

# MOD-MUX

**MODBUS MULTIPLEXING I/O SYSTEM**



**CATALOG AND DESIGN GUIDE**



**FUZYPRO**

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# 1. AN OVERVIEW OF THE MOD-MUX SYSTEM

## 1.1 DESCRIPTION

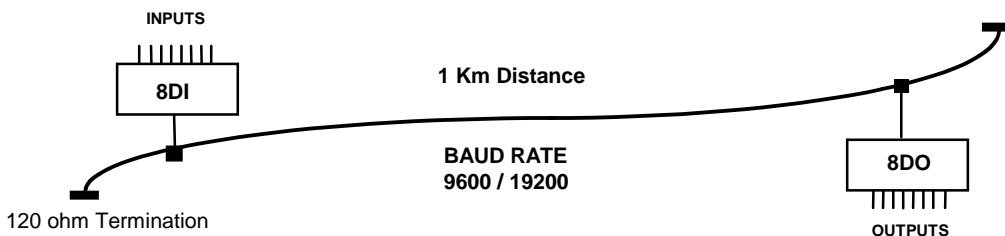
MOD-MUX is an innovative modular I/O system which provides a simple low cost solution for distributed I/O requirements. The MOD-MUX system consists of stand-alone Digital and Analog Input and Output modules which are connected together on a **RS485** two wire multi-drop network using the **MODBUS** protocol. 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:

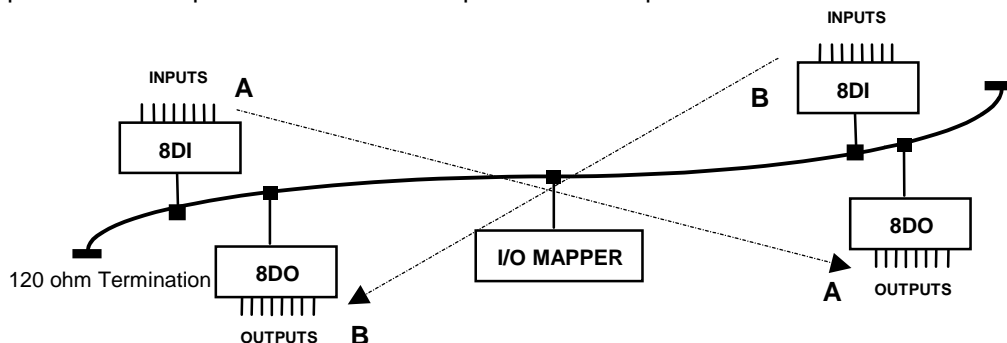
### A. Simple Point to Point I/O.

This is the basic configuration where 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.



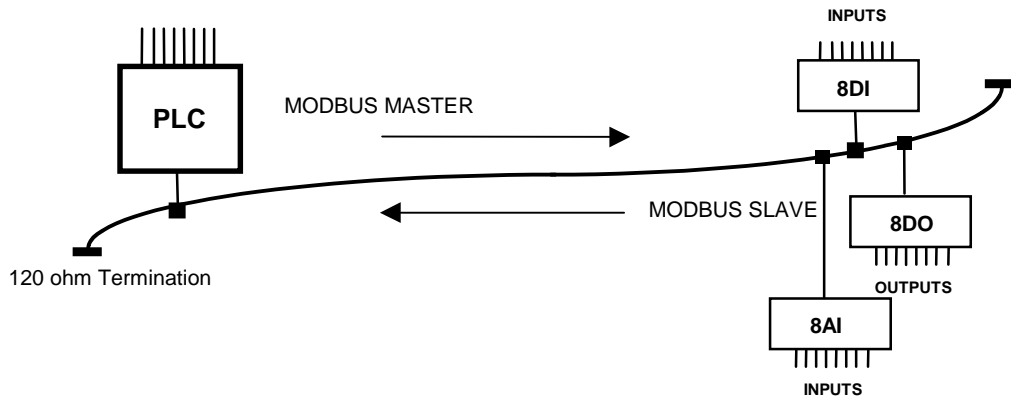
### B. Complex Point to Point I/O.

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.



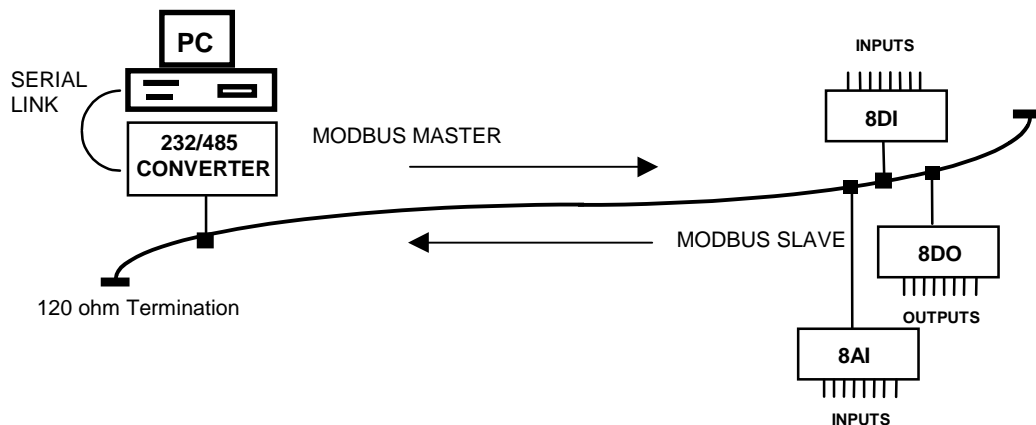
### C. I/O Expansion.

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.



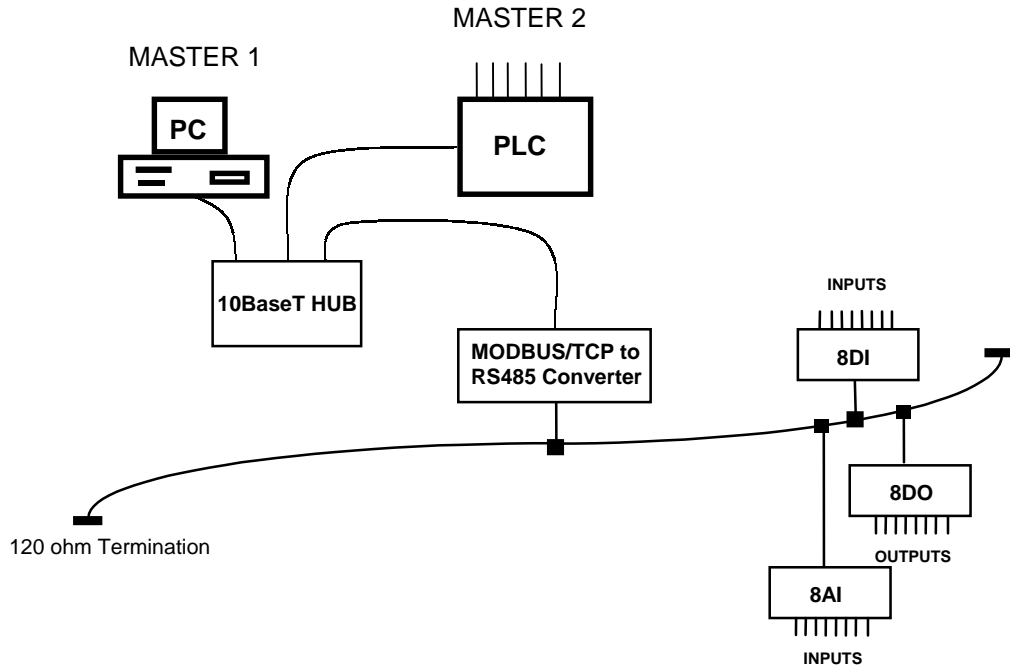
### D. Data Acquisition.

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.



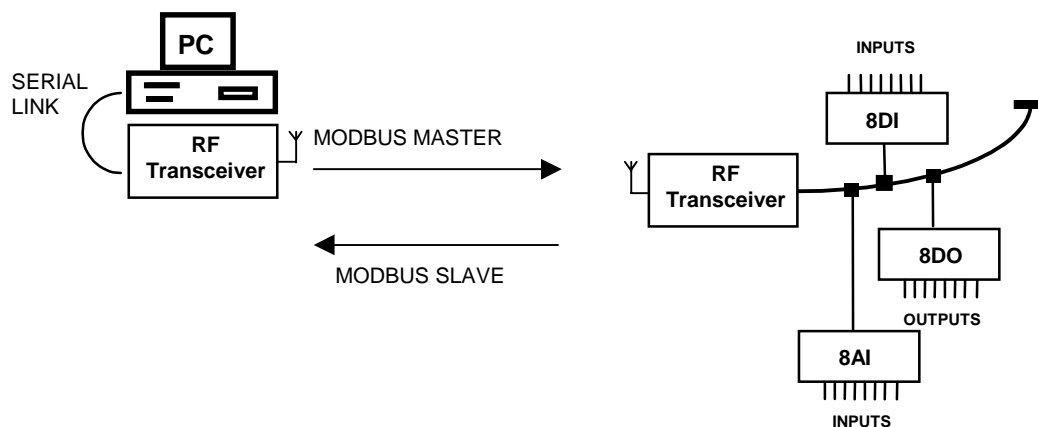
### E. Ethernet.

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
<b>POWER SUPPLIES</b>	
MMPSU150	220VAC / 2 x 12Vdc UNREG.POWER SUPPLY 150mA
MMPSU151	220VAC / 24Vdc UNREG.POWER SUPPLY 150mA
<b>I/O MODULES</b>	
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
MM4DIO	4 DIGITAL INPUT / 4 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
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
MM1AI2RO	1 ANALOG INPUT 0(4) - 20mA / 0(2) - 10V / 0(1) - 5V WITH DUAL ALARMS
MM1TI2RO	1 TEMPERATURE INPUT TC / RTD WITH DUAL ALARMS
MMMEM	MEMORY MODULE
<b>COMMUNICATION MODULES</b>	
MMTCPCONV	MODBUS/TCP RS485 CONVERTER
MMINTCONV	RS232 / RS485 INTELLIGENT CONVERTER
MMINTBCONV	RS232 / RS485 INTELLIGENT BOXED CONVERTER
MMDUALCONV	DUAL MASTER RS232 / RS485 BOXED CONVERTER
MM485REP	RS485 REPEATER
MM232OPTO	RS232 / FIBRE OPTIC CONVERTER 850nm
MM485OPTO	RS485 / FIBRE OPTIC CONVERTER 850nm
<b>MODBUS MASTERS</b>	
MMI/OMAP	I/O MAPPER
<b>ACCESSORIES</b>	
MM11PINBASE	11 PIN DIN RAIL MOUNT BASE
MM232CBL	RS232 9-PIN D-TYPE CONNECTOR AND CABLE
<b>DISPLAYS</b>	
UCLK	UNIVERSAL CLOCK
UCNTR6A	UNIVERSAL 6 DIGIT COUNTER
UDISP6A	UNIVERSAL 6 DIGIT DISPLAY

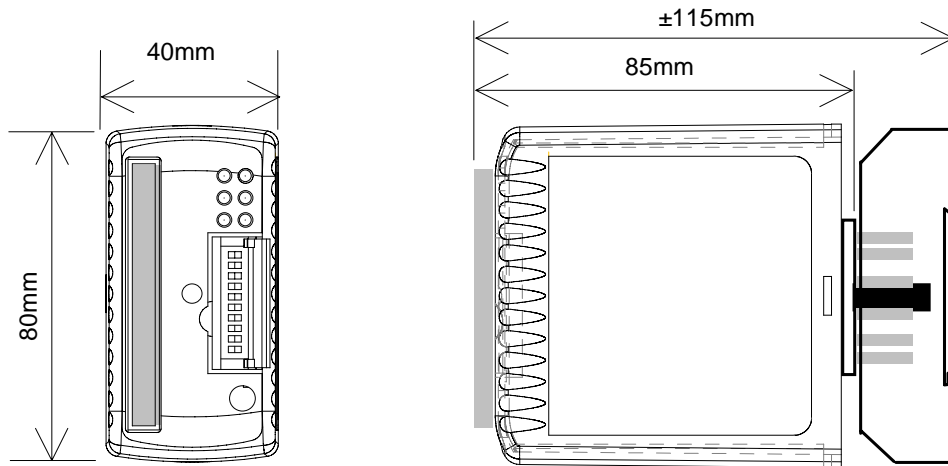
<b>MODEL</b>	<b>MODULE TYPE</b>
UCLK6LA	UNIVERSAL CLOCK 100mm DISPLAY
UCNTR6LA	UNIVERSAL 6 DIGIT COUNTER 100mm DISPLAY
UDISP6LA	UNIVERSAL 6 DIGIT DISPLAY 100mm DISPLAY
<b>MISCELLANEOUS</b>	
MM-LPI	LOOP POWERED ISOLATOR 4 - 20mA
MM232/485CONV	RS232/RS485(422) ISOLATED CONVERTER
DU01	DIAGNOSTIC UNIT
<b>MODBUS TCP MODULES</b>	
MMTCP16DI	16 DIGITAL INPUT MODULE WITH 8 COUNTERS
MMTCP16DO	16 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
MMTCP8TC	8 THERMOCOUPLE INPUT MODULE
MMTCP6RTD	6 RTD INPUT MODULE PT100, Ni120
MMTCPCONV	MODBUS TCP / RS485 CONVERTER

## 2. MOD-MUX GENERAL INFORMATION

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### 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.

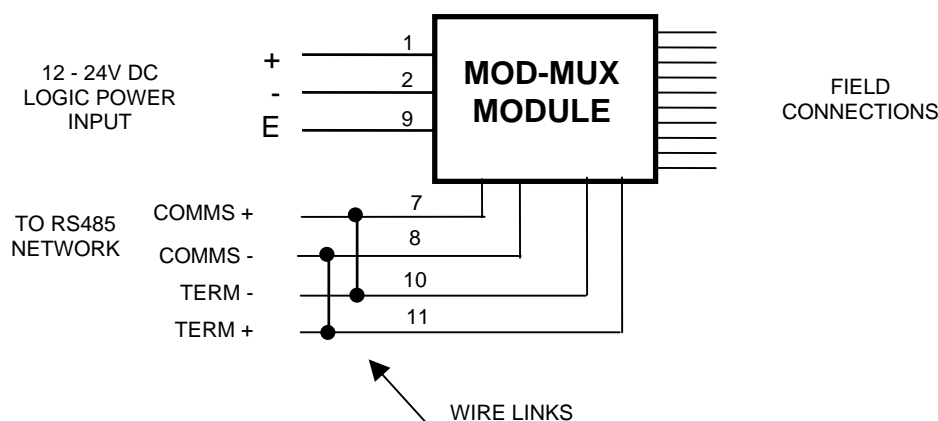
## 2.3 NETWORK TERMINATION

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  $\pm 1$  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
<b>NODE ID</b>	<b>DIP SWITCH SETTINGS</b>						
	<b>SW1</b>	<b>SW2</b>	<b>SW3</b>	<b>SW4</b>	<b>SW5</b>	<b>SW6</b>	<b>SW7</b>
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
<b>NODE ID</b>	<b>DIP SWITCH SETTINGS</b>						
	<b>SW1</b>	<b>SW2</b>	<b>SW3</b>	<b>SW4</b>	<b>SW5</b>	<b>SW6</b>	<b>SW7</b>
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.



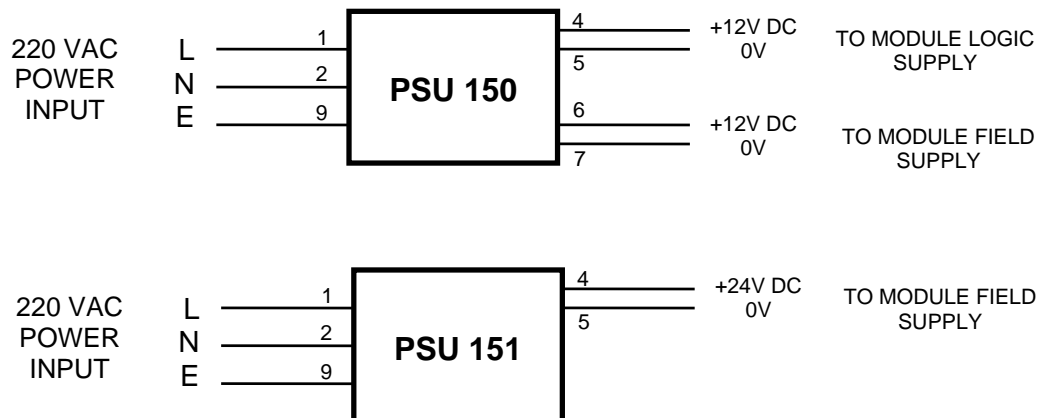
##### 3.1.2 SPECIFICATIONS

Power Supply: 200 - 260VAC @ 3VA 50/60 Hz

Outputs: MMPSU150 - 2 X Isolated 12 Vdc UNREG @ 150mA each  
 MMPSU151 - 1 X 24 Vdc UNREG @ 150mA

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 (See section 3.2.4).

