MXV - Dry Switch Monitor, 5 Input

Installation & Operating Instructions

Overview

The MXV monitors five dry switch closure devices and provides one 0 to 10V analog output to the controller. Each switch closure adds a precise voltage to the output so a simple subtraction algorithm lets the controller know which switches are closed at any time.

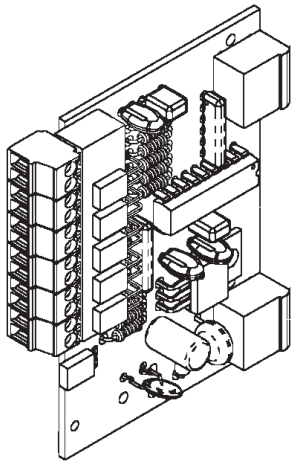

Fig. 1: MXV - Dry Switch Monitor, 5 Input

Mounting

The MXV plugs into either the BP2, BP4 or BP8 backplane and receives its power from the backplane.

Each switch terminates on an independent plug on the front of the module and an LED associated with each input indicates when the switch is closed.

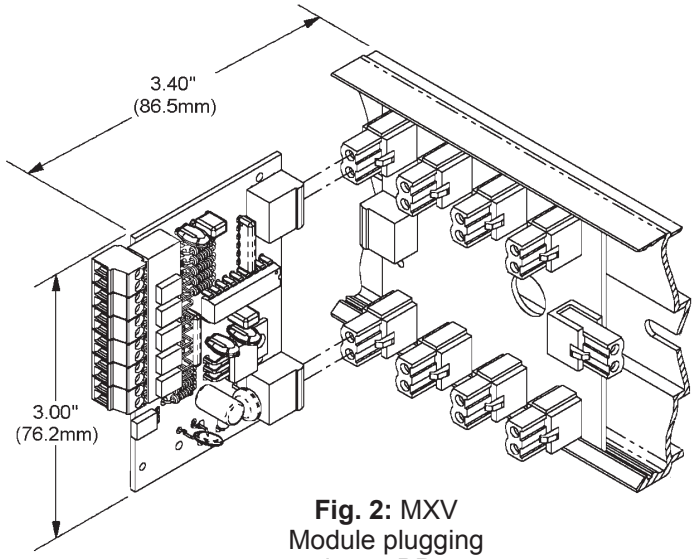

Fig. 2: MXV Module plugging into a BP4 Backplane

Specifications

Power Voltage: 24 to 34VDC or 20 to 24VAC

Power Current: 35mA max (1.2VA max)

Input Sensing Voltage: 15VDC

Input Sensing Current: 2mA

Output Voltage: 0 to 10 VDC

Output Current: 5mA max sourcing, 10KΩ resistance pull down sinking

Specifications subject to change without notice.

Building Automation Products, Inc., 750 North Royal Avenue, Gays Mills, WI 54631 USA
Tel:+1-608-735-4800 • Fax+1-608-735-4804 • E-mail:sales@bapihvac.com • Web:www.bapihvac.com

Termination

The five inputs on terminal J3 are dry contacts isolated from other circuits as shown in Fig. 3.

The 0 to 10V output to the controller comes from pins 1 and 2 of terminal J3.

Note: The switch circuits provide 2 mA sealing current at an open circuit voltage of 15 VDC. Carefully check your switch specifications for proper operation at these levels.

