MAC VALVES, INC.

TITLE: **User's Manual for MAC Valves AS-I SM32 Manifold**

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User's Manual
for
MAC Valves
AS-I SM32 Serial Manifold
7/21/00

1. SYSTEM OVERVIEW

1-1 AS-I

The Activator Sensor Interface Bus (AS-I Bus) is an open control system which supports high speed transfer of simple structure control information typically associated with valves and proximity switches. A network consists of one master PLC and multiple slave devices.

The master PLC and slave devices are connected via a standard two connector flat cable which provides both communications and node bias voltage to the product. Also, required in this network, is an AS-I compatible power supply which places power on the communications bus.

The PLC communicates with each slave device on the network via a standard "shift register" format where all nodes (numbers 0-31) are scanned in order. The first node (number 0) is reserved for the master PLC. The other addresses can be assigned to any slave in any order. The SM32 has two nodes in each box. Thus, there must be two node numbers for each SM32. The number also must be unique.

The MAC SM32 AS-I product has the option of using a hand held programmer to assign the node numbers to each half of the unit. This is accomplished by way of an optional programmer port. The other way to assign node numbers is by way of the PLC and the bus line.

The 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 on the slave using either the master PLC (after communications wiring) or hand held programmer (depending on the options ordered).
2. Wire the communications bus on the new product.
3. Place power on the new node (product).
4. Initialize the master.
5. Program the master for the required work.
6. Go on-line.

1-2 MAC Valves SM32 Serial Manifold

The MAC Serial Manifold (SM32) is a slave device within the AS-I 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.

Each SM32 consumes two nodes in the network. Thus, it can control eight output channels and eight input channels. We will discuss the inputs later in this document.

The inputs are capable of interfacing up to four sensors on top of the electronics box or up to 8 sensors for the tethered input module. The inputs which are accepted by our electronics can be either NPN or PNP type. This must be known prior to powering the unit up. If the inputs are improperly wired, damage can occur to the switches. There also is an option of using the bus power or external power to operate the inputs. This is selected by a jumper at the base of the module.

Each SM32 is mounted directly to the MAC Valve manifold and is connected to the PLC network via a pair of four pin micro (male) connectors (one for each node) 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. These four pin connectors are then connected to the flat wire bus cable via two "vampire clips".

MAC Valve SM32s 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 addresses at the time of installation.

2. SYSTEM STRUCTURE

2.1 Applicable PLCs

Table 1

PLC/Processor Type	Max. # SI Units
Balluff M-W-001-RS232C	31
Synergetic AS-I Master	31

For other applications or controllers, please consult the factory

2.2 Applicable MAC Valve Series for the SM32 Unit

The following are the valves which can be used with the SM32:

> 34/44 Series
> 42 Series
> 35/45 Series
> 37/47 Series
> ISO1/2/3 Series
> 82 Series
> 92 Series
> 93 Series
> 6300 Series
> 6500 Series
> 6600 Series

Please consult the factory for other series to be made available and additional options.

3. SPECIFICATIONS

3-1 General Specifications   Table 2

Item	Specifications
Operating ambient temperature	0~+50°C
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	Various. (Refer to Table 1)
Max. # of SI Units per Master Station	31
Transmission Speed	167kbits/sec
Transmission Distance	100m (300m w/ repeaters)
Transmission Path	Flat Wire Cable

3-3 SM32 Unit Specifications

Table 4

Item	Specification
Power supply voltage	For solenoid valves 24VDC +/-10% For SM32 Unit (bus) AS-I standard 30VDC Power Suppy
Power consumption	For solenoid valves: Max. 4.0A For SI Unit (internal) and Inputs: Max. 2A
Output points	8 points 5.4W/Channel Max (24VDC)
Input points	8 points
Residual voltage	1.0 V or less
Weight	0.75kg
Dimensions	34x71x146mm (Without Connectors)

4. Node Settings

4-1 Hand held Programmer

The SM32 has the option of using the Siemens (and compatible) hand held programmer for node addressing.
Each SM32 will have two (one for each node inside) addressing ports for the programmer. The procedure for
each programmer will vary by the manufacturer but the set-up is as follows:
1. Plug programmer into SM32
2. Read the node number
3. Select desire node number on programmer
4. Write this number into the node
5. Repeat above for the second node of SM32

4-2 PLC Programming

The master PLC has the options of either auto or manual programming the node numbers for the slaves. To auto program, each slave must be set to "0". Next, run the command in which the master assigns numbers to the slaves in order.

