MOD-MUX

MODBUS MULTIPLEXING I/O SYSTEM

CATALOG AND DESIGN GUIDE

PROCON ELECTRONICS

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22/02/2008 V19

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1. AN OVERVIEW OF THE MOD-MUX SYSTEM

1.1 DESCRIPTION

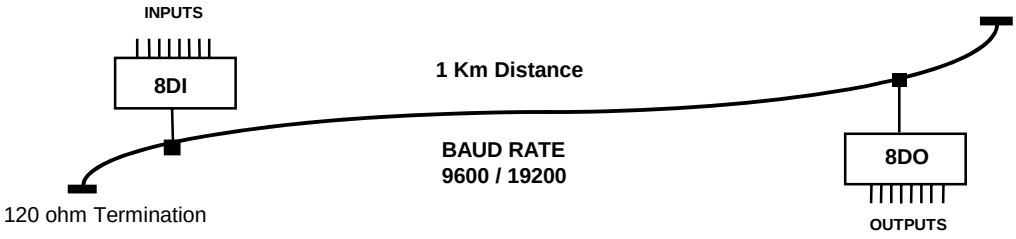
MOD-MUX is an innovative modular I/O system which provides a simple low cost solution for distributed I/O requirements. The MOD-MUX system consists of stand-alone Digital and Analog Input and Output modules which are connected together on a **RS485** two wire multi-drop network using the **MODBUS** protocol. Two baud rates are selectable, 9600 and 19200 baud. Typical response times are under 50ms.

All MOD-MUX modules plug into industry standard DIN rail mount 11 pin relay bases. All modules have a minimum isolation of 1000VAC rms between the field and logic.

There are a number of configurations in which the MOD-MUX modules may be used in a system. Some are listed as follows:

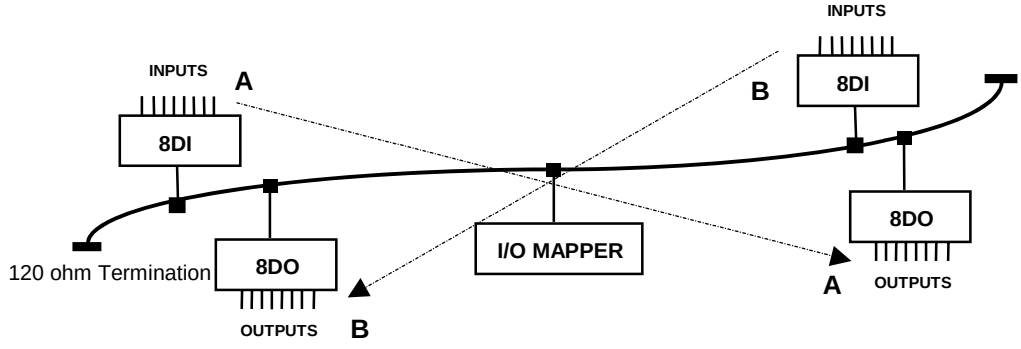
A. Simple Point to Point I/O.

This is the basic configuration were a maximum of **8 Digital or Analog Inputs** will be transmitted to **8 Digital or Analog Outputs** at a remote location on the network. The primary advantage of this configuration is cost saving where 9 wires are replaced by a single twisted pair. It may also be used on existing installations to avoid having to install additional cabling for expansion purposes.



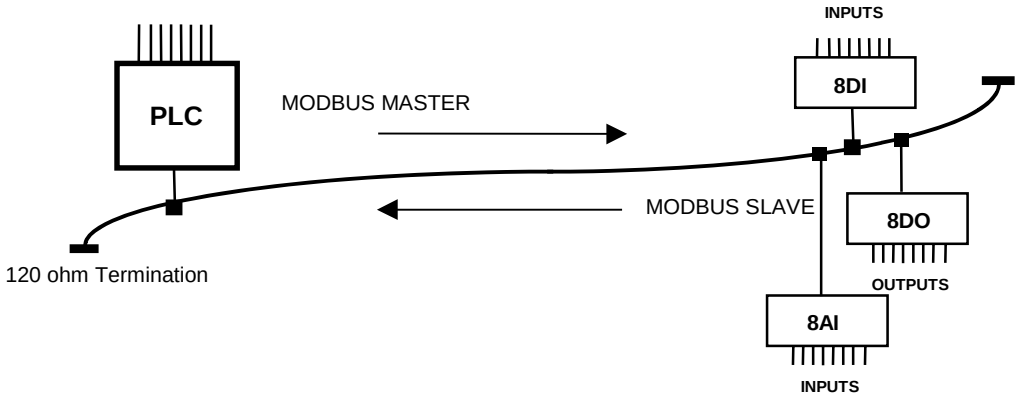
B. Complex Point to Point I/O.

This configuration allows for a larger number of I/O to be connected to the network at random points on the network. A maximum of 32 **Digital Input Modules** and 16 Analog Modules may be placed on the network, and the inputs are transmitted to a corresponding number of **Digital or Analog Output Modules**. In this configuration the Modules are set to operate in the MODBUS Slave mode and a Master Module called an **I/O MAPPER** is used to transmit the Inputs from the Input Modules to the Outputs on the Output Modules.



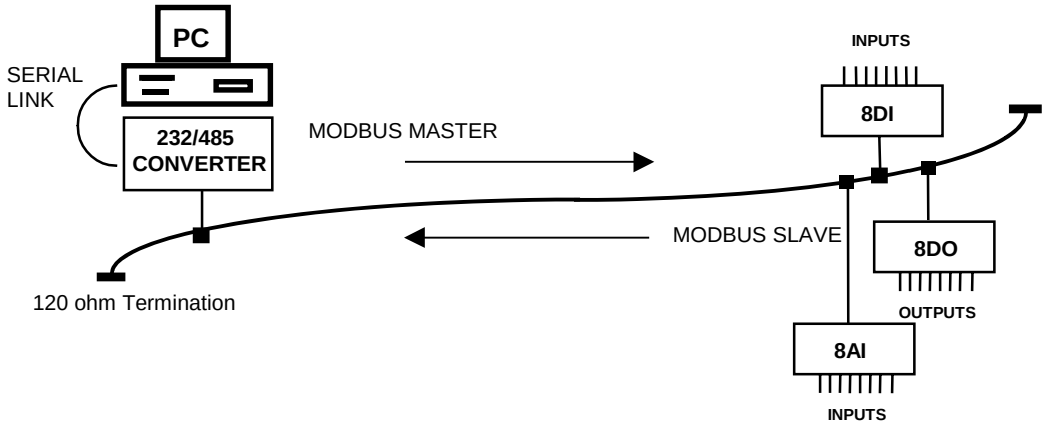
C. I/O Expansion.

There are a number of devices such as **PLC**'s (Programmable Logic Controllers) which have a MODBUS Communications facility available. When configured as a MODBUS Master, and attached to the RS485 network, MOD-MUX Modules may be used as remote I/O reducing cabling costs and increasing the I/O capability of the PLC.



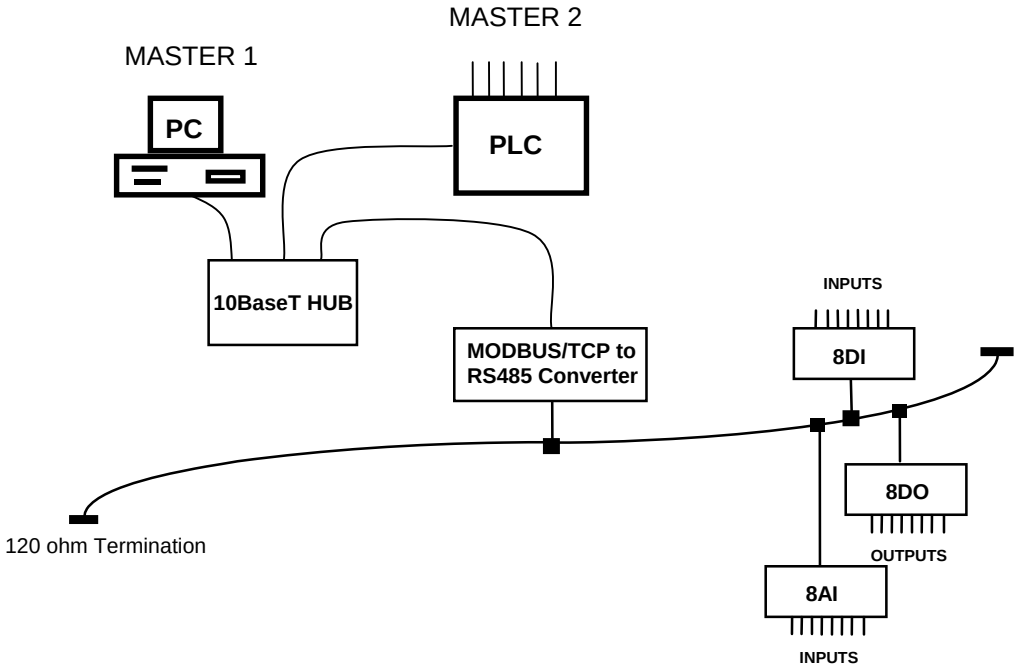
D. Data Acquisition.

Another use of the MOD-MUX Modules is for Data Acquisition where a **PC** (Personal Computer) is connected to the Network. Many SCADA software packages support the MODBUS Master Protocol and can hence retrieve data from Input Modules or send data to Output Modules. The **serial port** of the PC is connected to an **RS232/RS485 Converter** which in turn is connected to the Network.



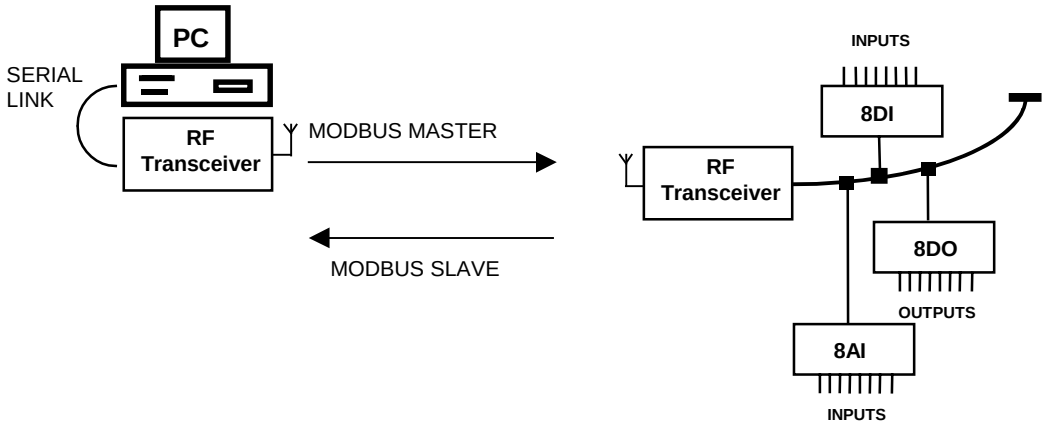
E. Ethernet.

Procon has developed a Converter which connects to a standard 10BaseT Ethernet network. The Converter is given a network IP address and can be accessed by up to 4 PC's at a time. The converter enables PC's and PLC's using the MODBUS/TCP protocol to communicate with the range of MOD-MUX modules.



F. Data Acquisition / Control Using RF Telemetry.

MOD-MUX Modules can be connected to a PC or PLC for remote monitoring and control via radio telemetry using standard RF transceivers. There are many transceivers available on the market which can transparently be used with MOD-MUX. Contact Procon for more details.



1.2 MODULE SELECTION TABLE

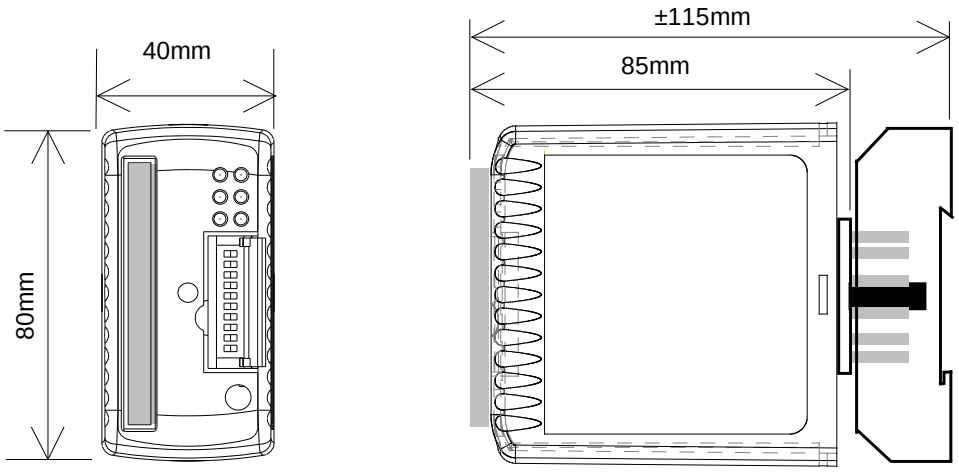
MODEL	MODULE TYPE
POWER SUPPLIES	
MMPSU150	220VAC / 2 x 12Vdc UNREG.POWER SUPPLY 150mA
MMPSU151	220VAC / 24Vdc UNREG.POWER SUPPLY 150mA
I/O MODULES	
MM8DI	8 DIGITAL INPUT MODULE INCLUDING 8 COUNTERS
MM8DIB	8 DIGITAL INPUT MODULE WITH BATTERY BACKED COUNTERS
MM16DI	16 DIGITAL INPUT MODULE INCLUDING 8 COUNTERS
MM8DO	8 DIGITAL OUTPUT MODULE
MM16DO	16 DIGITAL OUTPUT MODULE
MM4DIO	4 DIGITAL INPUT / 4 DIGITAL OUTPUT MODULE
MM8DIO	8 DIGITAL INPUT / 8 DIGITAL OUTPUT MODULE
MM4RO	4 RELAY OUTPUT MODULE
MM8AI/V	8 ANALOG INPUT 0 - 5V / 1 - 5V / 0 - 10V / 2 - 10V
MM8AI/V ISO	8 ANALOG INPUT 0 - 5V / 1 - 5V / 0 - 10V / 2 - 10V FULLY ISOLATED
MM8AI/I	8 ANALOG INPUT 0 - 20mA / 4 - 20mA
MM8AI/I ISO	8 ANALOG INPUT 0 - 20mA / 4 - 20mA FULLY ISOLATED
MM8AO	8 ANALOG OUTPUT MODULE 0(4) – 20mA
MM8VO	8 ANALOG OUTPUT MODULE 0(2) – 10V
MM8TC	8 THERMOCOUPLE INPUT MODULE INCL. 0 - 50mV I/P
MM8TCISO	8 TC INPUT MODULE INCL. 0 - 50mV I/P FULLY ISOLATED
MM6RTD	6 RTD INPUT MODULE - PT100 & Ni120
MM6RTDB	6 RTD INPUT MODULE - PT1000
MMDIOAIO	2 RTD I/P, 2 ANALOG INPUT 0(4) - 20mA / 0(2) - 10V, 1 ANALOG OUTPUT 0(4) - 20mA / 0(2) - 10V, 5 DIGITAL INPUTS, 2 DIGITAL OUTPUTS
COMMUNICATION MODULES	
MMTCPCONV	MODBUS/TCP RS485 CONVERTER
MMINTCONV	RS232 / RS485 INTELLIGENT CONVERTER
MMINTBCONV	RS232 / RS485 INTELLIGENT BOXED CONVERTER
MM485REP	RS485 REPEATER
MM232OPTO	RS232 / FIBRE OPTIC CONVERTER 850nm
MM485OPTO	RS485 / FIBRE OPTIC CONVERTER 850nm
MODBUS MASTERS	
MMI/OMAP	I/O MAPPER
ACCESSORIES	
MM11PINBASE	11 PIN DIN RAIL MOUNT BASE

MODEL	MODULE TYPE
MISCELLANEOUS	
MM232/485CONV	RS232/RS485(422) ISOLATED CONVERTER
DU02	DIAGNOSTIC UNIT
MODBUS TCP MODULES	
MMTCP16DI	16 DIGITAL INPUT MODULE WITH 8 COUNTERS
MMTCP16DO	16 DIGITAL OUTPUT MODULE
MMTCP8DIO	8 DIGITAL INPUT / 8 DIGITAL OUTPUT MODULE
MMTCP8AI/V	8 ANALOG INPUT 0-5V / 1-5V / 0-10V / 2-10V
MMTCP8AI/I	8 ANALOG INPUT 0-20mA / 4-20mA
MMTCP8AO	8 ANALOG OUTPUT 0-20mA
MMTCP8VO	8 ANALOG OUTPUT 0-10V
MMTCP8TC	8 THERMOCOUPLE INPUT MODULE
MMTCP8TCISO	8 TC INPUT MODULE INCL. 0 - 50mV I/P FULLY ISOLATED
MMTCP6RTD	6 RTD INPUT MODULE PT100, Ni120
MMTCPDIOAIO	2 RTD I/P, 2 ANALOG INPUT 0(4) - 20mA / 0(2) - 10V, 1 ANALOG OUTPUT 0(4) - 20mA / 0(2) - 10V, 5 DIGITAL INPUTS, 2 DIGITAL OUTPUTS
MMTCPCONV	MODBUS TCP / RS485 CONVERTER
MMTCPBCONV	MODBUS TCP / Serial CONVERTER

2. MOD-MUX GENERAL INFORMATION

2.1 PHYSICAL DIMENSIONS

The MOD-MUX enclosure is shown below. The module plugs into an industry standard 11 pin relay base. This base is normally clipped onto a DIN rail. Field wiring is on the front of the module via a separate plug in connector.



External dimensions of a typical module. Extra space will be required in the front for field wiring.(Approx. 25mm)

2.2 GROUNDING/SHIELDING

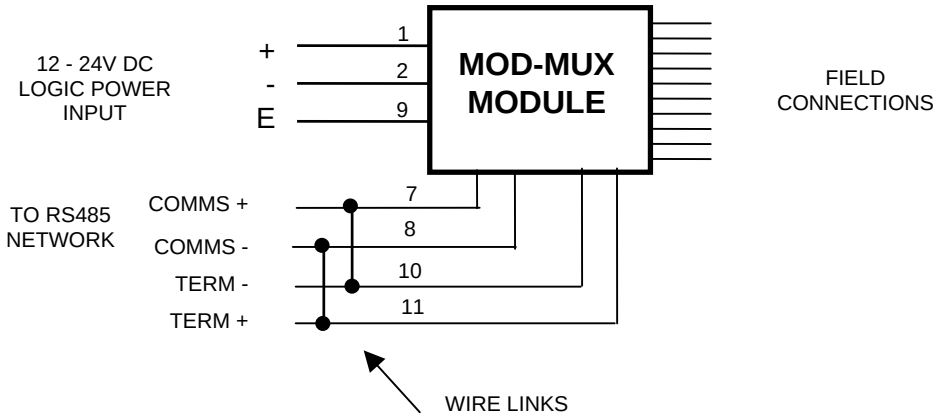
In most cases, MOD-MUX modules will be installed in an enclosure along with other devices which generate electromagnetic radiation. Examples of these devices are relays and contactors, transformers, motor controllers etc. This electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the module causing negative effects on the system. Appropriate grounding, shielding and other protective steps should be taken at the installation stage to prevent these effects. These protective steps include control cabinet grounding, module grounding, cable shield grounding, protective elements for electromagnetic switching devices, correct wiring as well as consideration of cable types and their cross sections.

2.3 NETWORK TERMINATION

Transmission line effects often present a problem on data communication networks. These problems include reflections and signal attenuation.

To eliminate the presence of reflections from the end of the cable, the cable must be terminated at both ends with a resistor across the line equal to its characteristic impedance. Both ends must be terminated since the direction of propagation is bidirectional. In the case of an RS485 twisted pair cable this termination is typically 120 ohms.

Some of the MOD-MUX modules have built in termination resistors which are connected to the network by linking connections on the 11 pin relay base as shown in the diagram below. **Note that only the modules at the end of the network should have the terminations linked onto the network.**



2.4 CPU DIAGNOSTICS

The MOD-MUX I/O modules have a built in watchdog circuit which is used to monitor the microprocessor. The POWER LED flashing at ± 1 second intervals indicates that the microprocessor is faulty and must be repaired.

2.5 NETWORK DIAGNOSTICS

The built in termination resistor networks provide a DC bias voltage which ensures that the output of the receiver circuits in the MOD-MUX modules maintain a known output when there is no communication activity on the network. Each MOD-MUX I/O module has a RXD LED which indicates the state of the RS485 network.

When power is applied to a module the RXD LED will flash on and should then go off. This indicates that the module has been correctly connected to the network. If the RXD LED remains on it could be due to the module being wired incorrectly and the RS485 wires being reversed, or that the built in terminator (as described in section 2.3) has not been linked across the network.

2.6 DIP SWITCH TABLE

The following table assists with the setting up of DIP switches for the required NODE ID.

