

User's Manual

for

MAC Valves Profibus

Serial Input Manifold

1/8/98

1. SYSTEM OVERVIEW

1-1 Profibus

The Profibus System is an open architecture control system based on a DIN standard format which supports high speed transfer of control information. A Profibus network consists of one or more master devices and multiple slave devices.

The master (PLC with its network scanner) and slave devices are connected via a standard five conductor cable which has both node power and communications on the same line. There is a standard approved cables which may be used for network wiring.

The scanner communicates with each slave device on the network in an exchange referred to as discrete I/O transfer. Data transferred on the network is organized by node addresses. There can be up to 123 slaves on a given network based on the number of repeaters and system topography. Each slave device is assigned a node number (or address) so it can communicate with the network.

1-2 MAC Valves Serial Input Manifold

The MAC Serial Input Manifold (SIM) is a slave device within the Profibus network. Thus, it will respond to all of the commands associated with the network like any other node of its type. The PLC programmer will not have to make any special allowances with the Serial Input Manifold.

Since the MAC SIM Unit is nothing more than a node on the Profibus network, it can also be used in conjunction with our Outputs Only Serial Interface (SLIM) product or any other Profibus compatible system.

Each SIM Unit (as shown in Figure 3) occupies a single node in the network. The output portion of the consumes 4 bytes (32 bits) so that the system can control up to 24 MAC solenoid valves plus 8 additional user defined outputs. These user outputs can control remote valve stacks or any other output within the current and voltage specification of the output modules. There can be up to two output modules with 4 outputs per module. The location and addressing of these words will be discuss later in this document.

Along with 32 output channels, the SIM unit has the capability to read 32 input channels. These inputs are controlled through four module of eight inputs per module which are located on the top of the SIM unit. The SIM produces 4 bytes (32 bits) which are read back into the master PLC in the same manner as the outputs. The inputs also can be specified so that they can accept inputs from either an NPN or PNP type switches along with traditional mechanical switches.

Each SIM Unit is mounted directly to the MAC Valve manifold and is connected to the PLC network via the five conductor cable rather than individual wires for each solenoid and each input. This greatly reduces both the distance between the input switches and the controller (the signal for the inputs are also on the same five conductor cable as the outputs) and the number of wires compared with a conventionally wired system (refer to Figure 1).

MAC Valve Serial Input Manifold Units have pre-wired solenoid connections. It is only necessary to make the communication and power connections to the Serial Interface terminals and to set the address switches in the SIM Unit at the time of installation. The MAC SIM system comes with a standard nine pin Sub-D type communications connector and with many optional power connectors. Thus, the amount of wiring by way of the connectors is minimal.

In the event additional valves need to be included at some future date, they can be easily installed (if add-a-unit is available) by simply adding valve(s) to the stack and connecting the mating electrical connector to the SIM ribbon cable.

Another feature of the SIM unit is the ability to add Input Modules or Output Modules anytime after installation. This is easily performed by removing the blanking plate(s) on the top of the SIM unit, placing the new Module in the slot, and securing the two screws on top.

2. SYSTEM STRUCTURE

2.1 Applicable PLCs

The SIM Profibus model is set up for the Siemens S-7 controllers. It has autobaud capacity between 9.6k to 12Mbaud. Please consult the Siemens for a complete list of current Profibus products.

2.2 Applicable MAC Valve Series for the SIM Unit

The following are the valves which can be used with the Serial Input Manifold:

- 34 Series
- 35 Series
- 44 Series
- 45 Series
- 82 Series
- 92 Series
- 93 Series
- 6200 Series
- 6300 Series
- 6500 Series
- 6600 Series
- ISO Series

Since additional valves can be used outside the manifold by way of the optional output modules, please refer to Table 2 for some application examples. The absolute maximum wattage per channel is 6.0W which corresponds to 0.25A at 24VDC, (higher wattage is available through a MOD., consult the factory). The total current load is a maximum of 8.0A. The SIM unit also has a capability for AC operation. Please consult the factory for specifications for AC use.