To manual program the node numbers, first select the desired slave. Next, select the new node number. Finally write this new number into the slave.

5. Wiring/Installation

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

5-1 Communications Connectors

Refer to Figure 2 for terminal identification during installation.

There are two sets of connectors for the communications visible on the side of the unit. These micro connectors are set up for the standard AS-I micro to vampire connector for communications. Each connector is set up for one node for the SM32 (half the total package).

To wire, simply connect the AS-I vampire connector to the flat communications wire and the SM32 micro connector.

5-2 DC Power Wiring

All DC power for the valves and inputs is connected through the four or five contact connector as specified by the customer. The first thing that must be decided is the number of power supplies which are to be used to operate the unit. The system is set up so that a separate DC supply can be used for Inputs and Outputs so as to be able to lock out a section (i.e. valve power) without turning off the communications section. The inputs can also be driven from the communications wire. It is also possible to operate the entire system from a single DC source. This connector will not power the communications bus. This power comes from a standard AS-I power supply connected directly to the bus. In either case, refer to Figure 2 for terminal instructions.

5-3 Input Wiring

The MAC SM32 employs the industry standard Eurostyle micro four pin female connector for the inputs. There are many companies which have lines of pre-assembled wire harnesses which will connect the electronics to a variety of sensors.

Also note the type of switch logic must be know prior to turning the circuit on. The type (NPN or PNP) is selected by way of a jumper on the bottom of the circuit board. Refer to Figure 3 for wiring and jumper information.

5-5 Fusing/Circuit Protection

The SM32 uses a multi-tiered approach to isolation and protection of the electronics and bus systems. The first line of defense is 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 electronics and inputs circuit. 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 or input and the communications bus. Along the valve circuits, we have both blocking and spike suppression diodes to significantly reduce the valve's de-energized spike from reaching the electronics.

The first of these protective systems is the fusing across all of the incoming power. Please refer to Figure 1 for fuse identification and Table 5 for size and replacement guide.

Table 5
Fuse Size/Replacement

Fuse Designation	Value	Protects	Replace P/N
F9	2A	Input Electronics	Schurter 3405.0921.25
F10	4A	Valve Power	Schurter 3405.0924.25

6. Output Programming/Bit Map

The outputs to the SM32 unit are mapped according to the node addresses inside the AS-I master controller. Due to the large variety of controllers, please refer to their User's Manual for complete programming instructions.

The MAC Valves SM32 will consume two nibbles (one for each node) which are assigned for use by the output section of the SM32 unit to the PLC memory for programming.

Table 6 is a mapping to the word inside the scanner.

Table 6

Channel	Location	Description
1	Valve Solenoid 1	Node A Bit 0
2	Valve Solenoid 2	Node A Bit 1
3	Valve Solenoid 3	Node A Bit 2
4	Valve Solenoid 4	Node A Bit 3
5	Valve Solenoid 5	Node B Bit 0
6	Valve Solenoid 6	Node B Bit 1
7	Valve Solenoid 7	Node B Bit 2
8	Valve Solenoid 8	Node B Bit 3

7. Input Programming/Bit Map

Like the outputs, the inputs to the SM32 are also mapped according to the node addresses. The SM32 will produce two nibbles (4 bits each) which are assigned for use by the input section of the unit to the PLC memory for programming. Refer to Table 7 for a memory map for the input channels.

In the table below, Top refers to input connectors on top of the electronics, Tether refers to input connectors on the tethered module.

Table 7

Channel	Location	Description
1	Top 1 or Tether 1	Node A Bit 0
2	Top 2 or Tether 2	Node A Bit 1
3	Top 3 or Tether 3	Node A Bit 2
4	Top 4 or Tether 4	Node A Bit 3
5	Tether 5	Node B Bit 0
6	Tether 6	Node B Bit 1
7	Tether 7	Node B Bit 2
8	Tether 8	Node B Bit 3

The location of the Input Connectors can be see in Figure 3. Notice each connector has assignments for one input channel 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 Inputs are 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, PNP or Negative Common, NPN). There is no option for connector by connector setting of type. If the tethered input module option is used, then each row of four inputs can be selected either Positive or Negative Common. **The jumper inside the SM32 must be removed prior to wiring the tethered input module**.