NODE ID	DIP SWITCH SETTINGS						
	SW1	**SW2**	**SW3**	**SW4**	**SW5**	**SW6**	**SW7**
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON	OFF	OFF
22	OFF	ON	ON	OFF	ON	OFF	OFF
23	ON	ON	ON	OFF	ON	OFF	OFF
24	OFF	OFF	OFF	ON	ON	OFF	OFF
25	ON	OFF	OFF	ON	ON	OFF	OFF
26	OFF	ON	OFF	ON	ON	OFF	OFF
27	ON	ON	OFF	ON	ON	OFF	OFF
28	OFF	OFF	ON	ON	ON	OFF	OFF
29	ON	OFF	ON	ON	ON	OFF	OFF
30	OFF	ON	ON	ON	ON	OFF	OFF
31	ON	ON	ON	ON	ON	OFF	OFF
32	OFF	OFF	OFF	OFF	OFF	ON	OFF
33	ON	OFF	OFF	OFF	OFF	ON	OFF
34	OFF	ON	OFF	OFF	OFF	ON	OFF
35	ON	ON	OFF	OFF	OFF	ON	OFF
36	OFF	OFF	ON	OFF	OFF	ON	OFF
37	ON	OFF	ON	OFF	OFF	ON	OFF
38	OFF	ON	ON	OFF	OFF	ON	OFF
39	ON	ON	ON	OFF	OFF	ON	OFF
40	OFF	OFF	OFF	ON	OFF	ON	OFF
41	ON	OFF	OFF	ON	OFF	ON	OFF
42	OFF	ON	OFF	ON	OFF	ON	OFF
43	ON	ON	OFF	ON	OFF	ON	OFF
44	OFF	OFF	ON	ON	OFF	ON	OFF
45	ON	OFF	ON	ON	OFF	ON	OFF
46	OFF	ON	ON	ON	OFF	ON	OFF
47	ON	ON	ON	ON	OFF	ON	OFF
48	OFF	OFF	OFF	OFF	ON	ON	OFF

49	ON	OFF	OFF	OFF	ON	ON	OFF
NODE ID	**DIP SWITCH SETTINGS**						
	SW1	**SW2**	**SW3**	**SW4**	**SW5**	**SW6**	**SW7**
50	OFF	ON	OFF	OFF	ON	ON	OFF
51	ON	ON	OFF	OFF	ON	ON	OFF
52	OFF	OFF	ON	OFF	ON	ON	OFF
53	ON	OFF	ON	OFF	ON	ON	OFF
54	OFF	ON	ON	OFF	ON	ON	OFF
55	ON	ON	ON	OFF	ON	ON	OFF
56	OFF	OFF	OFF	ON	ON	ON	OFF
57	ON	OFF	OFF	ON	ON	ON	OFF
58	OFF	ON	OFF	ON	ON	ON	OFF
59	ON	ON	OFF	ON	ON	ON	OFF
60	OFF	OFF	ON	ON	ON	ON	OFF
61	ON	OFF	ON	ON	ON	ON	OFF
62	OFF	ON	ON	ON	ON	ON	OFF
63	ON	ON	ON	ON	ON	ON	OFF
64	OFF	OFF	OFF	OFF	OFF	OFF	ON
65	ON	OFF	OFF	OFF	OFF	OFF	ON
66	OFF	ON	OFF	OFF	OFF	OFF	ON
67	ON	ON	OFF	OFF	OFF	OFF	ON
68	OFF	OFF	ON	OFF	OFF	OFF	ON
69	ON	OFF	ON	OFF	OFF	OFF	ON
70	OFF	ON	ON	OFF	OFF	OFF	ON
71	ON	ON	ON	OFF	OFF	OFF	ON
72	OFF	OFF	OFF	ON	OFF	OFF	ON
73	ON	OFF	OFF	ON	OFF	OFF	ON
74	OFF	ON	OFF	ON	OFF	OFF	ON
75	ON	ON	OFF	ON	OFF	OFF	ON
76	OFF	OFF	ON	ON	OFF	OFF	ON
77	ON	OFF	ON	ON	OFF	OFF	ON
78	OFF	ON	ON	ON	OFF	OFF	ON
79	ON	ON	ON	ON	OFF	OFF	ON
80	OFF	OFF	OFF	OFF	ON	OFF	ON
81	ON	OFF	OFF	OFF	ON	OFF	ON
82	OFF	ON	OFF	OFF	ON	OFF	ON
83	ON	ON	OFF	OFF	ON	OFF	ON
84	OFF	OFF	ON	OFF	ON	OFF	ON
85	ON	OFF	ON	OFF	ON	OFF	ON
86	OFF	ON	ON	OFF	ON	OFF	ON
87	ON	ON	ON	OFF	ON	OFF	ON
88	OFF	OFF	OFF	ON	ON	OFF	ON
89	ON	OFF	OFF	ON	ON	OFF	ON
90	OFF	ON	OFF	ON	ON	OFF	ON
91	ON	ON	OFF	ON	ON	OFF	ON
92	OFF	OFF	ON	ON	ON	OFF	ON
93	ON	OFF	ON	ON	ON	OFF	ON
94	OFF	ON	ON	ON	ON	OFF	ON
95	ON	ON	ON	ON	ON	OFF	ON
96	OFF	OFF	OFF	OFF	OFF	ON	ON
97	ON	OFF	OFF	OFF	OFF	ON	ON
98	OFF	ON	OFF	OFF	OFF	ON	ON
99	ON	ON	OFF	OFF	OFF	ON	ON
100	OFF	OFF	ON	OFF	OFF	ON	ON
101	ON	OFF	ON	OFF	OFF	ON	ON
102	OFF	ON	ON	OFF	OFF	ON	ON
103	ON	ON	ON	OFF	OFF	ON	ON

104	OFF	OFF	OFF	ON	OFF	ON	ON
NODE ID	**DIP SWITCH SETTINGS**						
	SW1	**SW2**	**SW3**	**SW4**	**SW5**	**SW6**	**SW7**
105	ON	OFF	OFF	ON	OFF	ON	ON
106	OFF	ON	OFF	ON	OFF	ON	ON
107	ON	ON	OFF	ON	OFF	ON	ON
108	OFF	OFF	ON	ON	OFF	ON	ON
109	ON	OFF	ON	ON	OFF	ON	ON
110	OFF	ON	ON	ON	OFF	ON	ON
111	ON	ON	ON	ON	OFF	ON	ON
112	OFF	OFF	OFF	OFF	ON	ON	ON
113	ON	OFF	OFF	OFF	ON	ON	ON
114	OFF	ON	OFF	OFF	ON	ON	ON
115	ON	ON	OFF	OFF	ON	ON	ON
116	OFF	OFF	ON	OFF	ON	ON	ON
117	ON	OFF	ON	OFF	ON	ON	ON
118	OFF	ON	ON	OFF	ON	ON	ON
119	ON	ON	ON	OFF	ON	ON	ON
120	OFF	OFF	OFF	ON	ON	ON	ON
121	ON	OFF	OFF	ON	ON	ON	ON
122	OFF	ON	OFF	ON	ON	ON	ON
123	ON	ON	OFF	ON	ON	ON	ON
124	OFF	OFF	ON	ON	ON	ON	ON
125	ON	OFF	ON	ON	ON	ON	ON
126	OFF	ON	ON	ON	ON	ON	ON
127	ON	ON	ON	ON	ON	ON	ON

3. MOD-MUX HARDWARE

3.1 POWER SUPPLIES

3.1.1 DESCRIPTION

There are two power supplies in the MOD-MUX product range.

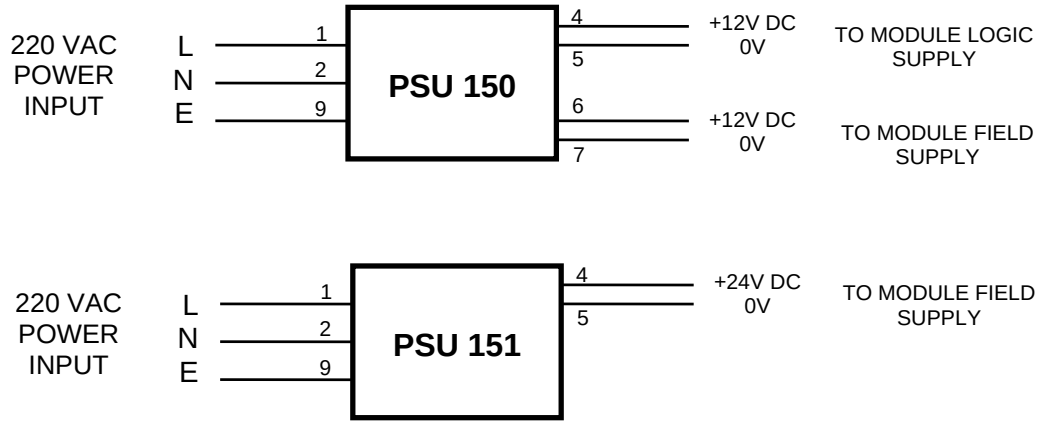
The MMPSU150 is a dual isolated unregulated 12VDC power supply designed such that one power supply output is connected to the logic supply input on a MOD-MUX I/O module whilst the second supply output is connected to the field supply input on the MOD-MUX I/O module. This is done to ensure isolation between the field and logic on all modules.

The MMPSU151 is a single unregulated 24VDC power supply and is used to power field wiring such as dry contacts for inputs or the output of the MM8AO current output module.

3.1.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 3VA 50/60 Hz
Outputs:	MMPSU150 - 2 X Isolated 12 Vdc UNREG @ 300mA each MMPSU151 - 1 X 24 Vdc UNREG @ 300mA
Connector:	11 Pin Connector on rear of unit

3.1.3 WIRING



3.2 MM8DI - DIGITAL INPUTS WITH COUNTERS

3.2.1 DESCRIPTION

The MM8DI module is an 8 channel digital input module. The inputs are isolated from the logic by bi-directional opto-couplers. The inputs are divided into 2 isolated groups of 4 inputs each. This allows for many configurations in which the input module may be used. One such configuration could be where one group is connected as common positive and the second group connected as common negative.

The counters operate in three modes.

In **mode 0** all the counters are disabled.

In **mode 1** all eight inputs (1-8) have internal counters associated with them. These counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method. The counters can also be reset automatically when read. This is done by setting on DIP switch 9 on the front panel .

In **mode 2** the inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1. In the same way, inputs 3&4 operate counter 2, inputs 5&6 operate counter 3 and inputs 7&8 operate counter 4.

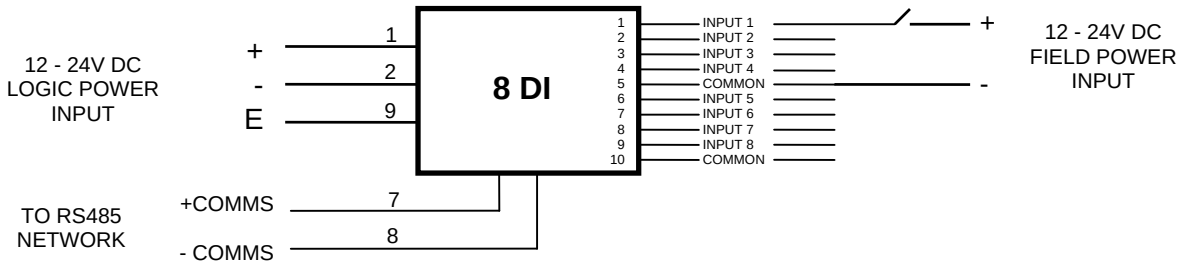
Note: The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

3.2.2 SPECIFICATIONS

Power Supply:	10 -26 Vdc @ 50 mA
Inputs:	
Supply Voltage	10 - 26 Vdc
Supply Current	8 X 4 mA @ 12Vdc / 8 X 8 mA @ 24Vdc
Isolation	1500Vrms between field and logic
Counters:	
Inputs	1 to 8
Resolution	32 Bits
Frequency	500 Hz (Max)
Pulse Width	1ms (min)
Connector:	11 Pin Connector on rear of unit 10 Way screw connector on front

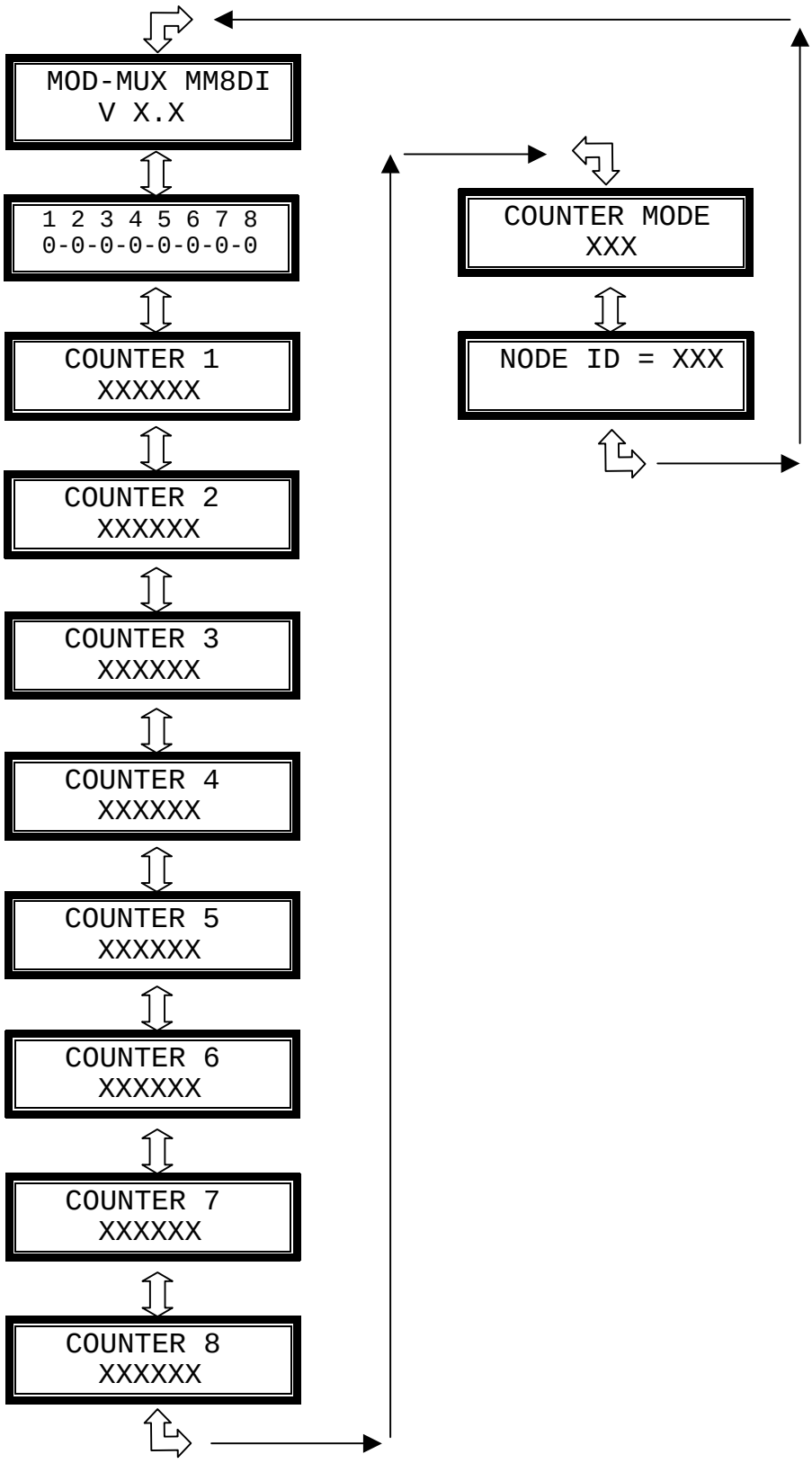
3.2.3 WIRING



3.2.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	INVERT	When switched ON the status of the inputs is inverted in the Modbus status register (30002).
9	CNTR	When switched ON the counters are automatically reset to zero when read.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.2.5 DIAGNOSTIC UNIT MENU FORMAT



3.3 MM8DIB - DIGITAL INPUTS WITH BATTERY BACKED COUNTERS

3.3.1 DESCRIPTION

The MM8DIB module is an 8 channel digital input module. The inputs are isolated from the logic by bi-directional opto-couplers. The inputs are divided into 2 isolated groups of 4 inputs each. This allows for many configurations in which the input module may be used. One such configuration could be where one group is connected as common positive and the second group connected as common negative.

All eight inputs (1-8) have internal counters associated with them. These counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method. The counters can also be reset automatically when read. This is done by setting on DIP switch 9 on the front panel.

A filter register is provided for each input channel. The user can write a value to this register between 1 and 255. The input filter time is this value X 5milliseconds. If a zero (0) is written to this register the counter will be disabled.

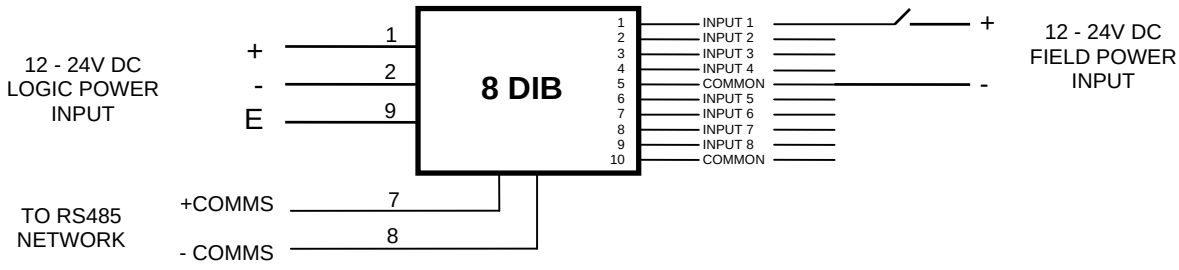
Note: The count values are battery backed-up and will not be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

3.3.2 SPECIFICATIONS

Power Supply:	10 -26 Vdc @ 50 mA
Inputs:	
Supply Voltage	10 - 26 Vdc
Supply Current	8 X 4 mA @ 12Vdc / 8 X 8 mA @ 24Vdc
Isolation	1500Vrms between field and logic
Counters:	
Inputs	1 to 8
Resolution	32 Bits
Frequency	50 Hz (Max)
Pulse Width	10ms (min)
Connector:	11 Pin Connector on rear of unit 10 Way screw connector on front

3.3.3 WIRING



3.3.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
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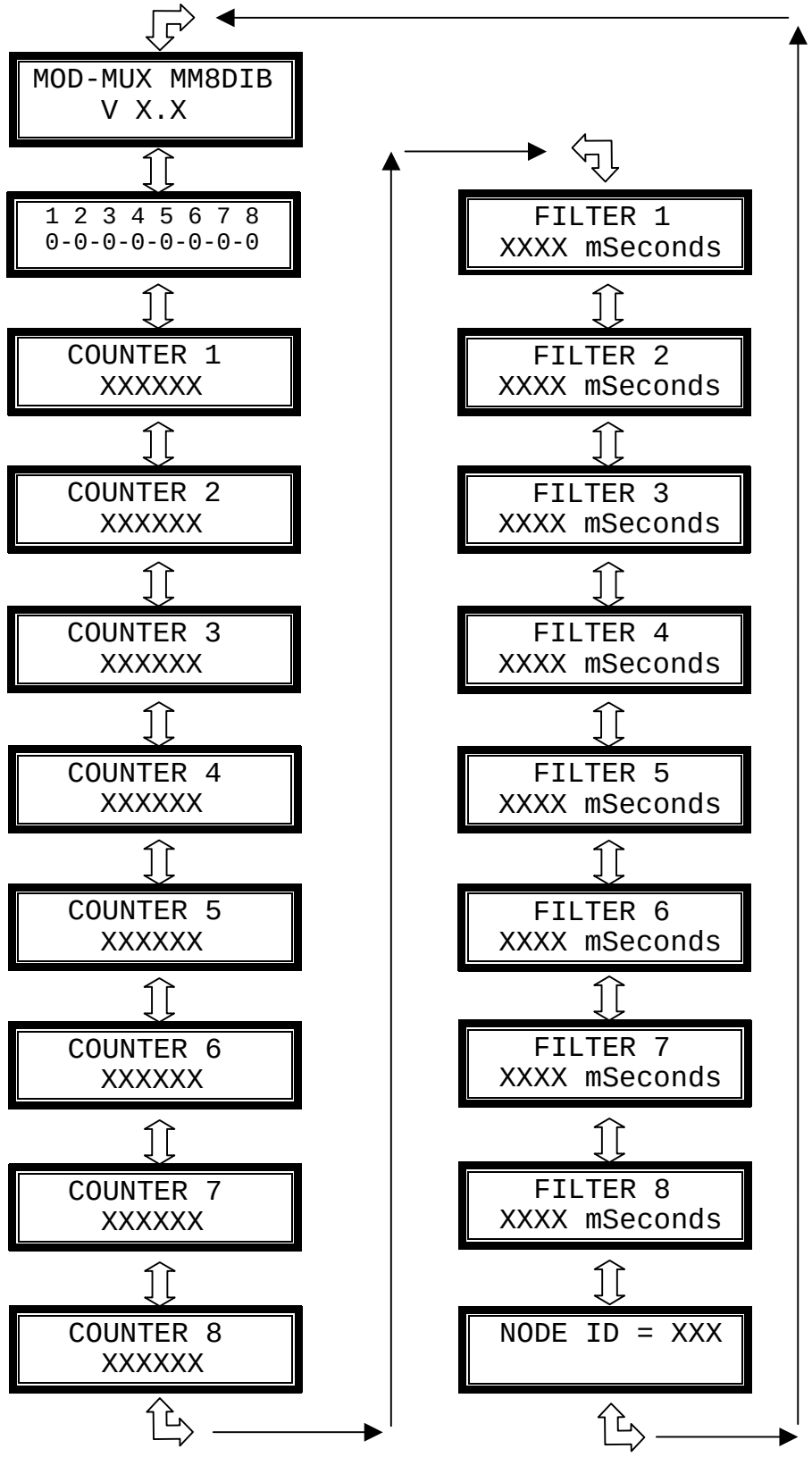
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	INVERT	When switched ON the status of the inputs is inverted in the Modbus status register (30002).
9	CNTR	When switched ON the counters are automatically reset to zero when read.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.3.5 DIAGNOSTIC UNIT MENU FORMAT



3.4 MM16DI - DIGITAL INPUTS WITH COUNTERS

3.4.1 DESCRIPTION

The MM16DI module is a 16 channel digital input module. The inputs are isolated from the logic by bi-directional opto-couplers. The inputs are divided into 2 isolated groups of 8 inputs each. This allows for many configurations in which the input module may be used. One such configuration could be where one group is connected as common positive and the second group connected as common negative.

The counters operate in three modes.

In **mode 0** all the counters are disabled.

In **mode 1** the first eight inputs (1-8) have internal counters associated with them. These counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method. The counters can also be reset automatically when read. This is done by setting on DIP switch 9 on the front panel.

In **mode 2** the inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1. In the same way, inputs 3&4 operate counter 2, inputs 5&6 operate counter 3 and inputs 7&8 operate counter 4.

Note: The count values are not battery backed-up and will be lost if power is turned off.

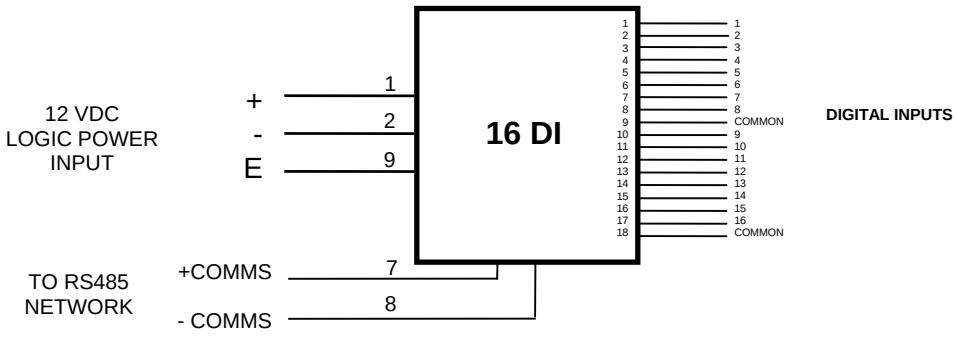
The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

3.4.2 SPECIFICATIONS

Power Supply:	10 -26 Vdc @ 50 mA
Inputs:	
Supply Voltage	10 - 26 Vdc
Supply Current	16 X 4 mA @ 12Vdc / 16 X 8 mA @ 24Vdc
Isolation	1500Vrms between field and logic
Counters:	
Inputs	1 to 8
Resolution	32 Bits
Frequency	500 Hz (Max)
Pulse Width	1ms (min)
Connector:	11 Pin Connector on rear of unit 10 Way screw connector on front

Note: Inputs 1 to 8 are used as both digital inputs and counter inputs.

