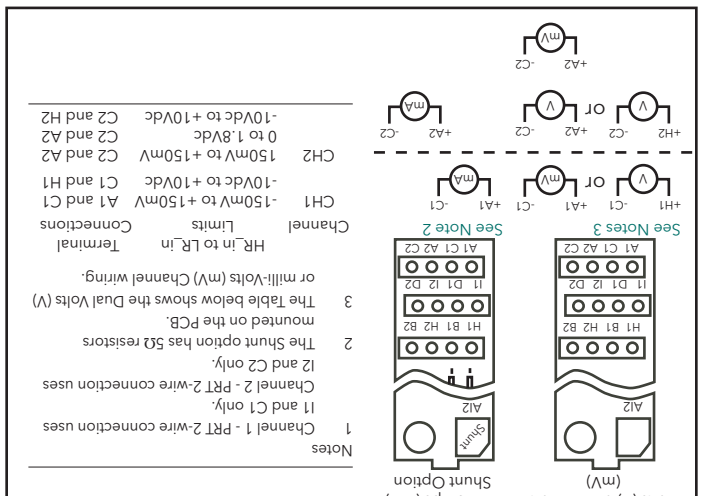
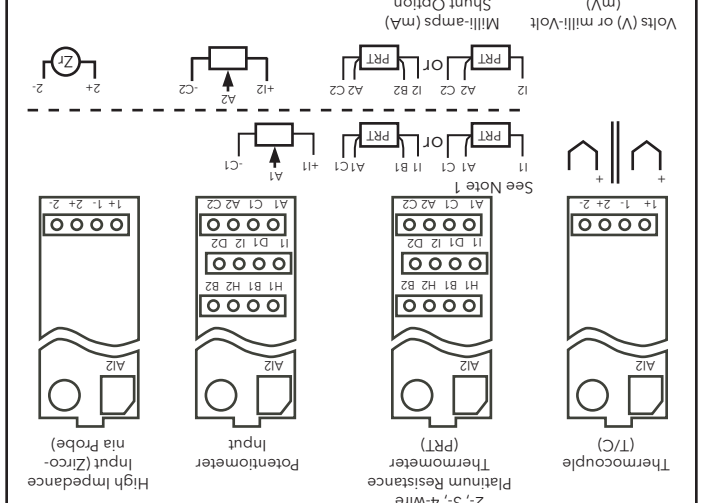


Notes
1 Channel 1 - PRT 2-wire connection uses I1 and C1 only. I2 and C2 only.
2 The Shunt option has 5Ω resistors mounted on the PCB.
3 The Table below shows the Dual Volts (V) or milli-Volts (mV) Channel wiring.

Channel	HR_in to LR_in Limits	Terminal Connections
CH1	-150mV to +150mV	A1 and C1
	-10Vdc to +10Vdc	C1 and H1
CH2	150mV to +150mV	C2 and A2
	0 to 1.8Vdc	C2 and A2
	-10Vdc to +10Vdc	C2 and H2

AI2 - Analogue Input Module



Notes:
1 Use the C/I terminals for externally powered inputs. Use the P/C terminals when using the module's internal supply
2. The number of AI3 modules must be restricted such that the overall, steady-state power consumption of the all base modules does not exceed an average of over 3W per module (e.g. 24 Watts for 8-unit bases or 48W for 16-unit bases).

T = 4 to 20 mA transmitter

AI3 - Analogue Input Module

*Note... External supply to power plant devices.

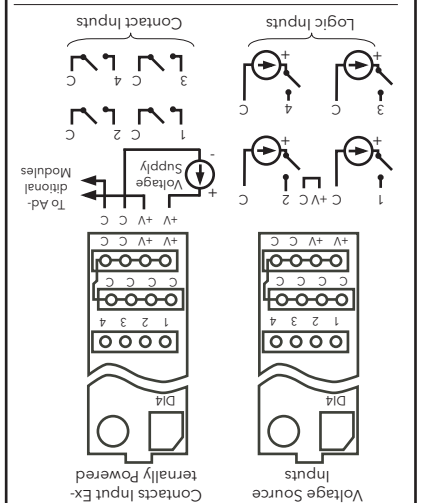
Caution
To avoid overheating, the daisy-chain current must not exceed 4 Amps.

