MAC VALVES, INC.

TITLE: **User's Manual for MAC Valves Profibus Slim Manifold**

REVISION LEVEL	DATE RELEASED	CHANGE	ECN NUMBER	P.E. APPROVAL	P.D. APPROVAL
A	8/25/98	**ENGINEERING RELEASE**	15285		TRJ
B	11/17/99	**Drawings included in Word format**	16178		TRJ

User's Manual
for
MAC Valves Profibus
Slim Manifold
8/24/98

1. SYSTEM OVERVIEW

1-1 Profibus

The Profibus System is an open architure 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 Slim Manifold 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 Slim Unit is nothing more than a node on the Profibus network, it can also be used in conjunction with our Serial Input Manifold (SIM) product or any other Profibus compatible system.

Each Slim 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 32 MAC solenoid valves. The location and addressing of these words will be discuss later in this document.

Each Slim 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. This greatly reduces the distance between the valves and the controller and the number of wires compared with a conventionally wired system (refer to Figure 1).

MAC Valves Slim 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 Slim Unit at the time of installation. The MAC Sliim 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 Slim ribbon cable.

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 Slim Unit

The following are the valves which can be used with the Slim 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

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 Slim 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 Slim Unit (Amps)
On Slim Stack "	8 Dbl 45	DA	24VDC	5.4W	6.0
	8 Sgl 45	DA		5.4W	
On Slim Stack " "	6 Dbl 92	FF	24VDC	2.4W	4.1
	5 Sgl 6300	50		6.0W	
	3 Sgl 82	DA		5.4W	
On Slim Stack	24 Sgl 6300	50	24VDC	6.0W	8.0
On Slim Stack	24 Sgl 34	DF	24VDC	4.0W	5.3

From the above table, it can be see some of the many different combinations of valves which can be operated with the Slim 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 Slim Unit Specifications   Table 5

Item	Specification
Power supply voltage	For solenoid valves 24VDC +/-10% For Slim Unit (internal) 24VDC +/-10%
Power consumption	For solenoid valves and Output Modules Max. 8.0A For Slim Unit (internal) Max. 300mA
Output points	32 points 6.0W/Channel Max (24VDC)
Residual voltage	1.0 V or less
Weight	2.4kg
Dimensions	152x126x70mm (6.0x5.0x2.8")

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 Slim 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
```