Table 2

Stack and Output Module Wiring	Number/Type of Valves (Output Module Valves)	Coil Designation	Voltage	Wattage	Total Current For Complete SIM Unit (Amps)
On SIM Stack “ Output Module	8 Dbl 45 8 Sgl 45 (8 Sgl 82)	DA DA DA	24VDC	5.4W 5.4W 5.4W	6.0
On SIM Stack “ “ Output Module “	6 Dbl 92 5 Sgl 6300 3 Sgl 82 (4 4.0W Lights) (4 Sgl 45)	FF 50 DA FB	24VDC	2.4W 6.0W 5.4W 4.0W 1.8W	4.1
On SIM Stack Output Module	24 Sgl 6300 (8 Sgl 6300)	50 50	24VDC	6.0W 6.0W	8.0
On SIM Stack Output Module “	24 Sgl 34 (4 Sgl 6500) (2 Dbl 82)	DF 59 DA	24VDC	4.0W 2.5W 5.4W	5.3

From the above table, it can be see some of the many different combinations of valves which can be operated with the Serial Input Manifold. Please consult the factory for other valve series to be made available and additional options.

3. SPECIFICATIONS

3-1 General Specifications

Table 3

Item	Specifications
Operating ambient temperature	0~+50°C (consult the factory for higher temperature operation)
Operating ambient humidity	10~90% RH (no condensation)
Vibrating resistance	5G (10~55 Hz, 0.5mm)
Impact resistance	10G
Dielectric strength	500VAC 60 Hz for 1 sec. (between external terminal and case)
Insulation resistance	10Mohm
Operating atmosphere	No corrosive gases

3-2 Performance Specifications **Table 4**

Item	Specification
Applicable PLC	Profibus S-7 compatible
Profibus Processor/Scanner	S-7 compatible
Max. # of SI Units per Master Station	32 w/o repeater
Transmission Speed	9.6k-12m baud
Transmission Distance	See Manufacturer's Specification
Transmission Path	Profibus 9 pin D-sub Standard

3-3 SIM Unit Specifications **Table 5**

Item	Specification
Power supply voltage	For solenoid valves 24VDC +/-10% For SIM Unit (internal) 24VDC +/-10%
Power consumption	For solenoid valves and Output Modules Max. 8.0A For SI Unit (internal) Max. 300mA For Input Modules Max. 3.0A
Output points	32 points 6.0W/Channel Max (24VDC)
Input points	32 points
Residual voltage	1.0 V or less
Weight	3.6kg with six Modules
Dimensions	152x126x187mm (6.0x5.0x7.4")

4 Dip Switch Settings/Electronic Data Sheet (EDS)

4-1 Addressing

(DIP SW1 - Refer to Fig. 2)

The Profibus system uses node numbers as a bases addressing. The system has a capacity of 32 modules (126 with a repeater). Each SIM must have a unique address for this to work correctly. Please consult the company from which the scanner is obtained for complete scanner specifications and operational methods.

With the power supply OFF, open the end access plate and locate the two rotary switches in the left half of the mother board as shown in the figure.

Use a small anti-static screwdriver to set the positions of the switches for the unit's node address. The Least Significant Number is the right switch and the Most Significant Number is the left switch.

4-2 Electronic Data Sheet (GSD and *.200 format)

The second part of commissioning a node in the Profibus is to attached the Electronic Data Sheet to the software in the scanner. Due to the differences in the software for a given scanner, please consult the scanner company's manual for instructions on EDS usage.

The following is a printed copy of the file in GSD format. A disk copy is available upon request.

```
*****  
;GSD-FILE HMS_1001.GSD 14.01.97  
#Profibus_DP  
Vendor_Name = "HMS Fieldbus Systems AB" ;max. 32 char.  
Model_Name = "PROFIBUS DP-64 MODULE" ;max. 32 char.  
Revision = "Version 1.4" ;max. 32 char.  
Ident_Number = 0x1001 ;unsigned 16  
Protocol_Ident = 0 ;0=Slave  
Station_Type = 0 ;0=DP only  
FMS_supp = 0 ;0=kein support  
Hardware_Release = "Version 1.0" ;max. 32 char.  
Software_Release = "Version 1.0" ;max. 32 char.  
9.6_supp = 1 ;baud rate supported  
19.2_supp = 1 ;baud rate supported  
93.75_supp = 1 ;baud rate supported  
187.5_supp = 1 ;baud rate supported  
500_supp = 1 ;baud rate supported
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1.5M_supp =      1          ;baud rate supported
3M_supp    = 1
6M_supp    = 1
12M_supp   = 1
; Duration to answer a request by a responder
MaxTsdr_9.6 = 60
MaxTsdr_19.2 = 60
MaxTsdr_93.75 = 60
MaxTsdr_187.5 = 60
MaxTsdr_500 = 100
MaxTsdr_1.5M = 150
MaxTsdr_3M = 250
MaxTsdr_6M = 450
MaxTsdr_12M = 800
;
Redundancy =      0          ;no redundancy
Repeater_Ctrl_Sig = 2          ;RTS=TTL level
24V_Pins =      0          ;not available
Freeze_Mode_supp = 1          ;freeze mode is supported
Sync_Mode_supp = 1          ;sync mode is supported
Auto_Baud_supp = 1          ;baud rate search is supp.
Set_Slave_Add_supp = 0          ;no support, EEPROM necess.
User_Prm_Data_Len = 5          ;LSPM2 / SPM2
User_Prm_Data = 0x00,0x00,0x00,0x00,0x00
Min_Slave_Intervall = 0x000B          ;1.1msec.
Modular_Station = 0          ;compact device
;Max_Module      necessary if Modular_Station = 1
;Max_Input_Len   necessary if Modular_Station = 1
;Max_Output_Len  necessary if Modular_Station = 1
;Max_Data_Len    necessary if Modular_Station = 1
;Unit_Diag_Bit   optional
;Unit_Diag_Area  optional
Module = "AB-PDP-64 I/O" 0x23,0x13 ;
EndModule