DO4 - Digital Output Module

Note Voltage Mode. Input impedance 'Rv' of the device connected to this output module must be > 550Ω for -0.1Vdc to +10.1Vdc range and > 1500Ω for the -0.3Vdc to +10.3Vdc range.
Current Mode. Input impedance (or loop impedance) 'Ri' of the device connected to this output module must be < 550Ω.

AO2 - Analogue Output Module

AI4 - Analogue Input Module



RLY4 - Relay Module

Notes.
1 Relays above shown in power off state
2 Fuses supplied for the Relay units are 3.15A (T type), 20mm to EN60127.
3 Fitted labels show manufacturing data including space to record which snubbers have been removed.

DI8 - Digital Input Module

DI14 - Digital Input Module

Notes
1 Negative logic inputs can be connected if required. Reverse the polarity of the input connections.
2 A link (+V to C) MUST be fitted in place of external supply.

DI6 - Digital Input Module

Installation Safety Requirements

Various symbols used on the instrument are described below:

Caution (refer to the accompanying documents) — Functional (ground) earth — Protective earth terminal

INSTALLATION CATEGORY AND POLLUTION DEGREE

This product has been designed to conform to BS EN61010 installation category II and pollution degree 2. These are defined as follows:

- Installation category II. The rated impulse voltage for equipment on nominal 230V ac mains is 2500V.
- Pollution degree 2. Normally, only non-conductive pollution occurs. However, occasionally a temporary conductivity caused by condensation can be expected.

Personnel

Installation must only be carried out by qualified personnel.

Enclosure of live parts

To prevent hands or metal tools touching parts that may be electrically live, the unit must be installed in an enclosure.

Blank Terminal Unit (part number 026373)

Base units are designed to hold up to16 modules. In order to maintain IP20 rating, base units that are not fully populated, must have a blank terminal unit fitted immediately to the right of the last module. A blank terminal unit is supplied with the base unit.

Warning: Live sensors

The unit is designed to operate with the temperature sensor connected directly to an electrical heating element. However it must be ensured that service personnel do not touch connections to these inputs while they are live. With a live sensor, all cables, connectors and switches for connecting the sensor must be mains rated.

Wiring

It is important to connect the unit in accordance with the wiring data given in this instruction sheet. Particular care should be taken not to connect AC supplies to the low voltage sensor input or other low level inputs and outputs. Only copper conductors should be used for connections (except thermocouple inputs) and the wiring of installations must comply with all local wiring regulations. For example in the UK use the latest version of the IEE wiring regulations (BS7671). In the USA use NEC Class 1 wiring methods.

Power Isolation

The installation must include a power isolating switch or circuit breaker. This device should be in close proximity (≤1 metre) to the unit, within easy reach of the operator and marked as the disconnecting device for the instrument.

Earth Leakage Current

Due to RFI Filtering there may be an earth leakage current of up to 3.5mA. This may affect the design of an installation of multiple units protected by Residual Current Device (RCD) or Ground Fault Detector, (GFD) type circuit breakers.

Overcurrent Protection

It is recommended that the DC power supply to the system is fused appropriately to protect the cabling to the unit. The unit provides a fuse on the 2500 module to protect the supply from a fault within the unit.

Voltage Rating

The maximum continuous voltage applied between any of the following terminals must not exceed 264Vac:

- DI6 input or RLY4 relay output to logic, dc or sensor connections;
- any connection to ground

The unit must not be wired to a three-phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 264Vac with respect to ground and the unit would then not be safe.

Conductive Pollution

Electrically conductive pollution must be excluded from the enclosure in which the unit is mounted. To secure a suitable atmosphere in conditions of conductive pollution, an air filter should be fitted to the air intake of the enclosure. Where condensation is likely, include a thermostatically controlled heater in the enclosure.

Installation requirements for EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary: For general guidance refer to EMC Installation Guide, Part no. HA025464. If relay outputs are being used it may be necessary to fit suitable filters for emission suppression. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.

