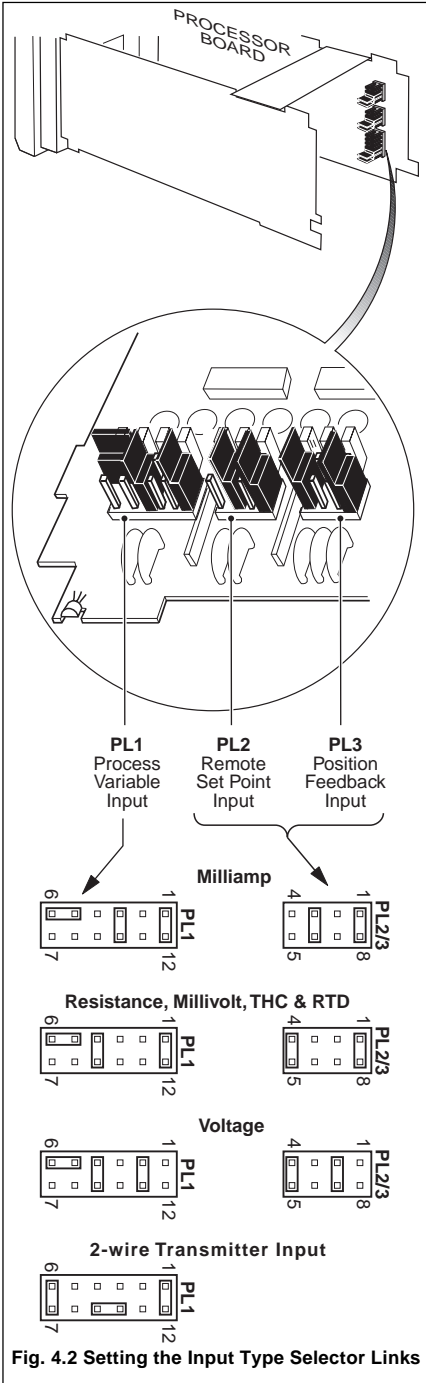


Fig. 4.2 Setting the Input Type Selector Links

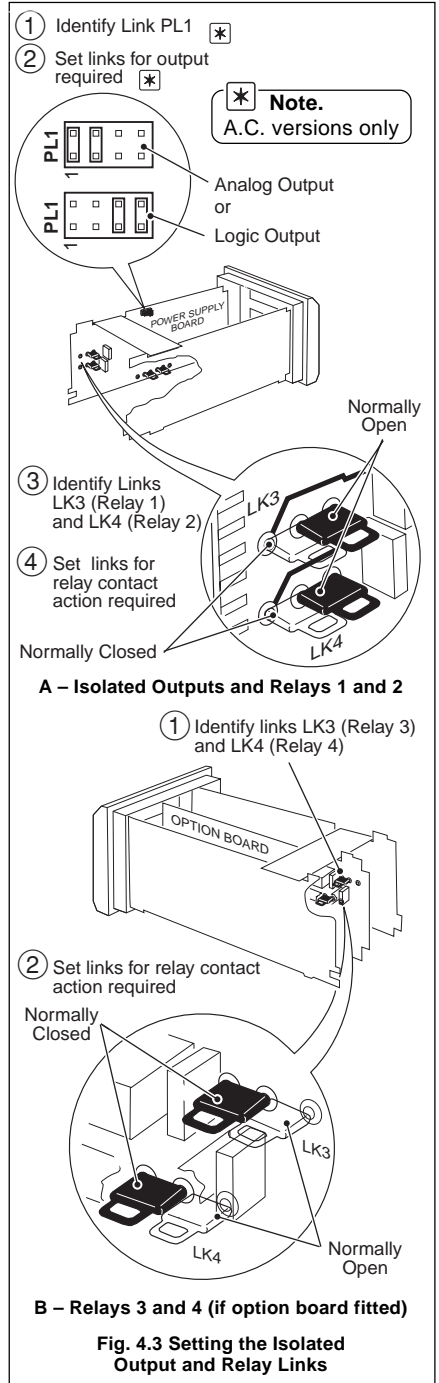


Fig. 4.3 Setting the Isolated Output and Relay Links

4.5 Connections Summary

i Information.
 Input impedances:
 Low voltage (mV) > 10MΩ.
 Voltage > 10MΩ.
 Current 10Ω.