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:

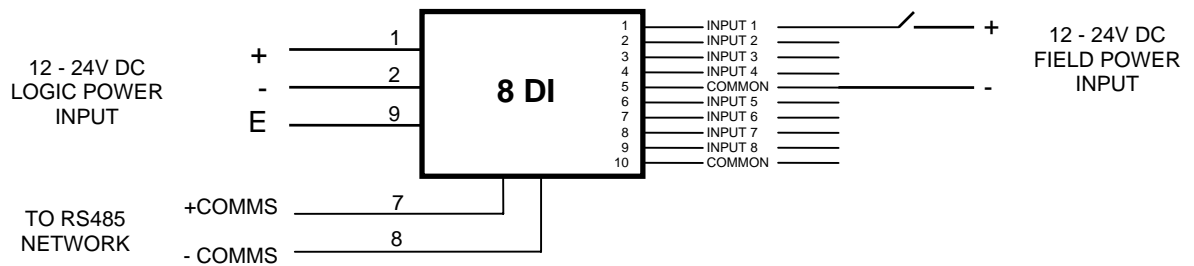
Supply Voltage	10 - 26 Vdc
Supply Current	8 X 4 mA @ 12Vdc / 8 X 8 mA @ 24Vdc
Isolation	1500Vrms between field and logic

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

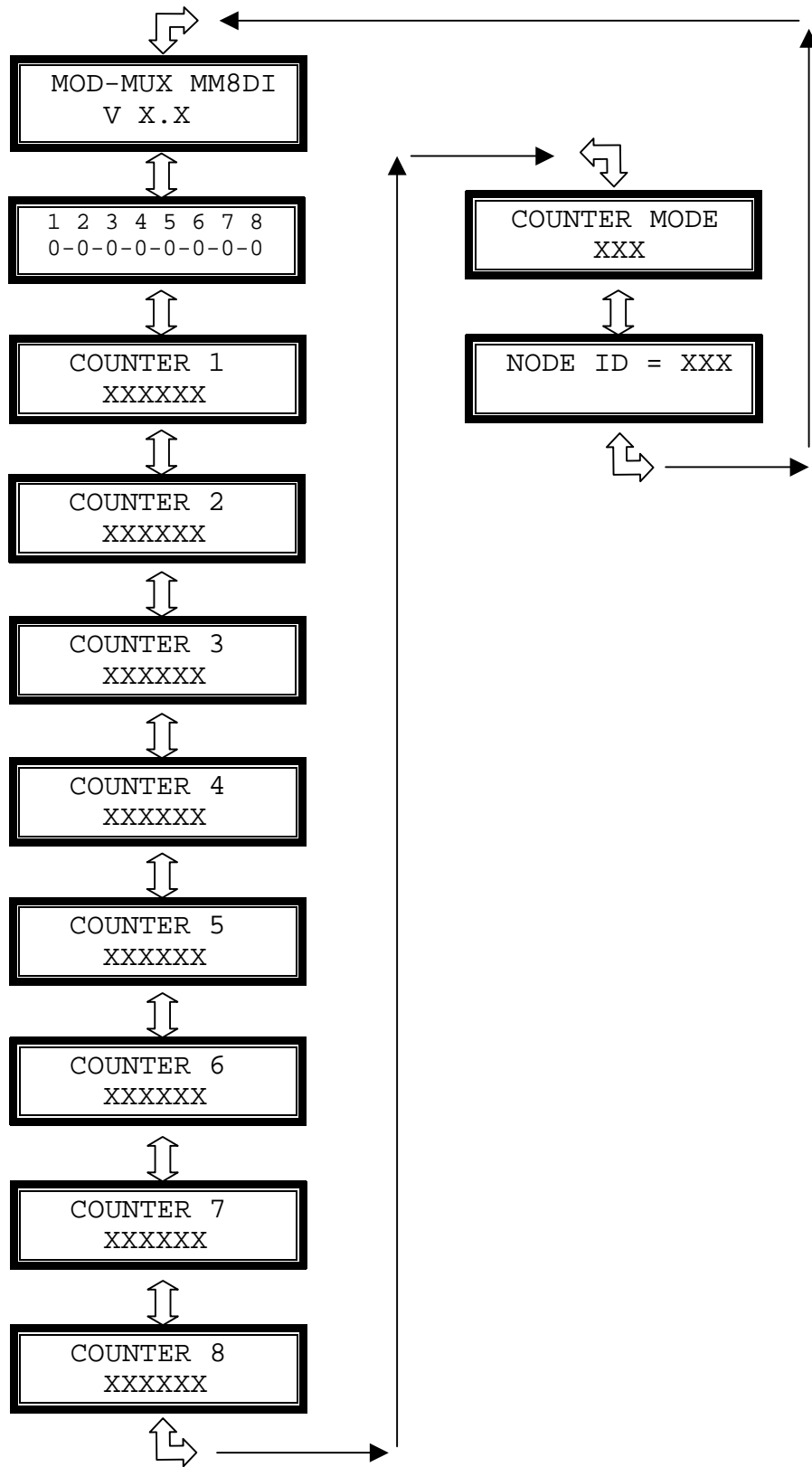
### 3.2.3 WIRING



### 3.2.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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 (See section 3.3.4).

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.

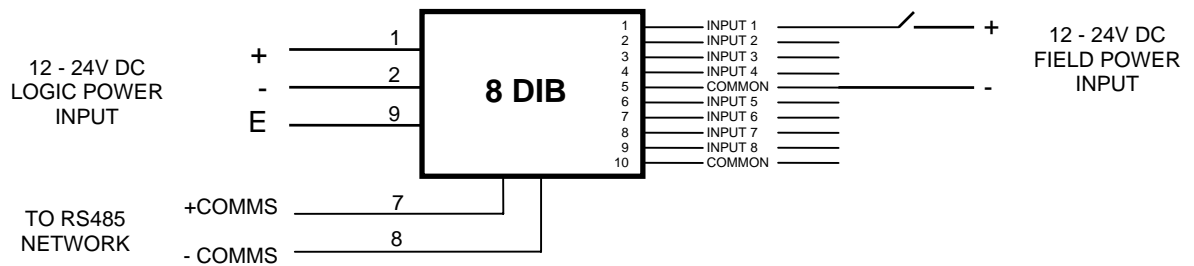
The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.



#### 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

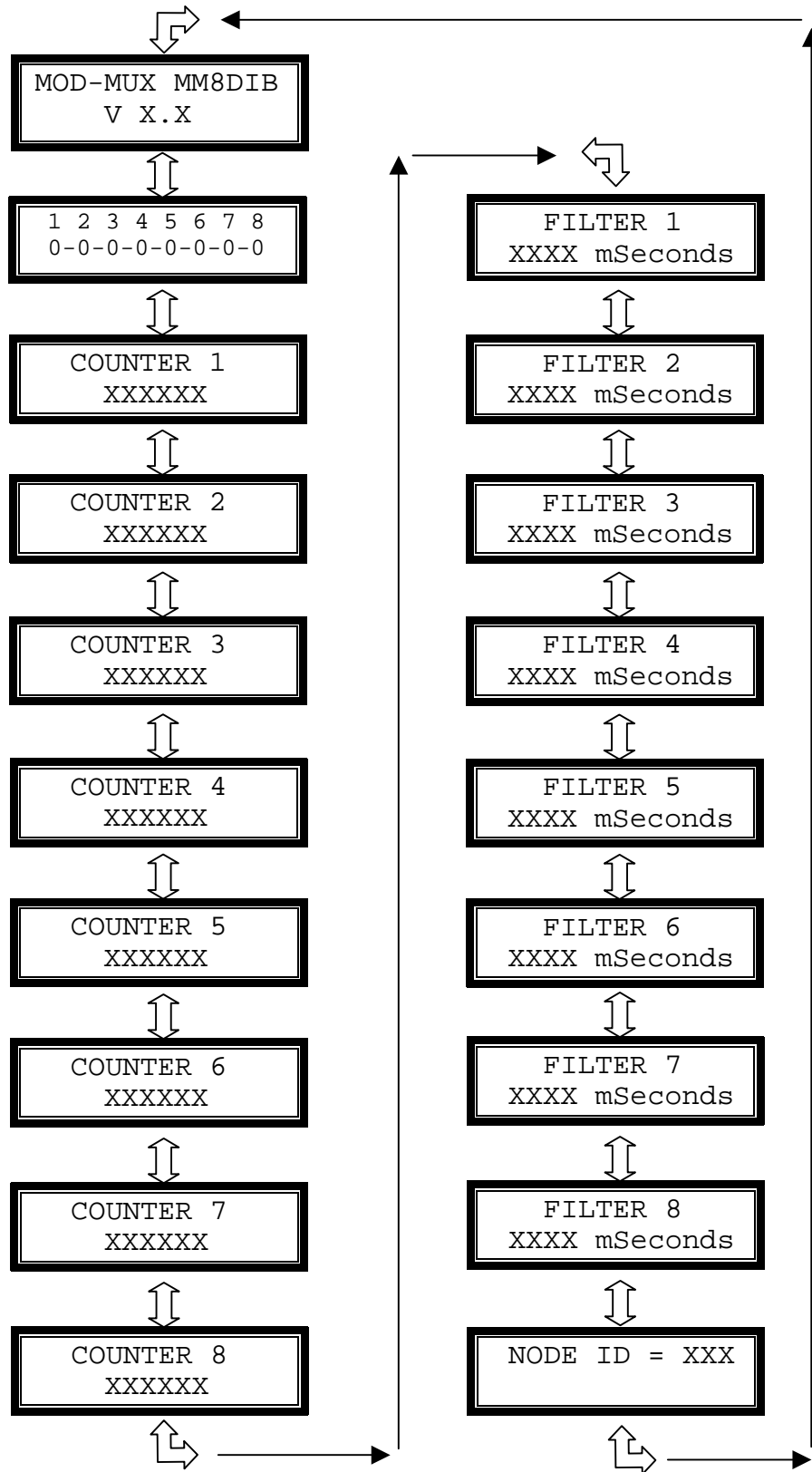
### 3.3.3 WIRING



### 3.3.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.3.5 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 (See section 3.4.4).

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:

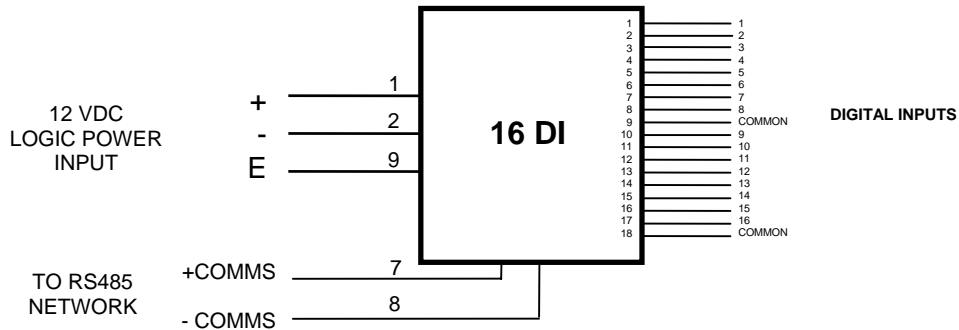
Inputs	1 to 8
Resolution	32 Bits
Frequency	500 Hz (Max)
Pulse Width	1ms (min)

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.



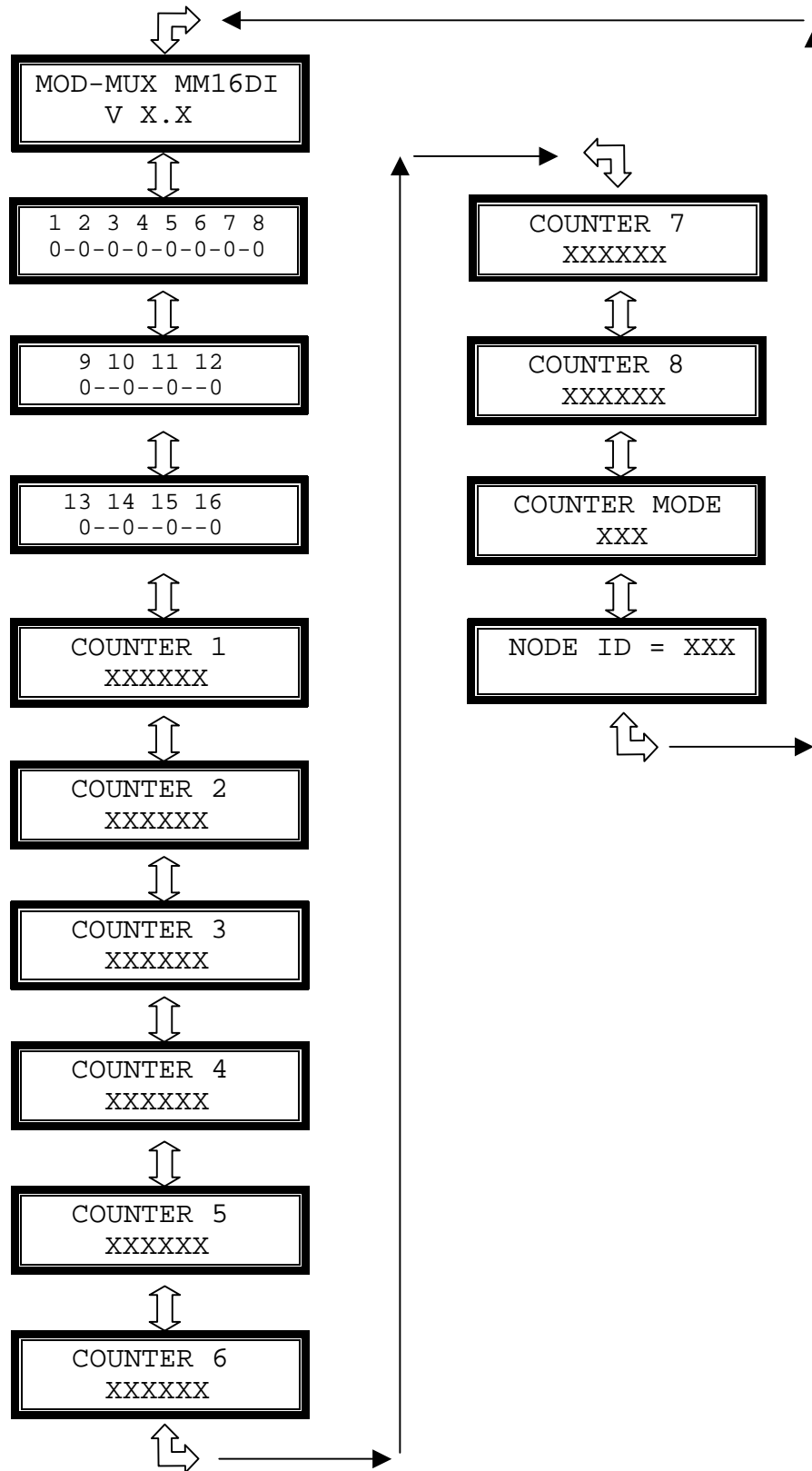
### 3.4.3 WIRING



### 3.4.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.4.5 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 (See Section 3.5.4) 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.



### 3.5.2 SPECIFICATIONS

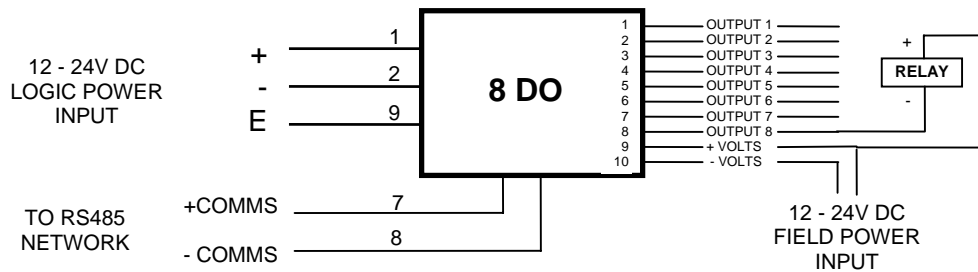
Power Supply:	(Logic)	10 - 26 Vdc @ 50 mA
	(Field)	20 - 26 Vdc @ 25 mA

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

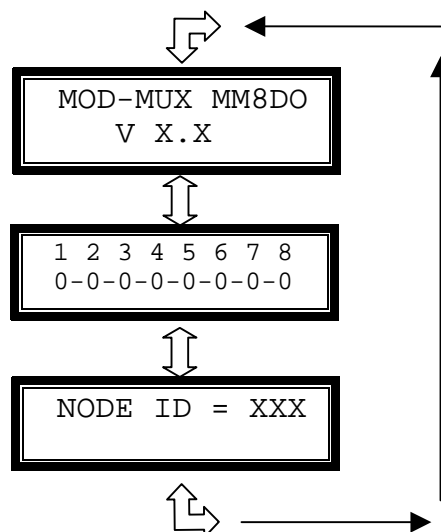
### 3.5.3 WIRING



### 3.5.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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 MM4DIO - DIGITAL INPUTS / OUTPUTS

### 3.6.1 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 (See section 3.6.4).

**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.

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.



### 3.6.2 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)

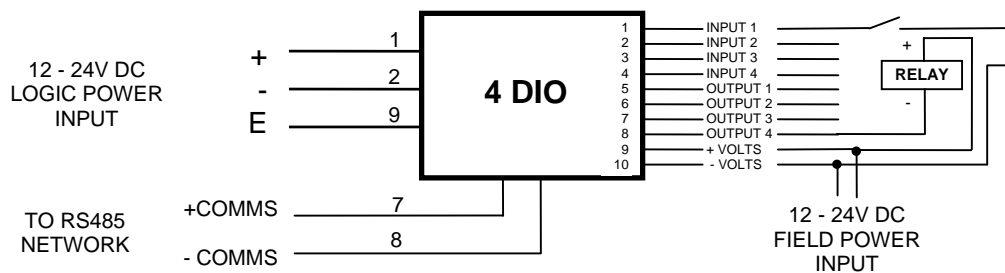
Outputs: Open Collector NPN

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

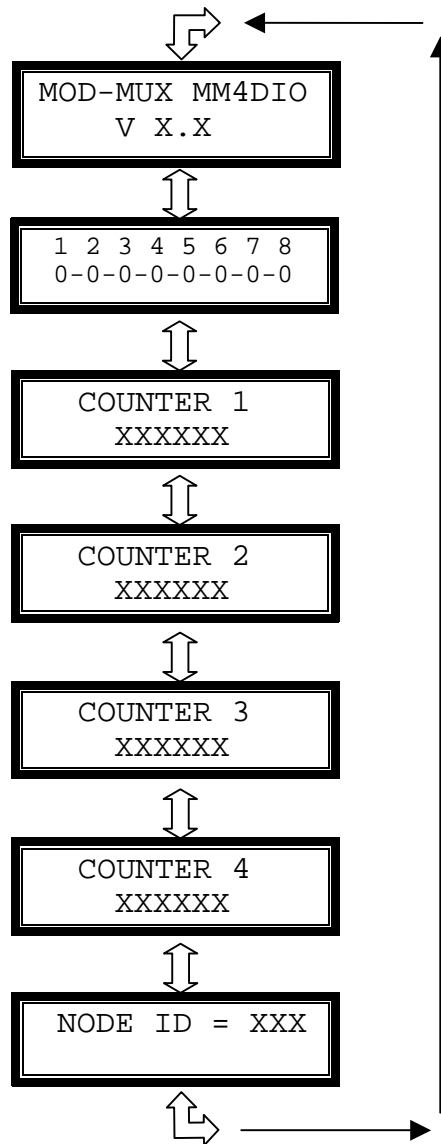
**Note:** Inputs 1 to 4 are used as both digital inputs and counter inputs.

### 3.6.3 WIRING



<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.6.4 DIAGNOSTIC UNIT MENU FORMAT



## 3.7 MM4RO - RELAY OUTPUTS

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### 3.7.1 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 (See Section 3.7.4) 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.



