VAV Modular Assembly (VMA) 1410/1420

Application

The Variable Air Volume (VAV) Modular Assembly (VMA) 1400 Series consists of configurable digital controllers. Both the VMA1410 and 1420 have a pressure sensor and actuator in a prewired unit. For additional information, refer to the *Variable Air Volume Modular Assembly (VMA) 1400 Series Overview and Engineering Guidelines Technical Bulletin (LIT-6363120)* and the *Variable Air Volume Modular Assembly (VMA) 1400 Series Application Note (LIT-6375125)*. Use HVAC PRO software to program these controllers. (Use EURO PRO in Europe.)

Installation

Set the N2 addresses using the following instructions before mounting the VMA.

Setting N2 Addresses

There are two ways to set the N2 addresses for VAV boxes: hardware addressing or software addressing. Hardware addresses take priority over software addresses. If software addressing is used, the hardware address of each VMA must be disabled by setting the N2 address (DIP) switch to 0 or to 255.

Hardware Addressing

In hardware addressing, the N2 address DIP switches on the side of the VMA are manually set to the appropriate address (Figure 1). The N2 hardware address equals the sum of the values beside each DIP switch that is set to ON. For example, if the first DIP switch (1) and the fifth DIP switch (16) are both set to ON, the N2 hardware address for that controller is 17 (1 + 16 = 17).

Use Addresses 1-253 (254 is reserved and should not be used by any N2 device on the same N2 trunk).

Software Addressing

In software addressing, use HVAC PRO software Release 8.01 or later to set the N2 address of each VMA over the Zone Bus. The VMA must be at firmware Revision B12 or later in order to use software addressing.

To use software addressing:

1. Set DIP switches to address 0 or 255 and install the VMAs. If the DIP switches are set to any other value during power up, the controller defaults to hardware addressing.

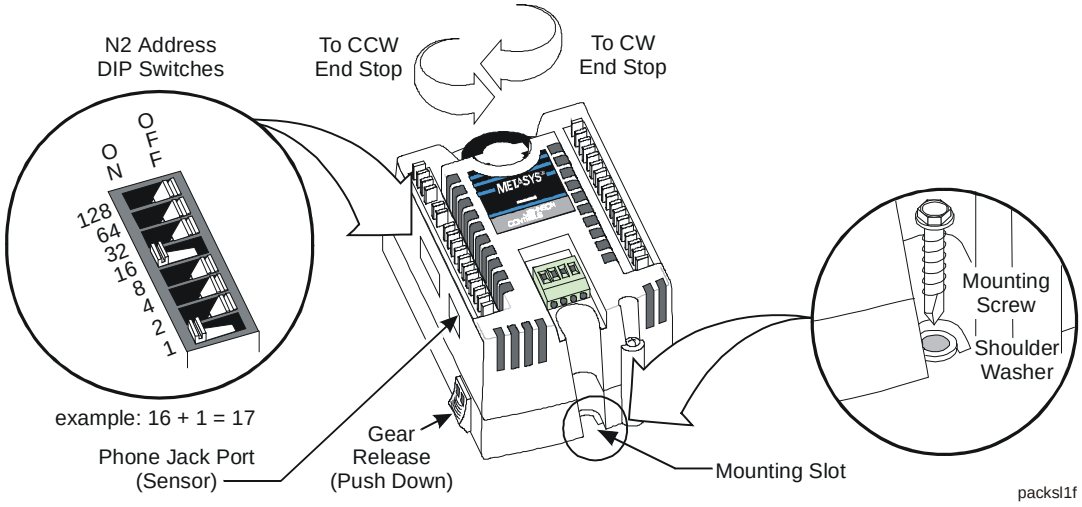

Figure 1: VMA1410/1420 Controller

2. Supply power to the units.
3. Program each address through the Zone Bus using a laptop, AS-CBLPRO-2 or AS-CVTPROx00-0 converter, and HVAC PRO software Release 8.01 or later. Select either Controller Information or VMA Balancer Tool from the Action menu in HVAC PRO software.

If you select Controller Information, select Single Device.

4. Select Zone Bus. The Controller Information screen or VMA Balancer Tool screen appears.
5. Select an N2 address from the drop-down list.
6. Click Set Address.
7. Wait for the new address to appear in the N2 Address field of the Controller Information screen or Balancer Tool screen.

Alternately, program each address through the Zone Bus using a Palm™ compatible handheld device and the VMA1400 Balancing Tool (VBT) software. Refer to the *Auxiliary Gear Technical Bulletin (LIT-6363080)* and *Using the VMA1400 Balancing Tool (VBT) Software Technical Bulletin (LIT-6363092).*

Refer to the *Testing and Receiving Data from Controllers* chapter *(LIT-63750416)* of the *HVAC PRO User's Guide* for more information.