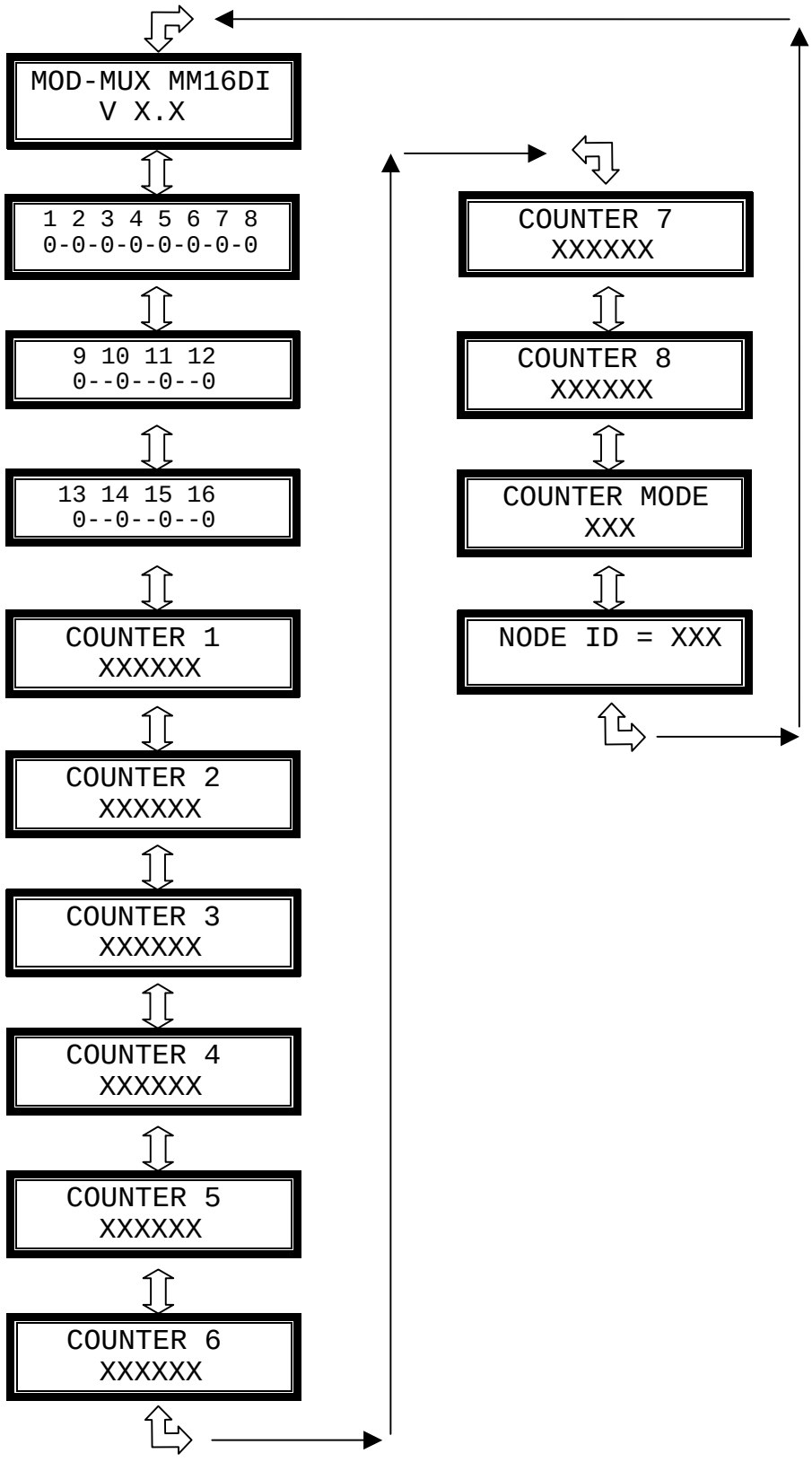
3.4.3 WIRING



3.4.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches
2	NODE ID	1 to 7.
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	INVERT	When switched ON the status of the inputs is inverted in the Modbus status register (30002).
9	CNTR	When switched ON the counters are automatically reset to zero when read.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.4.5 DIAGNOSTIC UNIT MENU FORMAT



3.5 MM8DO - DIGITAL OUTPUTS

3.5.1 DESCRIPTION

This module has 8 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal.

The module may be used as either a slave or master on the Modbus network. When used with a PC or PLC the module will be configured as a slave. When used with a MM8DI module in a point-to-point configuration, the DIP switch 9 must be turned on to set the module up as a master. In this mode the MM8DO module will automatically read the information from the MM8DI module and write the input status to the outputs.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

3.5.2 SPECIFICATIONS

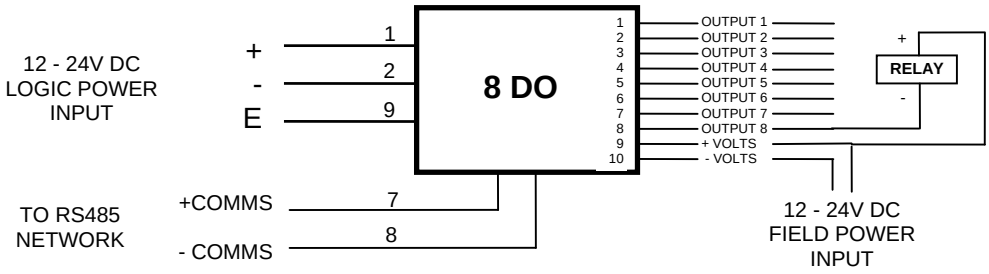
Power Supply:	(Logic)	10 - 26 Vdc @ 50 mA
	(Field)	10 - 26 Vdc @ 25 mA

Outputs: Open Collector NPN

Maximum Voltage	36 Vdc
Maximum Current	100 mA
Isolation	1500Vrms between field and logic
Vceon	1.1V Max.

Connector:	11 Pin Connector on rear of unit
	10 Way screw connector on front

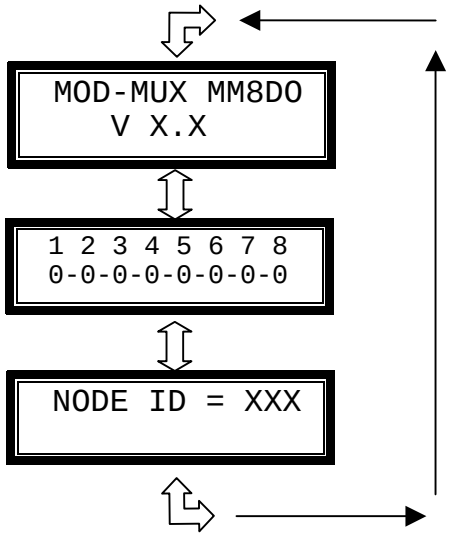
3.5.3 WIRING



3.5.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	MODE	Selects Master or Slave Mode. Master mode is used when the module is connected to a single digital input module. Slave mode is used when the module is to be polled either by the I/O Mapper or by a PC.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.5.5 DIAGNOSTIC UNIT MENU FORMAT



3.6 MM16DO - DIGITAL OUTPUTS

3.6.1 DESCRIPTION

This module has 16 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal.

The module may be used as either a slave or master on the Modbus network. When used with a PC or PLC the module will be configured as a slave. When used with a MM16DI module in a point-to-point configuration, the DIP switch 9 must be turned on to set the module up as a master. In this mode the MM16DO module will automatically read the information from the MM16DI module and write the input status to the outputs.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

3.6.2 SPECIFICATIONS

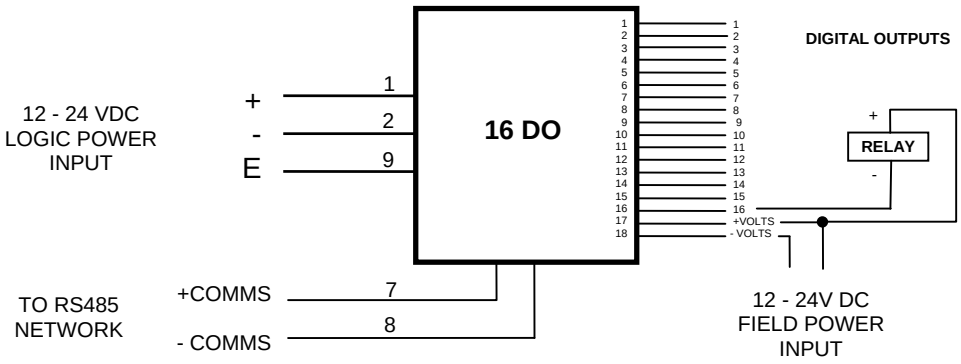
Power Supply:	(Logic)	10 - 26 Vdc @ 50 mA
	(Field)	20 - 26 Vdc @ 50 mA

Outputs: Open Collector NPN

Maximum Voltage	36 Vdc
Maximum Current	100 mA
Isolation	1500Vrms between field and logic
Vceon	1.1V Max.

Connector:	11 Pin Connector on rear of unit
	18 Way screw connector on front

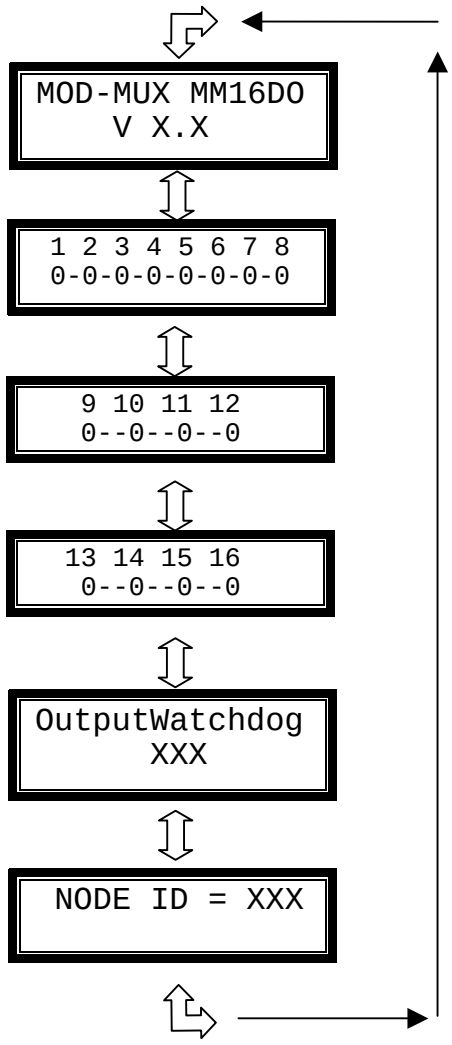
3.6.3 WIRING



3.6.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	MODE	Selects Master or Slave Mode. Master mode is used when the module is connected to a single digital input module. Slave mode is used when the module is to be polled either by the I/O Mapper or by a PC.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.6.5 DIAGNOSTIC UNIT MENU FORMAT



3.7 MM4DIO - DIGITAL INPUTS / OUTPUTS

3.7.1 DESCRIPTION

The MM4DIO module is an 4 channel digital input and 4 channel digital output module.

The inputs are isolated from the logic by bi-directional opto-couplers. The common is connected internally to either the -volts or +volts field power supply terminals using a jumper link which is situated inside the housing.

The inputs have internal counters associated with them. These counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method. The counters can also be reset automatically when read. This is done by setting on DIP switch 9 on the front panel.

Note: The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

The 4 digital outputs are open collector (NPN). The outputs may be used to drive lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

3.7.2 SPECIFICATIONS

Power Supply:	(Logic)	10 - 26 Vdc @ 50 mA
	(Field)	20 - 26 Vdc @ 25 mA

Inputs:

Supply Voltage	10 - 26 Vdc
Supply Current	4 X 4 mA @ 12Vdc / 4 X 8 mA @ 24Vdc
Isolation	1500Vrms between field and logic

Counters:

Resolution	32 Bits
Frequency	500 Hz (Max)
Pulse Width	1ms (min)

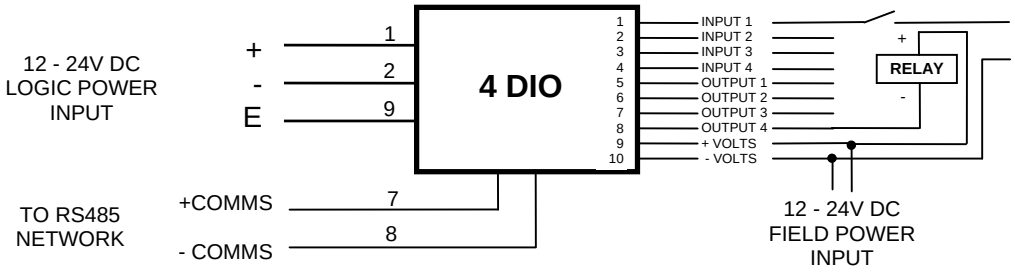
Outputs: Open Collector NPN

Maximum Voltage	36 Vdc
Maximum Current	100 mA
Isolation	1500Vrms between field and logic
Vceon	1.1V Max.

Connector: 11 Pin Connector on rear of unit
10 Way screw connector on front

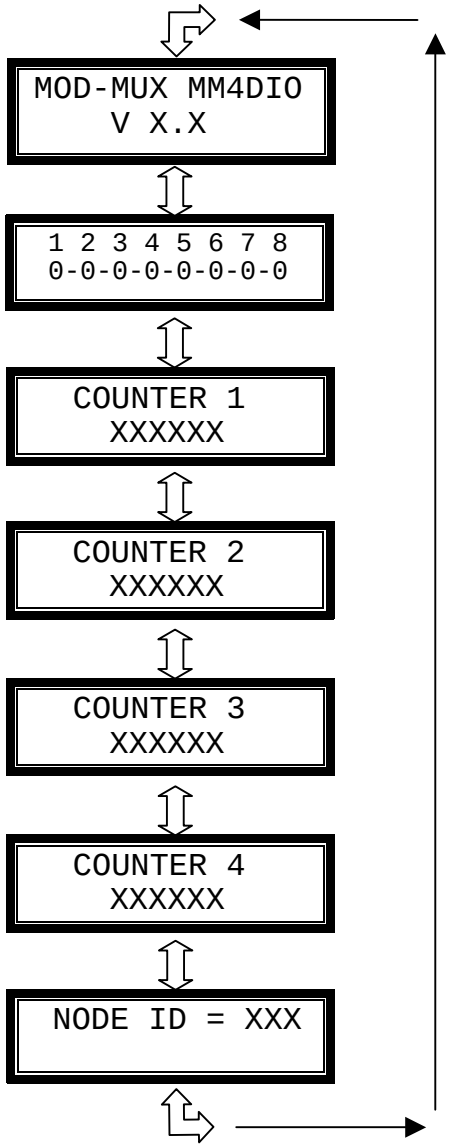
Note: Inputs 1 to 4 are used as both digital inputs and counter inputs.

3.7.3 WIRING



SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches
2	NODE ID	1 to 7.
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	INVERT	When switched ON the status of the inputs is inverted in the Modbus status register (30002).
9	CNTR	When switched ON the counters are automatically reset to zero when read.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.7.4 DIAGNOSTIC UNIT MENU FORMAT



3.8 MM8DIO - DIGITAL INPUTS / OUTPUTS

3.8.1 DESCRIPTION

The MM8DIO module is an 8 channel digital input and 8 channel digital output module.

The inputs are isolated from the logic by bi-directional opto-couplers. The common is connected internally to either the -volts or +volts field power supply terminals using a jumper link which is situated inside the housing.

The inputs have internal counters associated with them. These counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method. The counters can also be reset automatically when read. This is done by setting on DIP switch 9 on the front panel.

Note: The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

The 8 digital outputs are open collector (NPN). The outputs may be used to drive lamps or external relays when more drive capability is required. The outputs are isolated from the logic and they share a common negative terminal.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

3.8.2 SPECIFICATIONS

Power Supply:	(Logic)	10 - 26 Vdc @ 50 mA
	(Field)	20 - 26 Vdc @ 50 mA

Inputs:

Supply Voltage	10 - 26 Vdc
Supply Current	8 X 4 mA @ 12Vdc / 8 X 8 mA @ 24Vdc
Isolation	1500Vrms between field and logic

Counters:

Resolution	32 Bits
Frequency	500 Hz (Max)
Pulse Width	1ms (min)

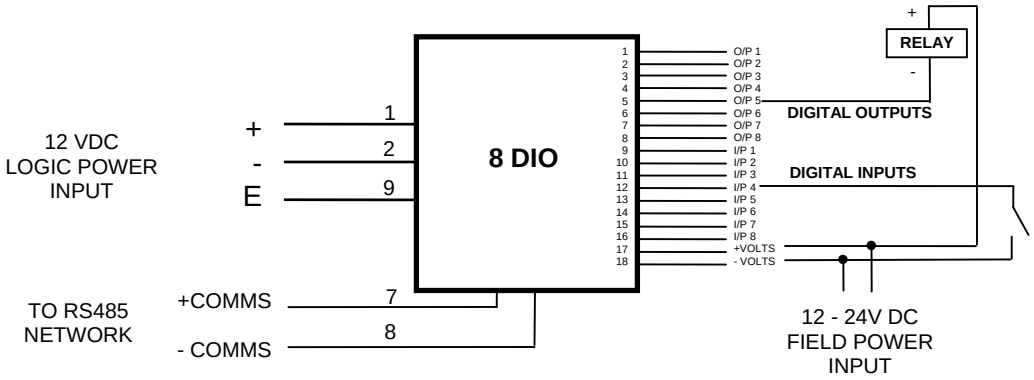
Outputs: Open Collector NPN

Maximum Voltage	36 Vdc
Maximum Current	100 mA
Isolation	1500Vrms between field and logic
Vceon	1.1V Max.

Connector: 11 Pin Connector on rear of unit
18 Way screw connector on front

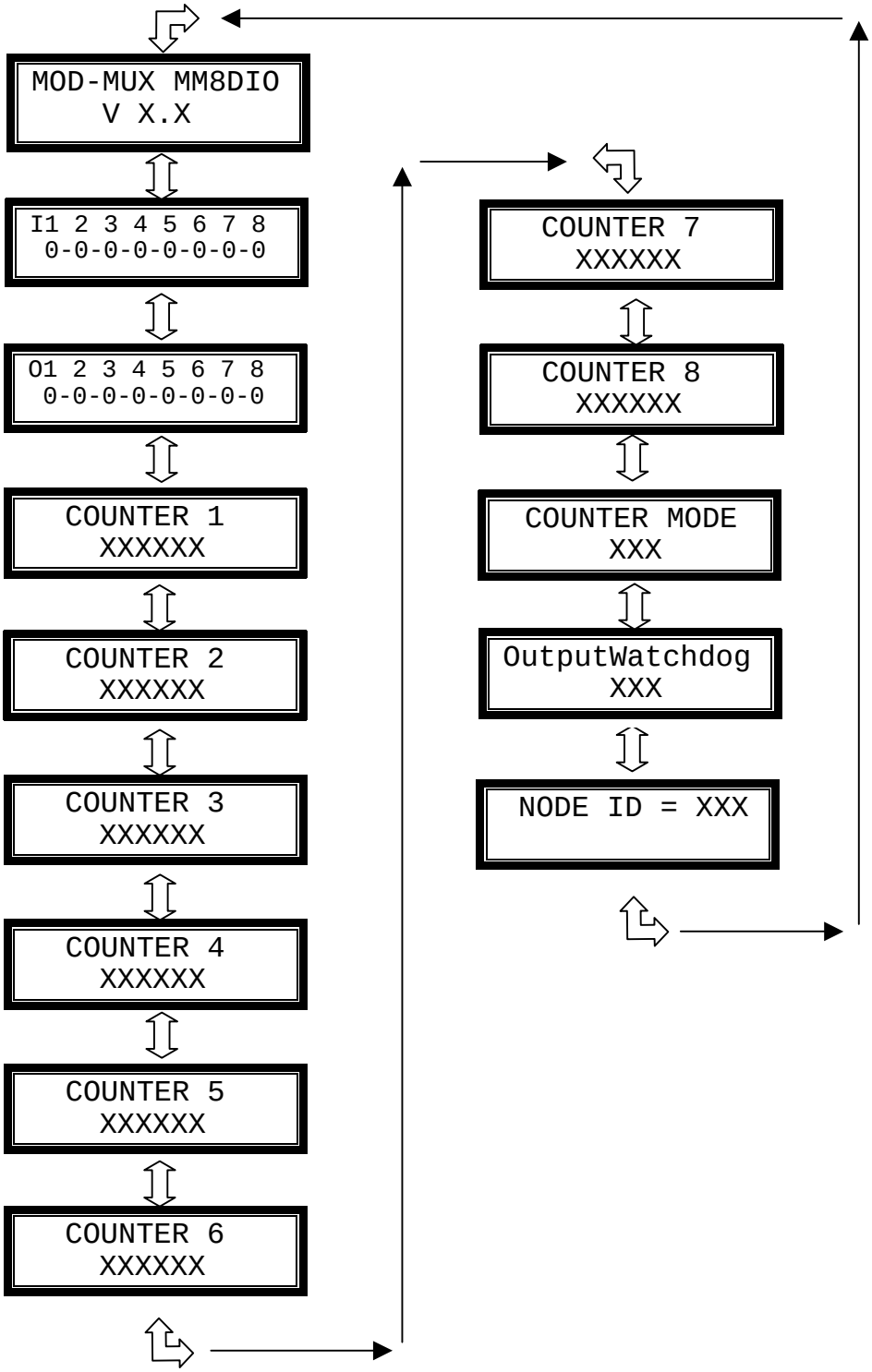
Note: Inputs 1 to 8 are used as both digital inputs and counter inputs.

3.8.3 WIRING



SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	INVERT	When switched ON the status of the inputs is inverted in the Modbus status register (30002).
9	CNTR	When switched ON the counters are automatically reset to zero when read.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.8.4 DIAGNOSTIC UNIT MENU FORMAT



3.9 MM4RO - RELAY OUTPUTS

3.9.1 DESCRIPTION

The MM4RO module has 4 normally open relay outputs. These modules may be used when a higher drive capability is required, or when isolation between outputs are required.

The module may be used as either a slave or master on the Modbus network. When used with a PC or PLC the module will be configured as a slave. When used with a MM8DI module in a point-to-point configuration, the DIP switch 9 must be turned on to set the module up as a master. In this mode the MM4RO module will automatically read the information from the MM8DI module and write the input status of the first four inputs to the corresponding outputs.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

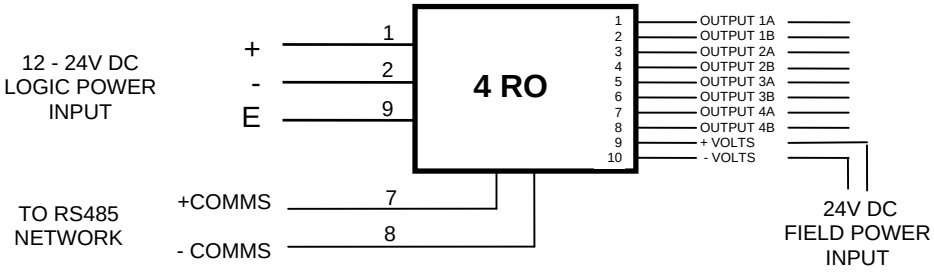
3.9.2 SPECIFICATIONS

Power Supply: (Logic) 10 - 26 Vdc @ 50 mA
(Field) 20 - 26Vdc @ 105mA

Outputs: Normally Open Relay Contacts
Maximum Voltage 250VAC
Maximum Current 0.5A @ 220VAC / 1A @ 28VDC
Isolation 1000Vrms between field and logic
1000Vrms between outputs

Connector: 11 Pin Connector on rear of unit
10 Way screw connector on front

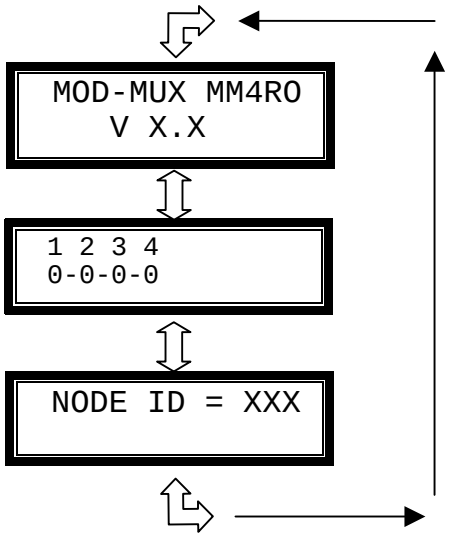
3.9.3 WIRING



3.9.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	I/O MODE	When used with an I/O Mapper and Switch 8 is off, the lower 4 inputs of an 8DI module are mapped to the 4RO module. When switched on, the upper 4 inputs of an 8DI module are mapped to the 4RO module.
9	MODE	Selects Master or Slave Mode. Master mode is used when the module is connected to a single digital input module. Slave mode is used when the module is to be polled either by the I/O Mapper or by a PC.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.9.5 DIAGNOSTIC UNIT MENU FORMAT



3.10 MM8RO - RELAY OUTPUTS

3.10.1 DESCRIPTION

The MM8RO module has 8 relay outputs. These modules may be used when a higher drive capability is required, or when isolation between outputs are required.