Terminal Block A							
1	+	}	Current Proportioning Control Output/Heat Output Fig. 4.13 or 12V Logic Control Output Fig. 4.12				
2	-						
3	+	}	Retransmission Output/Cool Output – see Fig. 4.13				
4	-						
5	C	}	Relay 1 Output – see Fig. 4.14	}	Motorized Valve Control Relay (open) – see Figs. 4.15 and 4.16		
6	NO/NC						
7	C	}	Relay 2 Output – see Fig. 4.14	}	Motorized Valve Control Relay (close) – see Figs. 4.15 and 4.16		
8	NO/NC						
9	Not used						
AC Supply			DC Supply				
L	}	115V, 230V a.c. – see Fig. 4.19A	or	}	+ - E		
N						24V – see Fig. 4.19B	12V or 24V – see Fig. 4.19C
E							
Terminal Block B							
1	Common						
2	Logic Input 1 – see Figs. 4.17 and 4.18						
3	Logic Input 2 – see Figs. 4.17 and 4.18						
4	3 rd lead	}	Position Feedback Input – see Figs. 4.15 and 4.16				
5	Input 3+						
6	Input 3-						
7	3 rd lead	}	Remote Set Point Input – see Figs. 4.4 to 4.9 and 4.11				
8	Input 2+						
9	Input 2-						
10	3 rd lead/2-wire TX	}	Process Variable Input – see Figs. 4.4 to 4.6, 4.9 and 4.11	or	2-wire Tx Power Supply – see Fig. 4.10		
11	Input 1+						
12	Input 1-						

Table 4.1A Electrical Connections (Terminal Blocks A and B)

...4.5 Connections Summary

Terminal Block C				
1	Common			
2	Logic Input 3	– see Figs. 4.17 and 4.18		
3	Logic Input 4	– see Figs. 4.17 and 4.18		
4	C	} Relay 3 Output	} Alarm Relays	
5	NO/NC			
6	C			
7	NO/NC	} – see Fig. 4.14		
		} Relay 4 Output		
8	Common	} – see Fig. 4.14 RS 485 Modbus Serial Communications Option 3 only – see <i>Modbus (RTU) Communications Supplement, IM/C300–MOD</i>		
9	Rx+			
10	Rx–			
11	Tx+			
12	Tx–			

Table 4.1B Electrical Connections (Terminal Block C)

4.6 Input Connections

Make connections to each input, as shown in Figs 4.4 to 4.11, first removing any factory-fitted wire links not required.

4.6.1 Thermocouple (THC) Inputs – Fig. 4.4

*** Note.** Automatic Cold Junction Compensation (ACJC) is active when an input is programmed for thermocouple input signals. Use the correct compensating cable between the THC and the terminals – see Table 4.2.

If an external fixed cold junction is used, the connections to the instrument must be made with copper cable. The input must be programmed for mV input signals and the appropriate THC linearizer selected – see Sections 4.5 and 4.6 of the *Programming Guide*.