```

The following is a printed copy of the file in *.200 format. A disk copy is available upon request.

```

*****
Typfile HMS Fieldbus Systems AB<AB64-PDP-xxx>
V5.x;
AB64-PDP Module ;
HMS ;
PROFIBUS ;
;
DPS/CLASS1 ;
04097;
N;

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J;

N;
J;
J;
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0;
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N;
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00011;
1111011111;
004;
004;
002;
013;
012;
PV005;
00;
00;
00;
00;
00;
PSL000;
KX002;
035;
019;
SY;
DKM000;
DKK000;
DP_NORM;
ISNONAME;
SO000;
008;
MLFB000;
LSK000;
000;
SPT000;
HTT000;

5 Wiring/Installation

All Wiring and installation steps should be performed with the system power supply off.

5-1 Communications

The communications comes from the 9 pin sub-D connector on the outside of the SIM box. The wiring to the SIM from the connector is performed by the factory. The user must only connect a 9 pin Profibus compatible cable to establish communications. Refer to Figure 4.

5-2 Valve/Input Power

There are two sets of terminal blocks visible when the cover plate is removed. The six contact terminal block on the far right is for DC power. The four contact terminal block in the middle is for future AC use.

Because of the wide variety of connectors and wiring that may be employed for DC power to the valves and optional Input/Output Modules, the terminals only will be identified here. Please refer to Figure 5 of the use of these terminals.

5-3 AC Power Wiring

In the SIM, it is possible for future models to drive AC valves. Consult the factory for AC specifications and availability.