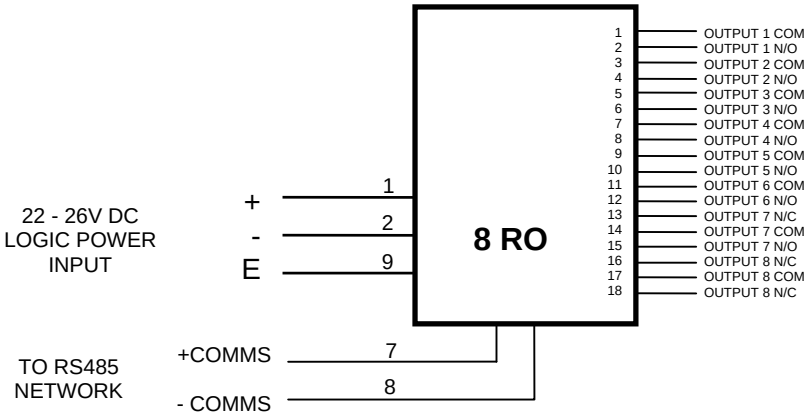
The module may be used as either a slave or master on the Modbus network. When used with a PC or PLC the module will be configured as a slave. When used with a MM8DI module in a point-to-point configuration, the DIP switch 9 must be turned on to set the module up as a master. In this mode the MM8RO module will automatically read the information from the MM8DI module and write the input status of the first four inputs to the corresponding outputs.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

3.10.2 SPECIFICATIONS

Power Supply:		22 - 26 Vdc @ 110 mA
Outputs:		6 X Normally Open Relay Contacts 2 X Change over Contacts
	Maximum Voltage	250VAC
	Maximum Current	2.0A @ 220VAC / 2A @ 28VDC
	Isolation	1000Vrms between field and logic 1000Vrms between outputs
Connector:		11 Pin Connector on rear of unit 18 Way screw connector on front

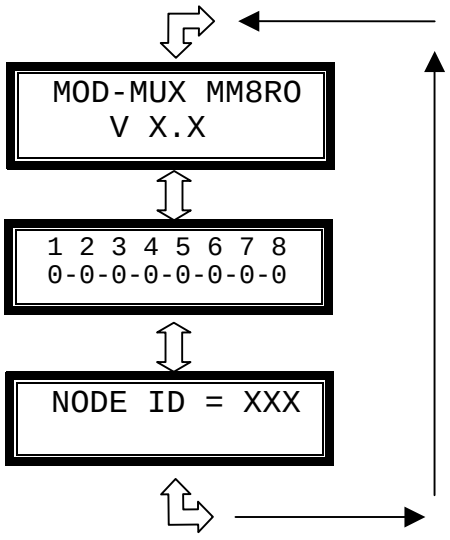
3.10.3 WIRING



3.10.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	-
9	MODE	Selects Master or Slave Mode. Master mode is used when the module is connected to a single digital input module. Slave mode is used when the module is to be polled either by the I/O Mapper or by a PC.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.10.5 DIAGNOSTIC UNIT MENU FORMAT



3.11 MM8AI - ANALOG INPUTS

3.11.1 DESCRIPTION

The Analog Input modules are supplied as either a current input module (MM8AI/I) or a voltage input module (MM8AI/V). The inputs are isolated from the logic and share a common negative terminal.

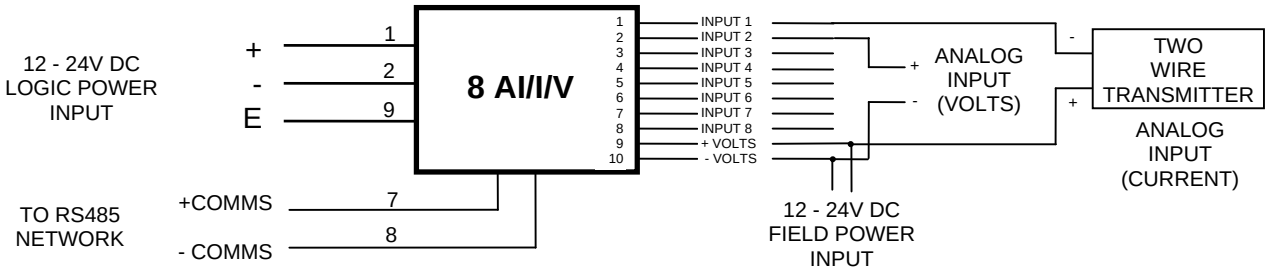
The standard setting for the MM8AI/I module is 0 - 20mA input current which represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register. To obtain an output value of 0 to 4095 for an input signal of 4 to 20mA the offset switch is switched on.

The same applies to the MM8AI/V module. An input voltage of 0 - 10Volts represents an output of 0 - 4095 and 2 volts would give a reading of 819 ± 1LSB. To obtain an output value of 0 to 4095 for an input signal of 2 to 10V the offset switch is switched on. An input range of 0(1) to 5Vdc is available by removing the jumper link located on the analogue board inside the enclosure.

3.11.2 SPECIFICATIONS

Power Supply: Logic	10 - 26 Vdc @ 50 mA		
Field	10 - 26 Vdc @ 25 mA		
Inputs:			
Voltage	0(2) - 10 Vdc or 0(1) - 5 Vdc	-	8AI/V
Current	0(4) - 20 mA	-	8AI/I
Input Resistance (8AI/V)	20kohms		
Input Resistance (8AI/I)	250ohms		
Resolution	12 bits		
Isolation	1500Vrms between field and logic		
Drift	100ppm/°C		
Accuracy	0.2% of span		
Connector:	11 Pin Connector on rear of unit		
	10 Way screw connector on front		

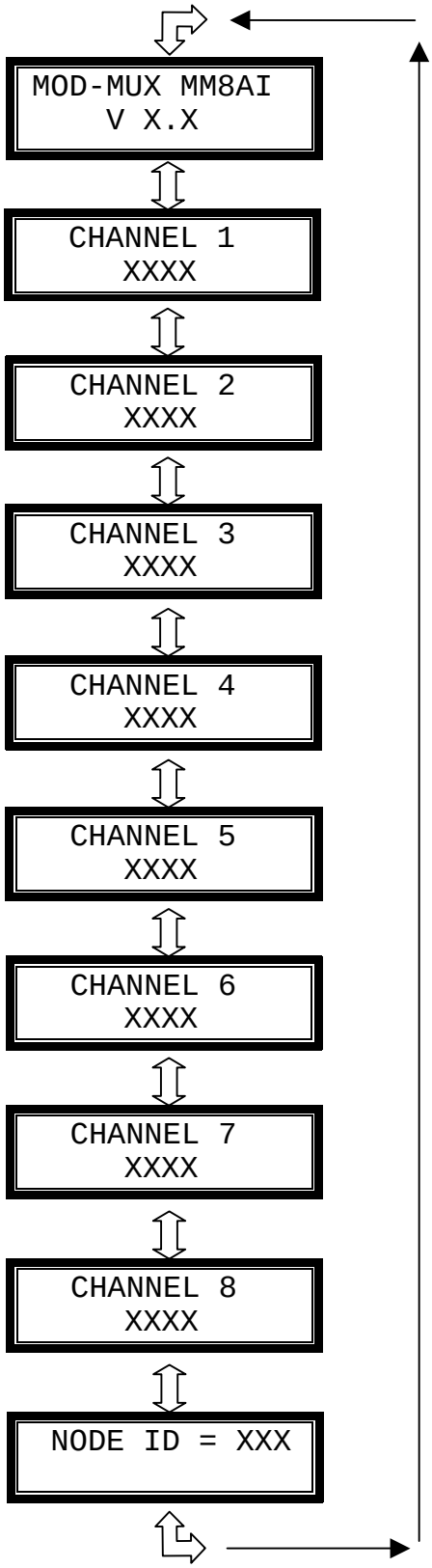
3.11.3 WIRING



3.11.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches
2	NODE ID	1 to 7.
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	OFFSET	When switched ON the inputs scaled to accept a 2V or 4mA offset .
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

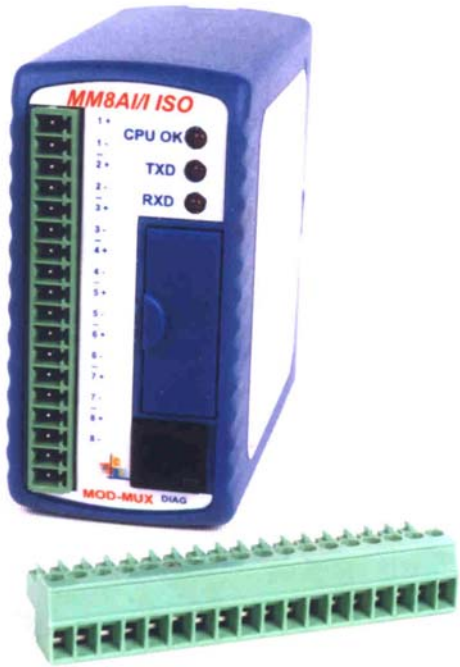
3.11.5 DIAGNOSTIC UNIT MENU FORMAT



3.12 MM8AI/I ISO AND MM8AI/V ISO - ISOLATED ANALOG INPUTS

3.12.1 DESCRIPTION

The Analog Input modules are supplied as either a current input module (MM8AI/I) or a voltage input module (MM8AI/V). The inputs are fully isolated from input to logic and between inputs. This module is ideal for monitoring existing 4-20mA current loops which are isolated from each other and cannot be connected to a common point of reference.



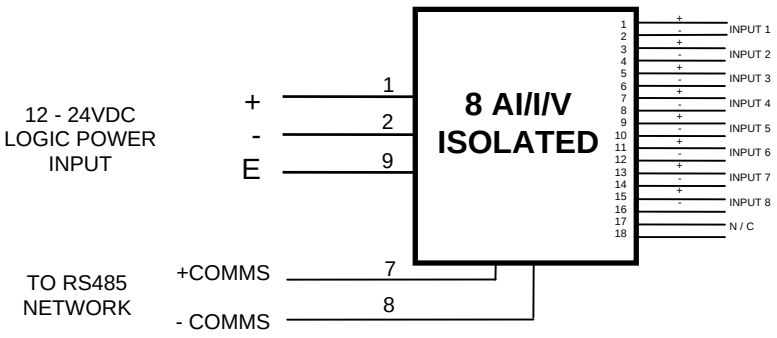
The standard setting for the MM8AI/I module is 0 - 20mA input current which represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register. To obtain an output value of 0 to 4095 for an input signal of 4 to 20mA the offset switch is switched on.

The same applies to the MM8AI/V module. An input voltage of 0 - 10Volts represents an output of 0 - 4095 and 2 volts would give a reading of 819 ± 1LSB. To obtain an output value of 0 to 4095 for an input signal of 2 to 10V the offset switch is switched on. An input range of 0(1) to 5Vdc is available by removing the jumper link located on the analogue board inside the enclosure.

3.12.2 SPECIFICATIONS

Power Supply: Logic	10 - 26 Vdc @ 85 mA		
Inputs:			
Voltage	0(2) - 10 Vdc or 0(1) - 5 Vdc	-	8AI/V
Current	0(4) - 20 mA	-	8AI/I
Input Resistance (8AI/V)	20kohms		
Input Resistance (8AI/I)	250ohms		
Resolution	12 bits		
Isolation	1500Vrms between field and logic 350Vpeak between inputs		
Drift	100ppm/°C		
Accuracy	0.2% of span		
Connector:	11 Pin Connector on rear of unit 18 Way screw connector on front		

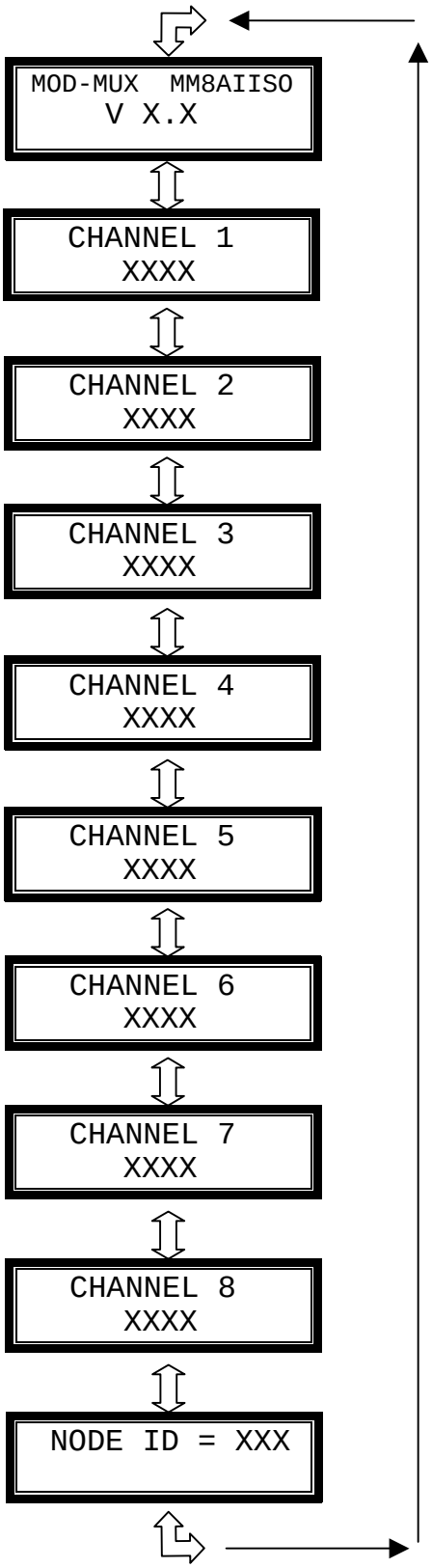
3.12.3 WIRING



3.12.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches
2	NODE ID	1 to 7.
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	OFFSET	When switched ON the inputs scaled to accept a 2V or 4mA offset .
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.12.5 DIAGNOSTIC UNIT MENU FORMAT



3.13 MM8TC - THERMOCOUPLE INPUTS

3.13.1 DESCRIPTION

The MM8TC module is a 8 thermocouple input module. The module uses differential inputs to reduce effects of electrical noise and mains pickup. The thermocouple inputs are isolated from the logic. If inter channel isolation is required then the MM8TCISO should be used.

The thermocouple voltage is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range as indicated in the table of TC types. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The thermocouple type is setup by writing a value to the TC Type register . The value is obtained from the table below. For example to select type K thermocouples, the value "2" must be written to the TC Type register. All 8 thermocouple inputs adopt the same TC type.

The DIP switch 9 is used to select upscale or downscale burnout. A value of 32768 is used to indicate upscale burnout and a value of -32767 is used to indicate downscale burnout.

The module has built in Cold Junction Compensation. Use must be made of the correct thermocouple extension wire to avoid reading errors.

The thermocouple module can also be configured for a 0 - 50mV input range. The TC Type register must be set to 9 for this option. The value in the register which is read back over the network is 0 - 50,000.

Note: As there is no inter-channel isolation, isolated thermocouples must be used in order to prevent ground loops and reading errors.

3.13.2 SPECIFICATIONS

Power Supply: Logic 10 - 26Vdc @ 80 mA

Inputs:

TC Type	Range	Accuracy
1 - J	-150 to 760 °C	0.2°C
2 - K	-200 to 1370 °C	0.3°C
3 - E	0 to 600 °C	0.1°C
4 - T	-200 to 400 °C	0.3°C
5 - N	0 to 1300 °C	0.3°C
6 - B	400 to 1820 °C	0.5°C
7 - S	-50 to 1767 °C	0.6°C
8 - R	-50 to 1767 °C	0.7°C

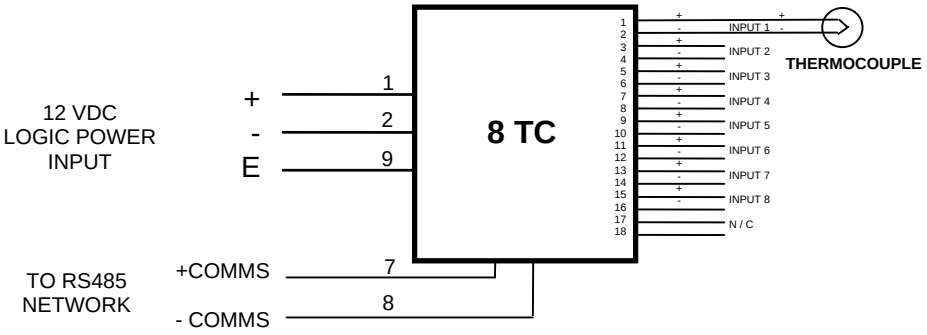
9 - mV	0 to 50mV	0.1%
10 - C	0 to 2315.5 °C	0.7°C
11 - D	0 to 2315.5 °C	0.7°C
12 - G	0 to 2315.5 °C	0.9°C

Resolution	0.1°C
Drift	100ppm/°C Typ.
Isolation	1000Vrms between field and logic

CJC error: ±0.5°C Typ.

Connector: 11 Pin Connector on rear of unit
18 Way screw connector on front

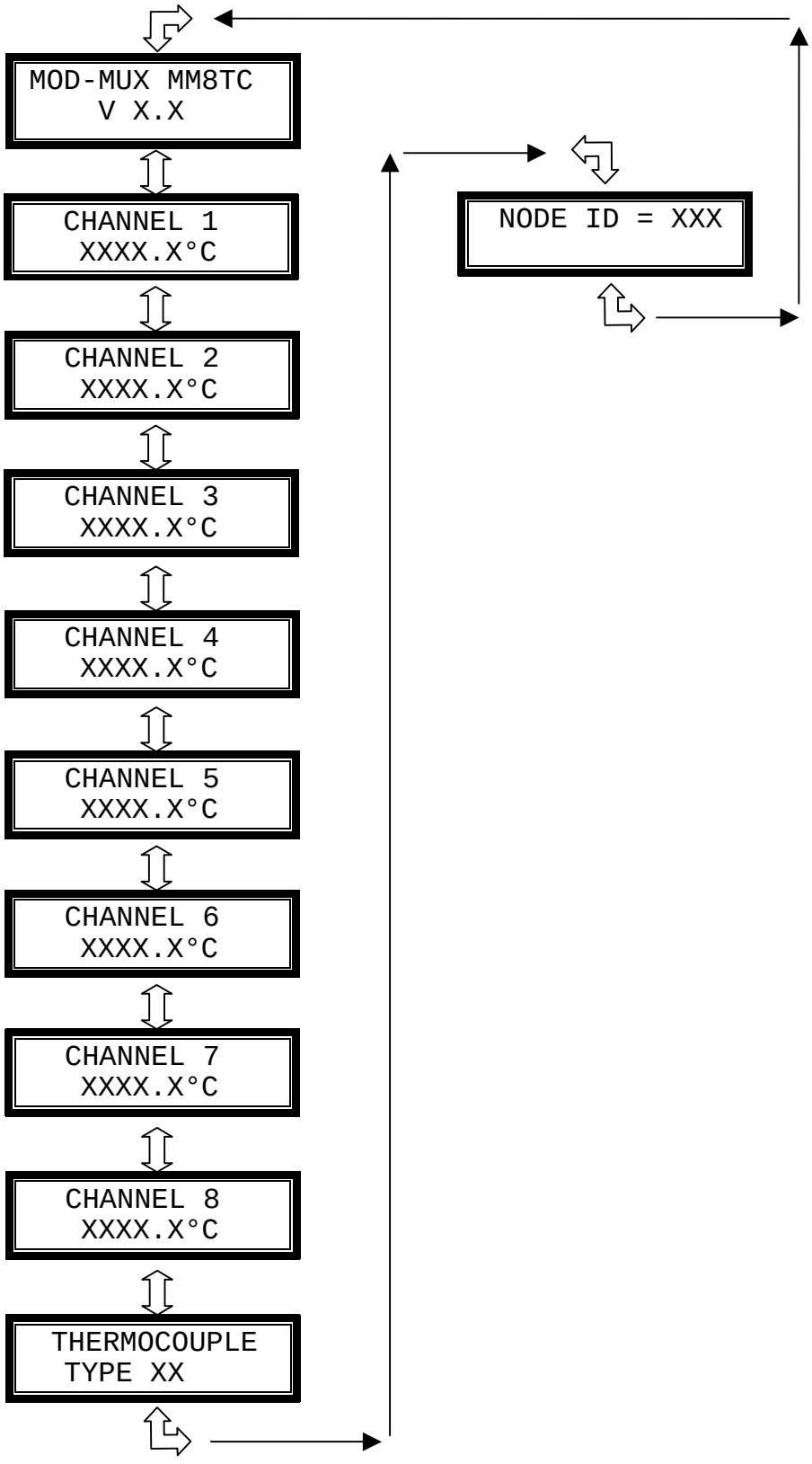
3.13.3 WIRING



3.13.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches
2	NODE ID	1 to 7.
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	BREAK	TC break. When switched off the TC value will loaded with -32767 when the TC is faulty. When switched on the TC value will be loaded with 32768.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.13.5 DIAGNOSTIC UNIT MENU FORMAT



3.14 MM8TCISO - ISOLATED THERMOCOUPLE INPUTS

3.14.1 DESCRIPTION

The MM8TCISO module is a 8 isolated thermocouple input module. The module uses differential inputs to reduce effects of electrical noise and mains pickup. The thermocouple inputs are isolated from the logic and from each other. This module is operated in an identical way to the MM8TC module and is fully interchangeable.

The thermocouple voltage is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range as indicated in the TC table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The thermocouple type is setup by writing a value to the TC Type register. The value is obtained from the table below. For example to select type K thermocouples, the value "2" must be written to the TC Type register. All 8 thermocouple inputs adopt the same TC type.