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

Table 4.2 Thermocouple Compensating Cables

4.6.2 3-lead Resistance Thermometer (RTD) Inputs – Fig. 4.5

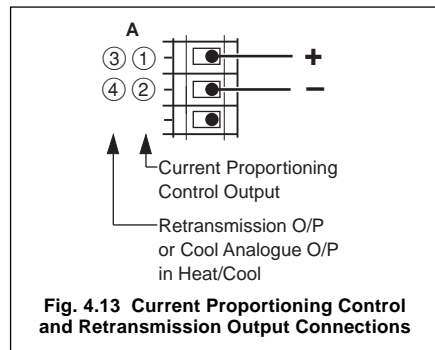
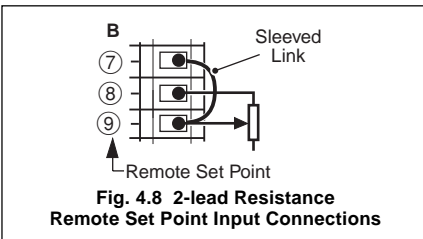
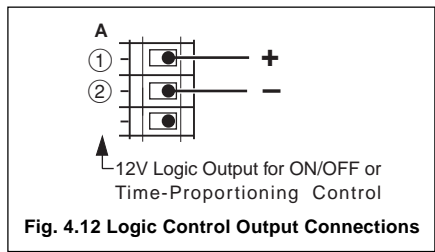
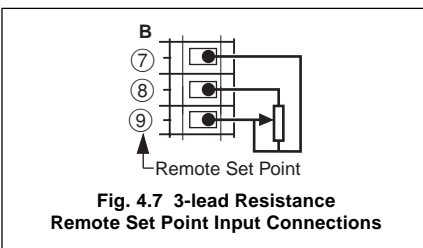
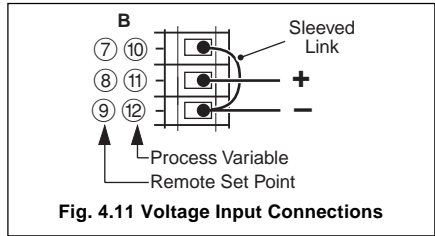
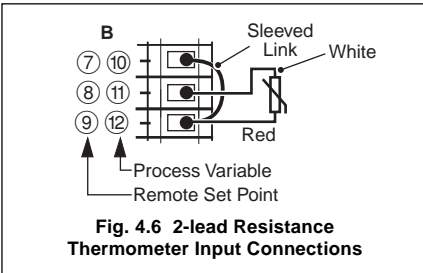
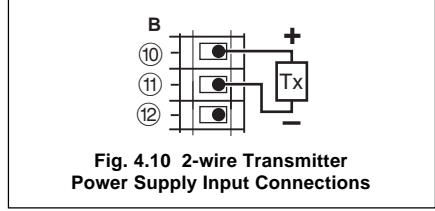
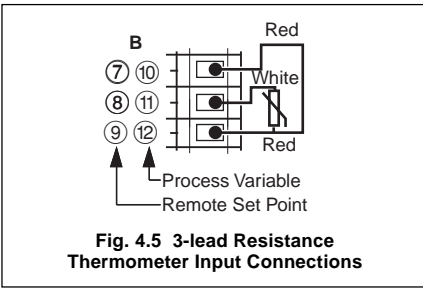
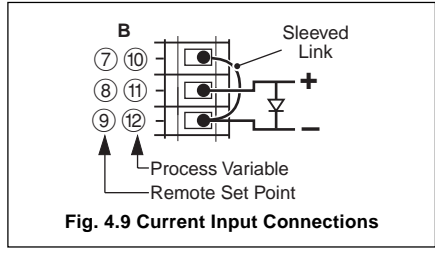
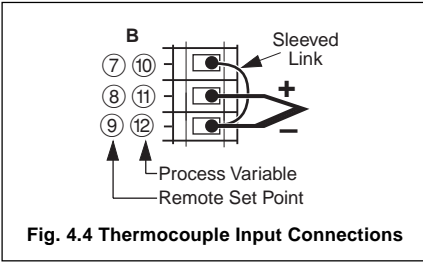
The three leads must have equal resistance, not exceeding 50Ω each.

4.6.3 2-lead Resistance Thermometer (RTD) Inputs – Fig. 4.6

If long leads are necessary it is preferable to use a 3-lead RTD. If the RTD is to be used in a hazardous area a 3-lead RTD must be used.

4.6.4 Links for Unused Inputs

To reduce susceptibility to electro-magnetic interference, ensure that the three terminals on each unused input are shorted together with sleeved wire links.



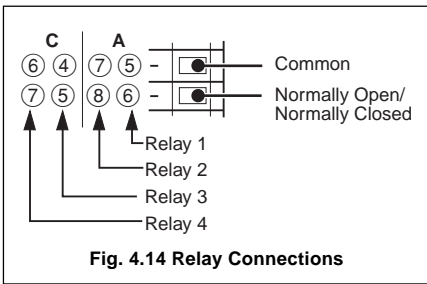
4.7 Output Connections

Make connections as shown in Figs 4.12 and 4.13.

