MAC VALVES, INC.

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TITLE: **User's Manual for MAC Valves DeviceNet**

SM16 Manifold

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User's Manual
for
MAC Valves DeviceNet
SM16 Serial Manifold
1/24/02

1. SYSTEM OVERVIEW

1.1 DeviceNet

The DeviceNet System is an open architure control system based on the Bosch CAN format which supports high speed transfer of control information. A DeviceNet network is an open network consisting of one or more master devices and multiple slave devices. Because it is an open network, the system will consist of products from a wide variety of vendors. The organization which has overall control of bus issues is the ODVA.

The master (a PC or 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 are a number of DeviceNet 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 polled I/O. Data transferred on the network is organized by node addresses. There can be up to 63 slaves on a given network (62 if you have a network PC along with a PLC master scanner). Each slave device is assigned a node number (or address) so it can communicate with the network.

The commissioning (introduction) of a new product on the network varies slightly from master to master but in general, the process is as follows:

1. Set the address dip switches on the slave to correspond to the required node number.
2. Wire the communications bus on the new product.
3. Place power on the new node (product).
4. Initialize the master.
5. Load in the Electronic Data Sheet or EDS (more about that later) into the master.
6. Attach the EDS for the slave to the node assigned it in the master.
7. Program the master for the required work.

1.2 MAC Valves SM16 Serial Manifold

The MAC Serial Manifold (SM16) is a slave device within the DeviceNet 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 this product.

Since the MAC SM16 Unit is nothing more than a node on the DeviceNet network, it can also be used in conjunction with our Serial Input Manifold (SIM), SLIM, Addressable Valve, or any other DeviceNet compatible device.

Each SM16 occupies a single node in the network. The output portion consumes 2 bytes (16 bits) and produces 2 bytes (16 bits) so that the system can control up to 16 MAC solenoid valves. Even though the unit products 2 bytes, it does not have the ability to read input sensors. If the need is there for input sensors monitoring through the valve stack, then the MAC Valves SM 32 or SIM products would be a possible substitution for the SM16. These products do read input sensors. The memory mapping of the output channels and addressing of these bytes also will be discussed later in this document.

Each SM16 is mounted directly to the MAC Valve manifold and is connected to the PLC network via the DeviceNet standard five conductor cable rather than individual wires for each solenoid and each input as would be the case for discretely wired manifolds. This greatly reduces both the amount of wiring and the time required to get the product on line compared to conventionally wired system.

MAC Valve SM16s 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 node address and baud rate dip switches, located on the bottom of the electronics box, at the time of installation. The MAC SM16 system comes with a standard five pin Micro type communications cable and with a standard four pin Micro connector for power.

2. SYSTEM STRUCTURE

2.1 Applicable PLCs

The following is a partial list of scanners and cabling approved by the DeviceNet governing body at the time of this wiring. Please consult the ODVA for a complete list of current DeviceNet products.

Table 1

Company	Product
Allen-Bradley	Scanners, PC Cards, Cabling
Belden Wire and Cable	Cables
Crouse-Hinds	Connectors
Daniel Woodhead	Cables, Connectors
Lumberg	Connectors
Molex	Cables, Connectors
Turck	Cables, Connectors
Omron	Scanners
S-S Technologies	Scanners
Huron Networks	Scanners
Synergetic Micro Systems	Scanners
Toshiba	Scanners
Hilscher GmbH	Scanners

2.2 Applicable MAC Valve Series for the SM16

The following are the valves which can be used with the SM16 Valve Manifold:

> 34 Series
> 35 Series
> 37 Series
> 44 Series
> 45 Series
> 47 Series
> 82 Series
> 92 Series
>
> Other valves available upon request, please consult the factory.

The maximum wattage per channel is 5.4W which corresponds to 0.225A at 24VDC The total output current load is a maximum of 4.0A. Note, if the power connector is a micro type, the maximum current load for the valves is 3.0A due to the limitations of the connector. Also, DeviceNet has power through the bus cable which operates the inputs and the node itself. Consult the DeviceNet wiring standards for the correct wiring and power requirements of the bus power.