### 3.7.2 SPECIFICATIONS

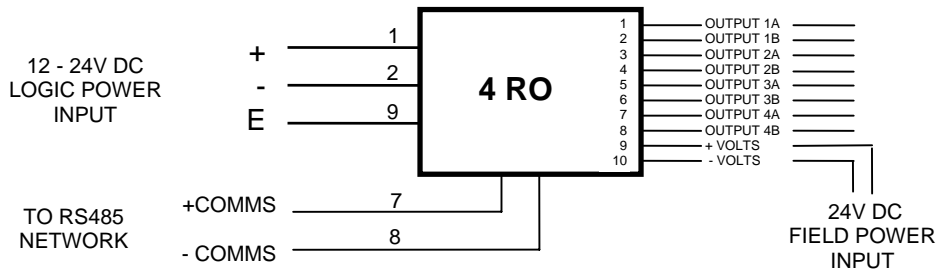
Power Supply: (Logic) 10 - 26 Vdc @ 50 mA  
(Field) 20 - 26Vdc @ 105mA

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



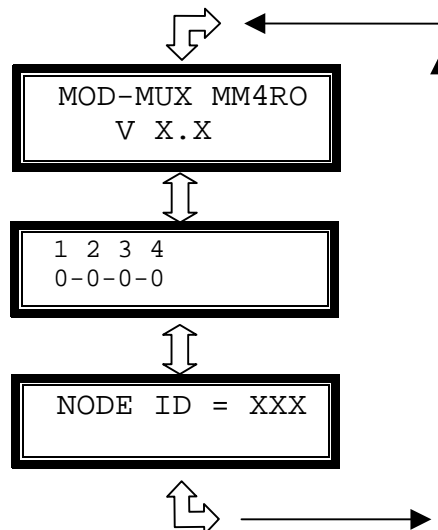
### 3.7.3 WIRING



### 3.7.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	
9	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. 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)

### 3.7.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.8 MM8AI - ANALOG INPUTS

### 3.8.1 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.

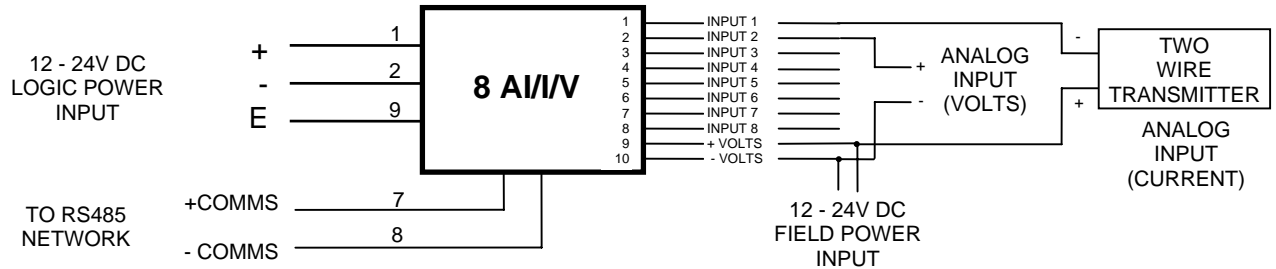
The same applies to the MM8AI/V module. An input voltage of 0 - 10Volts represents an output of 0 - 4095 and 2 volts would give a reading of  $819 \pm 1\text{LSB}$ . To obtain an output value of 0 to 4095 for an input signal of 2 to 10V the offset switch is switched on. An input range of 0(1) to 5Vdc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



### 3.8.2 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		

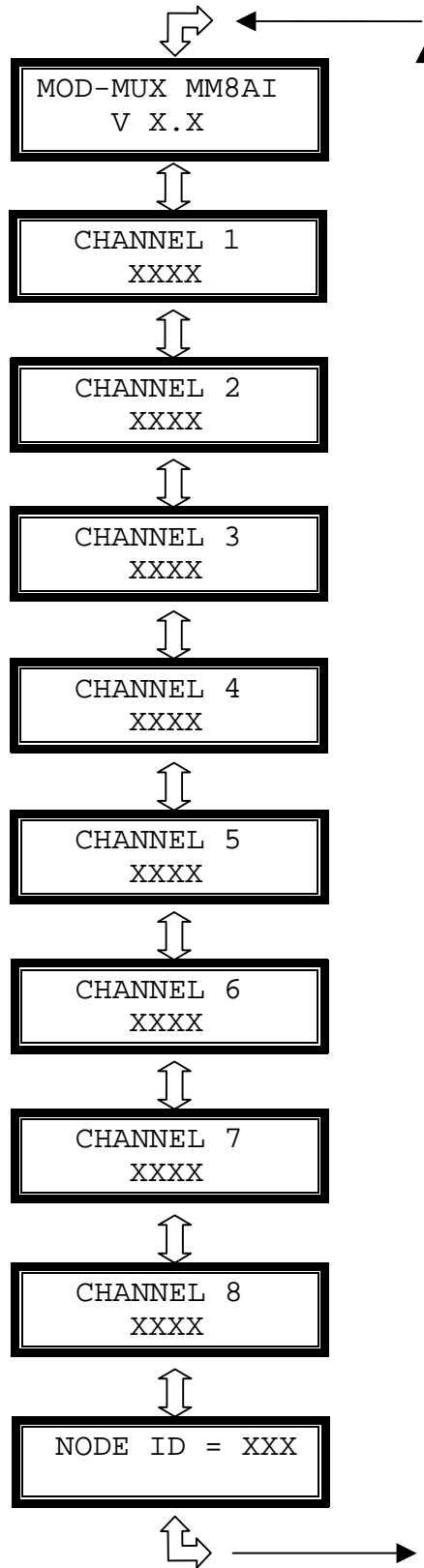
### 3.8.3 WIRING



### 3.8.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	OFFSET	When switched ON the inputs scaled to accept a 2V or 4mA offset .
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

### 3.8.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.9 MM8AI/I ISO AND MM8AI/V ISO - ISOLATED ANALOG INPUTS

### 3.9.1 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  $819 \pm 1\text{LSB}$ . 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.



### 3.9.2 SPECIFICATIONS

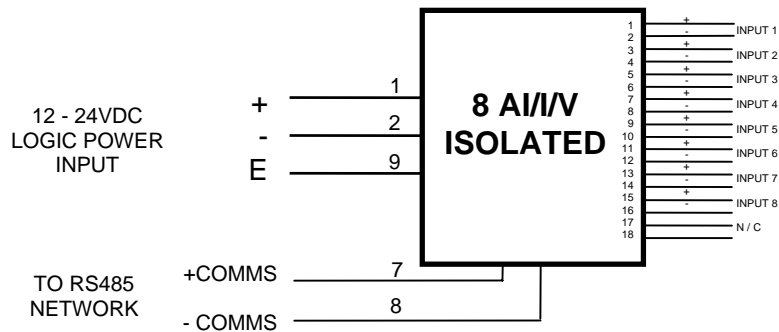
Power Supply: Logic                      10 - 26 Vdc @    85 mA

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

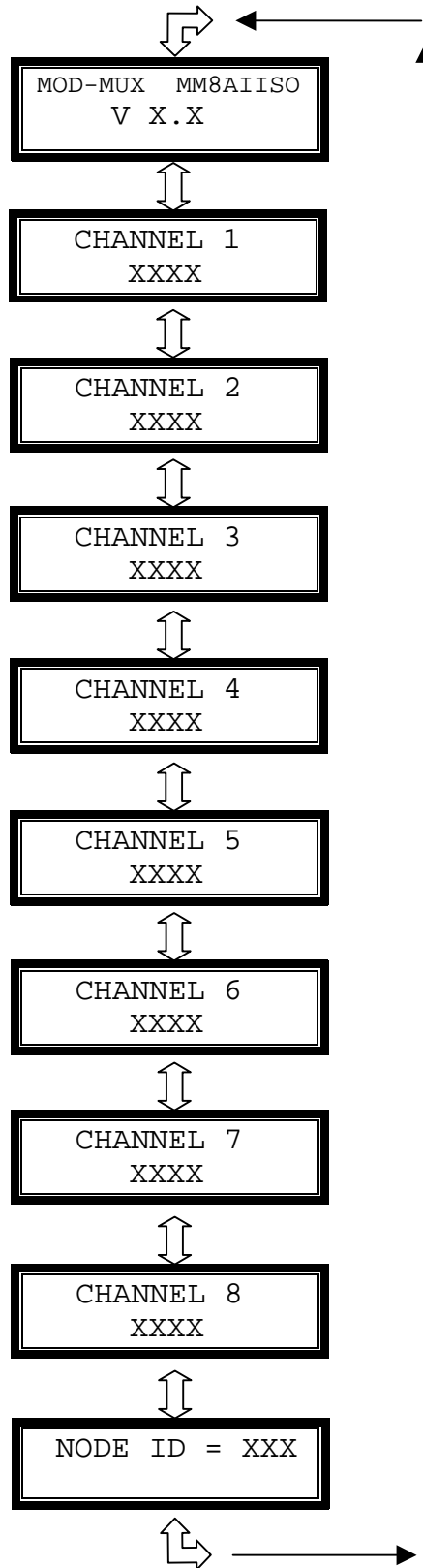
### 3.9.3 WIRING



### 3.9.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	OFFSET	When switched ON the inputs scaled to accept a 2V or 4mA offset .
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

### 3.9.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.10 MM8TC - THERMOCOUPLE INPUTS

### 3.10.1 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 Section 3.10.2. 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 (See Section 3.10.2). 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 (See Section 3.10.4) 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.



### 3.10.2 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



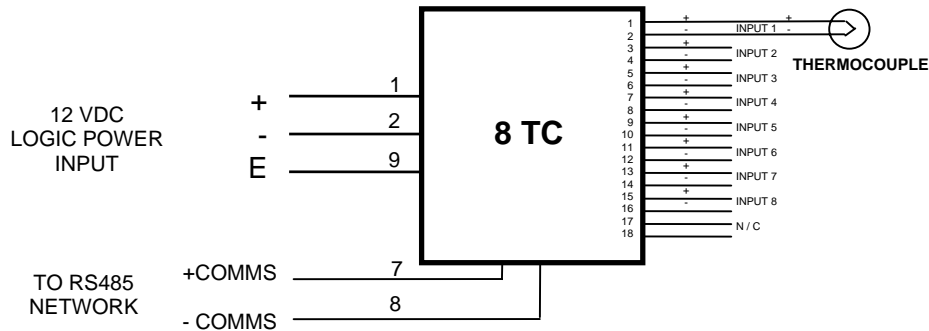
8 - R	-50 to 1767 °C	0.7°C
9 - mV	0 to 50mV	0.1%
10 - C	0 to 2315.5 °C	0.7°C
11 - D	0 to 2315.5 °C	0.7°C
12 - G	0 to 2315.5 °C	0.9°C

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

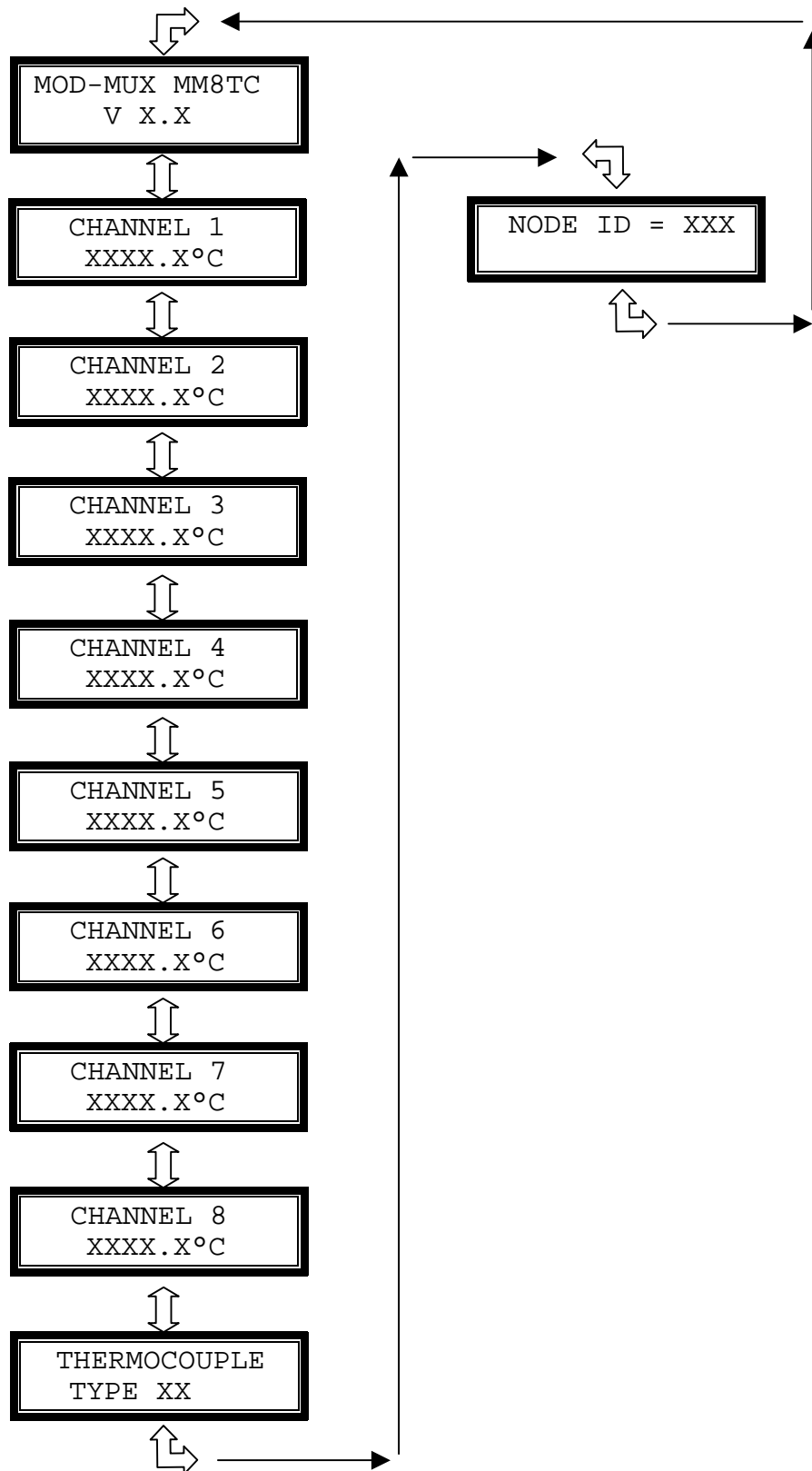
### 3.10.3 WIRING



### 3.10.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.10.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.11 MM8TCISO - ISOLATED THERMOCOUPLE INPUTS

### 3.11.1 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 Section 3.11.2. 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 (See Section 3.11.2). 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 (See Section 3.11.4) 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.



### 3.11.2 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%

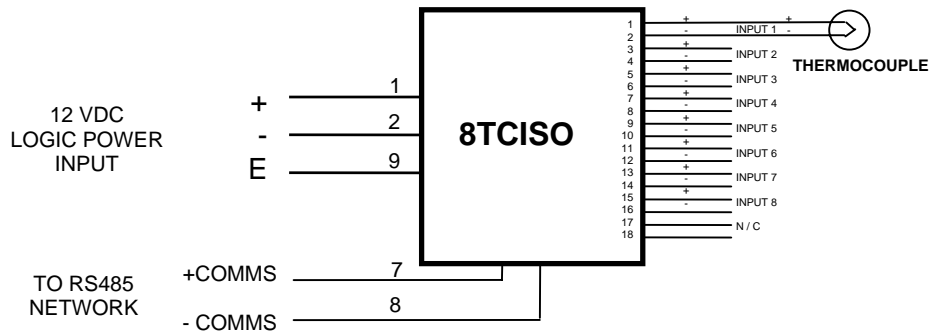
10 - C	0 to 2315.5 °C	0.7°C
11 - D	0 to 2315.5 °C	0.7°C
12 - G	0 to 2315.5 °C	0.9°C

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

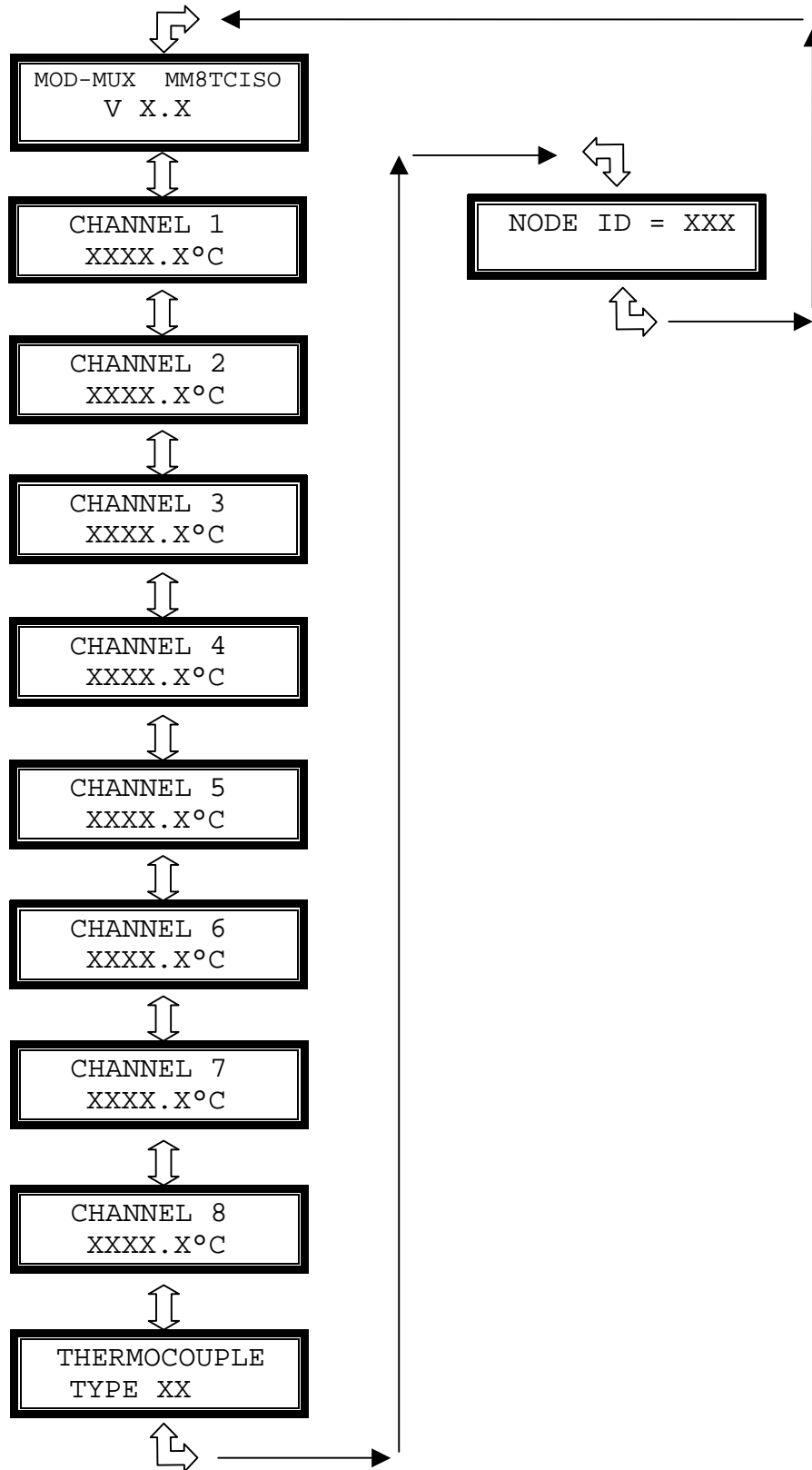
### 3.11.3 WIRING



### 3.11.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.11.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.12 MM6RTD - RTD INPUTS

### 3.12.1 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 Section 3.12.2. 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 (See Section 3.12.2). 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 (See Section 3.12.4) 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.