4.8 Relay Connections – Fig. 4.14

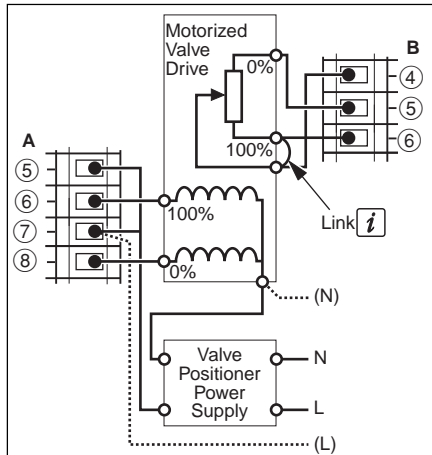
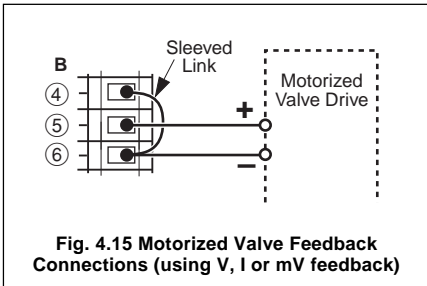
For relay functions refer to the following table.

	Relay 1	Relay 2	Relay 3	Relay 4
On/Off Control	✓	—	—	—
Time Prop. (Heat)	✓	—	—	—
Time Prop. (Cool)	—	✓	—	—
Motorized Valve	Open	Close	—	—
Alarm	✓	✓	✓	✓

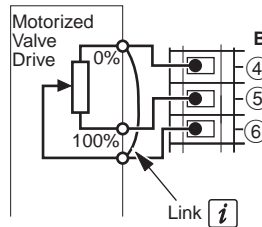


4.9 Motorized Valve Connections – Figs. 4.15 and 4.16

The relay links LK3 and LK4 must be set for normally open in motorized valve mode.



A – Standard Feedback Slidewire Configuration



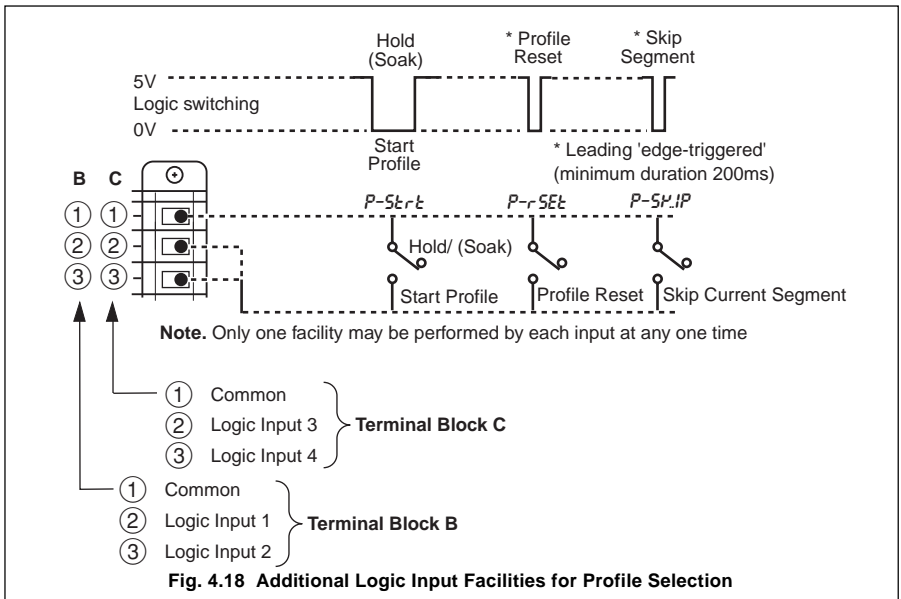
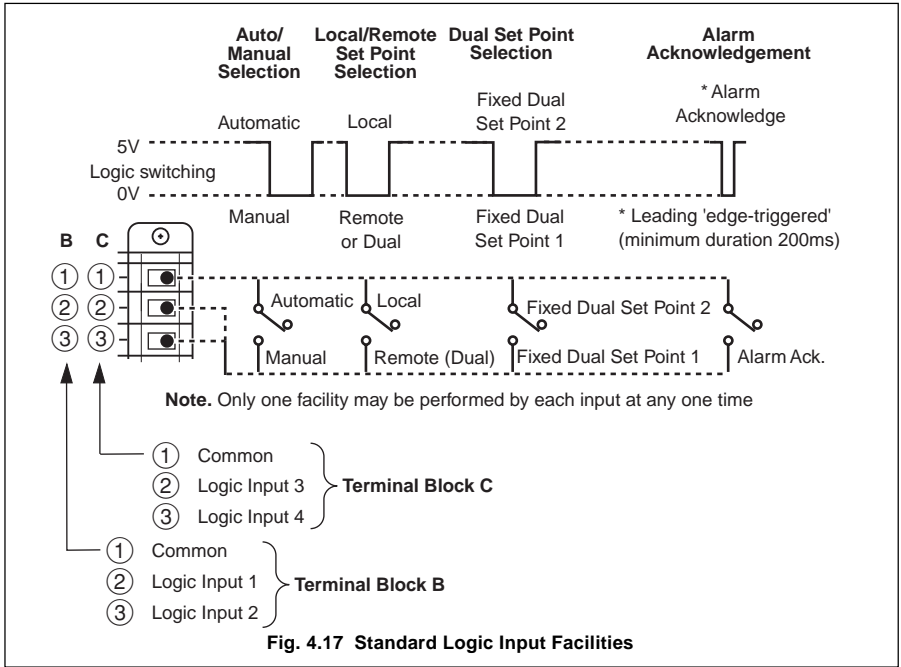
B – Alternative Feedback Slidewire Configuration