```
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;
```

```
J;
```

N;
J;
J;
N;
N;
N;
N;
J;
0;
N;
N;
N;
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 Slim box. The wiring to the Slim 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/Slim 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, 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 Slim, it is possible for future models to drive AC valves. Consult the factory for AC specifications and availability.

5-4 Fusing/Circuit Protection

There are three protective circuits incorporated into the Slim 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 Slim failure.

The first of these protective systems is the fusing across all of the incoming power. Please refer to Figure 6 for fuse identification and Table 6 for size and replacement guide.

Table 6
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	Slim 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

The next protective system engineered into your Slim 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. 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 Slim 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 Slim will consume four consecutive bytes (32 bits) which are assigned for use by the output section of the Slim unit to the PLC memory for programming.

7 Troubleshooting Guide

In the event of difficulties in either operation or installation of the Slim 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 7

ERR LED (Top)	DIA LED (Middle)	PWR LED (Bottom)	Function
X	X	Off	Power not applied.
		On	Unit is powered up.
X	-	X	Not implemented
Off	X	X	Normal Operation
On			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.
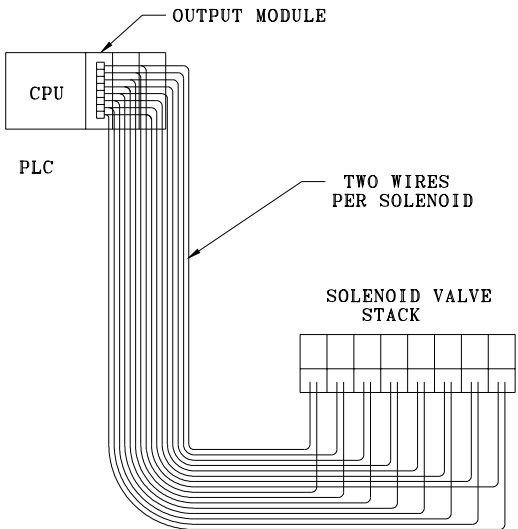
- Do not operate outside of prescribed pressure or temperature ranges.
- Air supply must be clean. Contamination of valve can affect proper operation.
- Before attempting to perform any service on valve, consult catalog, P & O sheet, or factory for proper maintenance procedures. Never attempt service 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.
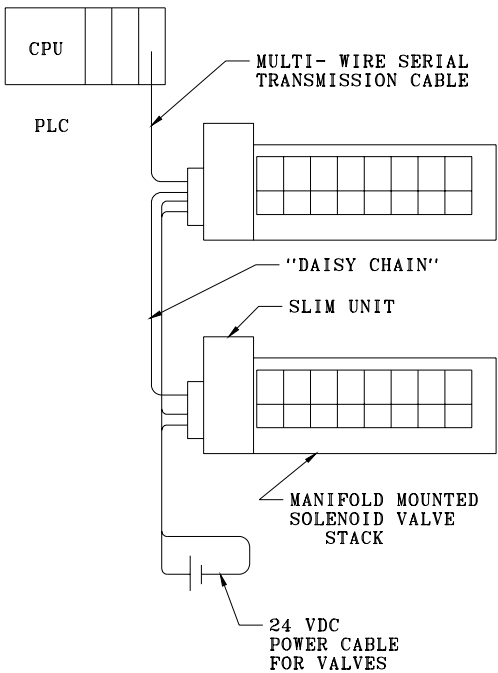
CONVENTIONAL WIRING
VS
SERIAL TRANSMISSION

FIGURE 1

CONVENTIONAL WIRING