### 3.12.2 SPECIFICATIONS

Power Supply: Logic                      10 - 26Vdc     @     80 mA

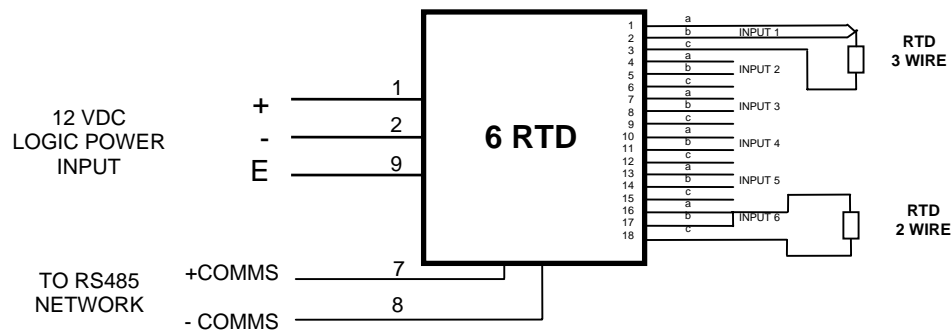
Inputs:                                        2 or 3 Wire

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

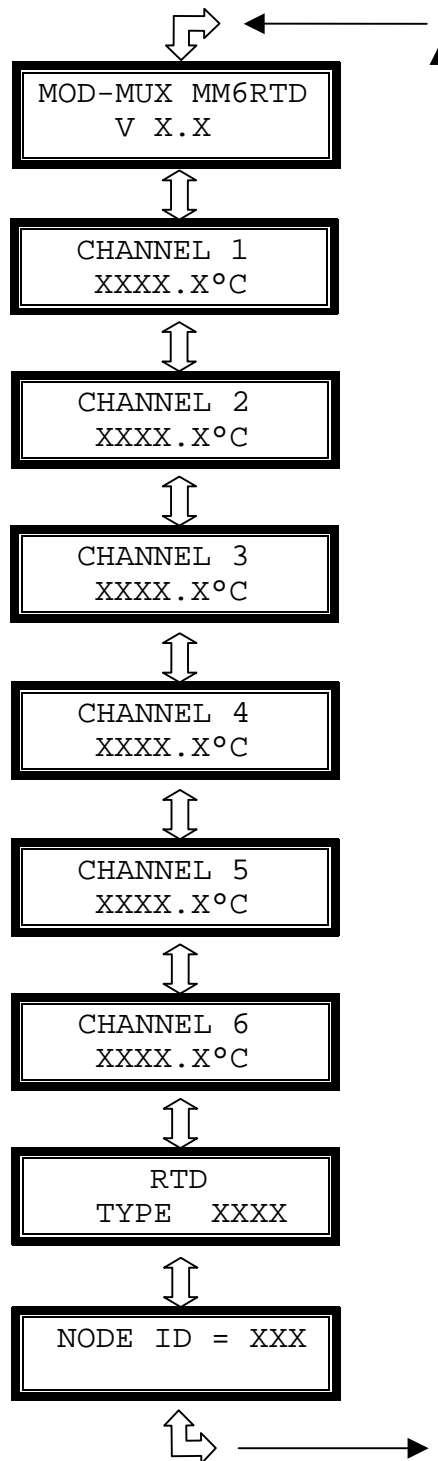
### 3.12.3 WIRING



### 3.12.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.12.5 DIAGNOSTIC UNIT MENU FORMAT





### 3.13 MM6RTDB - RTD INPUTS

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#### 3.13.1 DESCRIPTION

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

#### 3.13.2 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			

## 3.14 MM1AI2RO - 1 ANALOG INPUT WITH DUAL ALARMS

### 3.14.1 DESCRIPTION

The MM1AI2RO is a 1 channel analog input module with two alarm outputs. The input range can be configured for a current input of 0(4) - 20mA or a voltage input of 0(1) - 5V DC or 0(2) - 10V DC. The corresponding 12 bit raw value ( 0 - 4095) is read out of the Modbus registers. This raw value can be scaled by setting the zero and span registers to calculate a process value. The process value can be read out of the Modbus registers as a value between - 32767 and 32767 or as a floating point value using the IEEE754 notation.

The process value is filtered to prevent false alarms operations. The filter parameters can also be configured by writing to Modbus registers.

The alarms operate from the process values. A number of alarm modes can be configured depending on the application. Alarm setpoints, hysteresis and delays are configured by writing to the Modbus registers.

The alarms can also be operated manually by controlling the Modbus registers over the network.



### 3.14.2 SPECIFICATIONS

Power Supply: 10 - 26 Vdc 150 mA @ 12Vdc  
85 mA @ 24Vdc

#### Inputs:

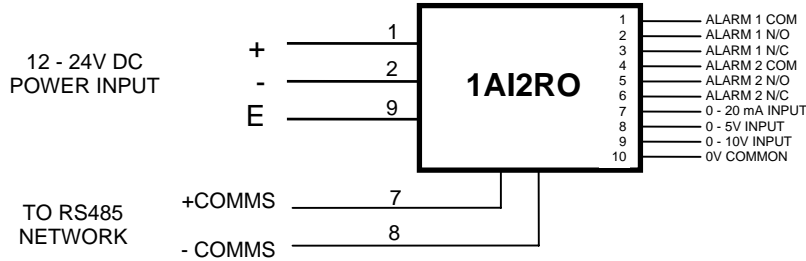
Voltage	0(2) - 10 Vdc or 0(1) - 5 Vdc
Current	0(4) - 20 mA
Input Resistance (V)	20kohms
Input Resistance (mA)	250ohms
Resolution	12 bits
Isolation	1000Vrms, 1 min. between input , RS485 and relays.
Drift	100ppm/°C
Accuracy	0.1% of span

#### Outputs:

Type	2 X Form C
Maximum Voltage	250VAC
Maximum Current	0.5A @ 220VAC / 1A @ 28VDC

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

### 3.14.3 WIRING



### 3.14.4 SWITCH SETTINGS

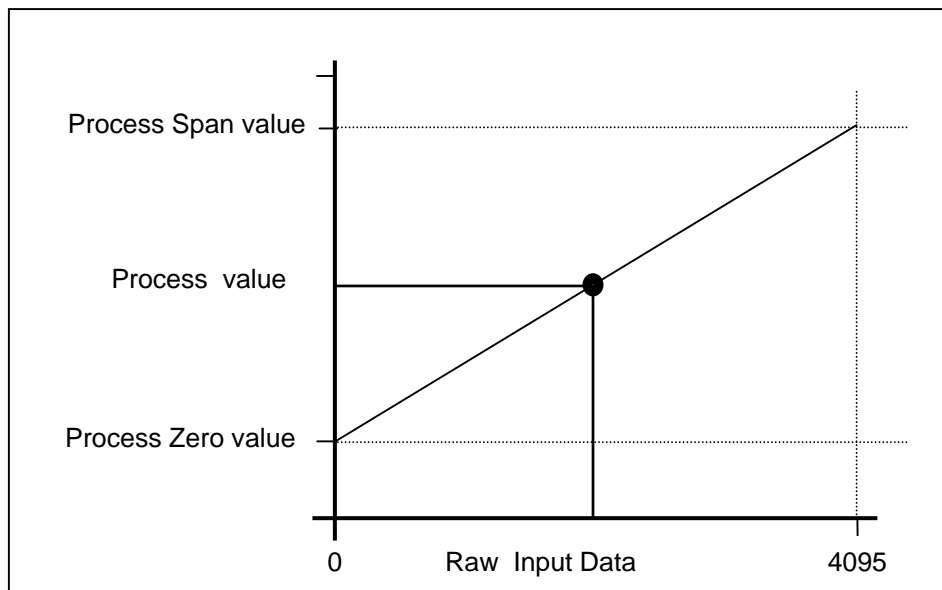
<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
1	NODE ID	Node ID's from 0 to 127 are set up using switches 1 to 7.
2	NODE ID	
3	NODE ID	
4	NODE ID	
5	NODE ID	
6	NODE ID	
7	NODE ID	
8	-	Not used.
9	-	Not used.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

### 3.14.5 CONFIGURATION OF THE INPUT

- A) The MM1AI2RO MOD-MUX module can be setup to accept a current or voltage input. The Modbus register 40006 must be programmed as follows:

Input Type	Input Range	Terminal No.
0	0 - 20mA	7
1	4 - 20mA	7
2	0 - 5V	8
3	1 - 5V	8
4	0 - 10V	9
5	2 - 10V	9

- B) The raw data ( 0 - 4095) can be obtained by reading the Modbus register 30002.
- C) The module has an internal maths block which converts the raw input data to a process value. The conversion uses the process zero value which is programmed into register 40009 and the process span value which is programmed into register 40010. The maths block automatically scales the raw input ( 0 - 4095) to a process value between the process zero and span. The calculated process value can be obtained by reading register 30003. The process value is also stored as an IEEE 754 floating point number and is stored in registers 30004 (lower 16 bits) and 30005 (upper 16 bits).



- D) The filter band is programmed into register 40007. This value is expressed in the same units as the process value and is used to override the digital filter. When there is a step change in the process value which is greater than the filter band value, the digital filter will be loaded with the new value. This ensures that the filter responds quickly to step changes in the process value.
- E) The filter response time is programmed into register 40008. This value is used to determine the time period of sampling the raw input value and is expressed in 0.1 seconds. I.e: a value of 15 would imply a sampling period of 1.5 seconds. The digital filter takes about 8 time periods to settle to the final value.

### 3.14.6 CONFIGURATION OF THE ALARM OUTPUTS

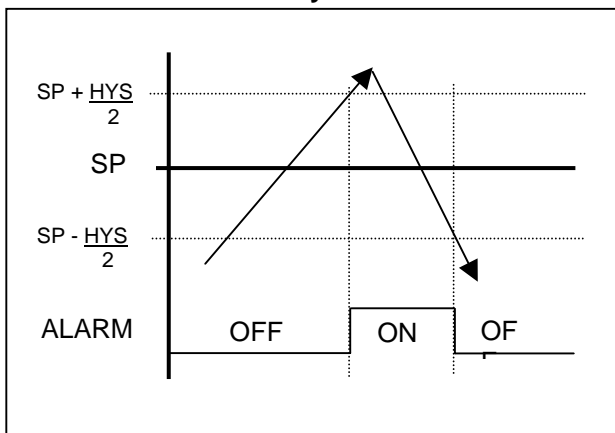
A) The MM1AI2RO module has two alarm outputs. These alarms can be configured to operate in a number of different modes as shown below. The Mode for Alarm 1 is programmed into register 40011 and the Mode for Alarm 2 is programmed into register 40015. The status of the Alarms can be read back over the network by reading the coils 00001 for Alarm1 and 00002 for Alarm 2. In mode 0 the relays can be manually operated over the RS485 network by writing to the Modbus coils 00003 for Alarm 1 and 00004 for Alarm2.

In the normal modes the relay follows the alarm. In the latched mode the relay latches on an alarm and must be manually reset over the network by writing to the coils 00005 for Alarm1 and 00006 for Alarm2.

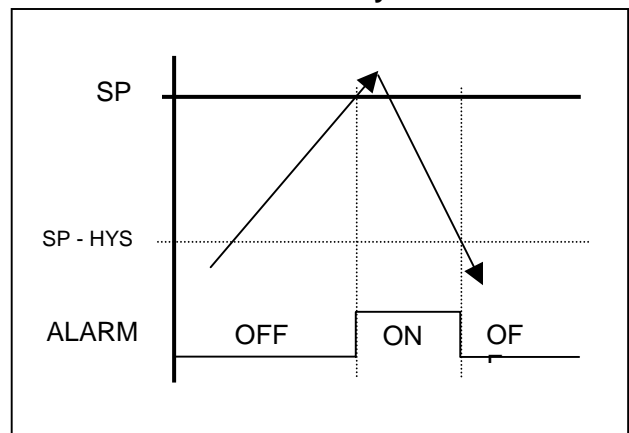
MODE NORMAL	MODE LATCHED	DESCRIPTION	ALARMS	
0	16	Alarms Operated Manually	1	2
1	17	Absolute High, Balanced Hysteresis	1	2
2	18	Absolute High, Unbalanced Hysteresis	1	2
3	19	Absolute Low, Balanced Hysteresis	1	2
4	20	Absolute Low, Unbalanced Hysteresis	1	2
5	21	Deviation High		2
6	22	Deviation Low		2
7	23	Band Outside		2