Restriction of Hazardous substances

Restriction of Hazardous Substances (RoHS)

Product group 2500

Table listing restricted substances

Chinese

限制使用材料一览表

产品 2500	有毒有害物质或元素 铅（Pb）	汞（Hg）	镉（Cd）	六价铬(Cr(VI))	多溴联苯(PBB)	多溴二苯醚(PBDE)
IOC	X	O	X	O	O	O
IO 模块	X	O	X	O	O	O
端子模件	X	O	X	O	O	O
基座	X	O	O	X	O	O
O	表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。					
X	表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006 标准规定的限量要求。					

English

Restricted Materials Table

Product 2500	Toxic and hazardous substances and elements Pb	Hg	Cd	Cr(VI)	PBB	PBDE
IOC	X	O	X	O	O	O
IO Module	X	O	X	O	O	O
Terminal Unit	X	O	X	O	O	O
Base	X	O	O	X	O	O
O	Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.					
X	Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement in SJ/T11363-2006.					

Approval

Name:	Position:	Signature:	Date:
Martin Greenhalgh	Quality Manager	Martin Greenhalgh	27 MAY 2011

IA029470U560 (CN27368) Issue 2 May 11

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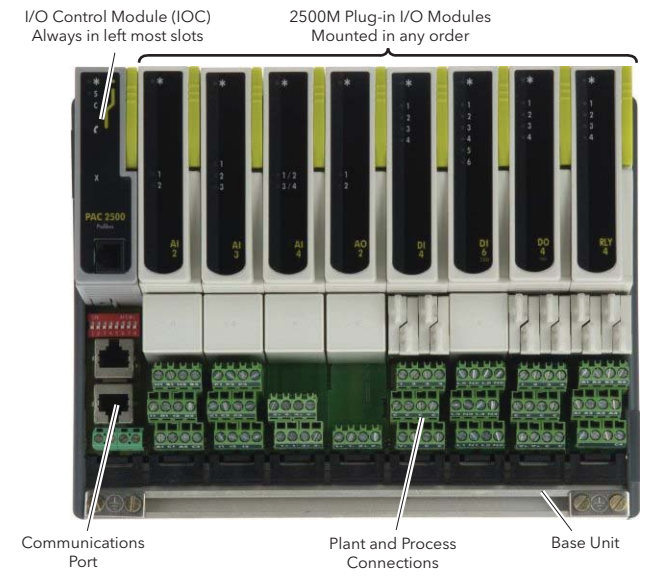
invensys

Foxboro

MODEL 2500 FOXBORO PAC

INSTALLATION AND WIRING INSTRUCTIONS



The 2500 is a modular system which can provide multi-loop PID control. It consists of a base unit into which are clipped a number of terminal units each of which has a control or I/O module plugged into it.

The Base Unit can be supplied with up to 16 I/O modules, and is suitable for DIN rail (35mm Top hat) or bulkhead mounting.

Customer connections with plant devices are provided by terminal units, specific to each module type, that clip into the Base Unit.

The terminal units also provide interconnections between I/O modules and the Input/Output Controller (IOC) Modules which contain system configuration and Modbus, Profibus or DeviceNet communications support.

The I/O Modules, which clip into their terminal units, are dedicated to specific analogue or digital, input or output.

The system requires 24Vdc at less than 100mA per module. A suitable Power Supply is the 2500P, available as 1.3, 2.5, 5, or 10 amp units.

HA027773/11 (CN27432)

The Base

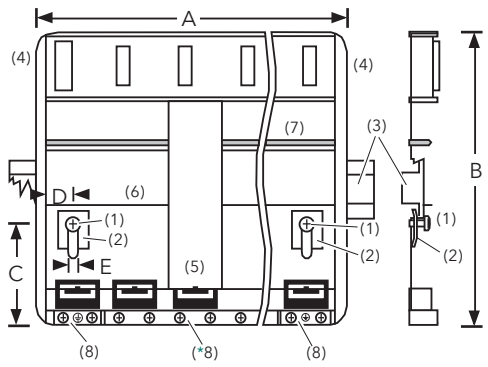
To mount the Base

This unit is intended to be mounted within an enclosure, or in an environment suitable for IP20 rated equipment. It can be DIN rail or bulkhead mounted.

(1) Retention Screws
(2) Base Retention Clip
(3) DIN Rail
(4) Side Cover
(5) Terminal Unit Retention Clip
(6) Support for Terminal Unit
(7) EMC Earthing
(8) Protective Earth Terminal Strip

(* - Optional)

Note Always ensure a 25mm clearance for ventilation.