The DIP switch 9 is used to select upscale or downscale burnout. A value of 32768 is used to indicate upscale burnout and a value of -32767 is used to indicate downscale burnout.

The module has built in Cold Junction Compensation. Use must be made of the correct thermocouple extension wire to avoid reading errors.

The thermocouple module can also be configured for a 0 - 50mV input range. The TC Type register must be set to 9 for this option. The value in the register which is read back over the network is 0 - 50,000.

3.14.2 SPECIFICATIONS

Power Supply: Logic 10 - 26Vdc @ 80 mA

Inputs:

TC Type	Range	Accuracy
1 - J	-200 to 760 °C	0.2°C
2 - K	-200 to 1370 °C	0.3°C
3 - E	0 to 600 °C	0.1°C
4 - T	-200 to 400 °C	0.3°C
5 - N	0 to 1300 °C	0.3°C
6 - B	400 to 1820 °C	0.5°C
7 - S	-50 to 1767 °C	0.6°C
8 - R	-50 to 1767 °C	0.7°C
9 - mV	0 to 50mV	0.1%
10 - C	0 to 2315.5 °C	0.7°C

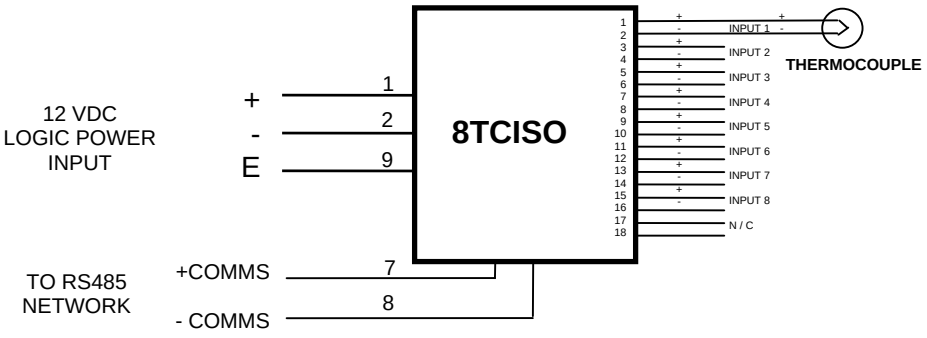
11 - D	0 to 2315.5 °C	0.7°C
12 - G	0 to 2315.5 °C	0.9°C

Resolution	0.1°C
Drift	100ppm/°C Typ.
Isolation	1000Vrms between field and logic 350Vpeak between each TC input

CJC error: ±0.5°C Typ.

Connector: 11 Pin Connector on rear of unit
18 Way screw connector on front

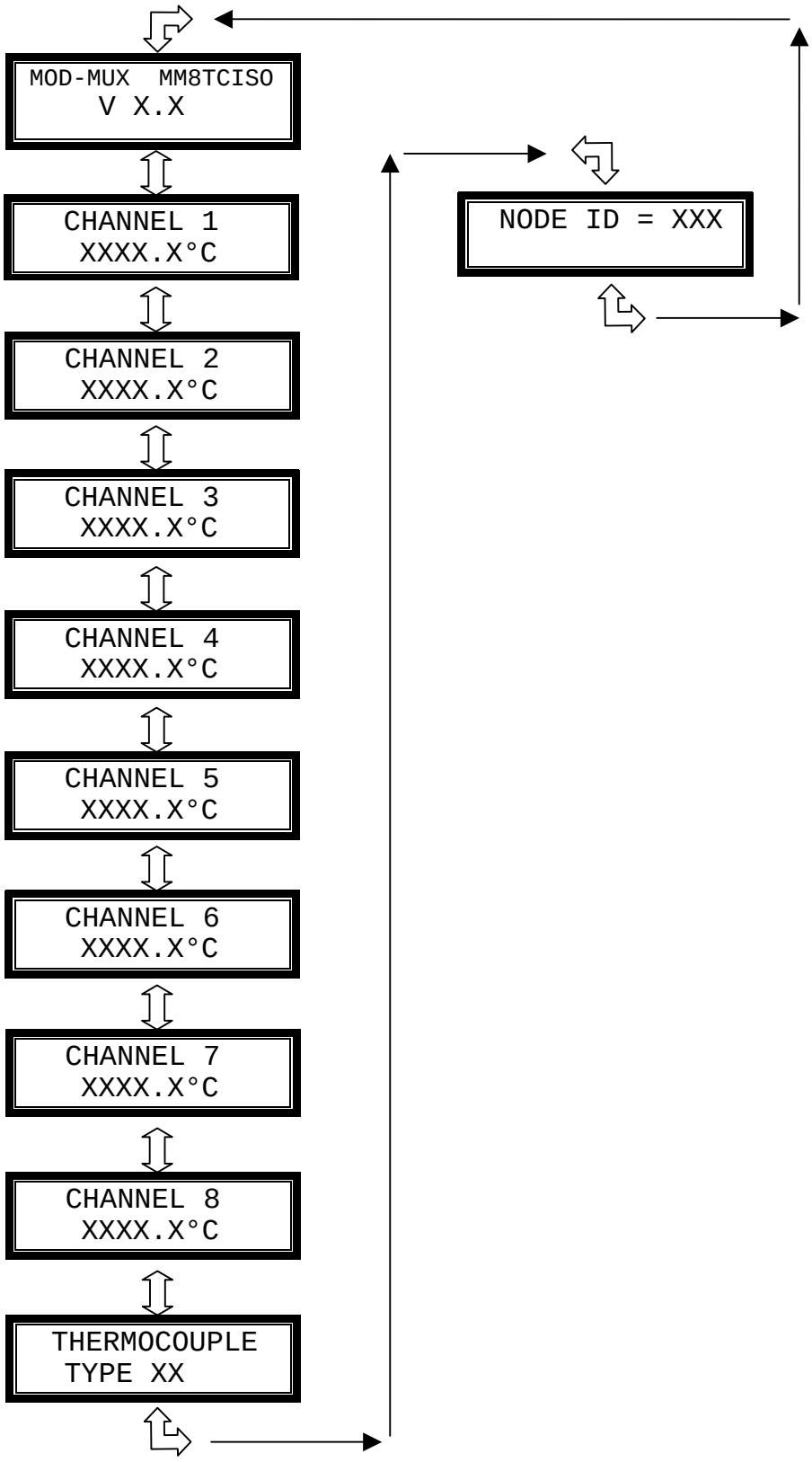
3.14.3 WIRING



3.14.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	BREAK	TC break. When switched off the TC value will loaded with -32767 when the TC is faulty. When switched on the TC value will be loaded with 32768.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.14.5 DIAGNOSTIC UNIT MENU FORMAT



3.15 MM6RTD - RTD INPUTS

3.15.1 DESCRIPTION

The MM6RTD module is a 6 RTD input module. The module can accommodate either 2 or 3 wire RTD sensors. The RTD inputs are isolated from the logic.

The RTD resistance is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range of the RTD as indicated in the RTD table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The RTD type is setup by writing a value to the RTD Type register. The value is obtained from the table below. For example to select a PT100 RTD, the value "1" must be written to the RTD Type register. All 6 RTD inputs adopt the same RTD type.

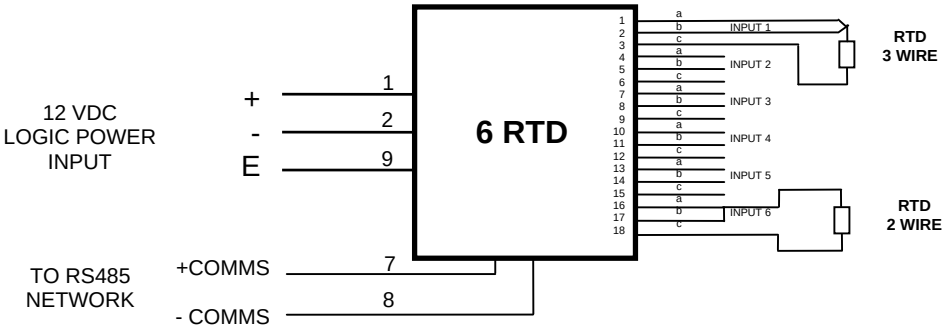
The DIP switch 9 is used to select upscale or downscale burnout for break detection. A value of 32768 is used to indicate upscale burnout and a value of -32767 is used to indicate downscale burnout.

Note: As there is no inter-channel isolation, isolated RTD's must be used in order to prevent ground loops and reading errors.

3.15.2 SPECIFICATIONS

Power Supply: Logic	10 - 26Vdc @ 80 mA		
Inputs:	2 or 3 Wire		
RTD Type	Range	Accuracy	Standard
1 - PT100	-200 to 850 °C	0.3°C	IEC 751:1983
2 - Ni120	-80 to 320 °C	0.3°C	
Resolution	0.1°C		
Drift	100ppm/°C Typ.		
Line resistance effect	< 0.1°C balanced		
Max. line resistance	100ohms		
Isolation	1000Vrms between field and logic		
Connector:	11 Pin Connector on rear of unit 18 Way screw connector on front		

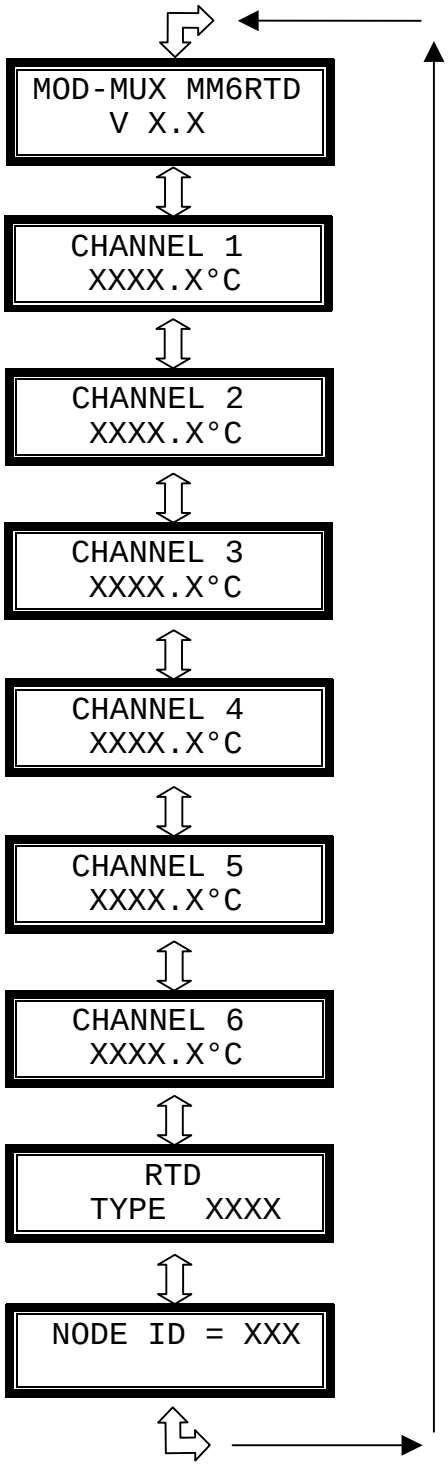
3.15.3 WIRING



3.15.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	BREAK	RTD break. When switched off the RTD value will loaded with -32767 when the RTD is faulty. When switched on the RTD value will be loaded with 32768.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.15.5 DIAGNOSTIC UNIT MENU FORMAT



3.16 MM6RTDB - RTD INPUTS

3.16.1 DESCRIPTION

The MM6RTDB module is identical to the MM6RTD except that the module has been designed for PT1000 temperature sensors.

3.16.2 SPECIFICATIONS

Power Supply: Logic 10 - 26Vdc @ 80 mA

Inputs: 2 or 3 Wire

RTD Type	Range	Accuracy	Standard
1 - PT1000	-200 to 850 °C	0.3°C	IEC 751:1983

Resolution	0.1°C
Drift	100ppm/°C Typ.
Line resistance effect	< 0.1°C balanced
Max. line resistance	100ohms
Isolation	1000Vrms between field and logic

Connector: 11 Pin Connector on rear of unit
18 Way screw connector on front

3.17 MMDIOAIO – DIGITAL + ANALOG INPUTS AND OUTPUTS

3.17.1 DESCRIPTION

The MMDIOAIO module is a multipurpose combination of inputs and outputs. The module can accommodate either 2 or 3 wire RTD sensors, current (0-20mA) and voltage (0-10V) inputs, current (0-20mA) or voltage (0-10V) output, and digital inputs and outputs.

RTD INPUTS:
There are 2 RTD inputs on the module. The RTD resistance is read by the module circuitry, linearised and converted to degrees Centigrade. No ranging is required as the module covers the full range of the RTD as indicated in the RTD table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. ie: a value of 3451 corresponds to a temperature of 345.1°C.

The RTD type is setup by writing a value to the RTD Type register. The value is obtained from the table below. For example to select a PT100 RTD, the value "1" must be written to the RTD Type register.

A value of -32767 is used to indicate downscale burnout.

Note: As there is no inter-channel isolation, isolated RTD's must be used in order to prevent ground loops and reading errors.

ANALOG INPUTS:

The Analog Inputs (2) can be configured by internal jumpers as either a current input (0-20mA) or a voltage input (0-10V).

An input of 0 - 20mA input current or 0 – 10V input voltage represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register.

ANALOG OUTPUT:

There is a single analog output which can be configured with internal jumpers for a current output (0-20mA) or voltage output (0-10V).

The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 - 20mA. A value of 819 ± 1LSB will give a current output of 4mA.

DIGITAL INPUTS:

There are 5 digital inputs on the module. The inputs have internal pull-up resistors and are switched to negative.

The first 2 inputs have got counters associated with them. The counters operate in three modes.

In **mode 0** all the counters are disabled.

In **mode 1** all counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

In **mode 2** the inputs are connected as up/down counters. Input 1 will increment counter 1 whilst input 2 decrements counter1.

Note: The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

DIGITAL OUTPUTS:

The module has 2 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required.

The outputs are written to by the Modbus master device such as a PC or PLC. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the module for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

3.17.2 SPECIFICATIONS

Power Supply: Logic	10 - 26 Vdc @	90 mA
Field	10 - 26 Vdc @	40 mA

RTD Inputs: 2 or 3 Wire

RTD Type	Range	Accuracy	Standard
1 - PT100	-200 to 850 °C	0.3°C	IEC 751:1983
2 - Ni120	-80 to 320 °C	0.3°C	

Resolution	0.1°C
Drift	100ppm/°C Typ.
Line resistance effect	< 0.1°C balanced
Max. line resistance	100ohms
Isolation	1000Vrms between field and logic

Analog Inputs:

Voltage	0(2) - 10 Vdc
Current	0(4) - 20 mA
Input Resistance (Volts)	190kohms
Input Resistance (Current)	250ohms
Resolution	12 bits
Drift	100ppm/°C
Accuracy	0.2% of span

Analog Outputs:

Current	0(4) - 20 mA
Resolution	12 bits
Drift	100ppm/°C typ.
Accuracy	0.05% of span
Compliance	1000 ohms max. @ 24Vdc 500 ohms max. @ 12Vdc
Voltage	0(2) - 10 V
Resolution	12 bits
Drift	100ppm/°C typ.
Accuracy	0.05% of span
Compliance	2000 ohms min. load

Digital Inputs:

Supply Voltage	10 - 26 Vdc (Internal) switch to negative
Input Current	2 mA @ 12Vdc / 4 mA @ 24Vdc

Counters:

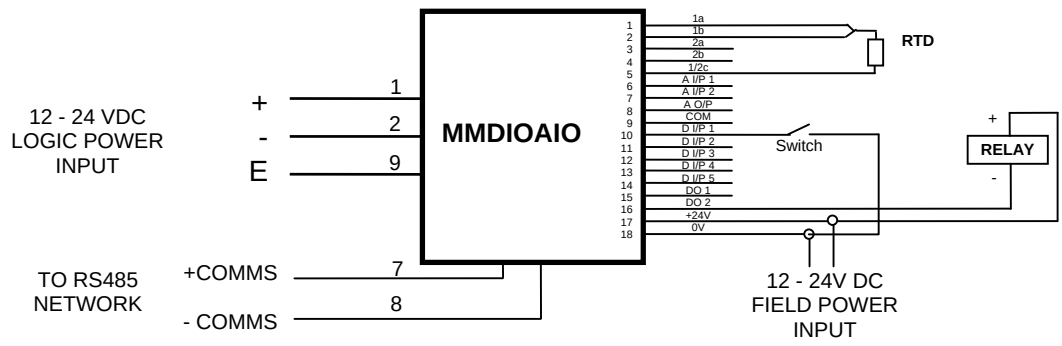
Inputs	1 & 2
Resolution	32 Bits
Frequency	50 Hz (Max)
Pulse Width	20 ms (min)

Digital Outputs: Open Collector NPN

Maximum Voltage	36 Vdc
Maximum Current	100 mA
Vceon	1.1V Max.

Connector:	11 Pin Connector on rear of unit
	18 Way screw connector on front

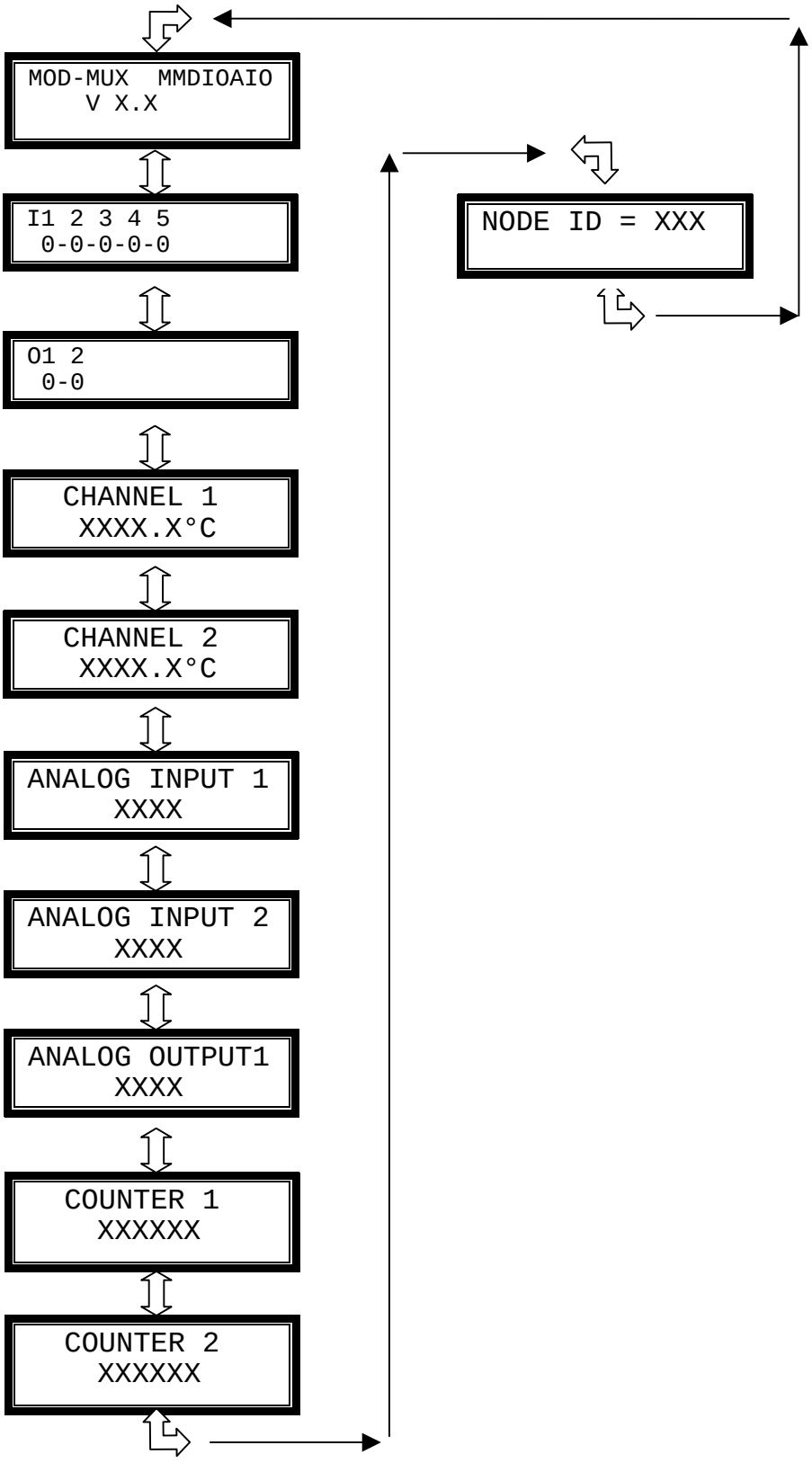
3.17.3 WIRING



3.17.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches
2	NODE ID	1 to 7.
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	-	Not used.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.17.5 DIAGNOSTIC UNIT MENU FORMAT



3.18 MM8AO - ANALOG OUTPUTS

3.18.1 DESCRIPTION

The MM8AO is a 8 channel current output module. Each channel can be set to output a current in the range 0 - 20mA. The outputs are isolated from the logic and share a common negative terminal.

The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 - 20mA. A value of 819 ± 1LSB will give a current output of 4mA.

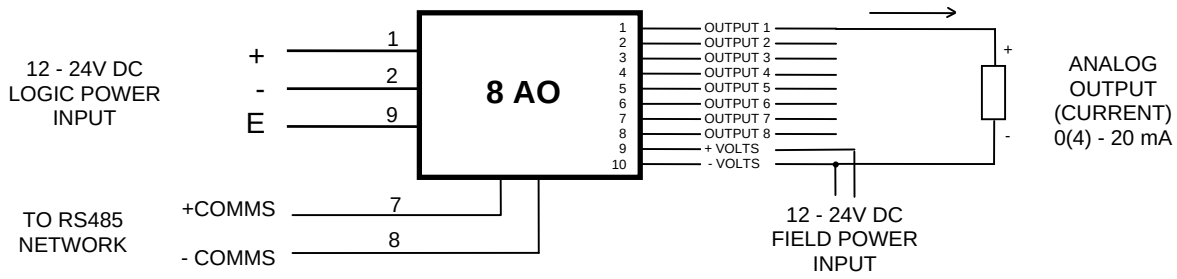
The module may be used as either a slave or master on the Modbus network. When used with a PC or PLC the module will be configured as a slave. When used with a MM8AI module in a point-to-point configuration, the DIP switch 9 must be turned on to set the module up as a master. In this mode the MM8AO module will automatically read the information from the MM8AI module and write the input status to the outputs.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC.