#### ABSOLUTE HIGH ALARMS (TYPES 1 AND 2)

**Balanced Hysteresis**

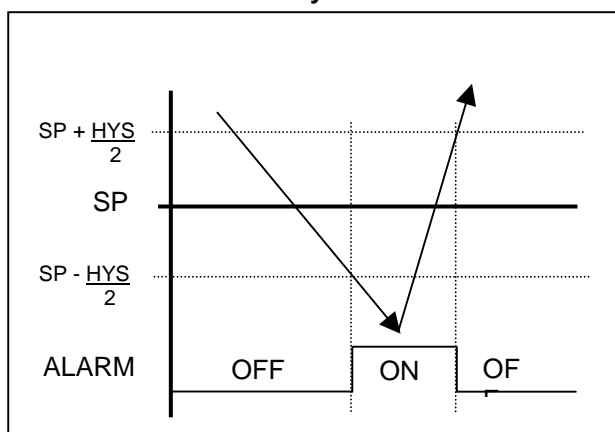


**Unbalanced Hysteresis**

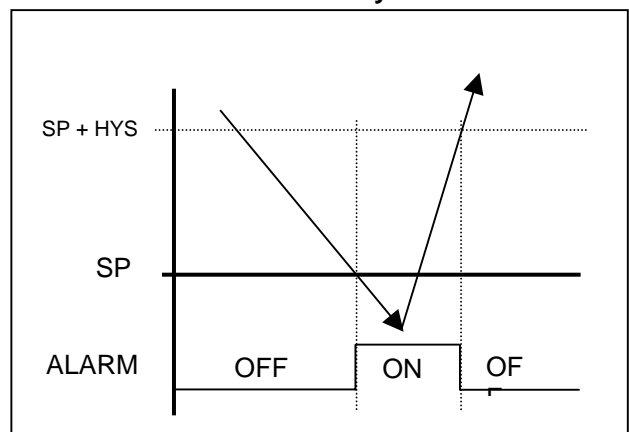


#### ABSOLUTE LOW ALARMS (TYPES 3 AND 4)

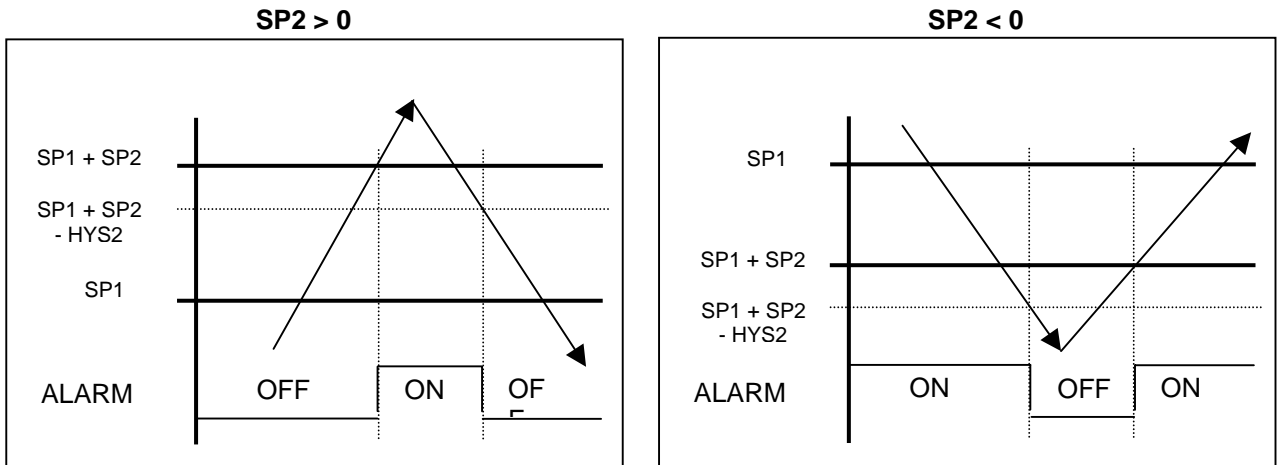
**Balanced Hysteresis**



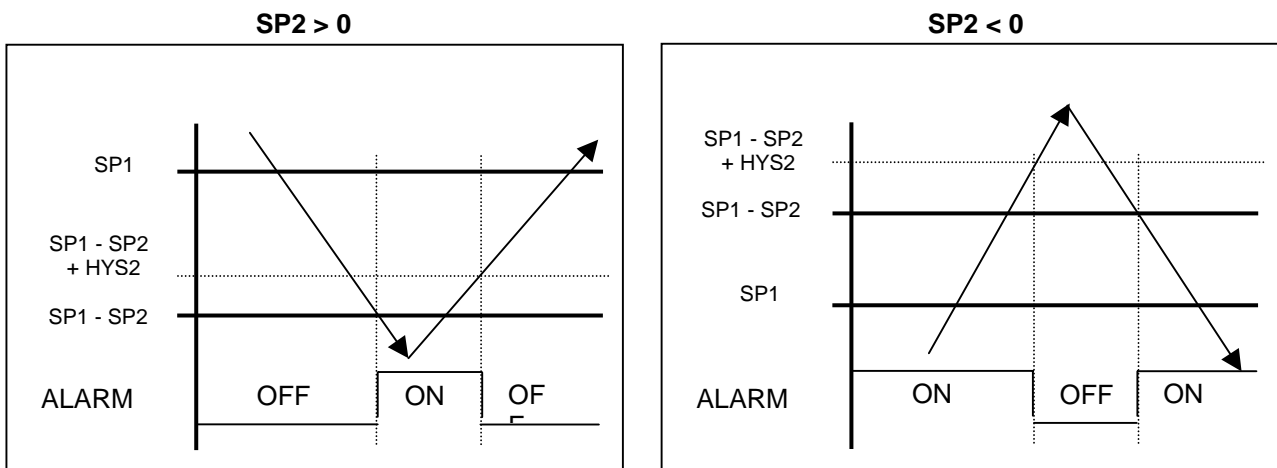
**Unbalanced Hysteresis**



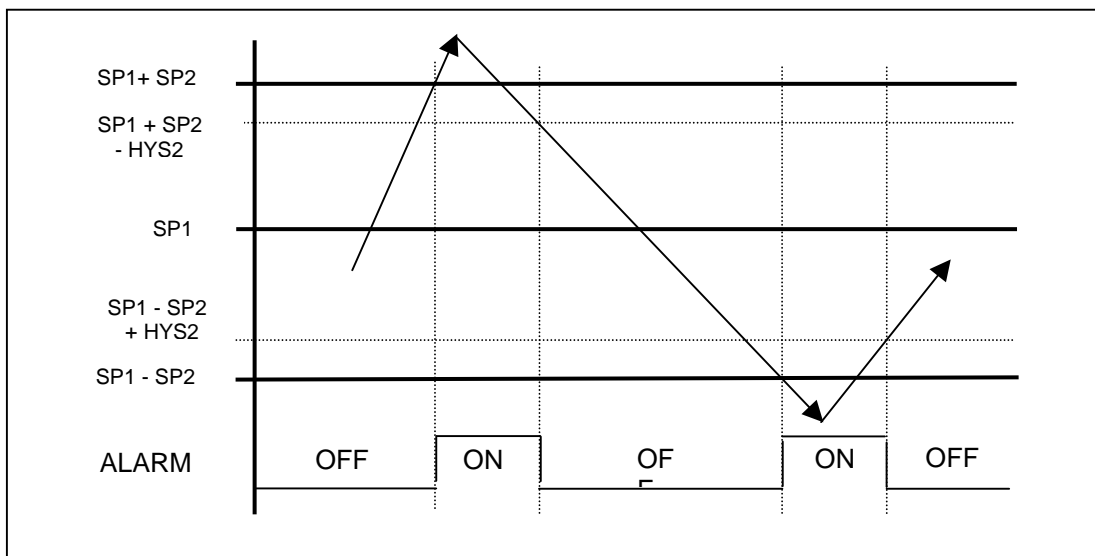
**DEVIATION HIGH ALARM 2 (TYPE 5)**



**DEVIATION LOW ALARM 2 (TYPE 6)**

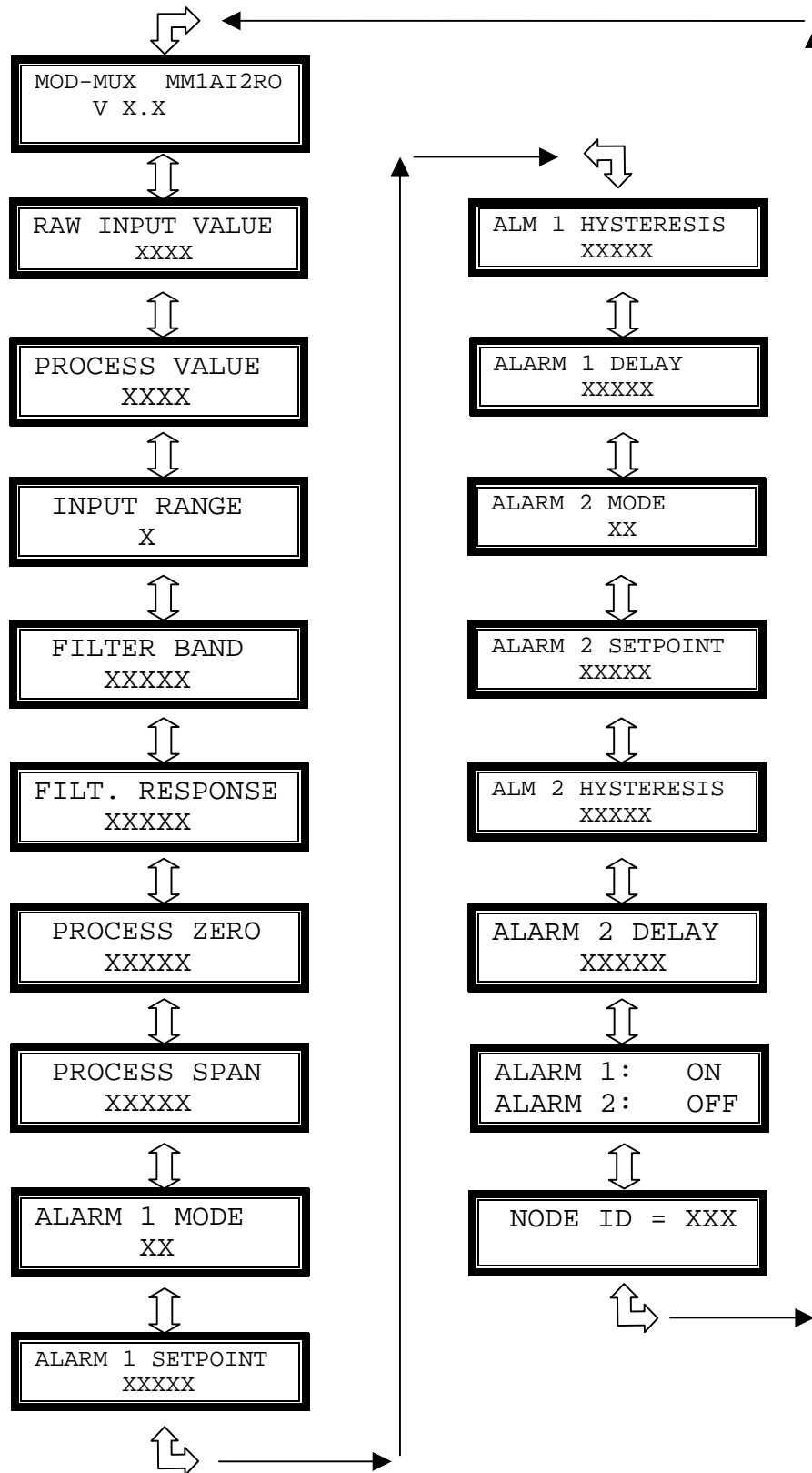


**BAND OUTSIDE ALARM 2 (TYPE 7)**



- B) The alarm Setpoints are programmed into the Modbus registers where Alarm 1 Setpoint is register 40012 and Alarm 2 Setpoint is register 40016.
- C) Next the Hysteresis is programmed for each of the alarms. Hysteresis is the difference between the points that an alarm will switch on and off and is used to eliminate rapid switching of the alarm outputs due to noise. Hysteresis is programmed into the Modbus registers in the same units as the process value. Alarm 1 Hysteresis is programmed into register 40013 and Alarm 2 Hysteresis into register 40017.
- D) Finally the alarm on delay is programmed into registers 40014 for Alarm 1 and register 40018 for Alarm 2. This delay is in seconds.

### 3.14.7 DIAGNOSTIC UNIT MENU FORMAT





## 3.15 MM1TI2RO - 1 TEMPERATURE INPUT WITH DUAL ALARMS

### 3.15.1 DESCRIPTION

The MM1TI2RO is a 1 channel Thermocouple/RTD input module with two alarm outputs. The input range can be configured for a range of thermocouple or RTD types. The module uses differential inputs to reduce effects of electrical noise and mains pickup.

The thermocouple voltage/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 as indicated in the table below. 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 temperature can be read out of the Modbus registers as a value between -32767 and 32767 or as a floating point value using the IEEE754 notation.

The type is setup by writing a value to the Type register (40006). 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.

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 - 50,00.

The temperature can be offset by writing an offset value to register 40009. The temperature is filtered to prevent false alarms operations. The filter parameters can also be configured by writing to Modbus registers.

The alarms operate from the temperature value. A number of alarm modes can be configured depending on the application. Alarm setpoints, hysteresis and delays are configured by writing to the Modbus registers.

The alarms can also be operated manually by controlling the Modbus registers over the network.



### 3.15.2 SPECIFICATIONS

Power Supply: 10 - 26 Vdc 150 mA @ 12Vdc  
85 mA @ 24Vdc

Thermocouple 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.

RTD Inputs: 2 or 3 Wire

RTD Type	Range	Accuracy	Standard
13 - PT100	-200 to 850 °C	0.3°C	IEC 751:1983
14 - Ni120	-80 to 320 °C	0.3°C	
15 - Ohms	10 - 400ohms	0.1%	

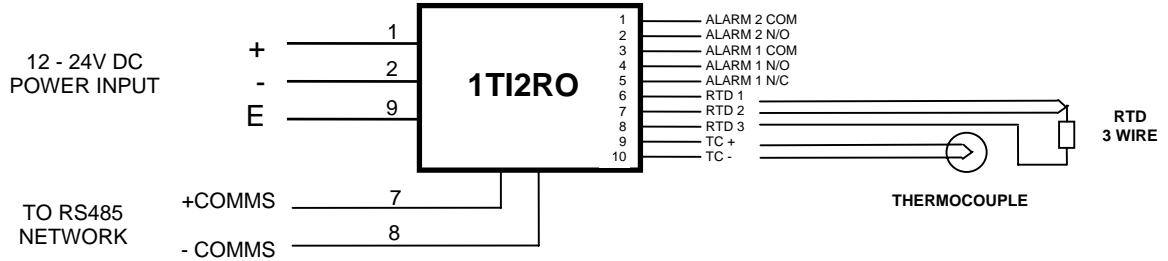
Resolution 0.1°C  
Drift 100ppm/°C Typ.  
Line resistance effect < 0.1°C balanced  
Max. line resistance 100ohms  
Isolation 1000Vrms between field and logic

Outputs:

Type 2 X Form C  
Maximum Voltage 250VAC  
Maximum Current 0.5A @ 220VAC / 1A @ 28VDC

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

### 3.15.3 WIRING



### 3.15.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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/RTD break. When switched off the temperature value will loaded with -32767 when the input is faulty. When switched on the temperature value will be loaded with 32768.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

### 3.15.5 CONFIGURATION OF THE INPUT

- A) The MM1TI2RO MOD-MUX module can be setup to accept a thermocouple or RTD input. The Modbus register 40006 must be programmed as follows:

Input Type	Input Range	Terminal No.
1 - J	-150 to 760 °C	9 & 10
2 - K	-200 to 1200 °C	9 & 10
3 - E	0 to 600 °C	9 & 10
4 - T	-200 to 400 °C	9 & 10
5 - N	0 to 1300 °C	9 & 10
6 - B	400 to 1820 °C	9 & 10
7 - S	-50 to 1767 °C	9 & 10
8 - R	-50 to 1767 °C	9 & 10
9 - mV	0 to 50mV	9 & 10
10 - C	0 to 2315.5 °C	9 & 10
11 - D	0 to 2315.5 °C	9 & 10
12 - G	0 to 2315.5 °C	9 & 10
13 - PT100	-200 to 850 °C	6, 7 & 8
14 - Ni120	-80 to 320 °C	6, 7 & 8
15 - ohms	10 - 400ohms	6, 7 & 8

- B) The module has an internal maths block which converts the raw input data to a temperature value in register 30003. When a temperature type is selected, the value is expressed in 1/10 of degrees. For example a temperature of 100.5°C would be represented as 1005 in register 30003. When type 9 is selected (mV) the value is in 1/100 of millivolts. For example a value of 20.05 mV will be represented as 2005. When type 15 is selected (ohms) the value is in 1/10 of ohms. For example a value of 12.3 ohms would be represented as 123 in register 30003. The conversion uses the offset value which is programmed into register 40009. The temperature value is also stored as an IEEE 754 floating point number and is stored in registers 30004 (lower 16 bits) and 30005 (upper 16 bits).
- C) The filter band is programmed into register 40007. This value is expressed in degrees and is used to override the digital filter. When there is a step change in the temperature which is greater than the filter band value, the digital filter will be loaded with the new value. This ensures that the filter responds quickly to step changes in temperature.
- D) The filter response time is programmed into register 40008. This value is used to determine the time period of sampling the raw input value and is expressed in 0.1 seconds. I.e: a value of 15 would imply a sampling period of 1.5 seconds. The digital filter takes about 8 time periods to settle to the final value.

### 3.15.6 CONFIGURATION OF THE ALARM OUTPUTS

- A) The MM1TI2RO module has two alarm outputs. These alarms can be configured to operate in a number of different modes as shown in the table. The Mode for Alarm 1 is programmed into register 40011 and the Mode for Alarm 2 is programmed into register 40015. The status of the Alarms can be read back over the network by reading the coils 00001 for Alarm1 and 00002 for Alarm 2. In mode 0 the relays can be manually operated over the RS485 network by writing to the Modbus coils 00003 for Alarm 1 and 00004 for Alarm2.

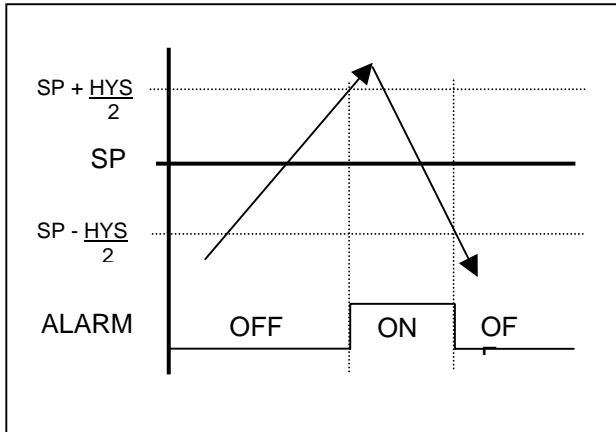
In the normal modes the relay follows the alarm. In the latched mode the relay

latches on an alarm and must be manually reset over the network by writing to the coils 00005 for Alarm1 and 00006 for Alarm2.

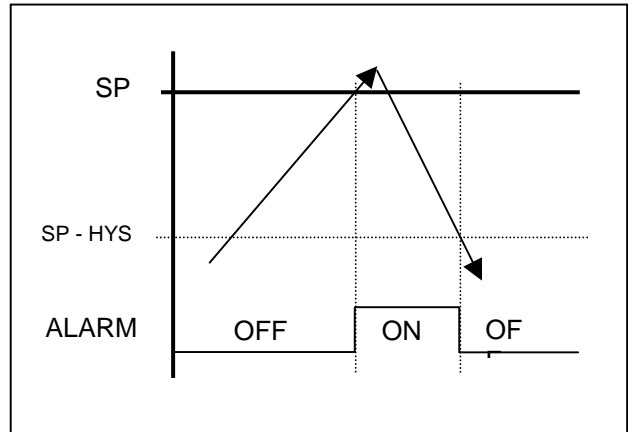
MODE NORMAL	MODE LATCHED	DESCRIPTION	ALARMS	
0	16	Alarms Operated Manually	1	2
1	17	Absolute High, Balanced Hysteresis	1	2
2	18	Absolute High, Unbalanced Hysteresis	1	2
3	19	Absolute Low, Balanced Hysteresis	1	2
4	20	Absolute Low, Unbalanced Hysteresis	1	2
5	21	Deviation High		2
6	22	Deviation Low		2
7	23	Band Outside		2