Base unit	Dimensions (mm)					Weight (kg)	
	A	B	C	D	E	No Modules	All Modules
S02	86	180	68	15	5	0.3	0.7
S04	137	180	68	15	5	0.4	1.2
S08	239	180	68	15	5	0.7	2.0
S10	289	180	68	15	5	0.8	2.4
S12	340	180	68	15	5	1.0	2.8
S16	442	180	68	15	5	1.3	3.6

DIN Rail Mounting (horizontal)

1 Mount the DIN rail horizontally, using suitable bolts.
2 Ensure that the DIN rail makes good electrical contact with the metal base of the enclosure.
3 Loosen screws (1) in the base, and allow them, and the associated base retention clips (2) to drop to the bottom of he screw slot.
4 In the back of the base is an extruded slot which locates with the DIN rail(3).
5 Fit the top edges of this into the top edge of the DIN rail (3). Slide the screws (1) with the associated clips (2) upwards as far as they will go towards the top of the screw slots. The angled edge of the base retaining clip (2) must locate behind the bottom edge of the DIN rail.
6 Tighen the screws (1).

DIN Rail Mounting (vertical)

Caution

If the base is mounted vertically, it is recommended that a fan be fitted in the cubicle in such a way as to ensure a free flow of air around the modules.

1 Mount the DIN rail vertically, using suitable bolts.
2 Ensure that the DIN rail makes good electrical contact with the metal base of the enclosure.
3 Loosen screws (1) in the base, and move them and the associated base retention clips (2) to the bottom of the screw slot.
4 In the back of the base is an extruder slot which locates with the DIN rail (3)
5 Fit the top edge of this into the top edge of the DIN rail (3)
6 Slide the screws (1) with the associated clips (2) upwards as far as they will go towards the top of the screw slots. The angled edge of the base retaining clip (2) must locate behind the bottom edge of the DIN rail.
7 Tighten the screws.

Direct Panel Mounting

1 Remove the screws (1) and base retention clips (2).
2 Hold the base horizontally or vertically on the panel and mark the position of the two holes on the panel.
3 Drill two 5.2mm holes in the panel.
4 Using M5 bolts supplied, secure the base to the metal panel.

Warning

The equipment may not be operated without a protective earth conductor being connected to one of the earth terminals on the base unit. The earth cable should have at least the current rating of the largest power cable used to connect to the unit.

The protective earth must be terminated with a suitable tinned copper eyelet, and secured using the screw and washer supplied with the base unit, tightened to a torque of 1.2Nm (10.6 lbin).

This connection also provides a ground for EMC purposes.

For DIN rail mounting, use symmetrical DIN rail to EN50022-35 X 7.5 or 35 X 15 mounted horizontally or vertically.

Connecting the 24Vdc Power Supply

Caution

Before proceeding with any wiring on this unit, please read section on Wiring, and Safety and EMC information. It is the responsibility of the installer to ensure the safety and EMC compliance of any particular installation.

The recommended power supply unit (PSU) is the 2500P. This is a DIN rail mounted unit, which may be mounted adjacent to the base or remotely. An alternative PSU may be used provided it meets the specification below.

The IOC terminal unit contains a fuse and a reverse biased power diode. If the power is wired reverse polarity the fuse will blow and protect the complete base from damage. The fuse is not user replaceable and if it is ruptured, the terminal unit should be returned to the factory for replacement.

POWER SUPPLY SPECIFICATION

Power supply voltage:	24Vdc ± 20%
Supply ripple:	2Vp-p max
Power comsumption:	82W max per base

Note The average current drawn by each module is 100mA.
18V is the absolute lower limit for the supply voltage and the use of an 18V PSU might cause unpredictable or out of specification operation if there is an appreciable voltage drop under load.

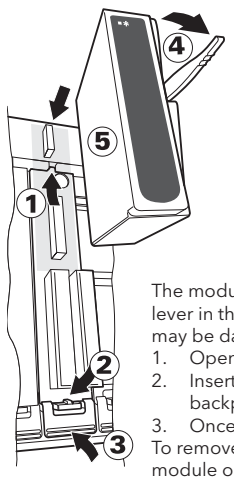
Software Upgrade Notification

Caution

The 2500 IOC version 3.6 and version 4.3 introduce additional fault action and sensor break detection parameters for Analogue Inputs.

Appropriate precautions should be taken when loading existing applications and Fault action responses should be carefully monitored.