3. SPECIFICATIONS

3.1 General Specifications   Table 2

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 3

Item	Specification
Applicable PLC	Refer to Table 1
DeviceNet Processor/Scanner	Refer to Table 1
Max. # of SI Units per Master Station	63
Transmission Speed	125k/ 250k/ 500k
Transmission Distance	500m @125k 250m @250k 100m @500k

Transmission Path	Five Conductor Cable

3.3 SM16 Unit Specifications **Table 4**

Item	Specification
Power supply voltage	For solenoid valves 24VDC +/-10% For SM16 (internal) 24VDC +/-10%
Power consumption	For solenoid valves Max. 4.0A, using micro connector, Max. 3.0A. For SM16 Node Power (for DeviceNet bus calculations) Max. 200mA
Output points	16 points 5.4W/Channel Max (24VDC) 2 bytes consumed
Input points	None
Residual voltage	1.0 V or less
Weight (Main Electronics Module)	0.2kg
Dimensions (Without Connectors)	34x61x84mm

4. Dip Switch Settings/Electronic Data Sheet (EDS)

4.1 Addressing

The DeviceNet system uses node numbers as a bases for addressing. The system has a capacity of 64 addresses. Of these addresses, one is used for the master scanner, and one could be used for the system monitor (this arrangement depends on the company used for the communications). From this, we can have as many as 63 SM16s on a given system. Each SM16 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, remove the SM16 from its base. On the bottom of the unit, find the eight dip switches. Refer to Figure 1 for the switch locations.

Use a small anti-static screwdriver to set the positions of the 8 bit switch for the unit's node address and baud rate as described below. The Least Significant Bit (LSB) is the left most dip switch and the Most Significant Bit (MSB) is the 6th switch from the left. Note, when the switch is in the position closest to the circuit board it means it is translated as a logic 1 (On).

(1) Address (Bits 1-6)

The address setting establishes the SM 16's "identity" within the DeviceNet network. The setting range is 0-63 (64 different settings). The addresses are refer to in decimal format but the dip switches are set up as binary. The following are some examples of decimal to binary conversion and their corresponding dip switches. Refer to Figure 1.

Address 55Dec = 111011Bin
                        =Switches 1,2,4,5, and 6 ON

Address 12Dec = 001100Bin
                        =Switches 3 and 4 ON

(2) Baud Rate (Bits 7,8)

It is important to note that all of the units on a particular network must operate at the same baud rate. Thus, the speed which is set into the Scanner Card must be duplicated by all of the nodes on the net or a bus error will occur.

With the power supply OFF, use a small anti-static screwdriver to set the positions of the two right most dip switches.

Table 4

Switch Position	Data Rate	Max. I/O Transmission Distance
00	125k	500m
10	250k	250m
01	500k	100m
11	not used	-------

4.2 Electronic Data Sheet (EDS)

The second part of commissioning a node in the DeviceNet is to attached the Electronic Data Sheet (EDS) to the software in the scanner. This product will use EDS part number 32_2_4.EDS Rev A. 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 EDS used for the MAC Valves/DeviceNet SM16 A disk copy is available upon request. Note, the EDS for the SM16 is the same file used for the configuration of the SM 16.

```
***********************************************************************************
************
$ DeviceNet Manager Generated Electronic Data Sheet
$

[File]


[Device]
      VendCode   = 90;                  $ Vendor Code
      ProdType   = 7;                   $ Product Type
      ProdCode   = 1;                   $ Product Code

      MajRev     =2;                    $ Major Rev
      MinRev     =4;                    $ Minor Rev
      VendName   = "HMS";
      ProdTypeStr = "Discrete I/O";
      ProdName   = "AB32I/O";
      Catalog    = "";
```

```
        Ucmm      = "0";


[IO_Info]
        Default    = 0X0001;
        PollInfo   = 0X0001, 1, 1;

        Input1     = 2;
        Output1    = 2;


[ParamClass]
        MaxInst=34;
        Descriptor=0;
```

```
        CfgAssembly=0;

$ Parameter Class Section


$ Parameter Section

[Params]

$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$
Param1 =                                    $ Idle State selection
0,                                          $ reserved
6,                                          $ Link Path Size
"20 1E 24 01 30 09",     $ Link Path to DOG object's idle state attribute.
0x02,                                       $ No support for settable path, scaling, scaling links, or
                                            $ real time update of value.  Value is gettable and
                                            $ Settable.  Enumerated strings are supported.
4,                                          $ Data Type - boolean
1,                                          $ Data Size
"Idle State",                 $ Parameter Name
"",                                         $ Units String
                                            $$$$$$$$$$ Help string $$$$$$$$$$$
"Defines output behavior during program mode.",
0,1,0;                              $ Min, Max (max enumeration #), and Default values
1,1,1,0,0,0,0,0,0;          $ Not Used



Param2 =                                    $ Fault State selection
0,                                          $ reserved
6,                                          $ Link Path Size
"20 1E 24 01 30 07",     $ Link Path to DOG object's fault state attribute.
0x02,                                       $ No support for settable path, scaling, scaling links, or
                                            $ real time update of value.  Value is gettable and
                                            $ Settable.  Enumerated strings are supported.
4,                                          $ Data Type - boolean
1,                                          $ Data Size
"Fault State",                $ Parameter Name
"",                                         $ Units String
```