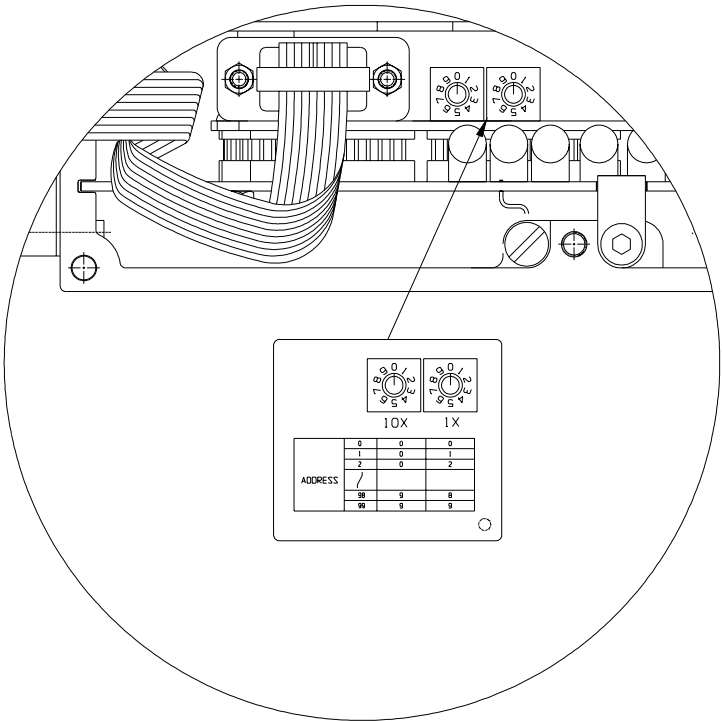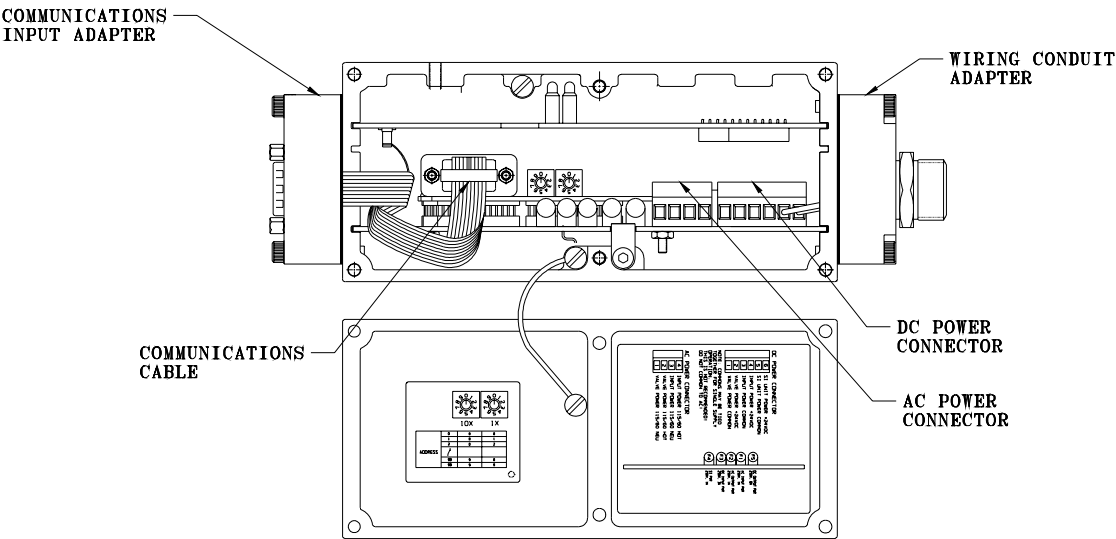
OUTPUT MODULE

CPU

PLC

TWO WIRES
PER SOLENOID

SOLENOID VALVE
STACK

SERIAL TRANSMISSION

CPU

PLC

MULTI- WIRE SERIAL
TRANSMISSION CABLE

"DAISY CHAIN"

SLIM UNIT

MANIFOLD MOUNTED
SOLENOID VALVE
STACK

24 VDC
POWER CABLE
FOR VALVES

ADDRESS SWITCHES
FIGURE 2

SLIM END VIEW
FIGURE 3

COMMUNICATIONS
INPUT ADAPTER

WIRING CONDUIT
ADAPTER

COMMUNICATIONS
CABLE

DC POWER
CONNECTOR

AC POWER
CONNECTOR

COMMUNICATIONS WIRING
FIGURE 4

PROFIBUS INPUT

COMMUNICATIONS CABLE

DC POWER WIRING
FIGURE 5

6	SERIAL INPUT MANIFOLD +24VDC
5	SERIAL INPUT MANIFOLD RETURN
4	INPUT MODULE +24VDC (NOT USED)
3	INPUT MODULE RETURN (NOT USED)
2	VALVES +24VDC
1	VALVE RETURN
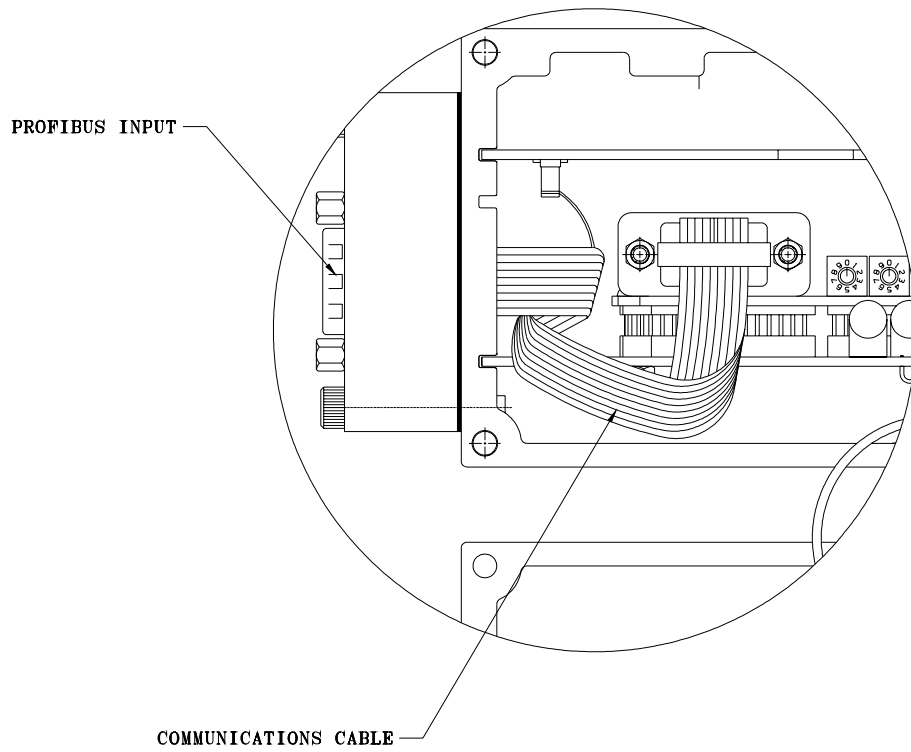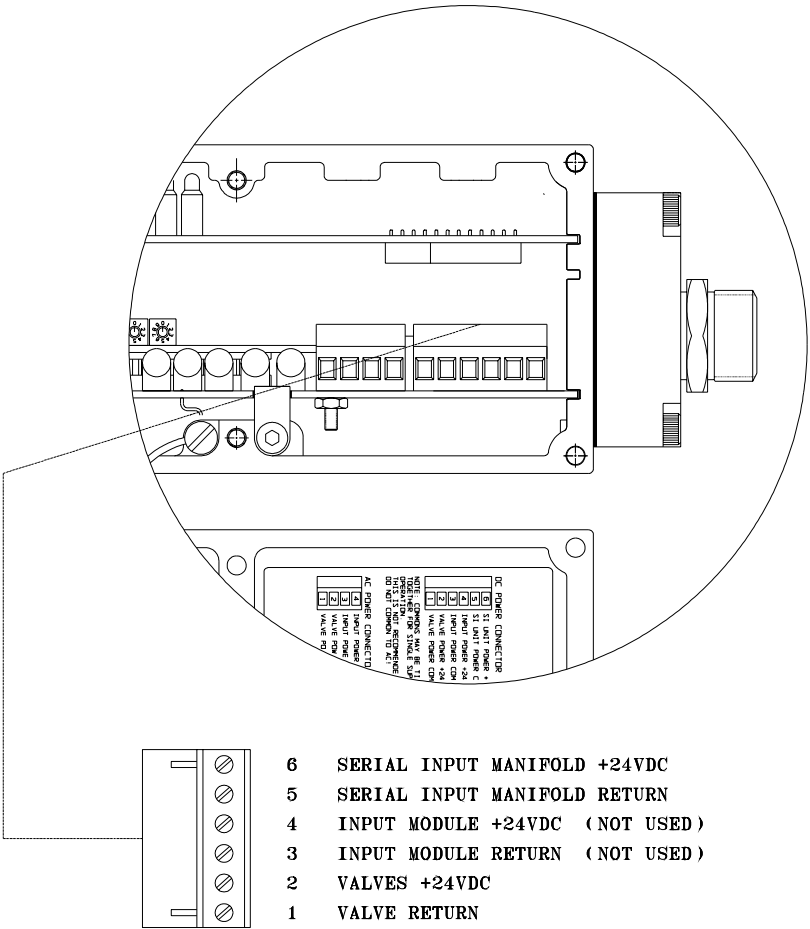
MULTIPLE POWER SUPPLY OPERATION
WIRING CHART

NUMBER OF POWER SUPPLIES	JUMPERS
1 (SEPARATE)	NONE
2 (SI, VALVES)	PIN 6 TO 2 PIN 5 TO 1

FUSE GUIDE
FIGURE 6

F4 SI POWER FUSE

F3 DC INPUT MODULE FUSE

F2 AC VALVE
/OUTPUT MODULE FUSE

F1 AC INPUT MODULE FUSE

F5 DC VALVE
/OUTPUT MODULE FUSE