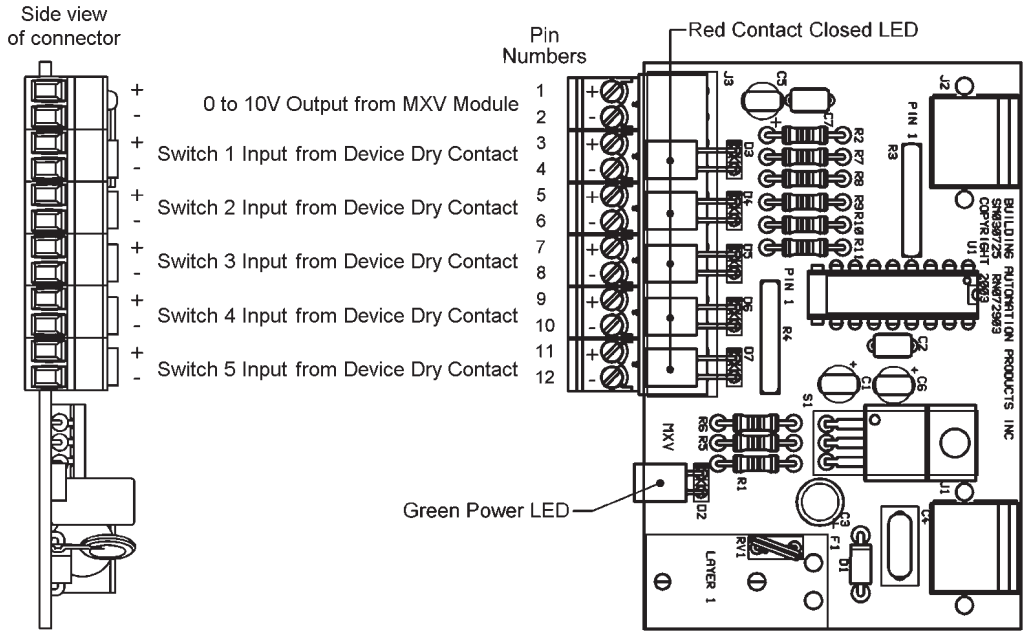

Fig. 3: MXV Component Identifier

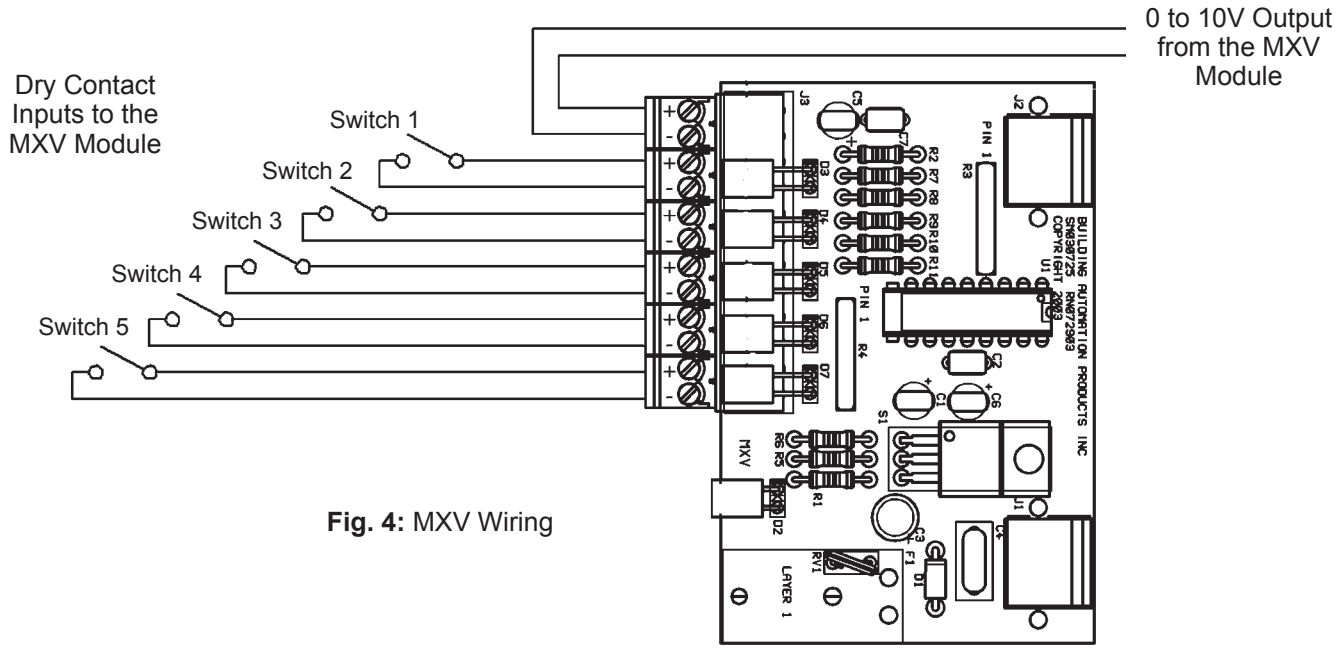

Fig. 4: MXV Wiring

Note on Termination:
The male connectors that plug into the header on the board use rising block screw terminals to hold the wires. It is possible for the block to be in a partially up position allowing the wire to be inserted under the block. Be sure that the male connector screws are turned fully counterclockwise before inserting the wire. Lightly tug on each wire after tightening to verify proper termination.

Operation

Each Dry Switch Input on terminal J3 has a red LED next to it. When the associated dry switch is closed, the LED will light. Each switch closure adds a precise voltage to the MXV output as shown in Table 2.

Table 2: Output Voltage

Input	Contribution to Output Voltage
Dry Switch #1	5.0000 ± 0.1 VDC
Dry Switch #2	2.5000 ± 0.1 VDC
Dry Switch #3	1.2500 ± 0.1 VDC
Dry Switch #4	0.6250 ± 0.1 VDC
Dry Switch #5	0.3125 ± 0.1 VDC

Table 3 shows what a display value would be if you scaled the voltage input for 0 to 10V equals 0 to 32 units. You can see in Table 3 that the "inputs" represent binary values with input 5 being the least significant bit and input 1 being the most significant bit.