3.18.2 SPECIFICATIONS

Power Supply: Logic	10 - 26 Vdc @	50 mA
Field	10 - 26 Vdc @	185 mA
Outputs:		
Current	0(4) - 20 mA	
Resolution	12 bits	
Isolation	1500Vrms between field and logic	
Drift	100ppm/°C typ.	
Accuracy	0.05% of span	
Compliance	1000 ohms max. @ 24Vdc 500 ohms max. @ 12Vdc	
Connector:	11 Pin Connector on rear of unit	
	10 Way screw connector on front	

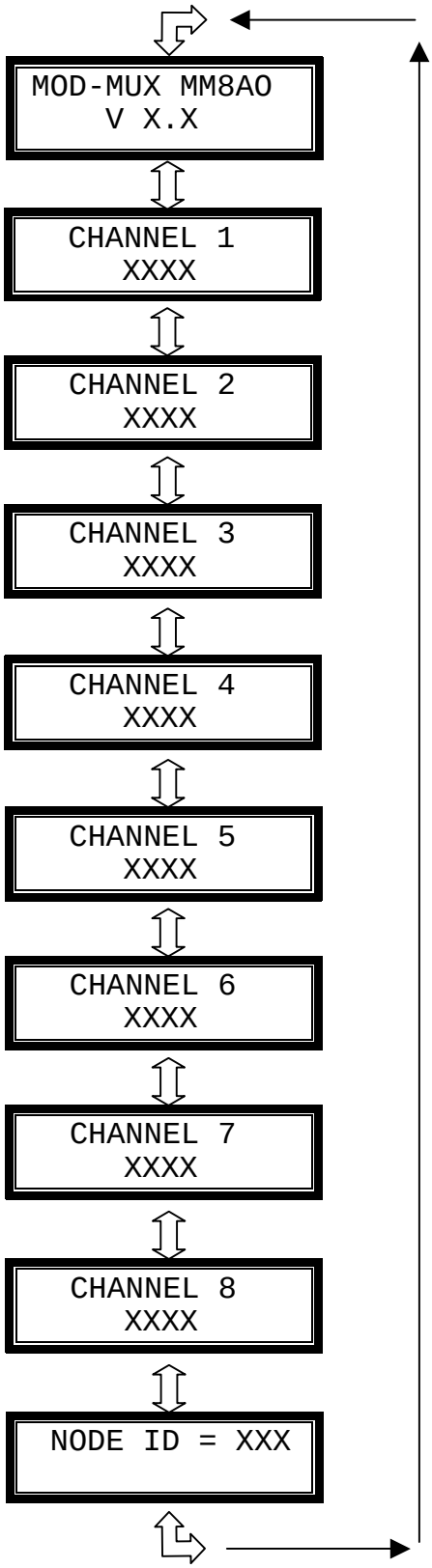
3.18.3 WIRING



3.18.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	MODE	Selects Master or Slave Mode. Master mode is used when the module is connected to a single Analog input module. Slave mode is used when the module is to be polled either by the I/O Mapper or by a PC.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.18.5 DIAGNOSTIC UNIT MENU FORMAT



3.19 MM8VO - ANALOG OUTPUTS

3.19.1 DESCRIPTION

The MM8VO is a 8 channel voltage output module. Each channel can be set to output a voltage in the range 0 – 10V. The outputs are isolated from the logic and share a common negative terminal.

The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0 – 10V. A value of 819 ± 1LSB will give a current output of 2V.

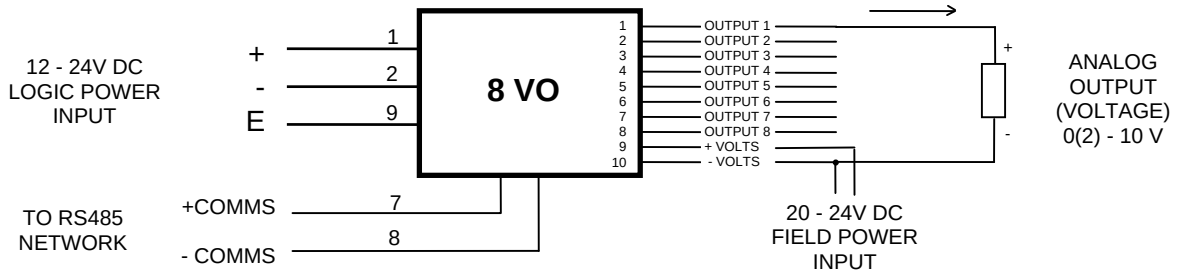
The module may be used as either a slave or master on the Modbus network. When used with a PC or PLC the module will be configured as a slave. When used with a MM8AI module in a point-to-point configuration, the DIP switch 9 must be turned on to set the module up as a master. In this mode the MM8AO module will automatically read the information from the MM8AI module and write the input status to the outputs.

When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC.

3.19.2 SPECIFICATIONS

Power Supply: Logic	10 - 26 Vdc @	50 mA
Field	20 - 26 Vdc @	85 mA
Outputs:		
Voltage	0(2) - 10 V	
Resolution	12 bits	
Isolation	1500Vrms between field and logic	
Drift	100ppm/°C typ.	
Accuracy	0.05% of span	
Compliance	2000 ohms min. load	
Connector:	11 Pin Connector on rear of unit	
	10 Way screw connector on front	

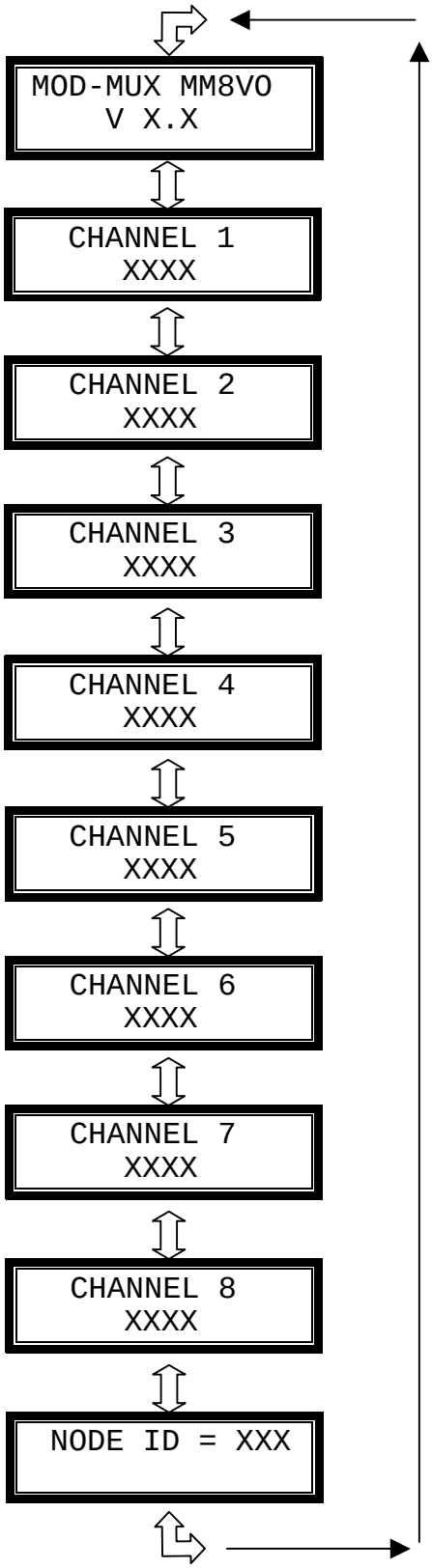
3.19.3 WIRING



3.19.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	MODE	Selects Master or Slave Mode. Master mode is used when the module is connected to a single Analog input module. Slave mode is used when the module is to be polled either by the I/O Mapper or by a PC.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.19.5 DIAGNOSTIC UNIT MENU FORMAT



3.20 MMI/OMAP - I/O MAPPER

3.20.1 DESCRIPTION

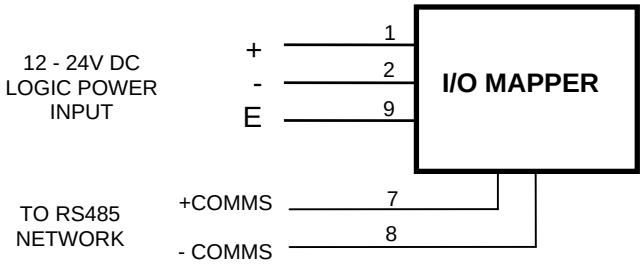
The I/O Mapper is used for point-to-point communications where it is required to send input information from a MM8DI or MM8AI input module to a MM8DO or MM8AO output module over the network. The I/O Mapper is the Modbus master and all I/O modules must be set up as slaves. The I/O Mapper is only required if there is more than one pair of modules on the network.

When the I/O Mapper is used, The ID's of the Digital modules must be set up in the range 0 to 31 and the Analog modules must be set up in the range 32 to 47, starting at the bottom of the range. The Input and Output modules must be set to the same ID.

3.20.2 SPECIFICATIONS

Power Supply:	10 - 26 Vdc @ 50 mA
Connector:	11 Pin Connector on rear of unit

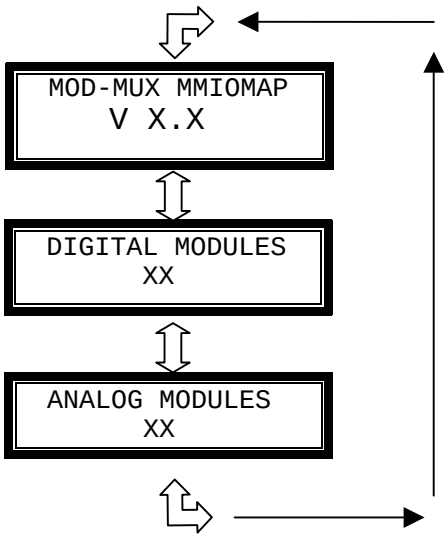
3.20.3 WIRING



3.20.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	No. of Digital Modules	The number of digital input/output pairs to be mapped
2	No. of Digital Modules	are set up with switches 1 to 5 inclusive. Node ID's for
3	No. of Digital Modules	digital modules are from 0 to 31.
4	No. of Digital Modules	
5	No. of Digital Modules	
6	No. of Analog Modules	The number of Analog input/output pairs to be mapped
7	No. of Analog Modules	are set up with switches 6 to 9 inclusive. Node ID's for
8	No. of Analog Modules	Analog modules are from 32 to 47.
9	No. of Analog Modules	
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

3.20.5 DIAGNOSTIC UNIT MENU FORMAT



3.21 MMTCPCONV & MMTCPBCONV - MODBUS/TCP SERIAL CONVERTER

3.21.1 DESCRIPTION

The Modbus/TCP SERIAL Converter enables serial devices communicating on RS485/232 using the Modbus protocol, such as MOD-MUX modules, to be connected to an Ethernet network.

The Modbus/TCP Converter performs two functions. The first being a modbus converter from Ethernet to RS485/232, and the second being a Web Server for configuration and diagnostic purposes.

The converter communicates using the standard Modbus/TCP protocol. This protocol is supported by many of the SCADA packages which are on the market. The result is a very simple and efficient way of connecting MOD-MUX devices to a PC or PLC on an Ethernet network. The converter supports 4 TCP sockets. This means that up to 4 devices can communicate with the MOD-MUX modules via the converter at any one time.

An added advantage of using the converter, is that the Modbus RS485 network can be split into a number of smaller networks, each with a separate converter. This increases throughput dramatically as the single Ethernet network has a much higher bandwidth than the individual RS485 networks and overall data polling times are reduced accordingly.

Each Modbus/TCP Converter has a unique Ethernet IP address which must be programmed into the PC or PLC. The IP address in the converter is configured via the Web Server. Any standard Web browser such as Internet Explorer can be used to access the web pages were configuration is carried out. The converters are factory programmed with a default IP address of 169.254.111.111. This address must be changed before the converter is added to an existing network.

For further information refer to the MOD-MUX TCP Manual.

3.22 MMINTCONV - INTELLIGENT RS232/RS485(RS422) CONVERTER

3.22.1 DESCRIPTION

The MMINTCONV unit is a bi-direction serial converter unit used to convert RS232 data communications signals for transmission over 2 or 4 wire RS485 (RS422) twisted pair cables. Each port is fully configurable via dipswitches for baud rate, parity, data bits, stop bits and full or half duplex modes. The converter can be used to communicate with RS422/RS485 devices and to extend the limited distance capabilities of RS232 devices such as printers and terminals for up to one kilometre.

Standard features of the converter are:

- **2 (RS485) or 4 (RS422) Wire Operation.**
  External wire links are required to select 2 wire (RS485) mode.

- **Baud Rate, Data Bits, Stop Bits, Parity and Half or Full Duplex Mode.**
  Each port is configurable via an 8way dipswitch.

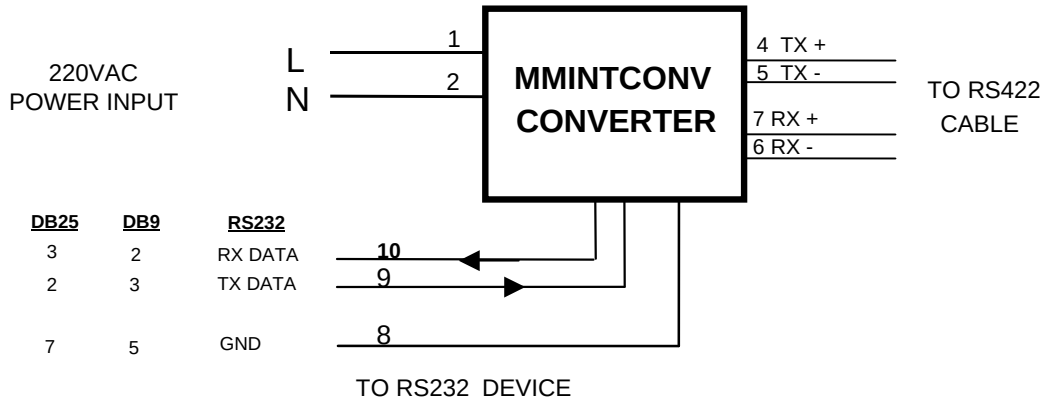
- **Signal Isolation**.
  The converter module isolates the RS232 and RS485/RS422 signals to prevent ground loops between remote devices.

- **DIN Rail Mount**.
  The converter module plugs directly on to a DIN rail.

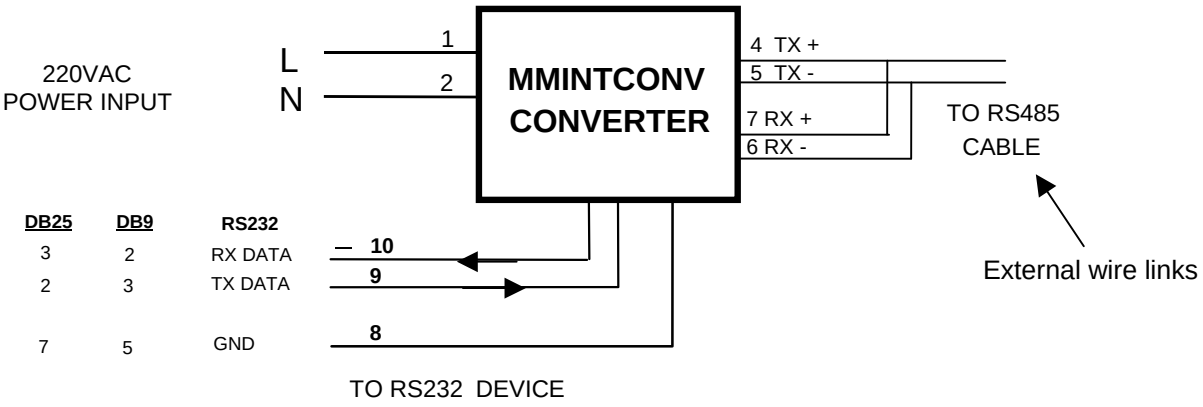
3.22.2 SPECIFICATIONS

1.	**POWER REQUIREMENT**:	200 - 260VAC 50/60Hz. – LED POWER indication
2.	**PORT TX/RX INDICATORS**:	1 x TX led and 1 x RX led per port.
3.	**TRANSMISSION MEDIUM**:	2 OR 4 Wire twisted pair cable.
4.	**TRANSMISSION DISTANCE**:	Up to 1 Km.
5.	**BAUD RATE**:	Selectable per port – 1200, 2400, 4800, 9600, 19200 and 38400.
6.	**DATA BITS**:	Selectable per port - 7 or 8 data bits
7.	**STOP BITS**:	Selectable per port – 1 or 2 stop bits
8.	**PARITY BITS**:	Selectable per port - none, even or odd parity
9.	**ISOLATION:**	Transformer/OptoCoupler - 1500VACrms
10.	**OPERATING TEMPERATURE**:	-20°C to + 80°C.
11.	**DIMENSIONS:**	105mm (HIGH) X 70mm (WIDE) X 60mm (DEEP)

3.22.3 WIRING



4 WIRE OPERATION



2 WIRE OPERATION

NOTE: 120ohm termination resistors must be placed at the ends of the RS422 / RS485 twisted pair cables for correct operation *.

3.22.4 SWITCH SETTINGS

SWITCH SW1 - RS232 PORT SETUP

SWITCH SW2 - RS422/RS485 PORT SETUP

SWITCH SETTINGS SW1 &SW2

No.	FUNCTION	ON	OFF
8	FULL DUPLEX	S8	-
8	HALF DUPLEX	-	S8
7	DATA BITS - 7	S7	-
7	DATA BITS - 8	-	S7
6	STOP BITS - 2	S6	-
6	STOP BITS - 1	-	S6
4,5	PARITY - ODD	S5	S4
4,5	PARITY - EVEN	S4	S5
4,5	PARITY - NONE	-	S4,S5
1,2,3	BAUD 38400	S3/S1	S2
1,2,3	BAUD 19200	S3	S1,S2
1,2,3	BAUD 4800	S1,S2	S3
1,2,3	BAUD 2400	S2	S1,S3
1,2,3	BAUD 1200	S1	S2,S3
1,2,3	BAUD 9600	-	S1,S2,S3

3.22.5 ORDER CODES

Order Code	Description
MMINTCONV	RS232 / RS485 INTELLIGENT CONVERTER

Other products available in this product range:

Order Code	Description
MM485REP	RS422 / RS485 REPEATER
MM232OPTO/SMA	RS232 / MULTI MODE FIBRE OPTIC CONVERTER WITH SMA CONNECTOR 850nm
MM485OPTO/SMA	RS485 / MULTI MODE FIBRE OPTIC CONVERTER WITH SMA CONNECTOR 850nm

3.23 MMINTBCONV - INTELLIGENT RS232/RS485 BOXED CONVERTER

3.23.1 DESCRIPTION

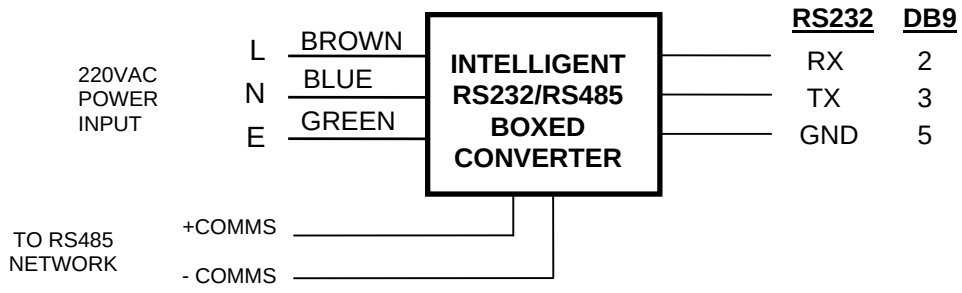
The intelligent boxed converter has been designed to convert RS232 signals from a PC or PLC to RS485. The advantage of using this module is that all network timing on the 2 wire network is performed by the module. Only three wires, the RX line, TX line and ground are required.

The intelligent converter also provides isolation between the RS232 and RS485 cables. This prevents ground loops between the PC or PLC and network.

3.23.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA or 110VAC @ 1.5VA
RS232:	3 Wire - TX/Rx/GND
RS485:	2 Wire Multidrop twisted
Baud Rate:	4800, 9600, 14400, 19200, 28800, 38400, 57600.
Connector:	RS232 - DB-9 connector. RS485 - 3 Way Screw connector.

3.23.3 WIRING



3.23.4 SWITCH SETTINGS

SWITCH	FUNCTION	DESCRIPTION
1	BAUD	Baud rate selection.
2	BAUD	"
3	BAUD	"
4	TIMEOUT	When this switch is off the RS485 TX/RX timeout is short. When this switch is on the timeout is extended for devices which have longer response times.

BAUD	ON	OFF
9600	-	S1/S2/S3
4800	S1	S2/S3
14400	S2	S1/S3
19200	S1/S2	S3
28800	S3	S1/S2
38400	S1/S3	S2
57600	S2/S3	S1

3.24 MM485REP - RS485 (RS422) REPEATER

3.24.1 DESCRIPTION

The MM485REP unit is a bi-direction serial repeater unit used to convert 2 or 4 wire RS485 (RS422) twisted pair data communications signals to another isolated 2 or 4 wire RS485 (RS422) twisted pair cable. Each port is fully configurable via DIP switches for baud rate, parity, data bits, stop bits and full or half duplex modes. The repeater can be used to extend a RS485 network up to a further 1000 metres. The isolation also prevents ground loops between different parts of the network.

Standard features of the repeater are:

- **2 (RS485) or 4 (RS422) Wire Operation.**
  External wire links are required to select 2 wire (RS485) mode.

- **Baud Rate, Data Bits, Stop Bits, Parity and Half or Full Duplex Mode.**
  Each port is configurable via an 8way dipswitch.

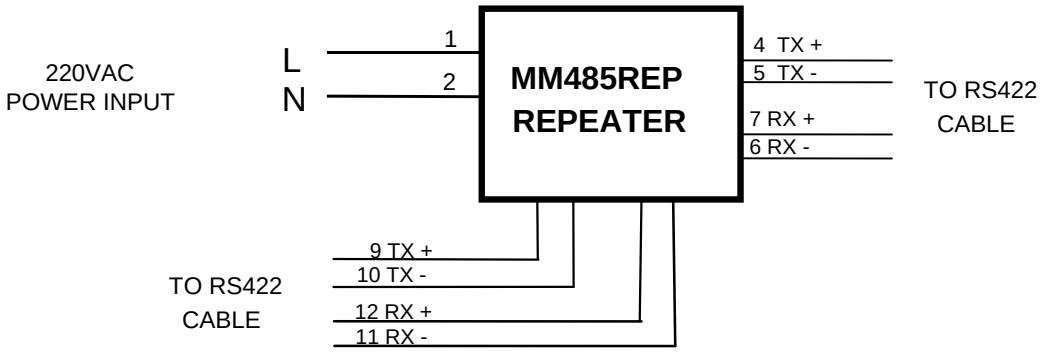
- **Signal Isolation**.
  The converter module isolates the RS485/RS422 and RS485/RS422 signals to prevent ground loops between remote devices.

- **DIN Rail Mount**.
  The converter module plugs directly on to a DIN rail.