5-4 Input Module Wiring

If your system has Input Modules installed, the wiring for the detectors should follow the pattern shown in Figure 6. The detector manufacturer's recommendations should be followed for the type of module used and the wiring which should be followed.

In some cases damage to the switch or detector could result from incorrect wiring. If there are questions, please consult the factory. Care should be exercised to ensure inputs are wired to an Input Module and not an Output Module.

The MAC SIM unit employs the industry standard Eurostyle micro four pin female connector for the modules. There are many companies which have lines of pre-assembled wire harnesses which will connect to the modules to a variety of sensors.

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5-6 DC Output Module Wiring

If your system has DC Output Modules installed, the wiring for the loads whether additional valves, lights, or other outputs should follow the pattern shown in Figure 7. The channel capacity is the same as the valve channels for the manifold. Thus, 6W at 24VDC per channel is the maximum load the modules can drive.

Like the Input Modules, the MAC SIM unit employs the industry standard Eurostyle micro four pin female connector for the Output Modules. The main difference is that all of the pins are not used for the Output Modules. There are many companies which have lines of pre-assembled wire harnesses which will connect to the modules to a variety of sensors.

5-7 Fusing/Circuit Protection

There are three protective circuits incorporated into the SIM unit. These being primary fusing, output electronic fusing, and reverse wiring protection. These are designed to protect the unit and the user's equipment in the event of either outside equipment failure, faulty installation, or SIM failure.

The first of these protective systems is the fusing across all of the incoming power. Please refer to Figure 8 for fuse identification and Table 8 for size and replacement guide.

**Table 7
Fuse Size/Replacement**

Fuse Designation	Value	Protects	Connector Ref.	Replace P/N
F1	1A	Input Module Device Power (AC)	CN3-4 (Hot) CN3-3 (Neutral)	Littelfuse 273 001
F2	1A	Valve/Output Module Device Power (AC)	CN3-2 (Hot) CN3-1 (Neutral)	Littelfuse 273 001
F3	3A	Input Module Device Power (DC)	CN2-4 (+) CN2-3 (-)	Littelfuse 273 003
F4	1A	SIM Primary Power (DC)	CN2-6 (+) CN2-5 (-)	Littelfuse 273 001
F5	8A	Valve/Output Module Device Power (DC)	CN2-2 (+) CN2-1 (-)	Littelfuse 218 008

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The next protective system engineered into your SIM unit is a reverse wiring protective circuit which, in the event of placing 24VDC (+) and 24VDC (-) on the wrong connector pins, will prevent the unit from being damaged by not allowing operation.

The last protective circuit is a series of electronic self-resetting fuses located on the outputs of both the valve drivers and Output Modules. In the event of a short on the valve or output side of the system, these fuses will open and remain open until the short has been cleared. Upon removal of the short, the fuses will reset and operation will continue. One of the methods for detecting an output short is by watching the channel in question's LED and observe during channel operation on whether the unit "flashes" or remains on. If it flashes, then the problem is in that channel.