Table 3: MXV Values

Display Value	Voltage Output	Inputs ON	Display Value	Voltage Output	Inputs ON
0	0.000	None	16	5.000	1
1	0.313	5	17	5.313	1, 5
2	0.625	4	18	5.625	1, 4
3	0.938	4, 5	19	5.938	1, 4, 5
4	1.250	3	20	6.250	1, 3
5	1.563	3, 5	21	6.563	1, 3, 5
6	1.875	3, 4	22	6.875	1, 3, 4
7	2.188	3, 4, 5	23	7.188	1, 3, 4, 5
8	2.500	2	24	7.500	1, 2
9	2.813	2, 5	25	7.813	1, 2, 5
10	3.125	2, 4	26	8.125	1, 2, 4
11	3.438	2, 4, 5	27	8.438	1, 2, 4, 5
12	3.750	2, 3	28	8.750	1, 2, 3
13	4.063	2, 3, 5	29	9.063	1, 2, 3, 5
14	4.375	2, 3, 4	30	9.375	1, 2, 3, 4
15	4.688	2, 3, 4, 5	31	9.688	1, 2, 3, 4, 5

Decoding

The following algorithm in the controller will determine which of the five switches are closed or open.

Step 1. Read the controller input voltage that is coming from the MXV output and call this value Vx.

Step 2. Is the value of Vx greater than 4.9VDC?

Yes: Set the software point for switch 1 "closed" or "on". Subtract 5V from Vx and set this as the new Vx.

No: Set the software point for switch 1 "open" or "off".

Step 3. Is the value of Vx greater than 2.4VDC?

Yes: Set the software point for switch 2 "closed" or "on". Subtract 2.5V from Vx and set this as the new Vx.

No: Set the software point for switch 2 "open" or "off".

Step 4. Is the value of Vx greater than 1.15VDC?

Yes: Set the software point for switch 3 "closed" or "on". Subtract 1.25 from Vx and set this as the new Vx.

No: Set the software point for switch 3 "open" or "off".

Step 5. Is the value of Vx greater than 0.525VDC?

Yes: Set the software point for switch 4 "closed" or "on". Subtract 0.625 from Vx and set this as the new Vx.

No: Set the software point for switch 4 "open" or "off".

Step 6. Is the value of Vx greater than 0.2125VDC?

Yes: Set the software point for switch 5 "closed" or "on".

No: Set the software point for switch 5 "open" or "off".

Step 7. End

"Best++" Language Program

Here is a simple decoding program in the "Best++" language that can be used by Carrier Comfort controllers:

The voltage output from the MXV connects to an analog input point named "MUX1" in the controller. Five discrete software points are on points 67 to 71. While multiple MXV's could be handled with one large program, it is more common to use individual small programs which can be added as needed. The "_1" in variable names throughout the program designates this as program 1.

```
PROGRAM MX1V {MX1V,"VOLTAGE INPUT MUX 1"}

CONNECT AI_1  AS A CUST_VOLT_INPUT {MUX1}
CONNECT DI1_1 AS A DI TO 67
CONNECT DI2_1 AS A DI TO 68
CONNECT DI3_1 AS A DI TO 69
CONNECT DI4_1 AS A DI TO 70
CONNECT DI5_1 AS A DI TO 71
ANALOG_MAINTENANCE MUXVAL_1 (X0_1)
{MUXVAL_1, "TOTAL VALUE OF VMUX BYTE", 56}

TASK MUX_1 {MUX_1,"Multiplexer 1 Program",,,1,1}

X1_1 = ROUNDDOWN(AI_1 + 0.45)
IF X1_1 <> X0_1 THEN X0_1 = X1_1 ; EXIT ENDIF
DI1_1 = (       (X1_1 / 32) >= 0.5)
DI2_1 = (FRACTION(X1_1 / 16) >= 0.5)
DI3_1 = (FRACTION(X1_1 /  8) >= 0.5)
DI4_1 = (FRACTION(X1_1 /  4) >= 0.5)
DI5_1 = (FRACTION(X1_1 /  2) >= 0.5)

ENDTASK
```


Building Automation Products, Inc., 750 North Royal Avenue, Gays Mills, WI 54631 USA
Tel:+1-608-735-4800 • Fax+1-608-735-4804 • E-mail:sales@bapihvac.com • Web:www.bapihvac.com

Applications

The MXV can be combined with other BAPI ETA modules, such as the DS8 - Discrete Summary Module, to monitor additional switches as shown in Fig 3.