**ABSOLUTE HIGH ALARMS (TYPES 1 AND 2)**

**Balanced Hysteresis**

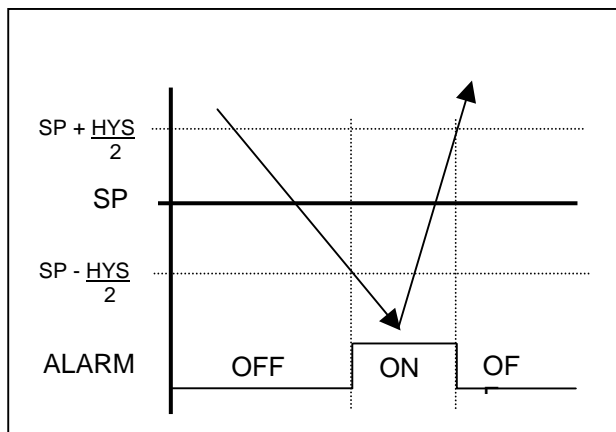


**Unbalanced Hysteresis**

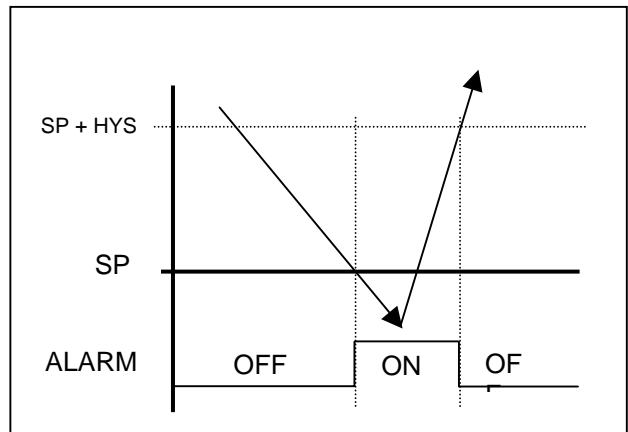


**ABSOLUTE LOW ALARMS (TYPES 3 AND 4)**

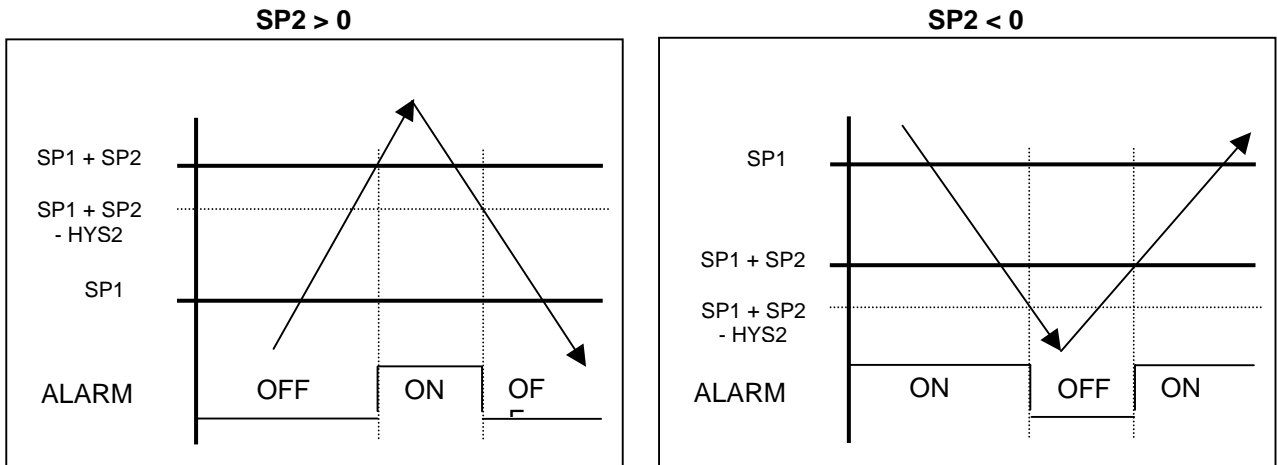
**Balanced Hysteresis**



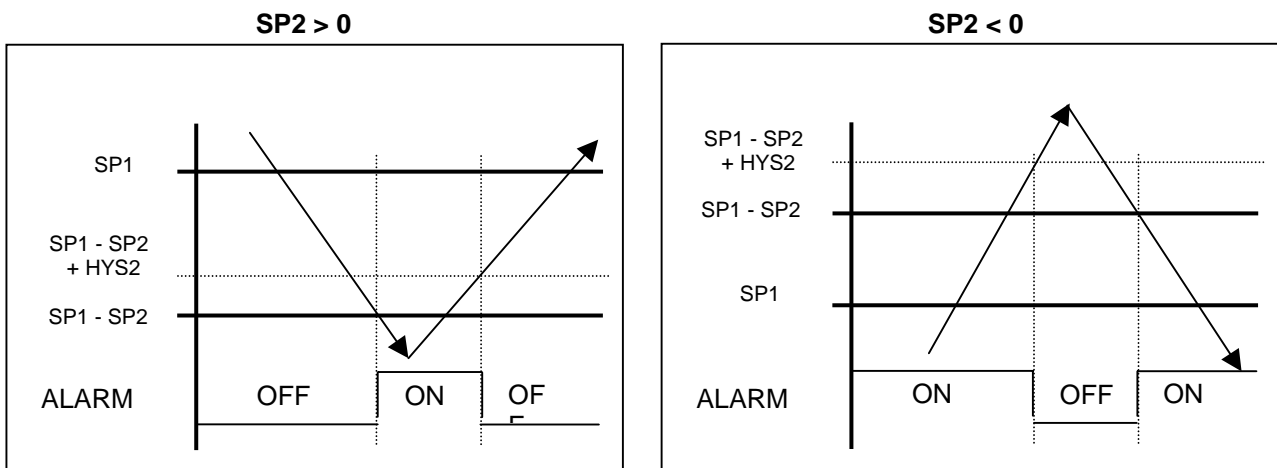
**Unbalanced Hysteresis**



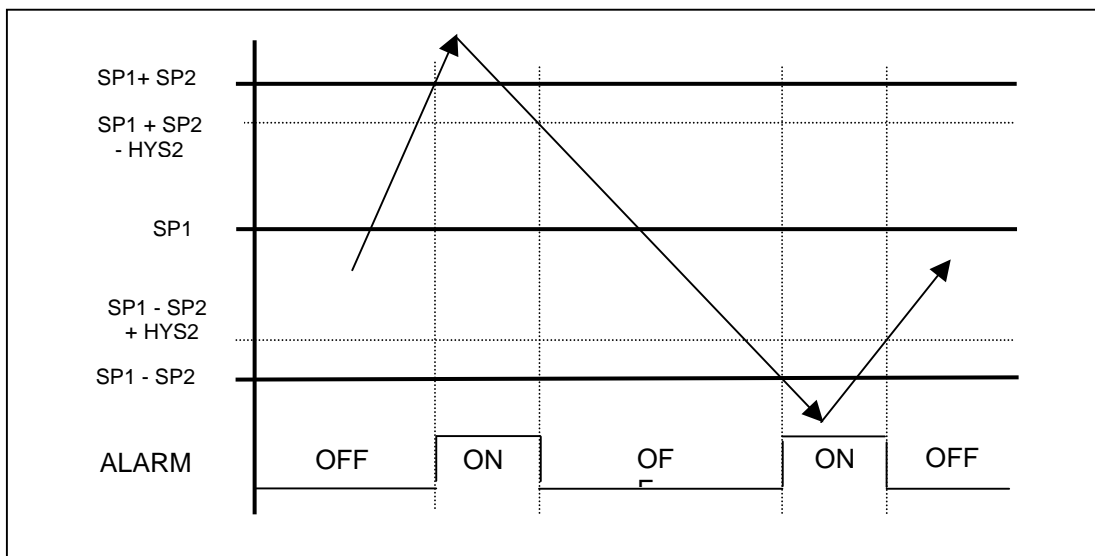
**DEVIATION HIGH ALARM 2 (TYPE 5)**



**DEVIATION LOW ALARM 2 (TYPE 6)**



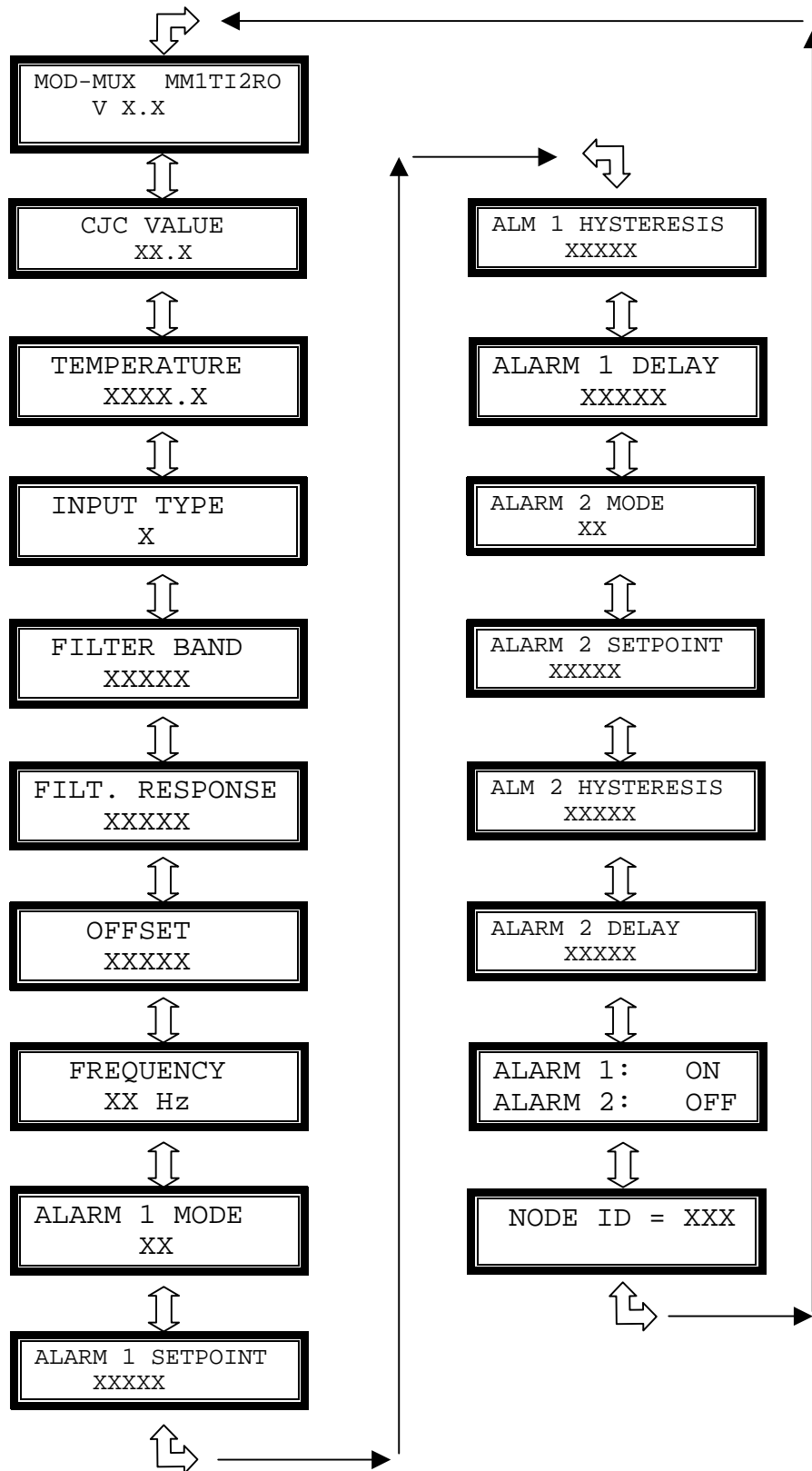
**BAND OUTSIDE ALARM 2 (TYPE 7)**



- B) The alarm Setpoints are programmed into the Modbus registers where Alarm 1 Setpoint is register 40012 and Alarm 2 Setpoint is register 40016.
- C) Next the Hysteresis is programmed for each of the alarms. Hysteresis is the difference between the points that an alarm will switch on and off and is used to eliminate rapid switching of the alarm outputs due to noise. Hysteresis is programmed into the Modbus registers in degrees. Alarm 1 Hysteresis is programmed into register 40013 and Alarm 2 Hysteresis into register 40017.
- D) Finally the alarm on delay is programmed into registers 40014 for Alarm 1 and register 40018 for Alarm 2. This delay is in seconds.



### 3.15.7 DIAGNOSTIC UNIT MENU FORMAT



## 3.16 MM8AO - ANALOG OUTPUTS

### 3.16.1 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 (See Section 3.14.4) 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.

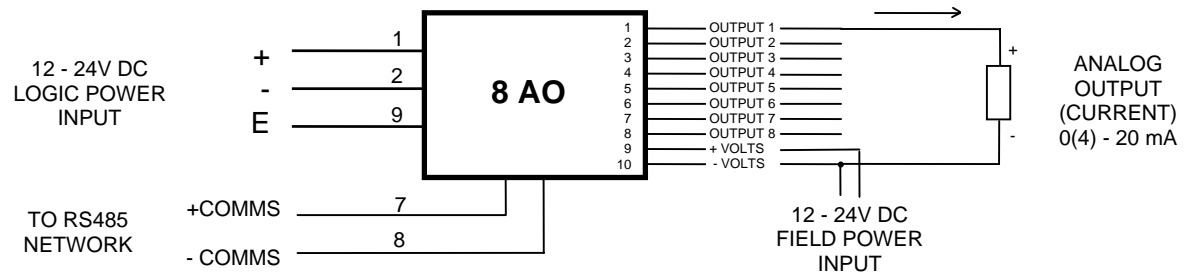
When used as a slave module, the outputs are written to by the Modbus master device such as a PC or PLC.



### 3.16.2 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	

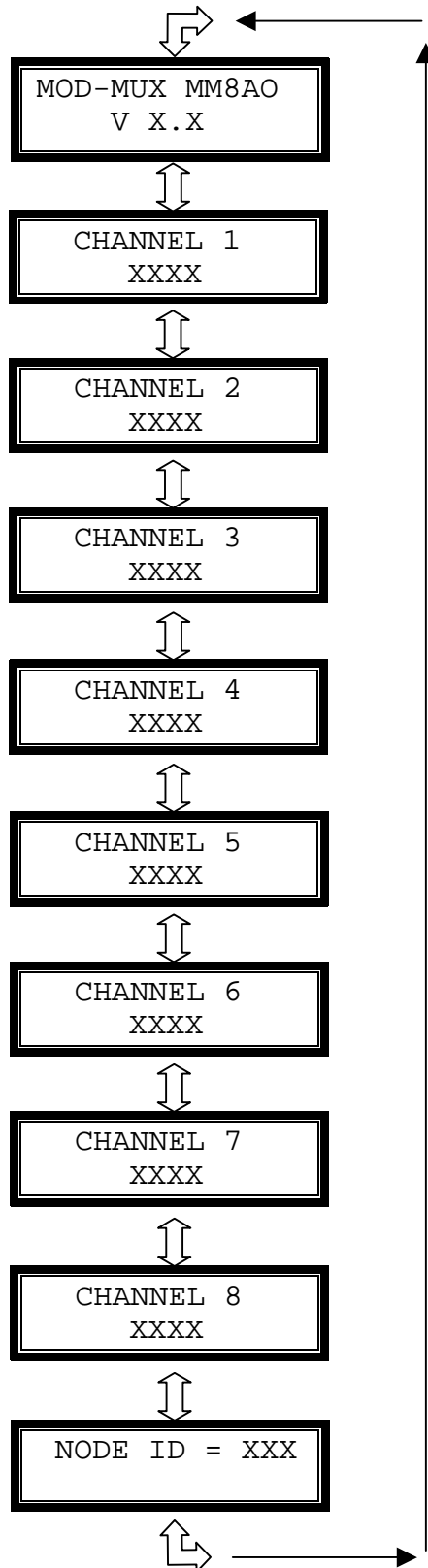
### 3.16.3 WIRING



### 3.16.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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)

### 3.16.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.17 MMMEM - MEMORY MODULE

### 3.17.1 DESCRIPTION

The Memory Module is used for storage of process variables and set-point variables. The Modbus registers 40002 - 40075 are RAM memory and is used for process variables which change frequently and do not need to be maintained when the power fails. The registers 40076 - 40099 are EEPROM memory and can be used for variables which are not written to often and need to be maintained when the power fails such as set-points.

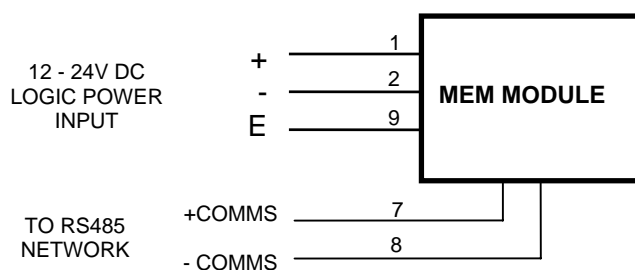


### 3.17.2 SPECIFICATIONS

Power Supply: 10 - 26 Vdc @  
50 mA

Connector: 11 Pin Connector  
on rear of unit

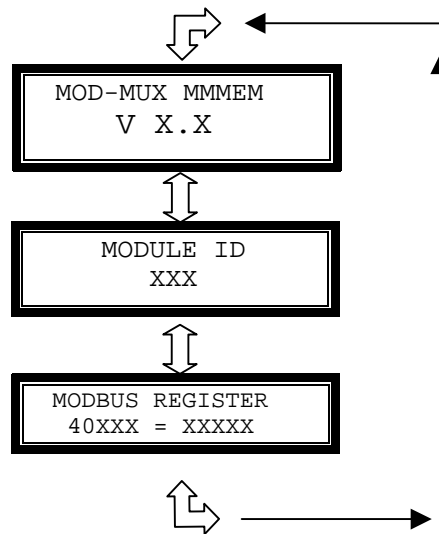
### 3.17.3 WIRING



### 3.17.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	-	Not used.
10	BAUD RATE	Selects 9600 (off) or 19200 BAUD (on)

### 3.17.5 DIAGNOSTIC UNIT MENU FORMAT



## 3.18 MMI/OMAP - I/O MAPPER

---

### 3.18.1 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.

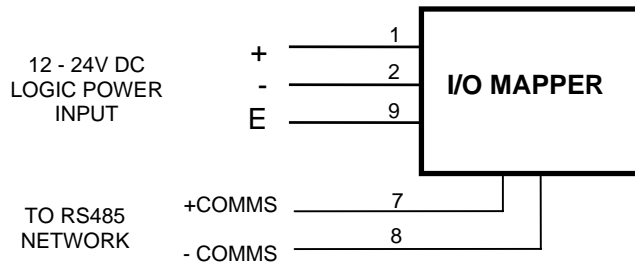


### 3.18.2 SPECIFICATIONS

Power Supply: 10 - 26 Vdc @ 50 mA

Connector: 11 Pin Connector on rear of unit

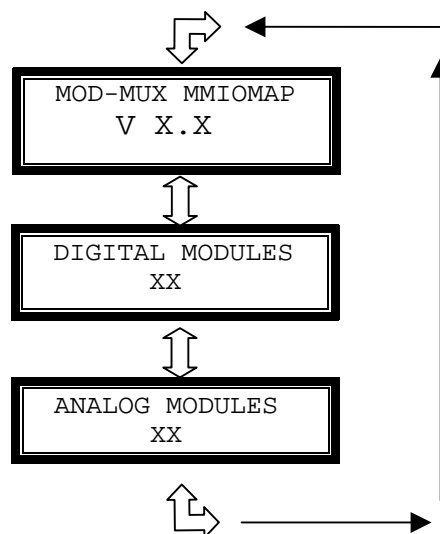
### 3.18.3 WIRING



### 3.18.4 SWITCH SETTINGS

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

### 3.18.5 DIAGNOSTIC UNIT MENU FORMAT





## 3.19 MMTPCONV - MODBUS/TCP SERIAL CONVERTER

---

### 3.19.1 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 where 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.



## 3.20 MMINTCONV - INTELLIGENT RS232/RS485 CONVERTER

---

### 3.20.1 DESCRIPTION

The intelligent 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.

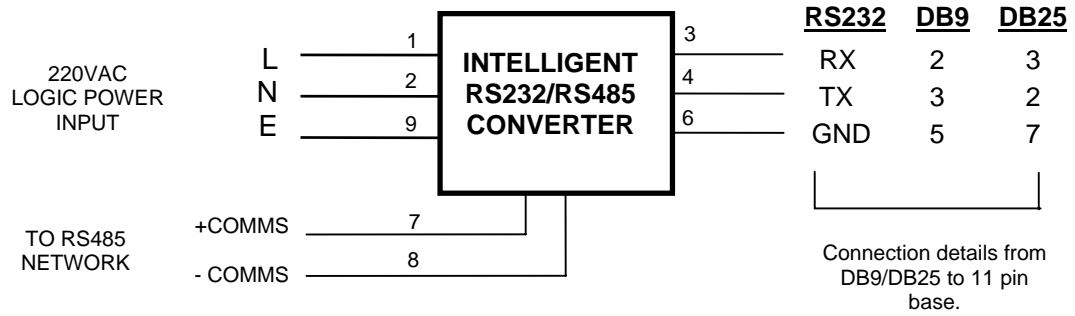
The intelligent converter also provides isolation between the RS232 and RS485 cables. This prevents ground loops between the PC or PLC and network.



### 3.20.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA
RS232:	3 Wire - TX/Rx/GND
RS485:	2 Wire Multidrop twisted
Baud Rate:	9600 and 19200 (Default 9600 with internal jumper)
Connector:	11 Pin Connector on rear of unit

### 3.20.3 WIRING



## **3.21 MMINTBCONV - INTELLIGENT RS232/RS485 BOXED CONVERTER**

### **3.21.1 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.

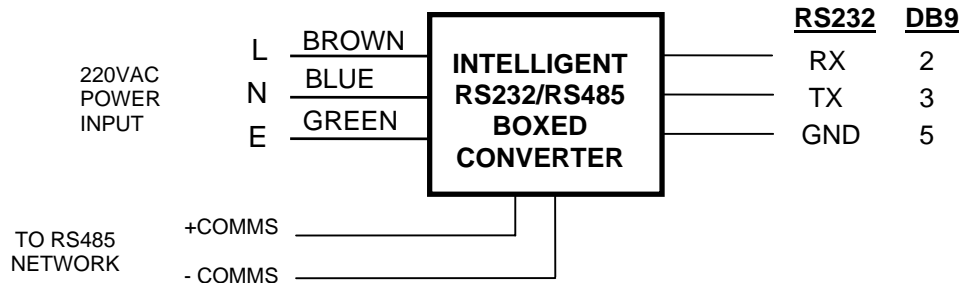
The intelligent converter also provides isolation between the RS232 and RS485 cables. This prevents ground loops between the PC or PLC and network.



### **3.21.2 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.

### 3.21.3 WIRING



### 3.21.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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.

<u>BAUD</u>	<u>ON</u>	<u>OFF</u>
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

## 3.22 MMDUALCONV - DUAL MASTER RS232/RS485 CONVERTER

### 3.22.1 DESCRIPTION

The dual master converter is used to connect two Modbus master devices to a single Modbus network using RS485.

The dual converter receives messages from the Modbus masters. The first message received is passed onto the RS485 network to the slave module. After a reply from the slave is received, the converter is ready to pass on the next message. If the converter receives two messages from the masters at the same time, the message from the master which transmitted first is passed on to the network while the message from the second master is stored in a buffer. This second message is sent once the previous reply has been received.

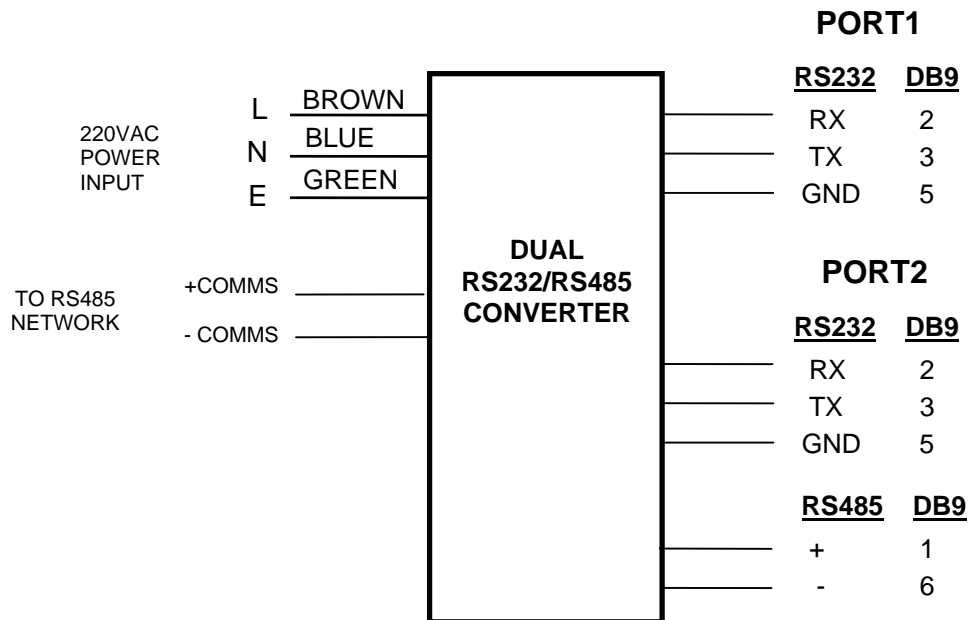


The dual converter also provides isolation between the RS232 and RS485 cables. This prevents ground loops between the PC or PLC and network.

### 3.22.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA or 110VAC @ 1.5VA
PORT1	RS232: 3 Wire - TX/Rx/GND
PORT2	RS232: 3 Wire - TX/Rx/GND RS485: 2 Wire Multidrop twisted
Baud Rate:	9600, 19200.
Connector:	2 X RS232 - DB-9 connector. RS485 - 3 Way Screw connector.

### 3.22.3 WIRING



### 3.22.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
1	BAUD	OFF = 9600. ON = 19200.
-		
-		
8	MASTER/SLAVE	When this switch is off the converter is transparent to both serial ports. When switched on, Port 2 is not able to perform Modbus write commands until Port 1 becomes inactive for longer than 5 seconds.