6 Output Programming/Bit Map

The outputs to the SIM unit are mapped according to the node address inside the Profibus scanner. Due to the large variety of scanners, please refer to their User's Manual for complete programming instructions.

The MAC Valves SIM will consume or produce four consecutive bytes (32 bits) which are assigned for use by the output section of the SIM unit to the PLC memory for programming.

7 Input Programming/Bit Map

Like the outputs, the inputs to the SIM unit are mapped according to the node address. The SIM will produce four consecutive bytes (32 bits) which are assigned for use by the input section of the SIM unit to the PLC memory for programming.

The location of the Input Modules can be see in Figure 3. Notice each connector has assignments for two input channels as noted in the above table.

There are two basic types of inputs based on the direction of current flow. We call the two types Positive Common and Negative Common. The Input Module is factory set by way of a jumper to either of these type. One word of caution, by setting the jumper for the mode of operation for the module, the whole module is that type (Positive Common or Negative Common). There is no option for connector by connector setting of type.

Refer to Figure 6 in selecting the desired mode of operation for the Input Modules. The terms "sinking" and "sourcing" are not used due to the possibility of confusion. In our terminology, Positive Common is used when the load is connected between the signal pins 2 or 4 and the positive voltage terminal pin 1. Negative Common is used when the load is connected between the signal pins 2 or 4 and the negative voltage terminal pin 3.