Mounting

For additional information, refer to the *Mounting and Wiring Variable Air Volume Modular Assembly (VMA) 1400 Series Controllers Technical Bulletin (LIT-6363125*).

To mount the VMA1410/1420:

1. Set the N2 address DIP switches to the appropriate address before mounting the VMA. Make sure the switches are pressed fully to the required position. See the *Setting N2 Addresses* section in this document.
2. Place the VMA in the proper mounting position on the damper shaft so that the wiring connections are easily accessible. Make sure the VMA base is parallel to the VAV box. If needed, use a spacer to offset tipping of the VMA caused by shaft bushings.

IMPORTANT: When the air supply to the VAV box is below 50°F (10°C), make sure that any condensation on the VAV box, particularly on the damper shaft, does not enter the electronics. Mount the VMA vertically above the damper shaft to allow any shaft condensation to fall away from the VMA controller. Additional measures may be required in some installations.

3. Secure the self-drilling No. 10 screw into the VMA mounting slot with a power screwdriver and 100 mm (4-inch) extension socket. Otherwise, use a punch to mark the position of the shoulder washer, and then drill a hole into the VAV box through the mark using a 3.5 mm (9/64 in.) drill bit. Insert the mounting screw, and tighten against the washer.

IMPORTANT: Do not overtighten the screws, or the threads may strip. If mounting to the VAV box, make sure the screws do not interfere with damper blade movement.

4. Locate the damper position using typical marking on the end of the damper shaft (see Figure 2).

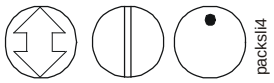

Figure 2: Typical Damper Shaft End Icons

5. Note the direction, Clockwise (CW) or Counterclockwise (CCW), required to close the damper. Grasp the damper shaft firmly with pliers and either manually close the damper for 90° boxes or manually open the damper for 45° or 60° boxes.
6. Push down and hold the gear release lever (see Figure 1), and turn the VMA coupler until it contacts the mechanical end-stop at either the fully closed (90° boxes) or fully open (45° or 60° boxes) position.
7. If the damper for a 90° box closes CCW, rotate the coupler to the CCW mechanical limit. If the damper for a 90° box closes CW, rotate the coupler to the CW mechanical limit.
   The open end-stop is automatically set for 90° boxes. Hard stops must be provided for 45° and 60° boxes at both fully closed and fully open damper positions. By installing the VMA at the fully open position, the VMA provides the open stop for 45° and 60° boxes. The closed damper seal provides the fully closed stop.

8. Tighten the square coupler bolt to the shaft using an 8 mm (5/16 in.) wrench or 10 mm (3/8 in.) 12-point socket. Tighten to 17 to 21 N·m (150 to 180 lb·in [14 lb·ft]).
9. Loop the pneumatic tubing to include a trap for condensation. Attach the tubing from the VMA to the VAV box pickup. The HI (red) tubing is connected to the inlet or high-pressure side and the clear tubing to the low side (see Figure 3).
10. Push the gear release lever, and turn the actuator coupling manually to ensure that the actuator can rotate from full closed to full open positions without binding.
11. Complete the mounting by rotating the damper to the full open position.

CAUTION: Risk of Equipment Damage.
Rotate the damper to full open position before starting the air handler. Failure to rotate the damper to the full-open position may result in damage to the VAV box when the air handler is started.

Wiring

CAUTION: Risk of Electric Shock.
Disconnect supply power to the VMA1410/1420 before attempting to adjust the DIP-switch. Failure to disconnect the supply power may result in electric shock.

To wire the VMA:

1. Terminate wiring per engineering drawings.
2. Install the N2 Bus to the Network Control Module (NCM) or N30/N31 controller in a daisy chain only (see Figure 3).
3. Ensure the N2 address DIP switches are set to the appropriate hardware address (0 or 255 if using software addressing).
4. Connect power to the VMA.
5. Download, commission, and balance the VMA.