i Information. Link must be connected at the drive end, not at the controller terminal.

Fig. 4.16 Motorized Valve Connections (using feedback slidewire)

4.10 Logic Input Connections – Figs. 4.17 and 4.18

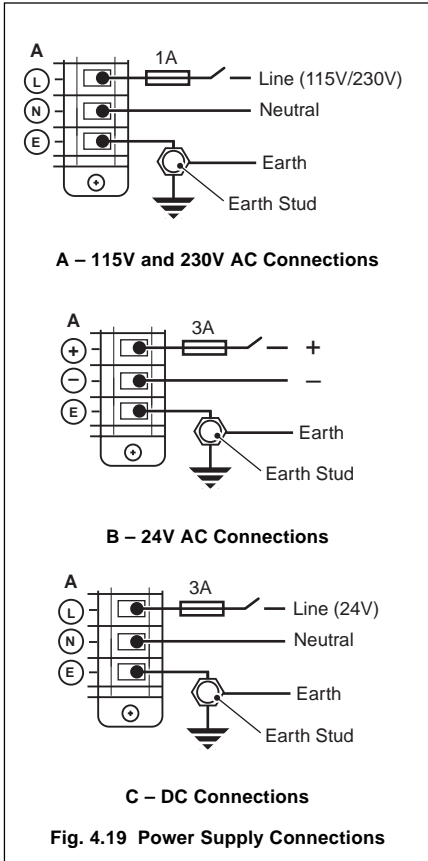
Each logic input can be programmed to perform one of a number of functions – see *Section 4.10 of the Programming Guide*.



4.11 Power Supply Connections – Fig. 4.19

Warning.

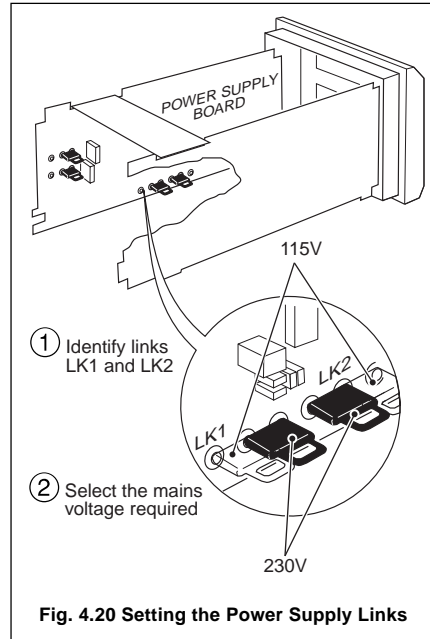
- The earth line must be connected to the earth stud and not to the E terminal on terminal block A. Do not disturb the link between the E terminal and the earth stud.
- Check whether an a.c. or d.c. supply is required – see Section 2.1.



4.12 Setting the Power Supply Links – Fig. 4.20

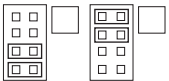
The power supply can be set to either 230V a.c. or 115V a.c.

Referring to Fig. 4.20, set the power supply required.