Refer to Figure 3 in selecting the desired mode of operation for the inputs. 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 and the positive voltage terminal pin 1 (typical for PNP logic switches). Negative Common is used when the load is connected between the signal pins 2 and the negative voltage terminal pin 3 (typical for NPN logic switches).

Also, there is the option for powering the inputs by way of the communications bus or external power. There is a jumper on the base of the unit which sets this option.

8. Troubleshooting Guide

In the event of difficulties in either operation or installation of the SM32 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. They consist of the ERR A, ERR B, and Bus PWR.

Table 8

Problem	Symptoms	Solutions
Does not operate	Node Fault LEDs off Bus Pwr LED on No Output LEDs on No Valve operation	1. Verify primary 24VDC supply Check fuse F1 and F2/ replace if blown
Does not operate	Node Fault LEDs on Bus Pwr LED on No Output LEDs on No Valve Operation	1. Verify communications cable properly connected 2. Verify correct addresses set
AS-I is active/does not drive valves	Node Fault LEDs off Bus Power LED on No Output LEDs on No Valve Operation	1. Check Output fuse F2 2. Check wiring for power

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.

FUSE GUIDE
FIGURE 1
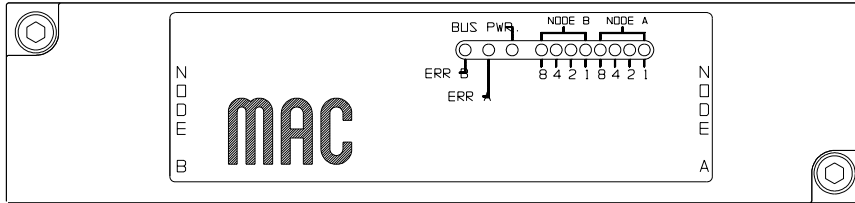
TOP VIEW, SHOWN WITH NO INPUTS

BOTTOM VIEW
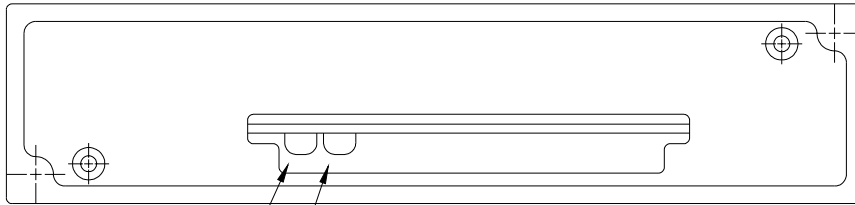
FUSE F9
ELECTRONICS

FUSE F10
VALVES
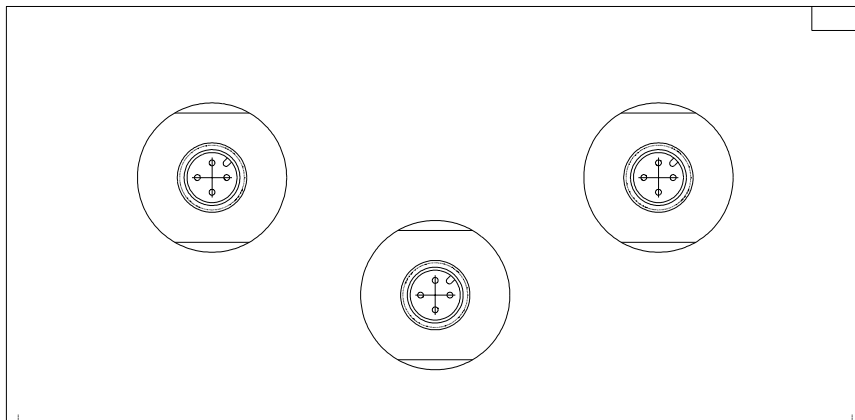
SIDE VIEW

CONNECTOR GUIDE
FIGURE 2
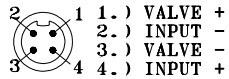
NODE B
PROGR. PORT

NODE A
PROGR. PORT

NODE B

NODE A

BUS PWR.