### 3.23 MM485REP - RS485 REPEATER

#### 3.23.1 DESCRIPTION

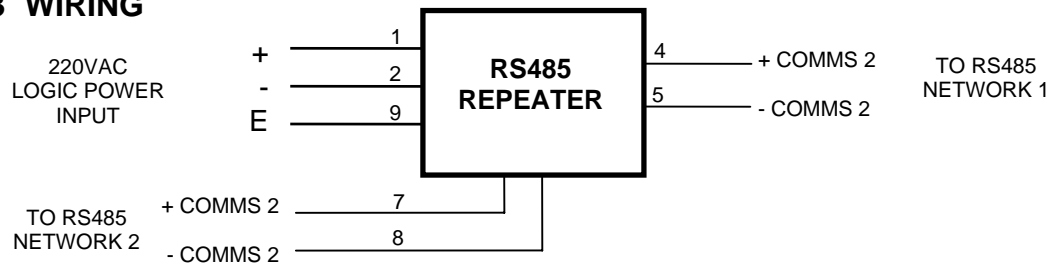
The MM485REP is an isolated RS485 repeater module. The repeater is used to amplify the RS485 signal to extend an existing RS485 network by a maximum of 1000m. The isolation also prevents ground loops between different parts of the network.



#### 3.23.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA
RS485:	2 Wire Multidrop twisted ( X2)
Connector:	11 Pin Connector on rear of unit

#### 3.23.3 WIRING





## 3.24 MM485/OPTO - FIBRE OPTIC CONVERTERS

### 3.24.1 DESCRIPTION

The MM485/Opto module may be used to extend the RS485 network through areas which exhibit excessive electrical noise and which may prevent the network from functioning correctly.

The fibre cable can also be run through hazardous areas without risk of explosion of hazardous chemicals and gasses.

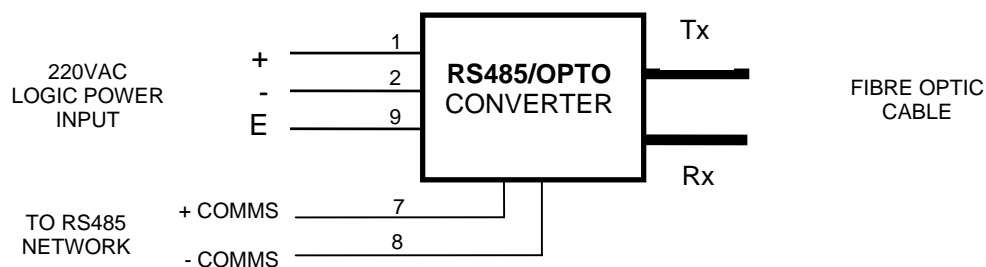
The fibre cable is also excellent for extending the network between buildings where ground loops may be present, or where risk of lightning strikes is great since the fibre is not affected by lightning.



### 3.24.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA
RS485:	2 Wire Multidrop twisted
Fibre Connectors:	Supplied with either SMA or ST connectors
Transmitter Wavelength:	820nm
Fibre Sizes:	50/125 $\mu$ m, 62.5/125 $\mu$ m and 100/140 $\mu$ m.
Transmission distance:	Up to 2 Km depending on attenuation of fibre used.
Connector:	11 Pin Connector on rear of unit

### 3.24.3 WIRING



## 3.25 UCLK - UNIVERSAL CLOCK

---

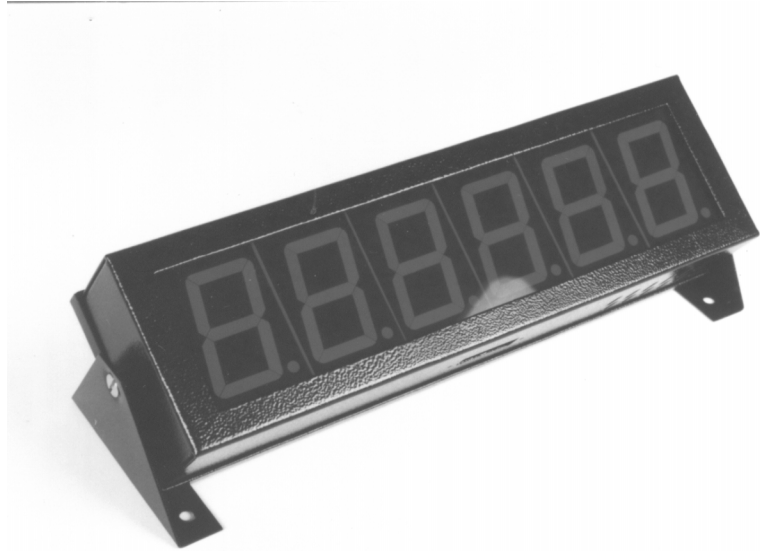
### 3.25.1 DESCRIPTION

The UNIVERSAL CLOCK consists of a high brightness 6 digit LED display incorporating a battery backed clock with time and date features.

RS485 MODBUS communications enables many clock units to be networked together back to a PC or PLC.

Setting up of the clock is easily done by remote pushbutton inputs or by writing the values to the internal registers over the networked.

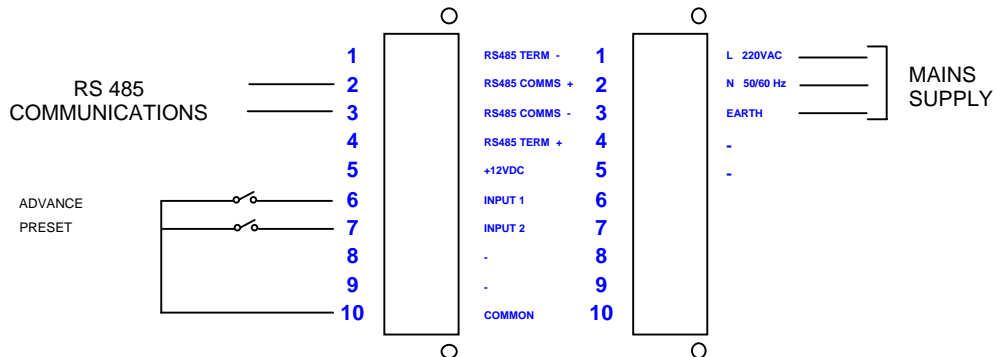
The clock can be configured to display the time only, or can be made to alternate the display between the time and the date.



### 3.25.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 5.5VA
Inputs:	The inputs may be activated by a potential free contact or open collector NPN transistor output.
RS485:	2 Wire Multidrop twisted. (9600 BAUD only)
Indicators:	LED indicators show RX and TX communications.
Connectors:	2 X 10 way plug in screw connectors.

### 3.25.3 WIRING



**UCLK**  
**UNIVERSAL CLOCK**

### 3.25.4 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	SCROLLING	When switched ON the clock will alternate between the date and time..
9	-	
10	-	

## 3.26 UCNTR6A - UNIVERSAL 6 DIGIT COUNTER

---

### 3.26.1 DESCRIPTION

The Universal 6 Digit Counter is a high brightness 6 digit LED display incorporating a built in up/down counter. The unit includes two relay trip outputs for upper and lower alarm outputs. RS485 Modbus communications enables many counters to be networked together back to a PLC or PC. This networking facility can be used to read the count value, or to clear/preset the count value. The alarm limits can be preset over the network or by means of digital inputs.



Standard features of the logic on the unit are :

- **Separate Up / Down Counter Inputs.**  
Two separate inputs allow the counter to be used as an up counter, down counter or both simultaneously.
- **Battery Backed-Up Counter.**  
In the event of a power failure, the counter and alarm preset values will be maintained.
- **Programmable Filter on Counter Inputs.**  
A filter is used to prevent false counting which may be caused by relay debounce, etc. This filter is setup using the DIP switches on the side of the unit..
- **Upper and Lower Alarm.**  
Two relays are used to give alarm outputs when the counter has counted up to a preset upper limit or counted down to zero.
- **Built In Power Supply.**  
The built in power supply enables potential free contacts to be used without the need for an extra power supply.

### 3.26.2 OPERATING DESCRIPTION

The counter is initially setup by programming the upper alarm limit. This is done by switching on input 3 for longer than 1 second. The first digit will begin to flash indicating that programming mode has been started. Switch 4 is now used to setup the correct value for this digit. Switch 3 is now used to advance to the next digit. Once all the digits have been setup, the value is saved into the upper limit alarm memory and the counter displays the count value. The counter can be used to count down from this value, or can be cleared by pressing switch 3 and 4 simultaneously.

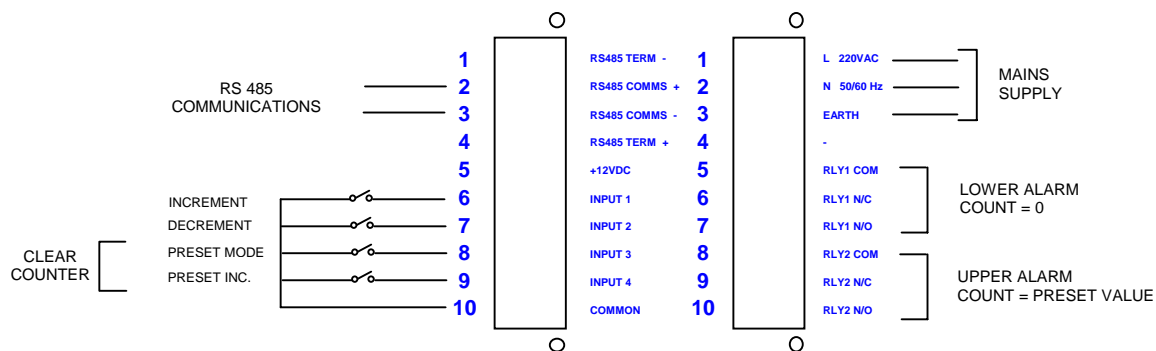
Counting is performed by pulsing input 1 for counting up or input 2 for counting down. The input filter can be setup by using DIP switches 9 and 10. Refer to the DIP switch table. The count value is from 0 to 999999.

Leading zero's can be turned on by switching on DIP switch 8.

### 3.26.3 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 5.5VA
Inputs:	The inputs may be activated by a potential free contact or open collector NPN transistor output.
Counter:	Resolution            16 or 32 Bits Frequency            50 Hz (Max) Pulse Width           10ms (min)
Outputs:	The outputs are a relay contact rated at 0.5A/220VAC.
RS485:	2 Wire Multidrop twisted (9600 BAUD only)
Indicators:	LED indicators show RX and TX communications.
Connectors:	2 X 10 way plug in screw connectors.

### 3.26.4 WIRING



**UCNTR**  
**UNIVERSAL 6 DIGIT**

### 3.26.5 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	LEADING ZERO'S	When switched on the leading zero's will be displayed.
9	FILTER	9 = off 10 = off - 10ms
10	FILTER	9 = on 10 = off - 50ms 9 = off 10 = on - 100ms

9 = on 10 = on - 500ms

## 3.27 UDISP6A - UNIVERSAL 6 DIGIT DISPLAY

---

### 3.27.1 DESCRIPTION

The Universal 6 Digit Display is a high brightness 6 digit LED display designed for displaying up to 8 process variables. The unit includes two digital inputs and two relay outputs which are accessed over the network. RS485 Modbus communications enables many displays to be networked together back to a PLC or PC.



### 3.27.2 OPERATING DESCRIPTION

The universal display has up to 8 modbus registers which can be written to over the network and used to display up to 8 process variables.

Since the display can only show one variable at a time, input 1 is used to scroll from display one to display eight each time it is operated. Input 2 can be permanently switched on to enable continuous scrolling at a rate of 2 seconds per value.

If DIP switch 9 is turned on, then the most significant digit of the display shows a number 1 to 8 which represents the process variable being displayed. As the process variable is scrolled, this number is incremented as well.

The format of each process variable allows for both positive and negative numbers to be displayed, and it is also possible to switch on a decimal point. The position of the decimal point is programmed into the decimal point register.

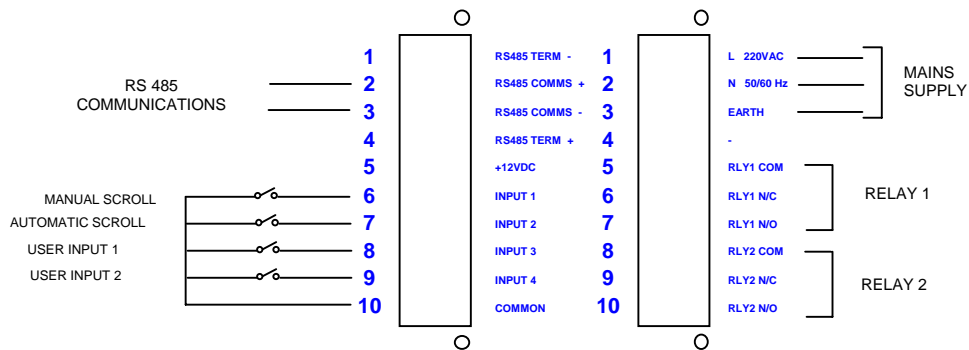
Leading zero's can be turned on by switching on DIP switch 8.

Two digital inputs and two relay outputs are available to the user as remote I/O over the network.

### 3.27.3 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 5.5VA
Inputs:	The inputs may be activated by a potential free contact or open collector NPN transistor output.
Outputs:	The outputs are a relay contact rated at 0.5A/220VAC.
RS485:	2 Wire Multidrop twisted (9600 BAUD only)
Indicators:	LED indicators show RX and TX communications.
Connectors:	2 X 10 way plug in screw connectors.

### 3.27.4 WIRING



**UDISP6A**  
**UNIVERSAL 6 DIGIT DISPLAY**

### 3.27.5 SWITCH SETTINGS

<u>SWITCH</u>	<u>FUNCTION</u>	<u>DESCRIPTION</u>
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	LEADING ZEROS	When switched ON the display will show leading zeros.
9	CHANNEL NUMBER	When switched ON the display will indicate which process variable is being displayed.
10	-	



## 3.28 MM-LPI - LOOP POWERED ISOLATOR

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### 3.28.1 DESCRIPTION

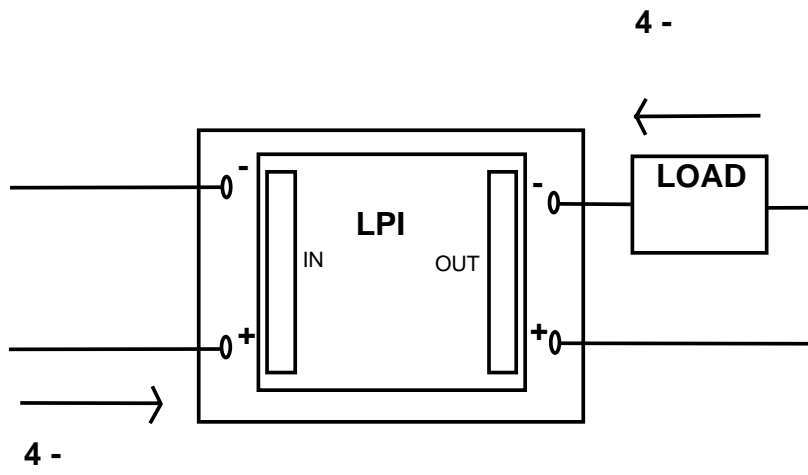
The loop powered isolator draws its power from an existing current loop and provides a fully isolated 4-20mA output to eliminate system ground loops or may be used as a noise reduction device. As a preventative measure in the design of new systems or for retrofits, the LPI is easy to install and requires no additional power supply.



### 3.28.2 SPECIFICATIONS

Input / Output:	4 - 20mA / 4 - 20mA
Load Resistance:	0 - 600 ohms
Load Resistance error:	0.001% / ohm
Linearity error:	0.15%
Operating Temperature:	-10 to +60°C
Mounting:	DIN rail mount

### 3.28.3 WIRING



## 3.29 MM232/485CONV- RS232/485(422) ISOLATED CONVERTER

### 3.29.1 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 :

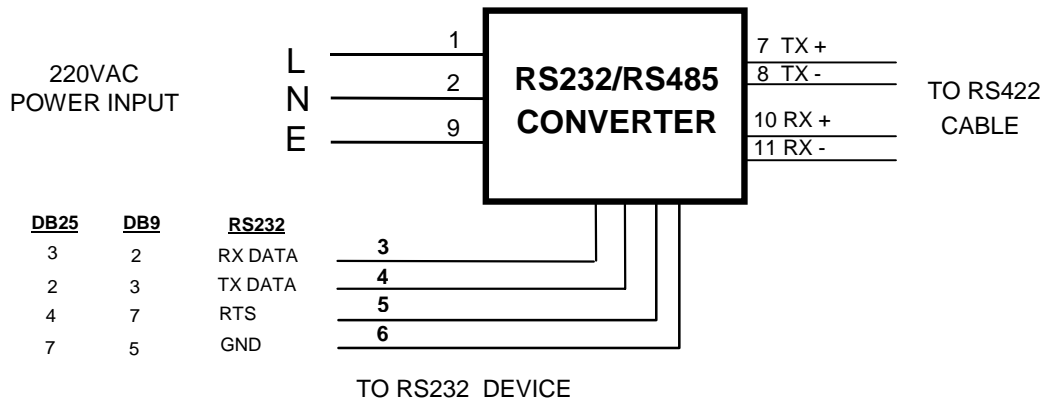
- **2 or 4 Wire Operation.**  
Internal jumpers are used to select 2 wire (RS485) or 4 wire (RS422) modes.
- **RTS Flow control.**  
The RS232 RTS signal can be used to switch the transmitter on and off when multiple converters are connected to the same cable. For 4 wire point to point operation the 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.



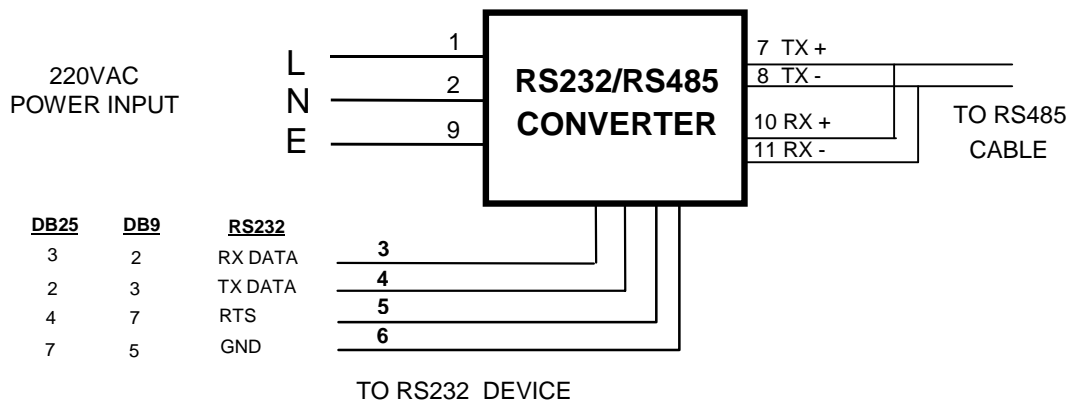
### 3.29.2 SPECIFICATIONS

Power Supply:	200 - 260VAC @ 1.5VA
Transmission Medium:	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.