"Defines output behavior in the event of a communication fault.",
0,1,0;   *$ Min, Max (max enumeration #), and Default values*
1,1,1,0,0,0,0,0,0;   *$ Not Used*
$$
Param3 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 01 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*

"Output1",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param4 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 02 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output2",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param5 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 03 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output3",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param6 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 04 30 03",   *$ Path size and Path to Output Attribute*

0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output4",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*
Param7 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 05 30 03",   *$ Path size and Path to Output Attribute*

0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output5",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param8 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 06 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output6",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param9 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 07 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output7",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param10 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 08 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output8",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param11 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 09 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output9",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param12 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 0A 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output10",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param13 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 0B 30 03",   *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output11",   *$ Name*
" ",   *$ Units (Not Used)*

"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param14 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 0C 30 03", *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output12",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*

1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param15 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 0D 30 03", *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output13",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param16 =   *$ Output*
0,   *$ Data Placeholder*
6, "20 09 24 0E 30 03", *$ Path size and Path to Output Attribute*
0x02,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Output14",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to AB64",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param17 =   *$ Output*
0,   *$ Data Placeholder*

```
6, "20 09 24 0F 30 03",  $ Path size and Path to Output Attribute
0x02,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Output15",             $ Name
" ",                     $ Units (Not Used)
"The state of the device connected to AB64",            $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                 $ mult, div, base, offset links (Not Used)
0;                       $ decimal places

Param18 =               $ Output
0,                       $ Data Placeholder
6, "20 09 24 10 30 03",  $ Path size and Path to Output Attribute
0x02,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Output16",             $ Name
" ",                     $ Units (Not Used)
```

```
"The state of the device connected to AB64",            $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                 $ mult, div, base, offset links (Not Used)
0;                       $ decimal places

Param19 =       $ Input
0,                       $ Data Placeholder
6, "20 08 24 01 30 03",  $ Path size and Path to Input Attribute
0x12,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Input1",               $ Name
" ",                     $ Units (Not Used)
"The state of the device connected to DeviceLink",            $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                 $ mult, div, base, offset links (Not Used)
0;                       $ decimal places

Param20 =       $ Input
0,                       $ Data Placeholder
6, "20 08 24 02 30 03",  $ Path size and Path to Input Attribute
0x12,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Input2",               $ Name
" ",                     $ Units (Not Used)
"The state of the device connected to DeviceLink",            $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
```

1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param21 = $ Intput
0,   *$ Data Placeholder*
6, "20 08 24 03 30 03", $ Path size and Path to Input Attribute
0x12,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Input3",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to DeviceLink",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*
Param22 = $ Input
0,   *$ Data Placeholder*
6, "20 08 24 04 30 03", $ Path size and Path to Input Attribute
0x12,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*