Assembling I/O Modules & Terminal Units



TO FIT A TERMINAL UNIT

1. Locate tag on the Terminal Unit PCB with the slot in the Base.
2. Press the lower end of the Terminal Unit until secured in place by the Retention clip. This is indicated by a 'click' as the clip locks into place.
3. To remove, press the Retention clip to release the Terminal Unit and withdraw it from the slot in the Base Unit.

TO FIT A MODULE

The module must be fitted and removed with the Retaining lever in the open position, as shown, or the module case may be damaged.

1. Open the Retaining lever on the face of the module (4).
2. Insert the module (5), ensuring that it engages with the backplane and terminal unit connectors.
3. Once secure, close the retaining lever.

To remove a module, open the retaining clip and pull the module out of the base unit.

The Configuration Port

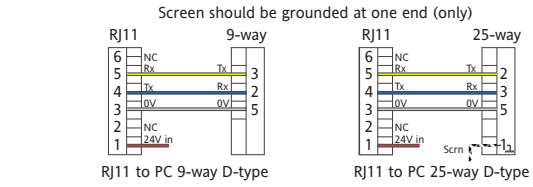
An EIA232 configuration port is provided on the front of the IOC, via an RJ11 socket. The IOC will start in configuration mode if it is powered up whilst a PC is connected to the RJ11 socket . Alternatively, the IOC can be placed into configuration mode by setting a command from the configuration software.

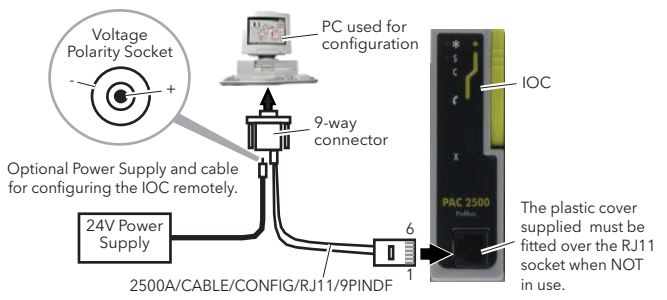
Note Exiting configuration mode must be done using LINtools or through communications.

The IOC will not control the process if:

- It is in configuration mode or standby mode
- A network watchdog time-out occurs (if configured)
- It is removed from the system

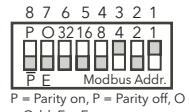
Under these conditions all modules adopt a 'safe' state, in which (unless configured otherwise), digital output modules go to an OFF state, and analogue output modules go to a minimum output state (generally 0V or 4mA). Pin connections for the configuration port are as shown below. The 24V to pin 1 is supplied via a special 9-way D-type connector and can be used when the IOC is not plugged into the base unit.





IOC Terminal unit Address Switches

MODBUS



P = Parity on, P = Parity off, O = Odd, E = Even.

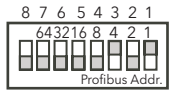
63 Modbus addresses can be set in binary using positions 1 to 6.

Parity has three possible states - none/even/odd - using SW7 and SW8.

If the address switches are all set OFF, the IOC expects to have the address set by the configuration tools.

For addresses between 65 and 255 the address switches must all be set OFF and the address set by LINtools.

PROFIBUS

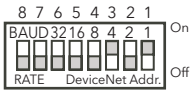


The switch gives 127 addresses from 1 to 127.

Address 0 is invalid.

Switch 8 is not normally used. If, set to ON the unit address is settable over communications.

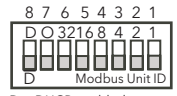
DEVICENET



The switch gives 64 addresses from 0 to 63.

SW7	SW8	Communications Speed
0	0	125K Baud
0	1	250K Baud
1	0	500K Baud
1	1	Speed and node address controlled by software (iTools)

ETHERNET



D = DHCP enabled,
D = DHCP disabled.

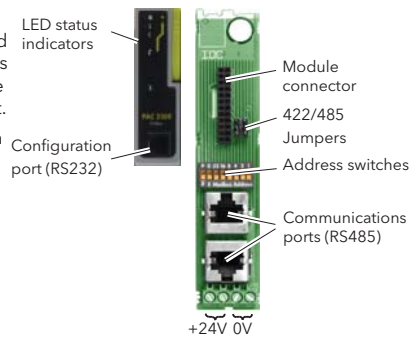
Addresses 1 to 63 are set on the rightmost 6 switches.
The leftmost switch may be used to enable DHCP Ethernet addressing.
If all switches are OFF, the Modbus address and DHCP enable will be determined by the value seen in LINtools.