See the DS8 installation and operation sheet (14645_ins_ds8.pdf) for more information on the DS8 Module. The document is available on the BAPI website by going to the DS8 product webpage.

The MXV may also be used with the outputs from an IRM4 and PE4, the feedback output of an EA1, or the pushbutton on a SD2.

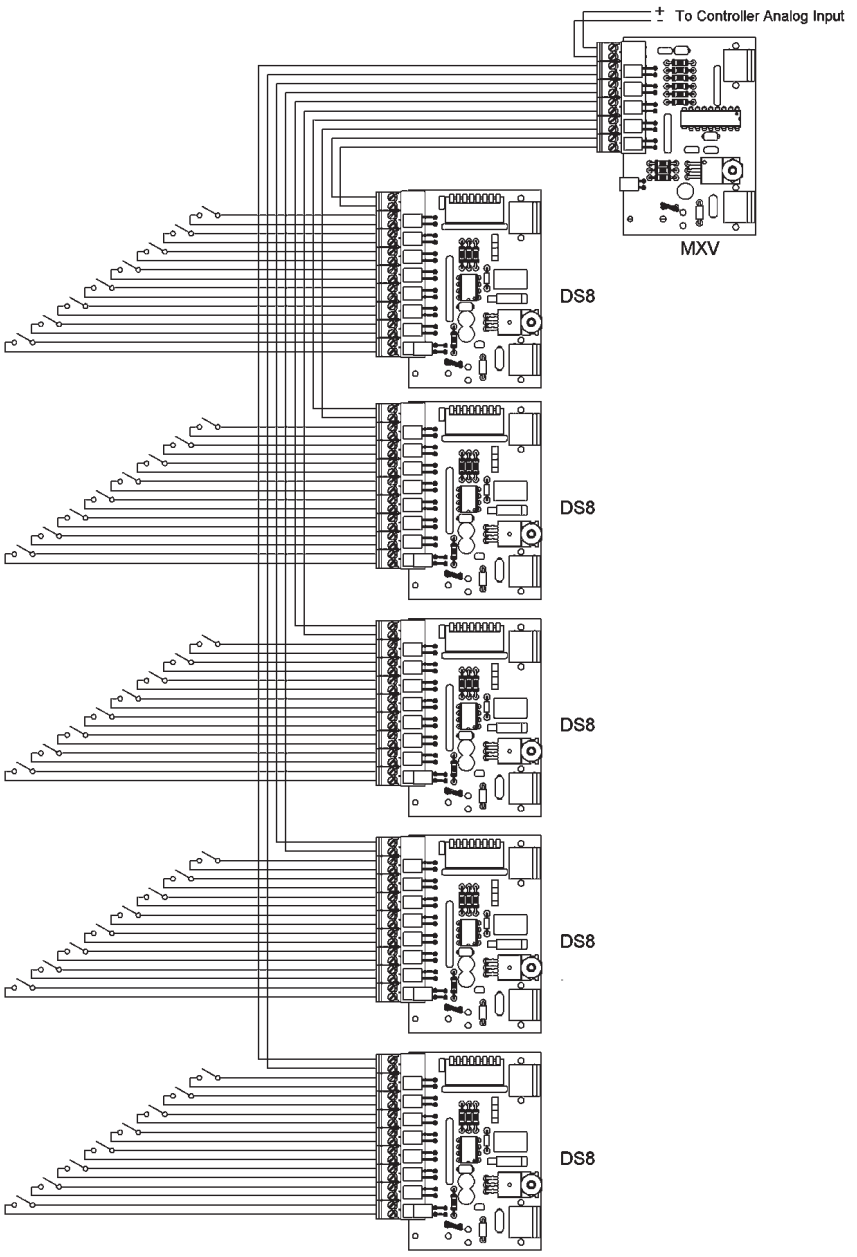

Fig. 5:
MXV Module and five DS8 Modules used to monitor 40 dry switch closures.

Diagnostics

Possible Problems:	**Possible Solutions:**
Green power LED on the MXV does not light	Verify that the MXV is firmly inserted into the backplane. Verify that the backplane is supplying the required 24 to 34VDC or 20 to 24VAC to the MXV.
Incorrect output voltage from the MXV	Verify that each dry switch is connected to the correct MXV input on terminal J3. Verify that the LED for each dry switch input lights up when that switch is closed. If the LED does not light up, remove the wiring from that MXV terminal and replace with a shorted plug. If the LED lights up with the shorted plug, then troubleshoot the switch and associated wiring that is going to that terminal of the MXV as it is likely shorted to ground. If the LED doesn't light up with the shorted plug installed, call BAPI technical support.