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Also, these modules have the ability to perform a logic inverse. Thus, if it is desired to have the controller read a logic "0" when the proximity switch is sending a logic "0", then the **negative logic** jumper should be set in the module. Conversely, if a logic "1" is desired for the PLC when the proximity switch is sending a logic "0", then the **positive logic** jumper should be set in the module.

8 Troubleshooting Guide

In the event of difficulties in either operation or installation of the Serial Input Manifold, your local MAC Valves Distributor and the factory are ready and able to assist you in solving any problems which might be encountered.

Below is a table for the LEDs on the Mother Board and their meanings.

Table 10

ERR LED (Top)	DIA LED (Middle)	PWR LED (Bottom)	Function
X	X	Off On	Power not applied. Unit is powered up.
X	-	X	Not implemented
Off On	X	X	Normal Operation Bus off/error

Warning:

Under no circumstances are MAC Valves to be used in any application or system where failure of the valves or related components to operate as intended could result in injury to the operator or any other person.

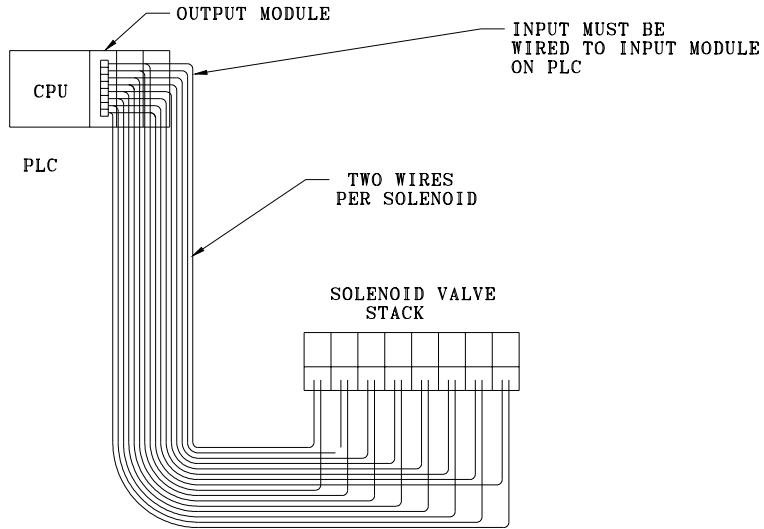
- Do not operate outside of prescribed pressure or temperature ranges.
- Air supply must be clean. Contamination of valve can affect proper operation.
- Before attempting to perform any service on valve, consult catalog, P & O sheet, or factory for proper maintenance procedures. Never attempt service with air pressure to valve.