Note Switch Position On.
Switch Position Off.

Modbus Communications

The Modbus network connection (RJ45 sockets) and the system power connections (standard screw terminals) are provided by the Terminal Unit.

The network connection to an operator interface unit, a PC running LINtools or 3rd party system, or to link further slave controllers or other Modbus equipment in a system.
The IOC can be configured from the Modbus network if required.



Modbus RJ45 Pin Connections to Network Connectors

RJ45 Pin	Colour	EIA485	2-wire	4-wire
1	Orange/White	B	D-	TX-
2	Orange	A	D+	TX+
3	Green/White	Gnd	Gnd	Gnd
4	Blue	N/A	N/A	N/A
5	Blue/White	N/A	N/A	N/A
6	Green	Gnd	Gnd	Gnd
7	Brown/White	B	N/A	RX-
8	Brown	A	N/A	RX+
Screen	N/A	N/A	N/A	N/A

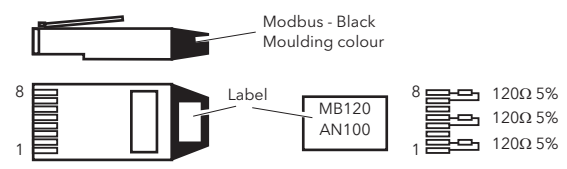
Caution

Wire colours might vary from one cable manufacturer to another.

Modbus - RJ45 Communications Line Terminator

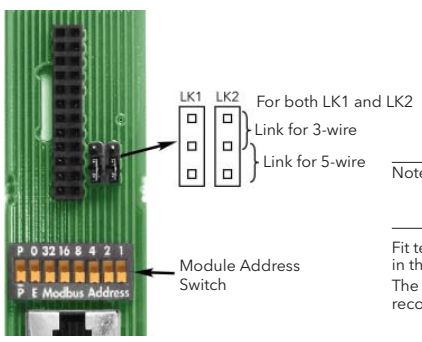
The communications line must be terminated using the appropriate load resistors. To minimise on site wiring and to provide the correct resistor values, 'Terminator' are available from your distributor.

Term/Modbus/RJ45



The terminator is plugged into the last RJ45 socket in the chain. If the operating interface is a PC or PLC this should be terminated in accordance using the appropriate load resistors.

3-wire / 5-wire Modbus communications selection



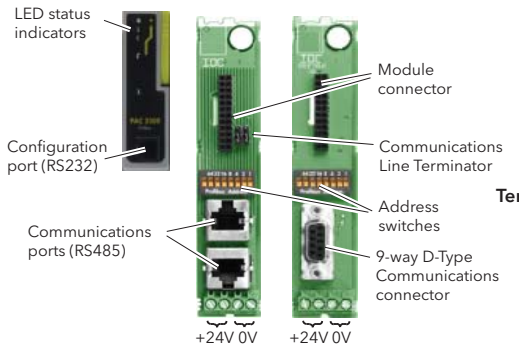
Note Earlier units were fitted with a single link for 3-wire or no link for 5-wire.

Fit termination only at the last device in the chain.
The use of the termination plug is recommended.

Profibus DP and DPv1 Communications

Connections to the Network Connectors

There are two ProfiBus TU options: a standard 9-Way D-type, and a dual RJ45 unit. The latter is similar to the Modbus terminal unit, but must not be confused; the Modbus unit includes capacitors that could affect high-speed data.



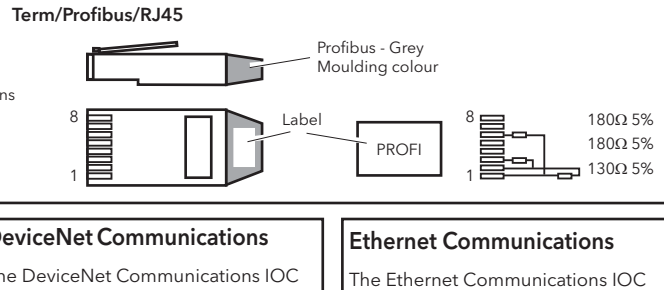
Baud rate

Baud rate is set by the Profibus Master which is able to detect the fastest Baud at which all slaves can operate. The Profibus IOC is capable of operating at 12Mbaud.