"Input4",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to DeviceLink",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param23 = $ Input
0,   *$ Data Placeholder*
6, "20 08 24 05 30 03", $ Path size and Path to Input Attribute
0x12,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Input5",   *$ Name*
" ",   *$ Units (Not Used)*
"The state of the device connected to DeviceLink",   *$ Help*
0,1,0,   *$ min, max, default values*
1,1,1,0,   *$ mult, div, base, offset scaling (Not Used)*
1,1,1,0,   *$ mult, div, base, offset links (Not Used)*
0;   *$ decimal places*

Param24 = $ Intput
0,   *$ Data Placeholder*
6, "20 08 24 06 30 03", $ Path size and Path to Input Attribute
0x12,   *$ Descriptor - (Support Enumerated Strings, Read-only)*
4, 1,   *$ Data Type and Size - (Boolean)*
"Input6",   *$ Name*

" ", $ Units (Not Used)
"The state of the device connected to DeviceLink", $ Help
0,1,0, $ min, max, default values
1,1,1,0, $ mult, div, base, offset scaling (Not Used)
1,1,1,0, $ mult, div, base, offset links (Not Used)
0; $ decimal places

Param25 = $ Input
0, $ Data Placeholder
6, "20 08 24 07 30 03", $ Path size and Path to Input Attribute
0x12, $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1, $ Data Type and Size - (Boolean)
"Input7", $ Name
" ", $ Units (Not Used)
"The state of the device connected to DeviceLink", $ Help
0,1,0, $ min, max, default values
1,1,1,0, $ mult, div, base, offset scaling (Not Used)
1,1,1,0, $ mult, div, base, offset links (Not Used)
0; $ decimal places

Param26 = $ Input
0, $ Data Placeholder

6, "20 08 24 08 30 03", $ Path size and Path to Input Attribute
0x12, $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1, $ Data Type and Size - (Boolean)
"Input8", $ Name
" ", $ Units (Not Used)
"The state of the device connected to DeviceLink", $ Help
0,1,0, $ min, max, default values
1,1,1,0, $ mult, div, base, offset scaling (Not Used)
1,1,1,0, $ mult, div, base, offset links (Not Used)
0; $ decimal places

Param27 = $ Intput
0, $ Data Placeholder
6, "20 08 24 09 30 03", $ Path size and Path to Input Attribute
0x12, $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1, $ Data Type and Size - (Boolean)
"Input9", $ Name
" ", $ Units (Not Used)
"The state of the device connected to DeviceLink", $ Help
0,1,0, $ min, max, default values
1,1,1,0, $ mult, div, base, offset scaling (Not Used)
1,1,1,0, $ mult, div, base, offset links (Not Used)
0; $ decimal places
Param28 = $ Input
0, $ Data Placeholder

```
6, "20 08 24 0A 30 03",  $ Path size and Path to Input Attribute
0x12,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Input10",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                 $ mult, div, base, offset links (Not Used)
0;                       $ decimal places


Param29 =      $ Input
0,                       $ Data Placeholder
6, "20 08 24 0B 30 03",  $ Path size and Path to Input Attribute
0x12,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Input11",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                 $ mult, div, base, offset links (Not Used)
0;                       $ decimal places
```

```
Param30 =      $ Intput
0,                       $ Data Placeholder
6, "20 08 24 0C 30 03",  $ Path size and Path to Input Attribute
0x12,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Input12",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                 $ mult, div, base, offset links (Not Used)
0;                       $ decimal places


Param31 =      $ Input
0,                       $ Data Placeholder
6, "20 08 24 0d 30 03",  $ Path size and Path to Input Attribute
0x12,                    $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                    $ Data Type and Size - (Boolean)
"Input13",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                   $ min, max, default values
1,1,1,0,                 $ mult, div, base, offset scaling (Not Used)
```

```
1,1,1,0,                $ mult, div, base, offset links (Not Used)
0;                      $ decimal places


Param32 =     $ Input
0,                      $ Data Placeholder
6, "20 08 24 0E 30 03", $ Path size and Path to Input Attribute
0x12,                   $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                   $ Data Type and Size - (Boolean)
"Input14",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                  $ min, max, default values
1,1,1,0,                $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                $ mult, div, base, offset links (Not Used)
0;                      $ decimal places


Param33 =     $ Intput
0,                      $ Data Placeholder
6, "20 08 24 0F 30 03", $ Path size and Path to Input Attribute
0x12,                   $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                   $ Data Type and Size - (Boolean)
"Input15",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                  $ min, max, default values
1,1,1,0,                $ mult, div, base, offset scaling (Not Used)
```

```
1,1,1,0,                $ mult, div, base, offset links (Not Used)
0;                      $ decimal places


Param34 =     $ Input
0,                      $ Data Placeholder
6, "20 08 24 10 30 03", $ Path size and Path to Input Attribute
0x12,                   $ Descriptor - (Support Enumerated Strings, Read-only)
4, 1,                   $ Data Type and Size - (Boolean)
"Input16",              $ Name
" ",                    $ Units (Not Used)
"The state of the device connected to DeviceLink",          $ Help
0,1,0,                  $ min, max, default values
1,1,1,0,                $ mult, div, base, offset scaling (Not Used)
1,1,1,0,                $ mult, div, base, offset links (Not Used)
0;                      $ decimal places


[Groups]

[EnumPar]
Param1="Reset Outputs","Hold Last State";
```