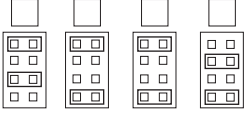
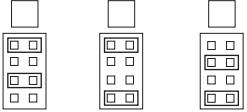
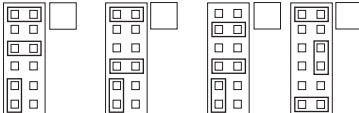


5 INSTALLATION RECORD

Terminal Block A


Control Output	1	+	Link Positions (Tick Box) 	Output Type: Output Function:
	2	-		
Retransmission Output	3	+	Output Type: Output Function:	
	4	-		
Relay 1 Output	5	C	Link Position (Tick Box) NO <input type="checkbox"/> Output Type: NC <input type="checkbox"/> Output Function:	
	6	NO/NC		
Relay 2 Output	7	C	Link Position (Tick Box) NO <input type="checkbox"/> Output Type: NC <input type="checkbox"/> Output Function:	
	8	NO/NC		
Not used	9			
Power Supply	10		Power Supply (Tick Box)	
	11		230V AC <input type="checkbox"/> } L 115V AC <input type="checkbox"/> } N	12V DC <input type="checkbox"/> } + 24V DC <input type="checkbox"/> } -
	12		24V AC <input type="checkbox"/>	

Terminal Block B

Common	1			
Logic Input 1	2			
Logic Input 2	3			
Position Feedback Input	4	3 rd	Link Positions (Tick Box) 	
	5	+		mA mV R V
	6	-		
Remote Set Point Input	7	3 rd	Link Positions (Tick Box) 	
	8	+		mA mV/THC/RTD V
	9	-		
Process Variable Input	10	3 rd	Link Positions (Tick Box) 	
	11	+		mA mV/THC/RTD V 2-wire TX
	12	-		

...5 INSTALLATION RECORD

Terminal Block C

Common	1		
Logic Input 3	2		
Logic Input 4	3		
Relay 3 Output (Alarm Relay)	4	C	Link Position (<i>Tick Box</i>) NO <input type="checkbox"/>
	5	NO/NC	NC <input type="checkbox"/>
Relay 4 Output (Alarm Relay)	6	C	Link Position (<i>Tick Box</i>) NO <input type="checkbox"/>
	7	NO/NC	NC <input type="checkbox"/>
Modbus Serial Communications Option 3 only	8	Common	 Termination Resistors (<i>Tick Box</i>)
	9	RX+	
	10	RX-	
	11	TX+	
	12	TX-	

PRODUCTS & CUSTOMER SUPPORT

A Comprehensive Product Range

Analytical Instrumentation

- **Transmitters**
On-line pH, conductivity, and dissolved oxygen transmitters and associated sensing systems.
- **Sensors**
pH, redox, selective ion, conductivity and dissolved oxygen.
- **Laboratory Instrumentation**
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- **Controllers**
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- **Smart & Analog Transmitters**
For draft, differential, gauge and absolute pressure measurement. Also, liquid level and temperature.
- **I to P Converters and Field Indicators**

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Electromagnetic, insertion type probes and watermeters.
- **Turbine Flowmeters**
- **Wedge Flow Elements**
- **Mass Flow Meters**
Transmitters, sensors, controllers and batch/display units.

Level Control

- **Submersible, Capacitance & Conductivity.**

Pneumatic Instrumentation

- **Transmitters**
- **Indicating Controllers**
- **Recording Controllers**

Customer Support

ABB Instrumentation provides a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

United Kingdom

ABB Instrumentation Limited
Tel: +44 (0)1480 475321
Fax: +44 (0)1480 470787

United States of America

ABB Automation Inc.
Instrumentation Division
Tel: +1 215-674-6000
Fax: +1 215-674-7183

Italy

ABB Instrumentation SpA
Tel: +39 (0) 344 58111
Fax: +39 (0) 344 58278

Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition.

In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of operating and maintenance records relating to the alleged faulty unit.



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

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St. Neots
Cams.
England, PE19 3EU
Tel: +44 (0) 1480 475321
Fax: +44 (0) 1480 217948

**ABB Automation Inc.
Instrumentation Division**

125 E. County Line Road
Warminster, PA 18974 USA
Tel: +1 215-674-6000
Fax: +1 215-674-7183

ABB Instrumentation SpA

22016 Lenno
Como
Italy
Tel: +39 (0) 344 58111
Fax: +39 (0) 344 58278