### 3.29.3 WIRING

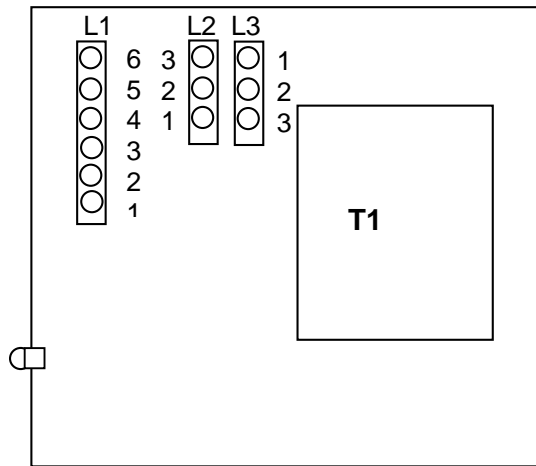


#### 4 WIRE OPERATION



#### 2 WIRE OPERATION

### 3.29.4 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):

L1                    2-3 & 4-5  
L2&L3                1-2

##### 4 WIRE:

L1                    1-2 & 5-6  
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

### 3.30 DU01 - DIAGNOSTIC UNIT

#### 3.30.1 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.

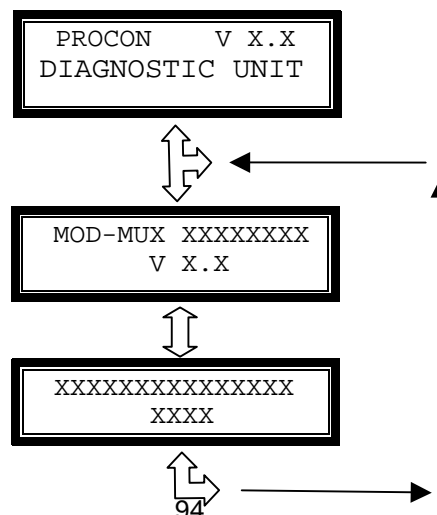
#### 3.30.2 SPECIFICATIONS

Power Supply: Automatically sourced from the MOD-MUX module.

Indicator: 2 Line X 16 character LCD display.

Operating Temperature: 0°C to + 70°C.

#### 3.30.3 DIAGNOSTIC UNIT MENU FORMAT



### 3.31 MM11PINBASE - DIN RAIL MOUNT 11 PIN RELAY BASE

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#### 3.31.1 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.

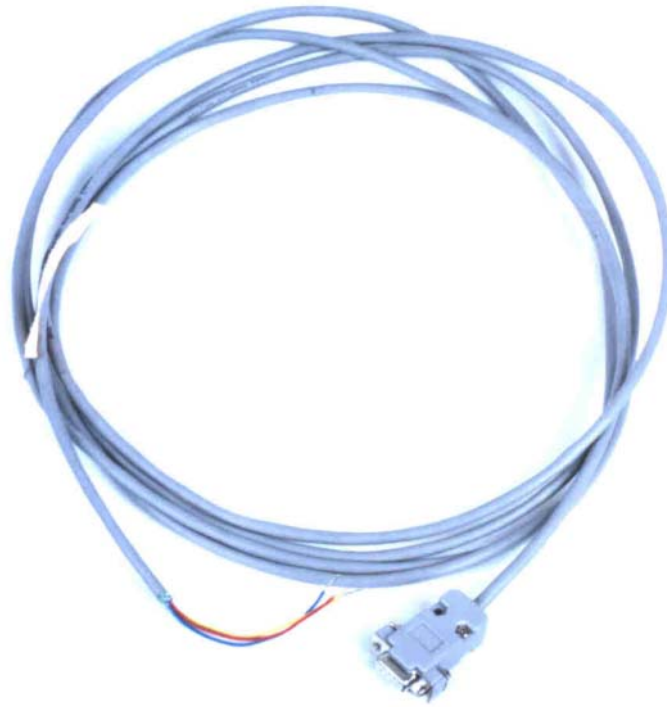


### 3.32 MM232CBL - RS232 9-PIN D-TYPE CONNECTOR AND CABLE

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#### 3.32.1 DESCRIPTION

The MM232CBL is used to connect the Intelligent converter to the serial port of a PC. The one end of the cable is fitted with a DB-9 connector which fits into the PC comm port. The other end of the cable has loose wires which are screwed into the terminals of the 11pin relay base.



#### 3.32.2 WIRING

<u>RS232</u>		<u>DB9</u>
RX	—————	2
TX	—————	3
GND	—————	5



## 4. DATA ADDRESSES

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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.

<u>Type</u>	<u>Start Address</u>	<u>Variable</u>
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 = Up Counting, 1 = 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 = Up Counting, 1 = 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.

#### 4.5 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	"

#### 4.6 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.

#### 4.7 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	"

#### 4.8 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	"

#### 4.9 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	yyy.y	R	Thermocouple Inputs. See table for range.
30003	TC Input 2	-xxx.x	yyy.y	R	Resolution in 0.1°C.
30004	TC Input 3	-xxx.x	yyy.y	R	"
30005	TC Input 4	-xxx.x	yyy.y	R	"
30006	TC Input 5	-xxx.x	yyy.y	R	"
30007	TC Input 6	-xxx.x	yyy.y	R	"
30008	TC Input 7	-xxx.x	yyy.y	R	"
30009	TC Input 8	-xxx.x	yyy.y	R	"
30010	CJC Temp.	-xxx.x	yyy.y	R	CJC Temperature in 0.1°C resolution.
40011	TC Type	1	13	R/W	See TC Tables.

#### 4.10 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	yyy.y	R	Thermocouple Inputs. See table for range.
30003	TC Input 2	-xxx.x	yyy.y	R	Resolution in 0.1°C.
30004	TC Input 3	-xxx.x	yyy.y	R	"
30005	TC Input 4	-xxx.x	yyy.y	R	"
30006	TC Input 5	-xxx.x	yyy.y	R	"
30007	TC Input 6	-xxx.x	yyy.y	R	"
30008	TC Input 7	-xxx.x	yyy.y	R	"
30009	TC Input 8	-xxx.x	yyy.y	R	"
30010	CJC Temp.	-xxx.x	yyy.y	R	CJC Temperature in 0.1°C resolution.
40011	TC Type	1	13	R/W	See TC Tables.

#### 4.11 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.

#### 4.12 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.

#### 4.13 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	"



#### 4.14 UCLK - UNIVERSAL CLOCK (MODULE TYPE = 13)

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	"
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 = 13
40002	Digital I/O	N/A	N/A	R/W	Digital Outputs in bits. 10-9, Inputs 4 - 1.
40003	Seconds	0	59	R/W	The following registers are used to set the time
40004	Minutes	0	59	R/W	Over the RS485 network.
40005	Hours	0	23	R/W	"
40006	Days	1	7	R/W	"
40007	Date	1	31	R/W	"
40008	Month	1	12	R/W	"
40009	Year	2000	2100	R/W	"

#### 4.15 UCNTR6A - UNIVERSAL COUNTER (MODULE TYPE = 14)

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	"
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 = 14
40002	Digital I/O	N/A	N/A	R/W	Digital Outputs in bits. 10-9, Inputs 4 - 1.
40003	Seconds	0	59	R/W	The following registers are used to set the time
40004	Minutes	0	59	R/W	Over the RS485 network.
40005	Hours	0	23	R/W	"
40006	Days	1	7	R/W	"
40007	Date	1	31	R/W	"
40008	Month	1	12	R/W	"
40009	Year	2000	2100	R/W	"
40010	Counter MSB	0	-	R/W	This is the actual displayed count value.
40011	Counter LSB	0	65535	R/W	The maximum value is 999999 for both regs.
40012	MIN trip MSB	0	-	R/W	Low count alarm value.
40013	MIN trip LSB	0	65535	R/W	"
40014	MAX trip MSB	0	-	R/W	High count alarm value.
40015	MAX trip LSB	0	65535	R/W	"

## 4.16 UDISP6A - UNIVERSAL DISPLAY (MODULE TYPE = 15)

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	"
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 = 15
40002	Digital I/O	N/A	N/A	R/W	Digital Outputs in bits. 10-9, Inputs 4 - 1.
40003	Seconds	0	59	R/W	The following registers are used to set the time
40004	Minutes	0	59	R/W	Over the RS485 network.
40005	Hours	0	23	R/W	"
40006	Days	1	7	R/W	"
40007	Date	1	31	R/W	"
40008	Month	1	12	R/W	"
40009	Year	2000	2100	R/W	"
40010	Decimal Point	1	6	R/W	Position of decimal point on display.
40011	Display Mode	0	1	R/W	0 = 16 bits, 1 = 32 bits.

### 1. Display Mode = 0 (16 bits)

40012	Display 1	0	65535	R/W	Display Value.
40013	Display 2	0	65535	R/W	"
40014	Display 3	0	65535	R/W	"
40015	Display 4	0	65535	R/W	"
40016	Display 5	0	65535	R/W	"
40017	Display 6	0	65535	R/W	"
40018	Display 7	0	65535	R/W	"
40019	Display 8	0	65535	R/W	"

### 2. Display Mode =1 (32 bits)

40012	Display 1 MSB	0	65535	R/W	Max Display Value = 999999.( MSB + LSB)
40013	Display 1 LSB	0	65535	R/W	"
40014	Display 2 MSB	0	65535	R/W	"
40015	Display 2 LSB	0	65535	R/W	"
40016	Display 3 MSB	0	65535	R/W	"
40017	Display 3 LSB	0	65535	R/W	"
40018	Display 4 MSB	0	65535	R/W	"

40019	Display 4 LSB	0	65535	R/W	"
40020	Display 5 MSB	0	65535	R/W	"
40021	Display 5 LSB	0	65535	R/W	"
40022	Display 6 MSB	0	65535	R/W	"
40023	Display 6 LSB	0	65535	R/W	"
40024	Display 7 MSB	0	65535	R/W	"
40025	Display 7 LSB	0	65535	R/W	"
40026	Display 8 MSB	0	65535	R/W	"
40027	Display 8 LSB	0	65535	R/W	"

#### 4.17 MM1AI2RO - ANALOG INPUT WITH ALARMS ( MODULE TYPE = 19)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Relay 1 Status	0	1	R	Alarm 1Relay status coil.
10002	Relay 2 Status	0	1	R	Alarm 2Relay status coil.
00003	Relay 1 Manual	0	1	R/W	Operate Alarm 1Relay coil manually.
00004	Relay 2 Manual	0	1	R/W	Operate Alarm 2 Relay coil manually.
00005	Relay 1 Reset	0	1	R/W	Alarm 1Relay manual reset if latched.
00006	Relay 2 Reset	0	1	R/W	Alarm 2Relay manual reset if latched.
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 19
30002	Raw Input Data	0	4095	R	Raw Data from A/D.
30003	Process Value	-32768	32767	R	Calculated Process Value with Zero and Span.
30004	IEEE Low	N/A	N/A	R	Process Value in IEEE 754 floating point
30005	IEEE High	N/A	N/A	R	format.
40006	Input Type	0	5	R/W	Select input type from configuration section.
40007	Filter Band	0	32767	R\W	Filter band in units of process value.
40008	Filter Response	0	32767	R/W	Filter response time X 0.1 seconds.
40009	Process Zero	-32768	32767	R/W	Zero value for process value.
40010	Process Span	-32768	32767	R/W	Span value for process value.
40011	Alarm 1 Mode	0	20	R/W	Valid modes 0 - 4 and 16 - 20.
40012	Alarm 1 Setpoint	-32768	32767	R/W	Setpoint in units of process value.
40013	Alm1 Hysteresis	0	32767	R/W	Hysteresis in units of process value.
40014	Alarm 1 Delay	0	32767	R/W	Alarm on time delay X 1 seconds
40015	Alarm 2 Mode	0	24	R/W	Valid modes 0 - 7 and 16 - 24.
40016	Alarm 2 Setpoint	-32768	32767	R/W	Setpoint in units of process value.
40017	Alm2 Hysteresis	0	32767	R/W	Hysteresis in units of process value.
40018	Alarm 2 Delay	0	32767	R/W	Alarm on time delay X 1 seconds
40019	Digital Status	N/A	N/A	R/W	Coils for relays.
30020	Node ID	0	127	R	Node ID according to DIP switch settings.
40021	Scratch RAM	-32768	32767	R/W	Start of scratch RAM. Not saved on power fail.
40030	Scratch RAM	-32768	32767	R/W	End of scratch RAM. Not saved on power fail.
40031	Scratch EEPROM	-32768	32767	R/W	Start of scratch EEPROM. Saved on power fail.
40040	Scratch EEPROM	-32768	32767	R/W	End of scratch EEPROM. Saved on power fail.

#### 4.18 MM1TI2RO - TEMPERATURE INPUT WITH ALARMS( MODULE TYPE = 20)

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Relay 1 Status	0	1	R	Alarm 1Relay status coil.
10002	Relay 2 Status	0	1	R	Alarm 2Relay status coil.
00003	Relay 1 Manual	0	1	R/W	Operate Alarm 1Relay coil manually.
00004	Relay 2 Manual	0	1	R/W	Operate Alarm 2 Relay coil manually.
00005	Relay 1 Reset	0	1	R/W	Alarm 1Relay manual reset if latched.
00006	Relay 2 Reset	0	1	R/W	Alarm 2Relay manual reset if latched.
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 20
30002	CJC Temp.	-xxx.x	yyyy.y	R	CJC Temperature in 0.1°C resolution.
30003	Temperature	-xxx.x	yyyy.y	R	Calculated temperature with offset.(40009)
30004	IEEE Low	N/A	N/A	R	Temperature in IEEE 754 floating point
30005	IEEE High	N/A	N/A	R	format.
40006	Input Type	1	14	R/W	Select input type from configuration section.
40007	Filter Band	0	32767	R/W	Filter band in units of 0.1°C.
40008	Filter Response	0	32767	R/W	Filter response time X 0.1 seconds.
40009	Temp. Offset	-32768	32767	R/W	Temperature Offset value.
40010	Frequency	50	60	R/W	Line Frequency for A/D. 50/60Hz.
40011	Alarm 1 Mode	0	20	R/W	Valid modes 0 - 4 and 16 - 20.
40012	Alarm 1 Setpoint	-32768	32767	R/W	Setpoint in units of process value.
40013	Alm1 Hysteresis	0	32767	R/W	Hysteresis in units of process value.
40014	Alarm 1 Delay	0	32767	R/W	Alarm on time delay X 1 seconds
40015	Alarm 2 Mode	0	24	R/W	Valid modes 0 - 7 and 16 - 24.
40016	Alarm 2 Setpoint	-32768	32767	R/W	Setpoint in units of process value.
40017	Alm2 Hysteresis	0	32767	R/W	Hysteresis in units of process value.
40018	Alarm 2 Delay	0	32767	R/W	Alarm on time delay X 1 seconds
40019	Digital Status	N/A	N/A	R/W	Coils for relays.
30020	Node ID	0	127	R	Node ID according to DIP switch settings.
40021	CAL	0	2	R/W	Calibration register.
40022	Raw A/D	-32768	65535	R	Raw data out of A/D.
40023	Scratch RAM	-32768	32767	R/W	Start of scratch RAM. Not saved on power fail.
40030	Scratch RAM	-32768	32767	R/W	End of scratch RAM. Not saved on power fail.
40031	Scratch EEPROM	-32768	32767	R/W	Start of scratch EEPROM. Saved on power fail.
40040	Scratch EEPROM	-32768	32767	R/W	End of scratch EEPROM. Saved on power fail.

#### 4.19 MMMEM - MEMORY MODULE (MODULE TYPE = 21)

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 = 21
30002	Module ID	0	127	R	DIP Switch settings for modbus ID
40003	Scratch RAM	0	65535	R/W	Start of scratch RAM. Not saved on power fail.
40075	Scratch RAM	0	65535	R/W	End of scratch RAM. Not saved on power fail.
40076	Scratch EEPROM	0	65535	R/W	Start of scratch EEPROM. Saved on power fail.
40099	Scratch EEPROM	0	65535	R/W	End of scratch EEPROM. Saved on power fail.

## 5. SPECIFICATIONS

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### 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

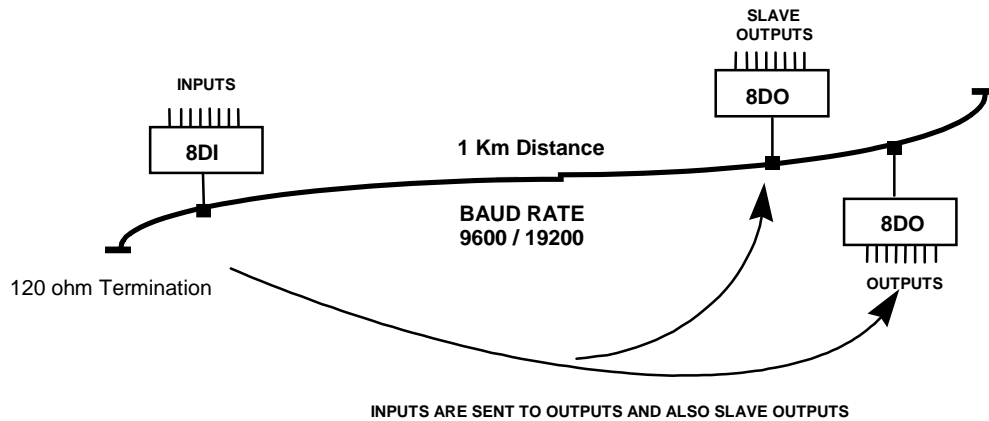
<b>DECLARATION OF CONFORMITY</b> according to EN 45014		
Manufacturer's Name:	Procon Electronics CC	
Manufacturer's Address:	26 Wareing Park 2 Wareing Road Pinetown 3610 South Africa	
declares that the product		
Product Name:	MOD-MUX	
Model Number(s):	MM8DI, MM8DIB, MM16DI, MM8DO, MM4DIO, MM4RO, MM8AI/I, MM8AI/V, MM8AI/IISO, MM8AO, MM8TC, MM8TCISO, MM6RTD, 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	
<u>Pinetown, SA</u> Location	<u>August 2000</u> Date	D.Ruddock

## 6. APPLICATION EXAMPLES

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### 6.1 POINT TO POINT I/O

#### 6.1.1 SYSTEM CONFIGURATION

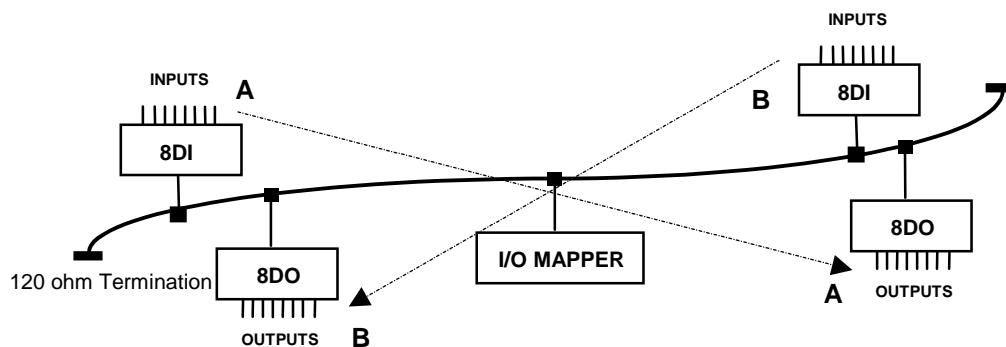


#### 6.1.2 SETUP PROCEDURE

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 then 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.