Param2="Reset Outputs","Hold Last State";
Param3="OFF","ON";
Param4="OFF","ON";
Param5="OFF","ON";
Param6="OFF","ON";
Param7="OFF","ON";
Param8="OFF","ON";
Param9="OFF","ON";
Param10="OFF","ON";
Param11="OFF","ON";
Param12="OFF","ON";
Param13="OFF","ON";
Param14="OFF","ON";
Param15="OFF","ON";
Param16="OFF","ON";
Param17="OFF","ON";
Param18="OFF","ON";
Param19="OFF","ON";
Param20="OFF","ON";
Param21="OFF","ON";
Param22="OFF","ON";
Param23="OFF","ON";
Param24="OFF","ON";
Param25="OFF","ON";
Param26="OFF","ON";
Param27="OFF","ON";
Param28="OFF","ON";
Param29="OFF","ON";

Param30="OFF","ON";
Param31="OFF","ON";
Param32="OFF","ON";
Param33="OFF","ON";
Param34="OFF","ON";

$ Parameter Groups Section
[Groups]
$Group1= "IO Assembly",   2,   1, 2;

$ End of ABDT EDS File

****
****

5. Wiring/Installation

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

5.1 Communications

The communications and basic node power comes from the 5 pin connector on the side of the SM16 stack.. The wiring inside the stack is performed by the factory. The user must only connect a standard five pin DeviceNet compatible cable to establish communications.

5.2 Valve Power

There is a second connector on the stack electrical cover plate for valve power. Depending on the type of connector required, the unit can have a variety of combinations of power to the valves.

5.3 Fusing/Circuit Protection

The SM16 uses a multi-tiered approach to isolation and protection of the electronics and bus systems. The first line of defense are the two fuses location on the bottom of the unit. One of these fuses is for the valve power circuit, the other is used to protect the electronicst. Inside this circuit is a blocking diode to prevent any damage from reverse power wiring. Next in line is the opto-isolation employed for the separation of any electronic interference which might be created by either the valves from reaching the communications bus. Along the valve circuits, we have both blocking and spike separation diodes to significantly reduce the valve's de-energized spike and external interference from reaching the electronics.

Table 5
Fuse Size/Replacement

Fuse Designation	Value	Protects	Replace P/N
F1	4A	Valve Power	3405.0924.25 Schuster Electronics
F2	1A	Electronics Power	3405.0921.25 Schuster Electronics

6. Output Programming/Bit Map

The outputs to the SM16 unit are mapped according to the node address inside the DeviceNet scanner. Due to the large variety of scanners, please refer to their User's Manual for complete programming instructions.

The MAC Valves SM16 will consume two consecutive bytes (16 bits) which are assigned for use by the output section of the SM16 unit to the PLC memory for programming.

Table 6 is a mapping using Class 9 and Attribute 3.