NODE B   NODE A

ERR B

ERR

8 4 2 1 8 4 2 1
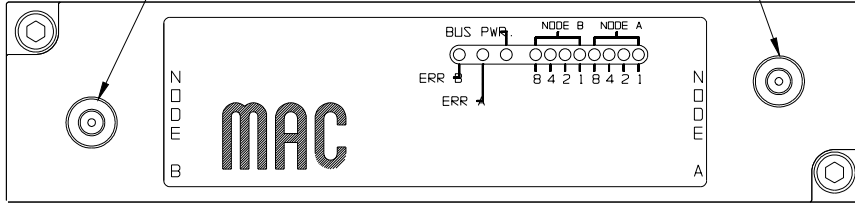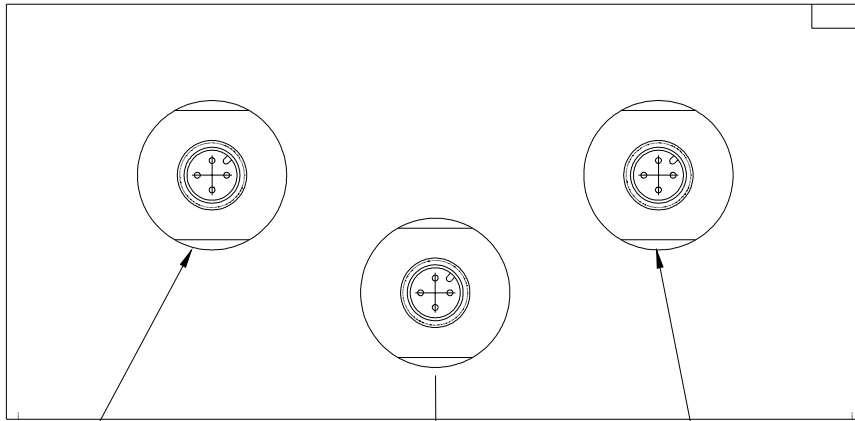
TOP VIEW

SIDE VIEW

NODE A
COMM

NODE B
COMM

MICRO POWER
CONNECTOR

2   1   1.) VALVE +
          2.) INPUT −
          3.) VALVE −
3   4   4.) INPUT +

INPUT GUIDE
FIGURE 3

INPUT 4

NODE B

BUS PWR

ERR B

ERR A

NODE B   NODE A

8 4 2 1 8 4 2 1

mac

NODE A

INPUT 3   INPUT 2   INPUT 1
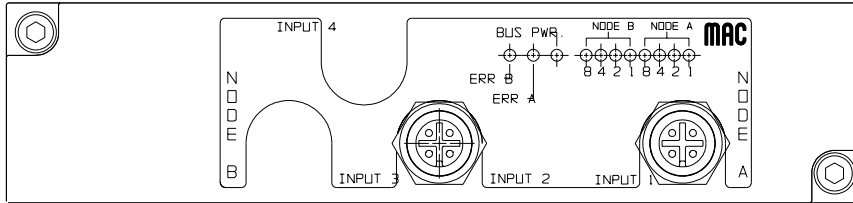
TOP VIEW, TWO INPUTS, COMM. AND POWER CONNECTORS REMOVED

JUMPER FOR
NPN INPUTS

JUMPER FOR
PNP INPUTS

BOTTOM VIEW
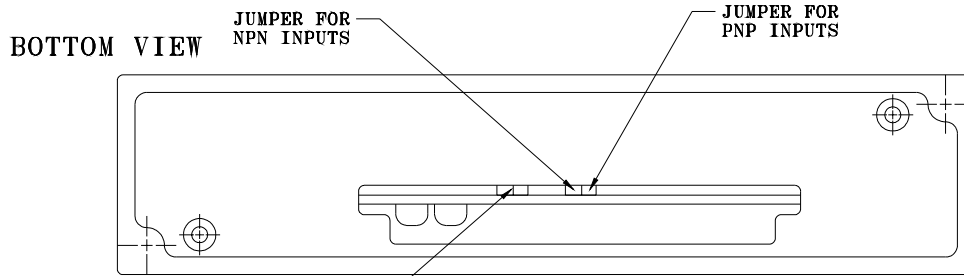
JUMPER FOR BUS
POWERED INPUTS
(REMOVED FOR EXTERNAL
POWERED INPUTS)

PIN #3
COMMON

PIN #1
+24VDC

PIN #2
INPUT

WIRING FOR POSITIVE COMMON
MODULE (PNP)

INPUT

PROXIMITY SWITCH (MECHANICAL)
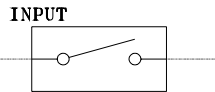
WIRING FOR NEGATIVE COMMON
MODULE (NPN)

PIN #3
COMMON

PIN #2
INPUT 1

PIN #1
+24VDC

INPUT
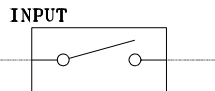
PROXIMITY SWITCH (MECHANICAL)

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