- If air line lubrication is used, consult catalog, P & O sheet, or factory for recommended lubricants.
- Before interfacing the product to any bus or serial system, consult the controller and bus manuals for proper usage.

CONVENTIONAL WIRING
VS
SERIAL TRANSMISSION

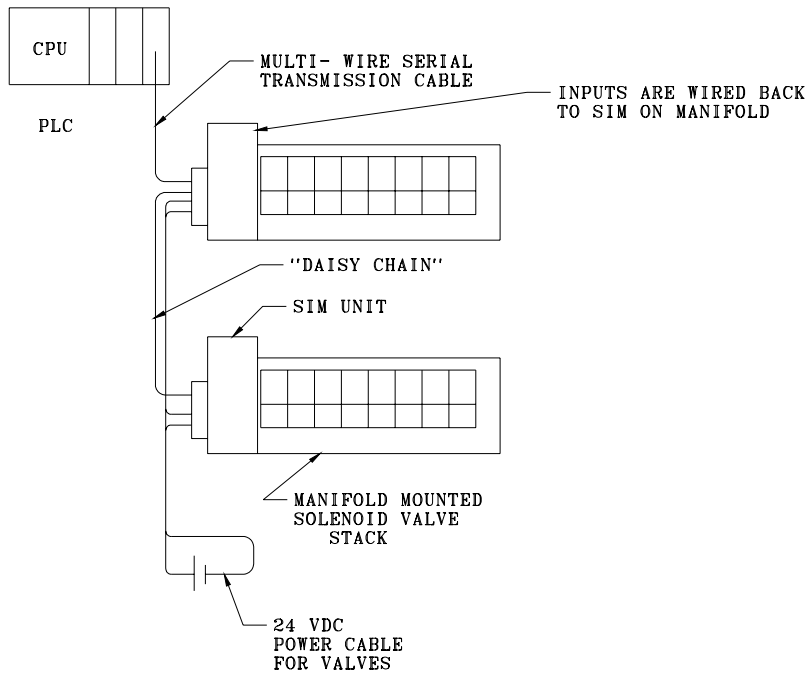
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FIGURE 1

CONVENTIONAL WIRING

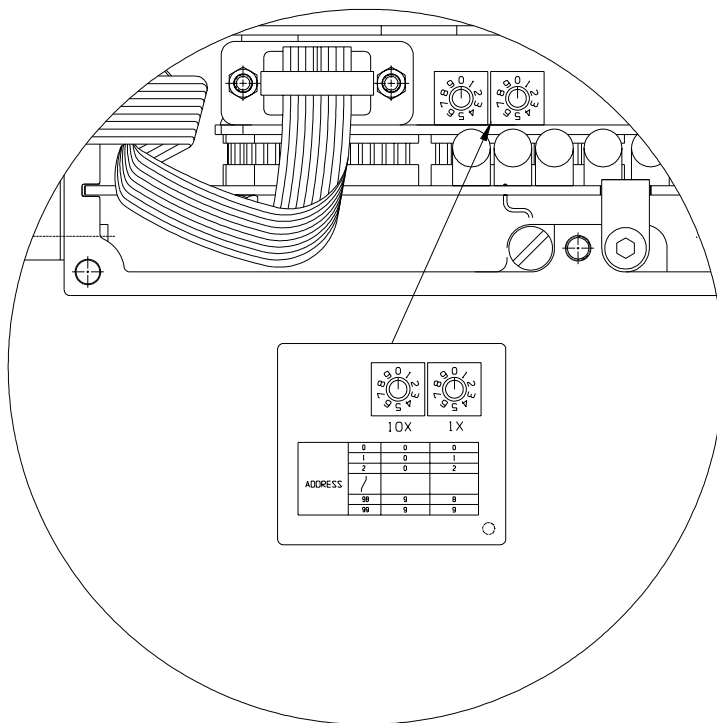


SERIAL TRANSMISSION

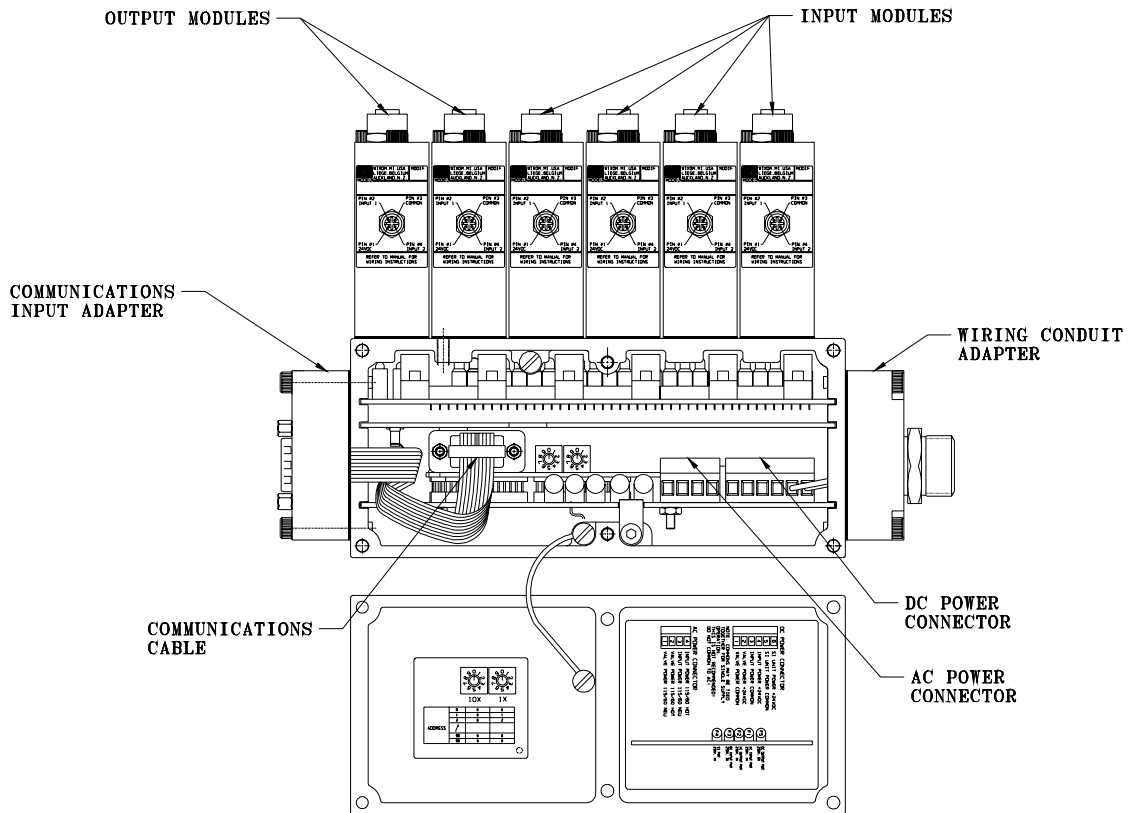


ADDRESS SWITCHES

FIGURE 2

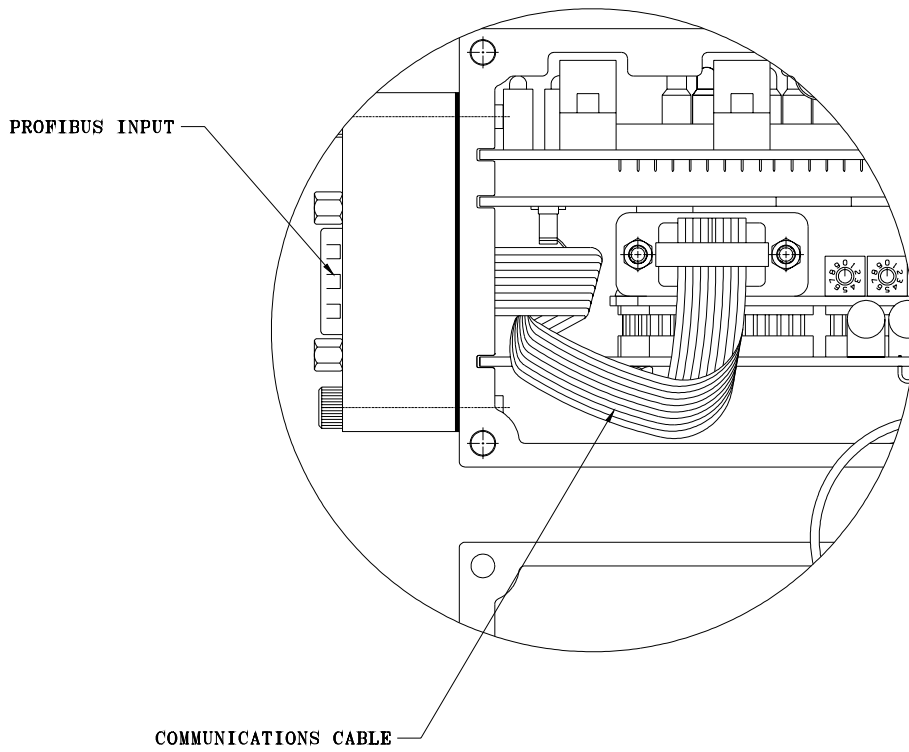


SIM END VIEW
FIGURE 3

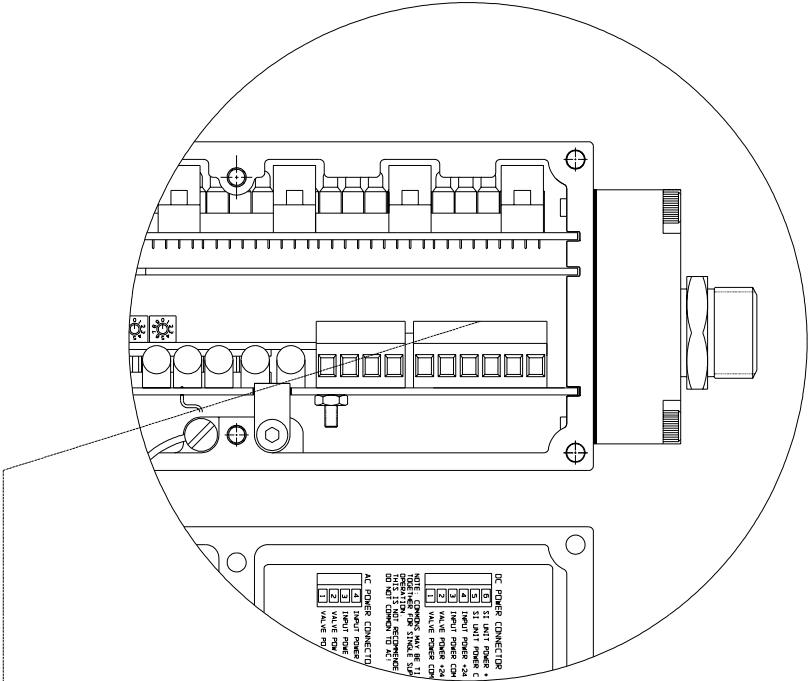


COMMUNICATIONS WIRING
FIGURE 4

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DC POWER WIRING
 FIGURE 5



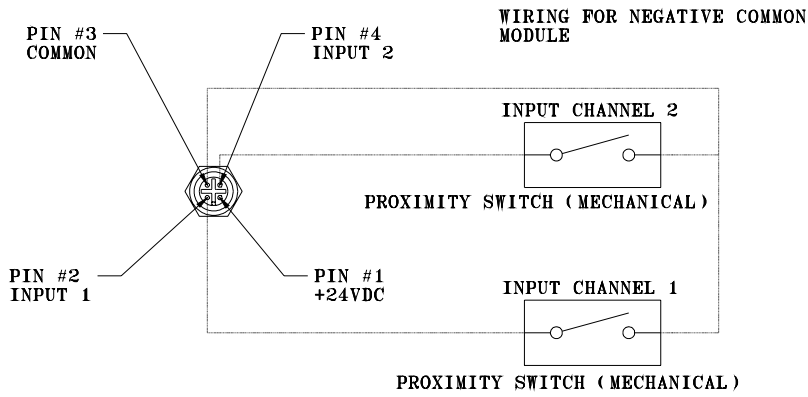
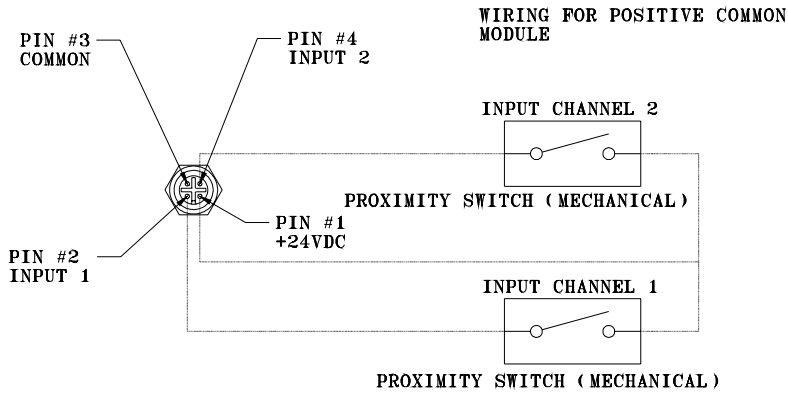
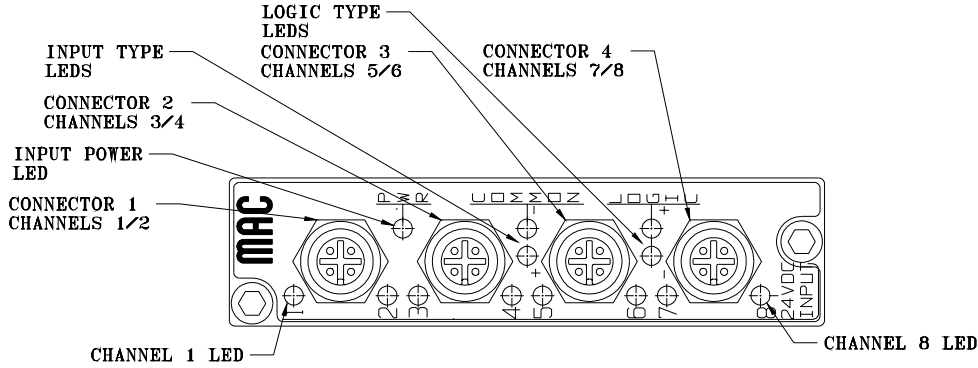
- 6 SERIAL INPUT MANIFOLD +24VDC
- 5 SERIAL INPUT MANIFOLD RETURN
- 4 INPUT MODULE +24VDC
- 3 INPUT MODULE RETURN
- 2 VALVE/OUTPUT MODULE +24VDC
- 1 VALVE/OUTPUT MODULE RETURN

MULTIPLE POWER SUPPLY OPERATION
 WIRING CHART

NUMBER OF POWER SUPPLIES	JUMPERS
3 (SEPARATE)	NONE
2 (SI -INPUT, VALVES/OUTPUT)	PIN 6 TO 4 PIN 5 TO 3
2 (INPUT - VALVES/OUTPUT, SI)	PIN 4 TO 2 PIN 3 TO 1
1 (SINGLE PS OPERATION)	PIN 6 TO 4 PIN 4 TO 2 PIN 5 TO 3 PIN 3 TO 1

INPUT MODULE GUIDE FIGURE 6

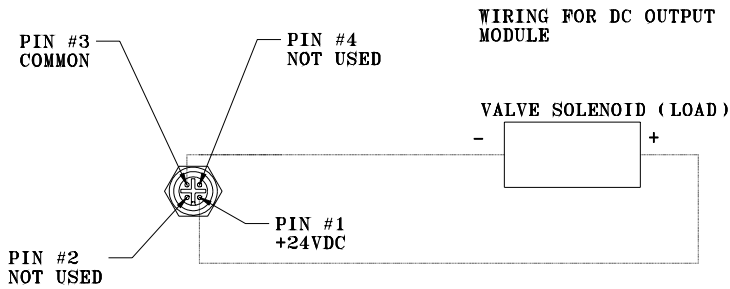
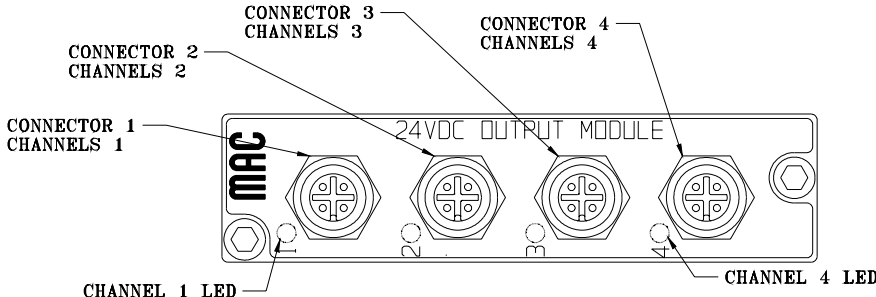
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NOTE. FOR ELECTRONIC SWITCHES, CONSULT THE MANUFACTURER'S RECOMMENDED WIRING PROCEDURE.

DC OUTPUT MODULE GUIDE

FIGURE 7



FUSE GUIDE

FIGURE 8