Profibus - RJ45 Pin Connections to Network Connectors

RJ45 Pin	Colour	Signal
1	Orange/White	Data 'N'
2	Orange	Data 'P'
3	Green/White	Gnd
4	Blue	N/A
5	Blue/White	N/A
6	Green	+15V
7	Brown/White	N/A
8	Brown	N/A

Term/Profibus/RJ45



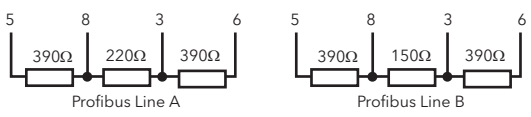
Profibus - 9-way D-Type Pin Connections to Network Connectors

9 Pin D-Type	Signal Name	Meaning
1	Shield	Shield (ground)
2	Not Used	N/A
3	RxD/TxD-P	Receive/Transmit - Data 'P'
4	Not Used	N/A
5	DGND	Data Ground
6	VP	Voltage Plus
7	Not Used	N/A
8	RxD/TxD-N	Receive/Transmit - Data 'P'
9	Not Used	N/A

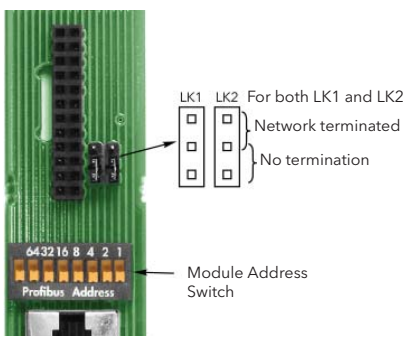
Profibus - 9-way D-Type Communications Line Terminator

For 9 pin D connectors standard ProfiBus cables should be used. These cables have special headers on the 9 pin D male connector which allow one or two cables to be connected into them and have a small termination load built in with an ON/OFF switch, which is set to ON at the two ends of the link.

The ProfiBus standard states that two types of cable, 'Line A' and 'Line B', may be used. The termination details for these two types of cable are shown below:



Profibus - RJ45 Built-in Communications Line Terminator



Note Earlier units were fitted with a single link. On these units this link had no function. Such networks should be terminated using a termination plug.

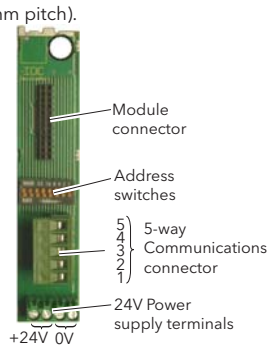
Fit termination only at the last device in the chain.

On earlier units the use of the termination plug is recommended. On later units either fit the termination plug or place both links in the upper position.

DeviceNet Communications

The DeviceNet Communications IOC is identified by the front label and the order code printed on the side label. This IOC must be used with the DeviceNet Terminal Unit.

The DeviceNet Connector is selected to comply with the DeviceNet Open Connector specification (5-way, 5.08mm pitch).



The mating DeviceNet connector (female Open Connector) is supplied to facilitate screwing user wiring. The pin functions are marked on the Terminal Unit.

Connections to Network Connectors

Pin	Function
1	V+
2	CAN_H
3	DRAIN
4	CAN_L
5	V-

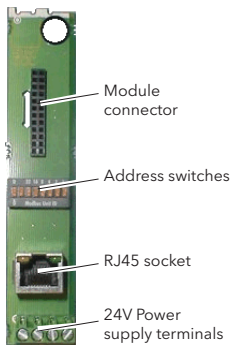
DeviceNet Terminators

The DeviceNet specification states that the bus terminators should not be included as any part of a master or slave. They are not supplied as part of the DeviceNet termination assembly.

Ethernet Communications

The Ethernet Communications IOC is identified by the front label and the order code printed on the side label. This IOC must be used with the Ethernet Terminal Unit.

The Ethernet port is a 10base T port and can be connected to a hub or switch with Cat5 cable via the standard RJ45 connector. Alternatively, an RJ45 cross-over cable may be used to connect direct to a PC 10base T network Interface Card.



Connections to RJ45 Socket

RJ45 Pin	Colour	Signal
1	Orange/White	TX+
2	Orange	TX-
3	Green/White	RX+
4	Blue	N/A
5	Blue/White	N/A
6	Green	RX-
7	Brown/White	N/A
8	Brown	N/A

Caution

Wire colours might vary from one cable manufacturer to another.