Table 6

Instance	Location	Channel
1	Valve Solenoid 1	1
2	Valve Solenoid 2	2
3	Valve Solenoid 3	3
4	Valve Solenoid 4	4
5	Valve Solenoid 5	5
6	Valve Solenoid 6	6
7	Valve Solenoid 7	7
8	Valve Solenoid 8	8
9	Valve Solenoid 9	9
10	Valve Solenoid 10	10
11	Valve Solenoid 11	11
12	Valve Solenoid 12	12
13	Valve Solenoid 13	13

14	Valve Solenoid 14	14
15	Valve Solenoid 15	15
16	Valve Solenoid 16	16

7. Input Programming/Bit Map

The SM16 produces two consecutive bytes of data but does not have the capacity to read into sensors.

8. Troubleshooting Guide

In the event of difficulties in either operation or installation of the SM16 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 of some typical problems, symptoms, and their solutions. All troubleshooting LEDs are visible on the top of the electronics module. These LEDs are limited to communications health and power and not valve operation. They are for Electronics Power, Module/Network Status, and Bus Address (not used).

<div align="center">Table 7</div>

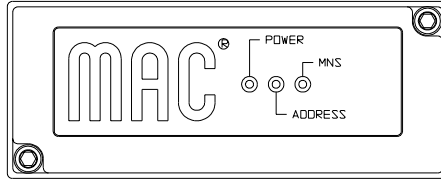| Problem	Symptoms	Solutions
Does not operate	Electronics Power LED off Mod/Net Status LED off No Valve operation	1. Verify primary 24VDC supply Check fuse F2/ replace if blown
Does not operate	Electronics Power LED on Mod/Net Status LED red Flashing No Valve Operation	1. Verify communications cable properly connected Verify correct address and baud rate is set on the dip switches
Does not operate	Electronics Power LED on Mod/Net Status LED Flashing green No Valve Operation	1. Verify correct address and is set on the dip switches 2. Unit On-line but not connected
DeviceNet is active/does not drive valves	Electronics Power LED on Mod/Net Status LED green No Output LEDs on No Valve Operation	1. Check Output fuse F1 2. Check wiring for power
DeviceNet is active/individual valve does not operate	Electronics Power LED on Mod/Net Status LED green	1. Check connection of valve

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.
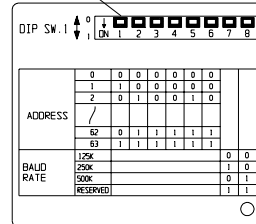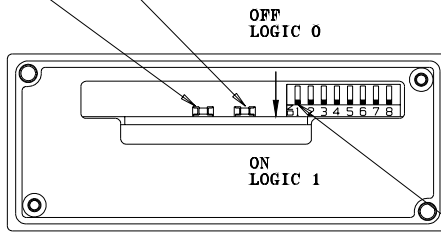
LEDS/DIP SWITCHES
FIGURE 1

TOP VIEW

POWER
MNS
ADDRESS

FUSE F2
ELECTRONICS

FUSE F1
VALVES

OFF
LOGIC 0

ON
LOGIC 1

BOTTOM VIEW

DIP SW.1

ADDRESS										
0	0	0	0	0	0	0			
1	1	0	0	0	0	0			
2	0	1	0	0	1	0			
/									
62	0	1	1	1	1	1			
63	1	1	1	1	1	1			

BAUD RATE		
125K	0	0
250K	1	0
500K	0	1
RESERVED	1	1

DEVICENET CONNECTOR

	MINI 5 PIN	MICRO 5 PIN (STANDARD)	
1	DRAIN	DRAIN	-BARE
2	V+	V+	- RED
3	V-	V-	-BLACK
4	CAN_H	CAN_H	-WHITE
5	CAN_L	CAN_L	-BLUE

NOTE:
OTHER CONNECTORS AVAILABLE
UPON REQUEST. PLEASE CONSULT
THE FACTORY.

POWER CONNECTOR

MINI
3 PIN

1	EARTH GROUND
2	VALVE +
3	VALVE -

MINI
4 PIN

1	ELECTRONICS +
2	ELECTRONICS -
3	VALVE +
4	VALVE -