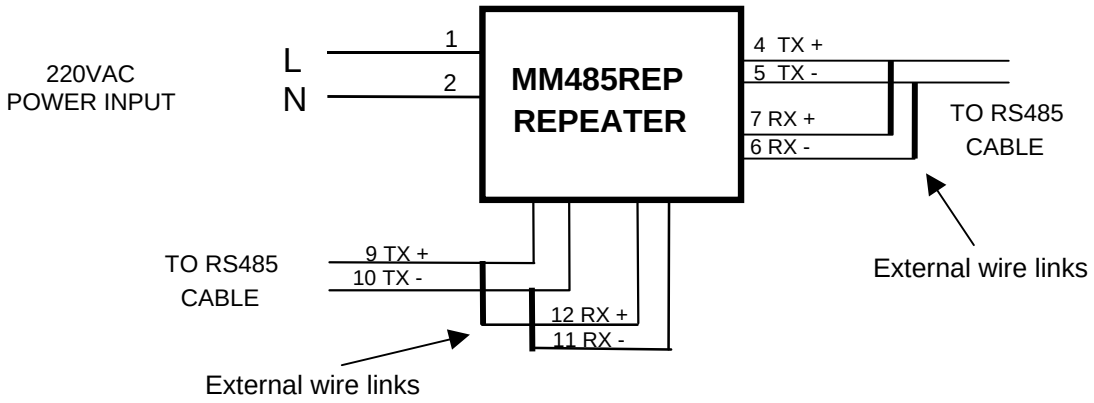
3.24.2 SPECIFICATIONS

12.	**POWER REQUIREMENT**:	200 - 260VAC 50/60Hz. – LED POWER indication
13.	**PORT TX/RX INDICATORS**:	1 x TX led and 1 x RX led per port.
14.	**TRANSMISSION MEDIUM**:	2 OR 4 Wire twisted pair cable.
15.	**TRANSMISSION DISTANCE**:	Up to 1 Km.
16.	**BAUD RATE**:	Selectable per port – 1200, 2400, 4800, 9600, 19200 and 38400.
17.	**DATA BITS**:	Selectable per port - 7 or 8 data bits
18.	**STOP BITS**:	Selectable per port – 1 or 2 stop bits
19.	**PARITY BITS**:	Selectable per port - none, even or odd parity
20.	**ISOLATION:**	Transformer/OptoCoupler - 1500VACrms
21.	**OPERATING TEMPERATURE**:	-20°C to + 80°C.
22.	**DIMENSIONS:**	105mm (HIGH) X 70mm (WIDE) X 60mm (DEEP)

3.24.3 WIRING



4 WIRE OPERATION



2 WIRE OPERATION

NOTE: 120ohm termination resistors must be placed at the ends of the RS422 / RS485 twisted pair cables for correct operation *.

3.24.4 SWITCH SETTINGS

SWITCH SW1 - RS422/RS485 PORT 1 SETUP

SWITCH SW2 - RS422/RS485 PORT 2 SETUP

SWITCH SETTINGS SW1 &SW2

No.	FUNCTION	ON	OFF
8	FULL DUPLEX	S8	-
8	HALF DUPLEX	-	S8
7	DATA BITS - 7	S7	-
7	DATA BITS - 8	-	S7
6	STOP BITS - 2	S6	-
6	STOP BITS - 1	-	S6
4,5	PARITY - ODD	S5	S4
4,5	PARITY - EVEN	S4	S5
4,5	PARITY - NONE	-	S4,S5
1,2,3	BAUD 38400	S3/S1	S2
1,2,3	BAUD 19200	S3	S1,S2
1,2,3	BAUD 4800	S1,S2	S3
1,2,3	BAUD 2400	S2	S1,S3
1,2,3	BAUD 1200	S1	S2,S3
1,2,3	BAUD 9600	-	S1,S2,S3

3.24.5 ORDER CODES

Order Code	Description
MM485REP	RS485 (RS422) REPEATER

Other products available in this product range:

Order Code	Description
MMINTCONV	RS232 / RS485(RS422) INTELLIGENT CONVERTER
MM232OPTO/SMA	RS232 / MULTI MODE FIBRE OPTIC CONVERTER WITH SMA CONNECTOR 850nm
MM485OPTO/SMA	RS485 / MULTI MODE FIBRE OPTIC CONVERTER WITH SMA CONNECTOR 850nm

3.25 MM232FIBRE - FIBRE OPTIC CONVERTERS

3.25.1 DESCRIPTION

The MOD-MUX RS232 / Fibre Optic converter module is used to convert RS232 data communications signals for transmission over fibre optic cables. The converters can be used to extend the limited distance capabilities of RS232 devices such as printers and terminals for up to two kilometres.

The RS232 Fibre Optic converter is ideal for extending RS232 signals through areas of high electrical noise due to the EMI immunity of fibre.

Standard features of the converter are :

- **Multiple Fibre Sizes.**
  Three fibre sizes are supported as standard on the converter module.

- **Industry Standard Fibre connectors.**
  The converter can be ordered for use with either the industry standard SMA or ST™ style connectors.

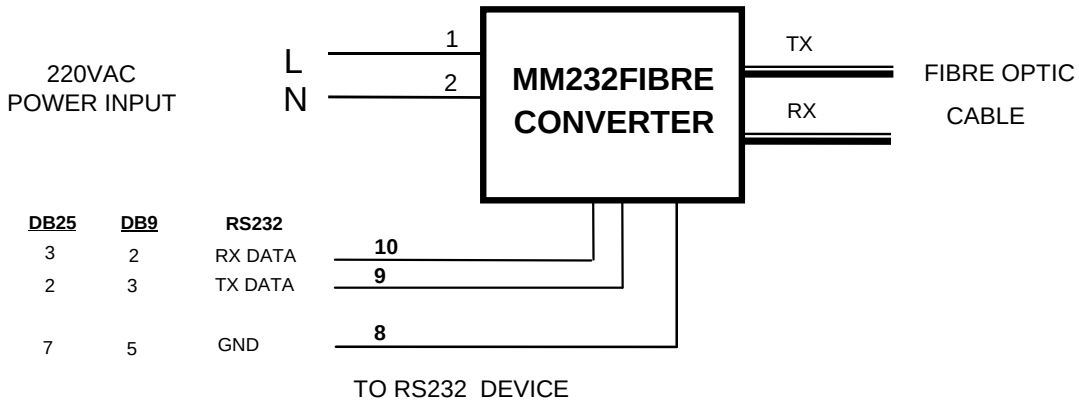
- **DIN Rail Mount**.
  The converter module plugs directly into a 11PIN industry standard relay base which may be DIN rail mounted or flush mounted.

3.25.2 SPECIFICATIONS

- **POWER REQUIREMENT**: 200 - 260VAC 50/60Hz. – LED POWER indication
- **PORT TX/RX INDICATORS**: 1 x TX led and 1 x RX led per port.
- **FIBRE CONNECTORS** : Supplied with either SMA or ST connectors.
- **FIBRE SIZES**: 50/125μm, 62.5/125μm, and 100/140μm.
- **TRANSMITTER WAVELENGTH:** 820 Nanometre. Multi-Mode.
- **TRANSMISSION DISTANCE**: Up to 2 Km depending on attenuation of fibre used.
- **BAUD RATE**: Selectable per port – 1200, 2400, 4800, 9600, 19200 and 38400.
- **DATA BITS**: Selectable per port - 7 or 8 data bits
- **STOP BITS**: Selectable per port – 1 or 2 stop bits
- **PARITY BITS**: Selectable per port - none, even or odd parity
- **ISOLATION:** Transformer/OptoCoupler - 1500VACrms
- **OPERATING TEMPERATURE**: -20°C to + 80°C.
- **DIMENSIONS:** 105mm (HIGH) X 70mm (WIDE) X 60mm (DEEP)

ST™ is a registered trademark of AT&T Lightguide Cable Connectors.

3.25.3 WIRING



3.25.4 SWITCH SETTINGS

SWITCH SW1 - RS232 PORT 1 SETUP

SWITCH SW2 - FIBRE PORT 2 SETUP

SWITCH SETTINGS SW1 &SW2

No.	FUNCTION	ON	OFF
8	FULL DUPLEX	S8	-
8	HALF DUPLEX	-	S8
7	DATA BITS - 7	S7	-
7	DATA BITS - 8	-	S7
6	STOP BITS - 2	S6	-
6	STOP BITS - 1	-	S6
4,5	PARITY - ODD	S5	S4
4,5	PARITY - EVEN	S4	S5
4,5	PARITY - NONE	-	S4,S5
1,2,3	BAUD 38400	S3/S1	S2
1,2,3	BAUD 19200	S3	S1,S2
1,2,3	BAUD 4800	S1,S2	S3
1,2,3	BAUD 2400	S2	S1,S3
1,2,3	BAUD 1200	S1	S2,S3
1,2,3	BAUD 9600	-	S1,S2,S3

3.25.5 ORDER CODES

Order Code	Description
MM232FIBRE	RS232 FIBRE OPTIC CONVERTER

3.26 MM485FIBRE - FIBRE OPTIC CONVERTERS

3.26.1 DESCRIPTION

The MOD-MUX RS485(RS422) / Fibre Optic converter module is used to convert RS485 data communications signals for transmission over fibre optic cables. The converters can be used to extend the limited distance capabilities of RS485 devices for up to two kilometres.

The RS485 Fibre Optic converter is ideal for extending RS485 signals through areas of high electrical noise due to the EMI immunity of fibre.

Standard features of the converter are :

- **Multiple Fibre Sizes.**
  Three fibre sizes are supported as standard on the converter module.

- **Industry Standard Fibre connectors.**
  The converter can be ordered for use with either the industry standard SMA or ST™ style connectors.

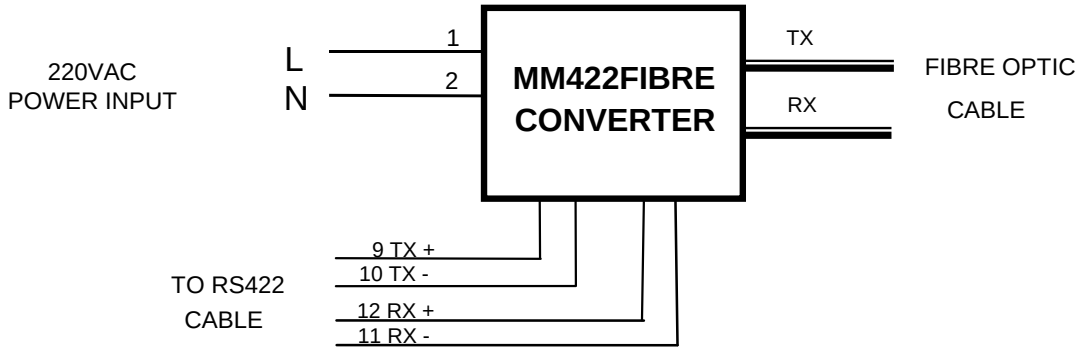
- **DIN Rail Mount**.
  The converter module plugs directly into a 11PIN industry standard relay base which may be DIN rail mounted or flush mounted.

3.26.2 SPECIFICATIONS

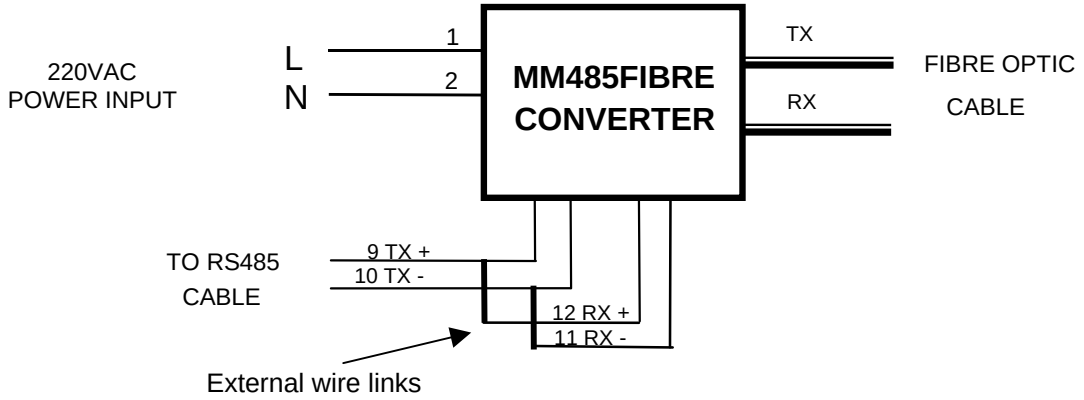
- **POWER REQUIREMENT**: 200 - 260VAC 50/60Hz. – LED POWER indication
- **PORT TX/RX INDICATORS**: 1 x TX led and 1 x RX led per port.
- **FIBRE CONNECTORS** : Supplied with either SMA or ST connectors.
- **FIBRE SIZES**: 50/125µm, 62.5/125µm, and 100/140µm.
- **TRANSMITTER WAVELENGTH:** 820 Nanometre. Multi-Mode.
- **TRANSMISSION DISTANCE**: Up to 2 Km depending on attenuation of fibre used.
- **BAUD RATE**: Selectable per port – 1200, 2400, 4800, 9600, 19200 and 38400.
- **DATA BITS**: Selectable per port - 7 or 8 data bits
- **STOP BITS**: Selectable per port – 1 or 2 stop bits
- **PARITY BITS**: Selectable per port - none, even or odd parity
- **ISOLATION:** Transformer/OptoCoupler - 1500VACrms
- **OPERATING TEMPERATURE**: -20°C to + 80°C.
- **DIMENSIONS:** 105mm (HIGH) X 70mm (WIDE) X 60mm (DEEP)

ST™ is a registered trademark of AT&T Lightguide Cable Connectors.

3.26.3 WIRING



4 WIRE OPERATION



2 WIRE OPERATION

3.26.4 SWITCH SETTINGS

SWITCH SW1 - RS485(RS422) PORT 1 SETUP

SWITCH SW2 - FIBRE PORT 2 SETUP

SWITCH SETTINGS SW1 &SW2

No.	FUNCTION	ON	OFF
8	FULL DUPLEX	S8	-
8	HALF DUPLEX	-	S8
7	DATA BITS - 7	S7	-
7	DATA BITS - 8	-	S7
6	STOP BITS - 2	S6	-
6	STOP BITS - 1	-	S6
4,5	PARITY - ODD	S5	S4
4,5	PARITY - EVEN	S4	S5
4,5	PARITY - NONE	-	S4,S5
1,2,3	BAUD 38400	S3/S1	S2
1,2,3	BAUD 19200	S3	S1,S2
1,2,3	BAUD 4800	S1,S2	S3
1,2,3	BAUD 2400	S2	S1,S3
1,2,3	BAUD 1200	S1	S2,S3
1,2,3	BAUD 9600	-	S1,S2,S3

3.26.5 ORDER CODES

Order Code	Description
MM485FIBRE	RS485 (RS422) FIBRE OPTIC CONVERTER

3.27 MM232/485CONV- RS232/485(422) ISOLATED CONVERTER

3.27.1 DESCRIPTION

The RS232 / RS485 Isolated converter module is used to convert RS232 data communications signals for transmission over 2 or 4 wire RS485(RS422) twisted pair cables. The RS232 RTS connection can be used to turn the transmitter on when transmitting in 2 wire mode (half duplex) or it can be permanently enabled, for an easy to use, one-to-one communications link in 4 wire mode (full duplex). The converters can be used to extend the limited distance capabilities of RS232 devices such as printers and terminals for up to one kilometre.

Standard features of the converter are :

- **2 or 4 Wire Operation.**
  Internal jumpers are used to select 2 wire (RS485) or 4 wire (RS422) modes.

- **RTS Flow control.**
  The RS232 RTS signal can be used to switch the transmitter on and off when multiple converters are connected to the same cable. For 4 wire point to point operation the RTS signal is not required and the RS485 Tx and Rx can be permanently enabled.

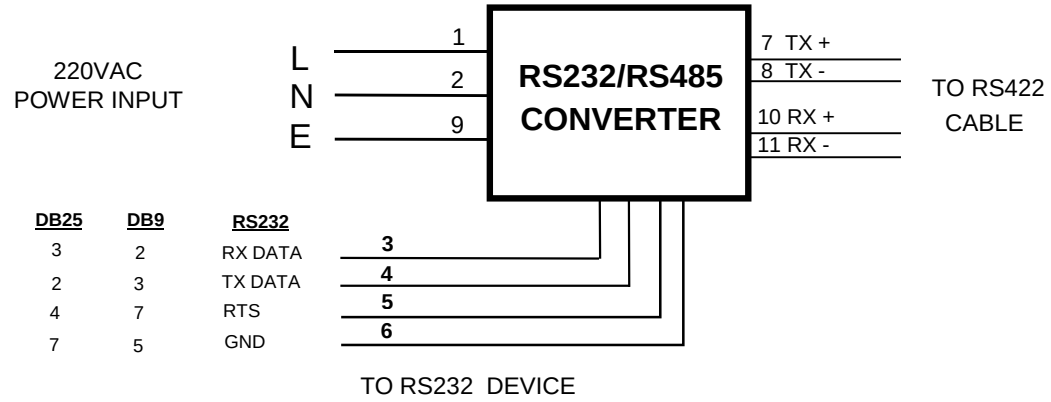
- **Signal Isolation**.
  The converter module isolates the RS232 and RS485 signals to prevent ground loops between remote devices.

- **DIN Rail Mount**.
  The converter module plugs directly into a 11PIN industry standard relay base which may be DIN rail mounted or flush mounted.

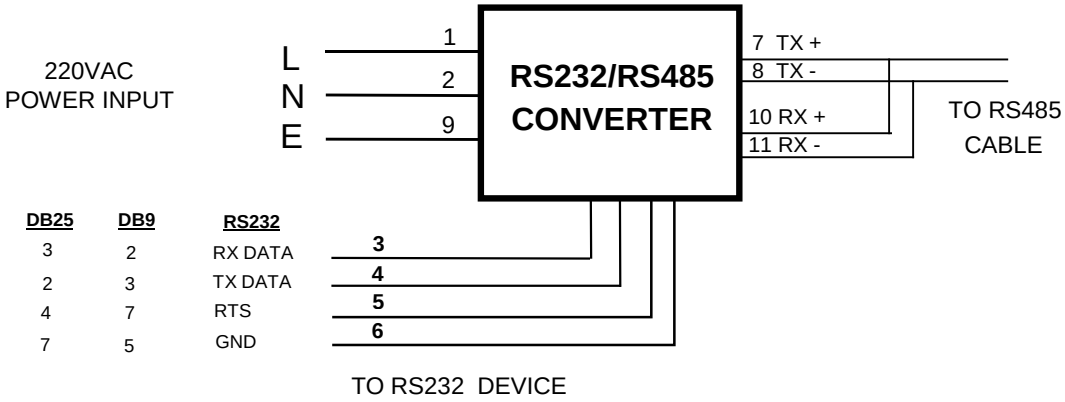
3.27.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA
Transmission Meduim:	2 OR 4 Wire twisted pair cable.
Transmission Distance:	Up to 1 Km.
Indicator:	LED indicator shows power state.
Isolation:	Transformer/OptoCoupler - 1500VACrms
Operating Temperature:	-20°C to + 80°C.
Connector:	11 Pin Connector on rear of unit.

3.27.3 WIRING

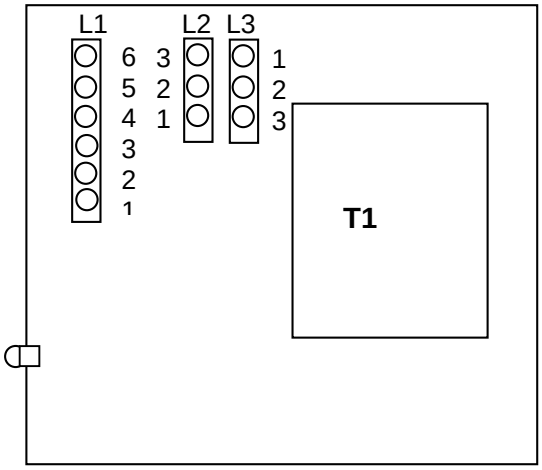


4 WIRE OPERATION



2 WIRE OPERATION

3.27.4 JUMPER SETTINGS:



L1 LINK SETTINGS:

1 - 2 TX PERMANENTLY ENABLED
2 - 3 TX CONTROLLED BY RTS

4 - 5 RX CONTROLLED BY RTS
5 - 6 RX PERMANENTLY ENABLED

L2 & L3 LINK SETTINGS:
(idle state receiver output)

1 - 2 RX OP = '1'
2 - 3 RX OP = '0'
NO CONNECTION - TRI STATE

RECOMMENDED SETTINGS:

2 WIRE (FACTORY DEFAULT):		**4 WIRE:**	
L1	2-3 & 4-5	L1	1-2 & 5-6
L2&L3	1-2	L2&L3	NO CONNECTION

*****NOTE:** 120ohm termination resistors must be placed at the ends of the twisted pair cables for correct operation.

Order Codes: MM232/485CONV

3.28 DU02 - DIAGNOSTIC UNIT

3.28.1 DESCRIPTION

The Diagnostic Unit is a self configuring hand held unit which plugs into the diagnostic port of most MOD-MUX modules. The unit can be used while the MOD-MUX module is active in a system, without interfering with the operation of the system or module.

The diagnostic unit is used to display field parameters and diagnostic parameters which are continuously being sent out from the MOD-MUX module. When the unit is plugged into the MOD-MUX module it automatically detects the module type, and formats the display accordingly. The parameters can be viewed by scrolling up and down. This is done by pressing the up and down buttons on the front of the diagnostic unit.

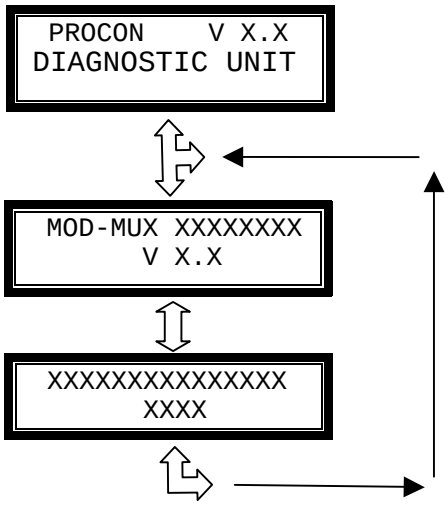
The following information is available:
1. Module type and software version.
2. I/O status(digital) or value(analog).
3. Configuration information.
4. Network ID number.

When the diagnostic unit is first plugged in , the display shows the software version number of the diagnostic unit.

3.28.2 SPECIFICATIONS

Power Supply:	Automatically sourced from the MOD-MUX module.
Indicator:	2 Line X 16 character LCD display.
Operating Temperature:	0°C to + 70°C.

3.28.3 DIAGNOSTIC UNIT MENU FORMAT



3.29 MM11PINBASE - DIN RAIL MOUNT 11 PIN RELAY BASE

3.29.1 DESCRIPTION

The MOD-MUX range of modules plug into a industry standard 11 pin relay base. An example as supplied by Procon is shown in the picture.

4. DATA ADDRESSES

The data in the modules is stored in registers. These registers are accessed over the network using the MODBUS communication protocol.

The MODBUS mode used is the **RTU** mode with the following set-up:

BAUD RATE	LOW (9600) / HIGH (19200)
DATA BITS	8
PARITY	NONE
STOP BITS	1

There are 4 types of variables which can be accessed from the module. Each module has one or more of these data variables.

Type	**Start Address**	**Variable**
1	00001	Digital Outputs
2	10001	Digital Inputs
3	30001	Input registers (Analog)
4	40001	Output registers (Analog)

Note: Due to the limited buffer memory size in the modules, the Modbus message length must be limited to 8 consecutive read or write registers. If more registers are required then a new poll group must be added for the next 8 registers.

4.1 MM8DI - DIGITAL INPUTS (MODULE TYPE = 01)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
10005	Digital Input 5	0	1	R	"
10006	Digital Input 6	0	1	R	"
10007	Digital Input 7	0	1	R	"
10008	Digital Input 8	0	1	R	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 1
30002	Digital Inputs	N/A	N/A	R	Digital Inputs in lower 8 bits. 8 - 1.
40003	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40004	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40005	Counter 2 MSB	0	65535	R/W	"
40006	Counter 2 LSB	0	65535	R/W	"
40007	Counter 3 MSB	0	65535	R/W	"
40008	Counter 3 LSB	0	65535	R/W	"
40009	Counter 4 LSB	0	65535	R/W	"
40010	Counter 4 LSB	0	65535	R/W	"
40011	Counter 5 MSB	0	65535	R/W	"
40012	Counter 5 LSB	0	65535	R/W	"
40013	Counter 6 MSB	0	65535	R/W	"
40014	Counter 6 LSB	0	65535	R/W	"
40015	Counter 7 MSB	0	65535	R/W	"
40016	Counter 7 LSB	0	65535	R/W	"
40017	Counter 8 MSB	0	65535	R/W	"
40018	Counter 8 LSB	0	65535	R/W	"
40019	Counter Mode	0	1	R/W	0 = Disable, 1 = Up Counting, 2 = Up/Down Counting

4.2 MM8DIB - DIGITAL INPUTS (MODULE TYPE = 10)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
10005	Digital Input 5	0	1	R	"
10006	Digital Input 6	0	1	R	"
10007	Digital Input 7	0	1	R	"
10008	Digital Input 8	0	1	R	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 10
30002	Digital Inputs	N/A	N/A	R	Digital Inputs in lower 8 bits. 8 - 1.
40003	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40004	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40005	Counter 2 MSB	0	65535	R/W	"
40006	Counter 2 LSB	0	65535	R/W	"
40007	Counter 3 MSB	0	65535	R/W	"
40008	Counter 3 LSB	0	65535	R/W	"
40009	Counter 4 LSB	0	65535	R/W	"
40010	Counter 4 LSB	0	65535	R/W	"
40011	Counter 5 MSB	0	65535	R/W	"
40012	Counter 5 LSB	0	65535	R/W	"
40013	Counter 6 MSB	0	65535	R/W	"
40014	Counter 6 LSB	0	65535	R/W	"
40015	Counter 7 MSB	0	65535	R/W	"
40016	Counter 7 LSB	0	65535	R/W	"
40017	Counter 8 MSB	0	65535	R/W	"
40018	Counter 8 LSB	0	65535	R/W	"
40019	Filter 1	0	255	R/W	Debounce Filter X 5milliseconds
40020	Filter 2	0	255	R/W	Debounce Filter X 5milliseconds
40021	Filter 3	0	255	R/W	Debounce Filter X 5milliseconds
40022	Filter 4	0	255	R/W	Debounce Filter X 5milliseconds
40023	Filter 5	0	255	R/W	Debounce Filter X 5milliseconds
40024	Filter 6	0	255	R/W	Debounce Filter X 5milliseconds
40025	Filter 7	0	255	R/W	Debounce Filter X 5milliseconds
40026	Filter 8	0	255	R/W	Debounce Filter X 5milliseconds

4.3 MM16DI - DIGITAL INPUTS (MODULE TYPE = 09)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
10005	Digital Input 5	0	1	R	"
10006	Digital Input 6	0	1	R	"
10007	Digital Input 7	0	1	R	"
10008	Digital Input 8	0	1	R	"
10009	Digital Input 9	0	1	R	"
10010	Digital Input 10	0	1	R	"
10011	Digital Input 11	0	1	R	"
10012	Digital Input 12	0	1	R	"
10013	Digital Input 13	0	1	R	"
10014	Digital Input 14	0	1	R	"
10015	Digital Input 15	0	1	R	"
10016	Digital Input 16	0	1	R	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 9
30002	Digital Inputs	N/A	N/A	R	Digital Inputs in 16 bits. 16 - 1.
40003	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40004	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40005	Counter 2 MSB	0	65535	R/W	"
40006	Counter 2 LSB	0	65535	R/W	"
40007	Counter 3 MSB	0	65535	R/W	"
40008	Counter 3 LSB	0	65535	R/W	"
40009	Counter 4 LSB	0	65535	R/W	"
40010	Counter 4 LSB	0	65535	R/W	"
40011	Counter 5 MSB	0	65535	R/W	"
40012	Counter 5 LSB	0	65535	R/W	"
40013	Counter 6 MSB	0	65535	R/W	"
40014	Counter 6 LSB	0	65535	R/W	"
40015	Counter 7 MSB	0	65535	R/W	"
40016	Counter 7 LSB	0	65535	R/W	"
40017	Counter 8 MSB	0	65535	R/W	"
40018	Counter 8 LSB	0	65535	R/W	"
40019	Counter Mode	0	1	R/W	0 = Disable, 1 = Up Counting, 2 = Up/Down Counting

4.4 MM8DO - DIGITAL OUTPUTS (MODULE TYPE = 02)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
00001	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00002	Digital Output 2	0	1	R/W	"
00003	Digital Output 3	0	1	R/W	"
00004	Digital Output 4	0	1	R/W	"
00005	Digital Output 5	0	1	R/W	"
00006	Digital Output 6	0	1	R/W	"
00007	Digital Output 7	0	1	R/W	"
00008	Digital Output 8	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 2
40002	Digital Outputs	N/A	N/A	R/W	Digital Outputs in lower 8 bits. 8 - 1.
40003	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.

4.5 MM16DO - DIGITAL OUTPUTS (MODULE TYPE = 25)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
00001	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00002	Digital Output 2	0	1	R/W	"
00003	Digital Output 3	0	1	R/W	"
00004	Digital Output 4	0	1	R/W	"
00005	Digital Output 5	0	1	R/W	"
00006	Digital Output 6	0	1	R/W	"
00007	Digital Output 7	0	1	R/W	"
00008	Digital Output 8	0	1	R/W	"
00009	Digital Output 9	0	1	R/W	"
00010	Digital Output 10	0	1	R/W	"
00011	Digital Output 11	0	1	R/W	"
00012	Digital Output 12	0	1	R/W	"
00013	Digital Output 13	0	1	R/W	"
00014	Digital Output 14	0	1	R/W	"
00015	Digital Output 15	0	1	R/W	"
00016	Digital Output 16	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 2
40002	Digital Outputs	N/A	N/A	R/W	Digital Outputs in bits. 16(msb) – 1(lsb).
40003	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.

4.6 MM4DIO - DIGITAL INPUTS / OUTPUTS (MODULE TYPE = 16)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
00005	Digital Output 5	0	1	R/W	Status of Digital Outputs.
00006	Digital Output 6	0	1	R/W	"
00007	Digital Output 7	0	1	R/W	"
00008	Digital Output 8	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 16
40002	Digital I/O	N/A	N/A	R/W	Digital Outputs in bits. 8 - 5, Inputs 4 - 1.
40003	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40004	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40005	Counter 2 MSB	0	65535	R/W	"
40006	Counter 2 LSB	0	65535	R/W	"
40007	Counter 3 MSB	0	65535	R/W	"
40008	Counter 3 LSB	0	65535	R/W	"
40009	Counter 4 LSB	0	65535	R/W	"
40010	Counter 4 LSB	0	65535	R/W	"

4.7 MM8DIO - DIGITAL INPUTS / OUTPUTS (MODULE TYPE = 23)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
10005	Digital Input 5	0	1	R	"
10006	Digital Input 6	0	1	R	"
10007	Digital Input 7	0	1	R	"
10008	Digital Input 8	0	1	R	"
00009	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00010	Digital Output 2	0	1	R/W	"
00011	Digital Output 3	0	1	R/W	"
00012	Digital Output 4	0	1	R/W	"
00013	Digital Output 5	0	1	R/W	"
00014	Digital Output 6	0	1	R/W	"
00015	Digital Output 7	0	1	R/W	"
00016	Digital Output 8	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 23
40002	Digital I/O	N/A	N/A	R/W	Digital Outputs in bits. 16 - 9, Inputs 8 - 1.
40003	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40004	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40005	Counter 2 MSB	0	65535	R/W	"
40006	Counter 2 LSB	0	65535	R/W	"
40007	Counter 3 MSB	0	65535	R/W	"
40008	Counter 3 LSB	0	65535	R/W	"
40009	Counter 4 MSB	0	65535	R/W	"
40010	Counter 4 LSB	0	65535	R/W	"
40011	Counter 5 MSB	0	65535	R/W	"
40012	Counter 5 LSB	0	65535	R/W	"
40013	Counter 6 MSB	0	65535	R/W	"
40014	Counter 6 LSB	0	65535	R/W	"
40015	Counter 7 MSB	0	65535	R/W	"
40016	Counter 7 LSB	0	65535	R/W	"
40017	Counter 8 MSB	0	65535	R/W	"
40018	Counter 8 LSB	0	65535	R/W	"
40019	Counter Mode	0	1	R/W	0 = Disable, 1 = Up Counting, 2 = Up/Down Counting
40020	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.

4.8 MM4RO - RELAY OUTPUTS (MODULE TYPE = 07)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
00001	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00002	Digital Output 2	0	1	R/W	"
00003	Digital Output 3	0	1	R/W	"
00004	Digital Output 4	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 7
40002	Digital Outputs	N/A	N/A	R/W	Digital Outputs in lower 4 bits. 4 - 1.
40003	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.

4.9 MM8RO - RELAY OUTPUTS (MODULE TYPE = 29)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
00001	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00002	Digital Output 2	0	1	R/W	"
00003	Digital Output 3	0	1	R/W	"
00004	Digital Output 4	0	1	R/W	"
00005	Digital Output 5	0	1	R/W	"
00006	Digital Output 6	0	1	R/W	"
00007	Digital Output 7	0	1	R/W	"
00008	Digital Output 8	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 29
40002	Digital Outputs	N/A	N/A	R/W	Digital Outputs in bits. 8 - 1.
40003	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.

4.10 MM8AI - ANALOG INPUTS(MODULE TYPE = 03)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 3
30002	Analog Input 1	0	4095	R	Analog Input lower 12 Bits
30003	Analog Input 2	0	4095	R	"
30004	Analog Input 3	0	4095	R	"
30005	Analog Input 4	0	4095	R	"
30006	Analog Input 5	0	4095	R	"
30007	Analog Input 6	0	4095	R	"
30008	Analog Input 7	0	4095	R	"
30009	Analog Input 8	0	4095	R	"

4.11 MM8AI ISO - ANALOG INPUTS (MODULE TYPE = 17)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 17
30002	Analog Input 1	0	4095	R	Analog Input lower 12 Bits
30003	Analog Input 2	0	4095	R	"
30004	Analog Input 3	0	4095	R	"
30005	Analog Input 4	0	4095	R	"
30006	Analog Input 5	0	4095	R	"
30007	Analog Input 6	0	4095	R	"
30008	Analog Input 7	0	4095	R	"
30009	Analog Input 8	0	4095	R	"

4.12 MM8TC - THERMOCOUPLE INPUTS (MODULE TYPE = 05)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 5
30002	TC Input 1	-xxx.x	yyyy.y	R	Thermocouple Inputs. See table for range.
30003	TC Input 2	-xxx.x	yyyy.y	R	Resolution in 0.1°C.
30004	TC Input 3	-xxx.x	yyyy.y	R	"
30005	TC Input 4	-xxx.x	yyyy.y	R	"
30006	TC Input 5	-xxx.x	yyyy.y	R	"
30007	TC Input 6	-xxx.x	yyyy.y	R	"
30008	TC Input 7	-xxx.x	yyyy.y	R	"
30009	TC Input 8	-xxx.x	yyyy.y	R	"
30010	CJC Temp.	-xxx.x	yyyy.y	R	CJC Temperature in 0.1°C resolution.
40011	TC Type	1	13	R/W	See TC Tables.
40017	Units Type	1	2	R/W	1=°C, 2=°F (from version 7)

4.13 MM8TCISO - THERMOCOUPLE INPUTS (MODULE TYPE = 18)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 18
30002	TC Input 1	-xxx.x	yyyy.y	R	Thermocouple Inputs. See table for range.
30003	TC Input 2	-xxx.x	yyyy.y	R	Resolution in 0.1°C.
30004	TC Input 3	-xxx.x	yyyy.y	R	"
30005	TC Input 4	-xxx.x	yyyy.y	R	"
30006	TC Input 5	-xxx.x	yyyy.y	R	"
30007	TC Input 6	-xxx.x	yyyy.y	R	"
30008	TC Input 7	-xxx.x	yyyy.y	R	"
30009	TC Input 8	-xxx.x	yyyy.y	R	"
30010	CJC Temp.	-xxx.x	yyyy.y	R	CJC Temperature in 0.1°C resolution.
40011	TC Type	1	13	R/W	See TC Tables.
40017	Units Type	1	2	R/W	1=°C, 2=°F (from version 7)

4.14 MM6RTD - RTD INPUTS (MODULE TYPE = 06)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 6
30002	RTD Input 1	-xxx.x	yyyy.y	R	RTD Inputs. See table for range.
30003	RTD Input 2	-xxx.x	yyyy.y	R	Resolution in 0.1°C.
30004	RTD Input 3	-xxx.x	yyyy.y	R	"
30005	RTD Input 4	-xxx.x	yyyy.y	R	"
30006	RTD Input 5	-xxx.x	yyyy.y	R	"
30007	RTD Input 6	-xxx.x	yyyy.y	R	"
40008	RTD Type	1	2	R/W	See RTD Tables.
40013	Units Type	1	2	R/W	1=°C, 2=°F (from version 4)

4.15 MM6RTDB - RTD INPUTS (MODULE TYPE = 12)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 12
30002	RTD Input 1	-xxx.x	yyyy.y	R	RTD Inputs. See table for range.
30003	RTD Input 2	-xxx.x	yyyy.y	R	Resolution in 0.1°C.
30004	RTD Input 3	-xxx.x	yyyy.y	R	"
30005	RTD Input 4	-xxx.x	yyyy.y	R	"
30006	RTD Input 5	-xxx.x	yyyy.y	R	"
30007	RTD Input 6	-xxx.x	yyyy.y	R	"
40008	RTD Type	1	2	R/W	See RTD Tables.
40013	Units Type	1	2	R/W	1=°C, 2=°F (from version 4)

4.16 MMDIOAIO - DIGITAL INPUTS / OUTPUTS (MODULE TYPE = 26)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
10005	Digital Input 5	0	1	R	"
00009	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00010	Digital Output 2	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 26
40002	Digital I/O	N/A	N/A	R/W	Digital Outputs in bits. 10 - 9, Inputs 5 - 1.
40003	RTD Input 1	-xxx.x	yyyy.y	R	RTD Inputs. See table for range.
40004	RTD Input 2	-xxx.x	yyyy.y	R	Resolution in 0.1°C.
40005	Analog Input 1	0	4095	R	Analog Input lower 12 Bits
40006	Analog Input 2	0	4095	R	Analog Input lower 12 Bits
40007	Analog Output 1	0	4095	R/W	Analog Output lower 12 Bits
40008	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40009	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40010	Counter 2 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40011	Counter 2 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40012	RTD 1 Type	1	2	R/W	See RTD Tables.
40013	RTD 2 Type	1	2	R/W	See RTD Tables.
40014	Analog Input 1 Type	1	2	R/W	1 = 0-20mA, 2 = 0-10V
40015	Analog Input 2 Type	1	2	R/W	"
40016	Analog Output Type	1	2	R/W	"
40017	Counter Mode	0	1	R/W	0 = Disable, 1 = Up Counting, 2 = Up/Down Counting
40018	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.

4.17 MM8AO - ANALOG OUTPUTS (MODULE TYPE = 08)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 8
40002	Analog Output 1	0	4095	R/W	Analog Outputs. 0 - 4095 = 0(4) - 20mA.
40003	Analog Output 2	0	4095	R/W	"
40004	Analog Output 3	0	4095	R/W	"
40005	Analog Output 4	0	4095	R/W	"
40006	Analog Output 5	0	4095	R/W	"
40007	Analog Output 6	0	4095	R/W	"
40008	Analog Output 7	0	4095	R/W	"
40009	Analog Output 8	0	4095	R/W	"
40014	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1-255 = enabled.

4.18 MM8VO - ANALOG OUTPUTS (MODULE TYPE = 24)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 8
40002	Analog Output 1	0	4095	R/W	Analog Outputs. 0 - 4095 = 0(2) – 10V.
40003	Analog Output 2	0	4095	R/W	"
40004	Analog Output 3	0	4095	R/W	"
40005	Analog Output 4	0	4095	R/W	"
40006	Analog Output 5	0	4095	R/W	"
40007	Analog Output 6	0	4095	R/W	"
40008	Analog Output 7	0	4095	R/W	"
40009	Analog Output 8	0	4095	R/W	"
40014	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1-255 = enabled.

5. SPECIFICATIONS

5.1 ENVIRONMENTAL

Operating Temperature	-5°C to +65°C
Storage Temperature	-20°C to +85°C
Humidity	Up to 95% non condensing.

5.2 EMC INSTALLATION INSTRUCTIONS

1. Screened twisted pair RS485 cable must be used with the screen grounded at one point only.
2. The RS485 cable must be terminated at both ends using a 120ohm resistor.
3. Use should be made of screened I/O, T/C, RTD cable with the screens grounded at one point as close to the MOD-MUX module as possible.

5.3 CONFORMITY CERTIFICATE

DECLARATION OF CONFORMITY
according to EN 45014

Manufacturer's Name:	Procon Electronics CC
Manufacturer's Address:	26 Wareing Park 2 Wareing Road Pinetown 3610 South Africa

declares that the product

Product Name:	MOD-MUX
Model Number(s):	MM8DI, MM8DIB, MM16DI, MM8DO, MM16DO, MM4DIO, MM8DIO, MM4RO, MM8AI/I, MM8AI/V, MM8AI/IISO, MM8AO, MM8VO, MM8TC, MM8TCISO, MM6RTD, MM6RTDB, MMDIOAIO, MMINTCONV, MMTCPCONV, MMI/OMAP, MM485REP, MM232OPTO/SMA, MM232OPTO/ST, MM485OPTO/SMA, MM485OPTO/ST, MMPSU150, MMPSU151

complies with EMC Directive 89/336/EEC and Low Voltage Equipment Directive 73/23/EEC and conforms to the following Product specifications:

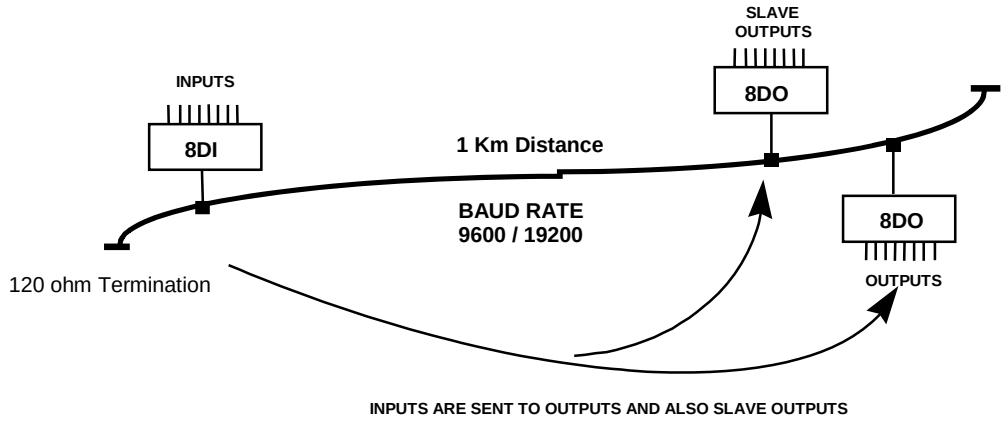
Safety:	IEC 950
EMC:	IEC 61000-4-2-A1 Level 2
	IEC 61000-4-3-A1 Level 2
	IEC 61000-4-4 Level 3
	CISPR 11:1997-A1 / EN 55011:1998 Group 1 Class A

Pinetown, SA — Location
August 2000 — Date
D.Ruddock

6. APPLICATION EXAMPLES

6.1 POINT TO POINT I/O

6.1.1 SYSTEM CONFIGURATION

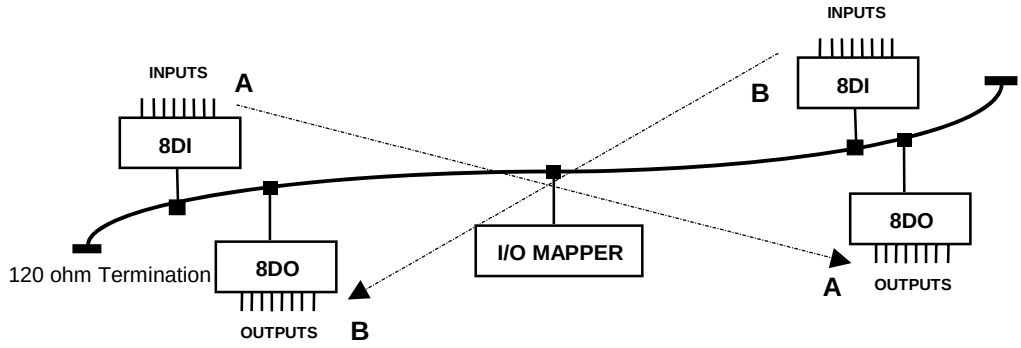


6.1.2 SETUP PROCEDURE

1. Install and wire up the modules as shown in section 2.
2. Ensure that the network has 120 Ohm termination resistors at the ends.
3. On the 8DI module switch all the switches off.
4. On the 8DO module switch on switch 9.
5. The TXD and RXD lights on both of the modules should now come on to indicate that the data is being transferred from the 8DI module to the 8DO module.
6. The identical setup is performed for a 8AI and 8AO module.
7. Additional slave 8DO or 8AO modules may be added to the network at any point. All switches should be switched off. The inputs will now also be available on these additional slave output modules. This feature allows for the inputs to be taken to a number of locations on the network.

6.2 COMPLEX POINT TO POINT I/O

6.2.1 SYSTEM CONFIGURATION



6.2.2 SETUP PROCEDURE

1. Install and wire up the modules as shown in section 2.
2. Ensure that the network has 120 Ohm termination resistors at the ends.
3. On the 8DI and 8DO module shown as “A” switch all the switches off. This selects NODE ID 0 for both modules.
4. On the 8DI and 8DO module shown as “B” switch on switch 1. This selects NODE ID 1 for both modules.
5. On the I/O Mapper switch on switch 2. This selects 2 pairs of digital I/O modules to be mapped.
6. The TXD and RXD lights on all of the modules should now come on to indicate that the data is being transferred from the 8DI modules to the 8DO modules.
7. If an 8AI and 8AO module are to be added to the system them switch on switch 6 on both of these modules and switch on switch 6 on the I/O Mapper. This sets the NODE ID of the 8AI and 8AO to ID 32 and selects 1 pair of Analog I/O modules to be mapped.
8. Additional 8DO or 8AO modules may be added to the network at any point. The NODE ID switches should be set to correspond to the ID of the input module were the data is coming from. The inputs will now also be available on these additional output modules. This feature allows for the inputs to be taken to a number of locations on the network.