Table 1: VMA Wiring List

Point	Description	Range	Input or Load Impedance (ohms)	Maximum Voltage	Maximum Current	Cable Length	Wire Size in mm or mm^2 (AWG)
AI-1*	Zone Temperature	1 K ohm Nickel, Silicon, or Platinum	10 K	5 VDC	0.5 mA	150 m (500 ft)	1.5 mm^2 (18)
						30 m (100 ft)	0.6 mm (24)
		2.25 K ohm NTC (Negative Temperature Coefficient)	10 K	5 VDC	0.5 mA	150 m (500 ft)	0.6 mm to 1.5 mm^2 (24 to 18)
AI-2*	Zone Setpoint	1.6 K ohm 2-wire potentiometer	10 K	5 VDC	0.5 mA	150 m (500 ft)	1.5 mm^2 (18)
						30 m (100 ft)	0.6 mm (24)
AI-3*	Humidity Transmitter	0 to 10 VDC	1.1 M	16.5 VDC	15 mA	150 m (500 ft)	0.6 mm to 1.5 mm^2 (24 to 18)
AI-4*	Perimeter Temperature or Supply Air Temperature	1 K ohm Nickel, Silicon, or Platinum	10 K	5 VDC	0.5 mA	150 m (500 ft)	1.5 mm^2 (18)
						30 m (100 ft)	0.6 mm (24)
		2.25 K ohm NTC	10 K	5 VDC	0.5 mA	150 m (500 ft)	0.6 mm to 1.5 mm^2 (24 to 18)

Continued on next page . . .

Point (Cont.)	Description	Range	Input or Load Impedance (ohms)	Maximum Voltage	Maximum Current	Cable Length	Wire Size in mm or mm^2 (AWG)
AI-5*	Velocity Pressure (internal)	0-1.5 in. W.C. (0.5 to 4.5 VDC)	250 K	5 VDC	0.020 mA	Internal	NA
BI-1*	Temporary Occupied	0-5 VDC, 3.1 V trigger	440	5 VDC	10 mA	150 m (500 ft)	1.5 mm^2 (18)
						30 m (100 ft)	0.6 mm (24)
BI-2*	Comfort (occupied)	0-15 VDC, 2.5 V trigger	47 K	17 VDC	0.3 mA	150 m (500 ft)	0.6 mm to 1.5 mm^2 (24 to 18)
BI-3*	Window, Off (shutdown)	0-15 VDC, 2.5 V trigger	47 K	17 VDC	0.3 mA	150 m (500 ft)	0.6 mm to 1.5 mm^2 (24 to 18)
AO-1*	Proportional Heat/ Humidity/Fan Speed	0-10 VDC	1 K-10 M	10 VDC	10 mA	150 m (500 ft)	1.5 mm^2 (18)
						60 m (200 ft)	0.6 mm (24)
AO-2*	Proportional Heat/ Humidity/Fan Speed	0-10 VDC	1 K-10 M	10 VDC	10 mA	150 m (500 ft)	1.5 mm^2 (18)
						60 m (200 ft)	0.6 mm (24)
BO-1, 2, 3, 4, 5^	Fan/Box Heat/ Baseboard Heat/Electric Heat/Lighting	24 VAC @25-500 mA	48-1000	30 VAC	100 mA	150 m (500 ft)	1.5 mm^2 (18)
					100 mA	30 m (100 ft)	0.6 mm (24)
					500 mA	30 m (100 ft)	1.5 mm^2 (18)
					500 mA	6 m (20 ft)	0.6 mm (24)
SM-1^	Stepper Motor (internal)	±34 VDC 2-phase	72-100	40 VDC	250 mA	Internal	NA
N2 Bus*^	Networking Bus	±5 V transmit, ±0.2 V receive	200	5 VDC	100 mA	1500 m (5000 ft)	0.6 mm to 1.5 mm^2 (24 to 18)
Zone Bus*	Local Room Sensor Bus	±0-5 VDC	>3000	5 VDC	100 mA	150 m (500 ft)	0.6 mm to 1.5 mm^2 (24 to 18)
Room Sensor Cable*	AI-1, AI-2, BI-1, Zone Bus, and +15 VDC	See Zone Bus above.				7.5 m (25 ft) 15 m (50 ft) 30 m (100 ft)	0.6 mm (24) eight-conductor phone cable
+15 VDC*	DC Output Supply	14-18 VDC	1 K-10 M	18 VDC	35 mA	150 m (500 ft)	1.5 mm^2 (18)
						60 m (200 ft)	0.6 mm (24)
24 VAC Power In^	AC Supply Voltage	20-30 VAC	12-48	30 VAC	417 mA (100 VA cable length)	67 m (222 ft)	6 mm^2 (10)
						42 m (140 ft)	4 mm^2 (12)
						27 m (88 ft)	2.5 mm^2 (14)
						17 m (55 ft)	1.5 mm^2 (16)
						11 m (35 ft)	1.5 mm^2 (18)

* Isolated from 24 VAC.

^ Isolated from AI, BI, AO, Zone Bus, 15 VDC.

Note: All field terminals are power limited.

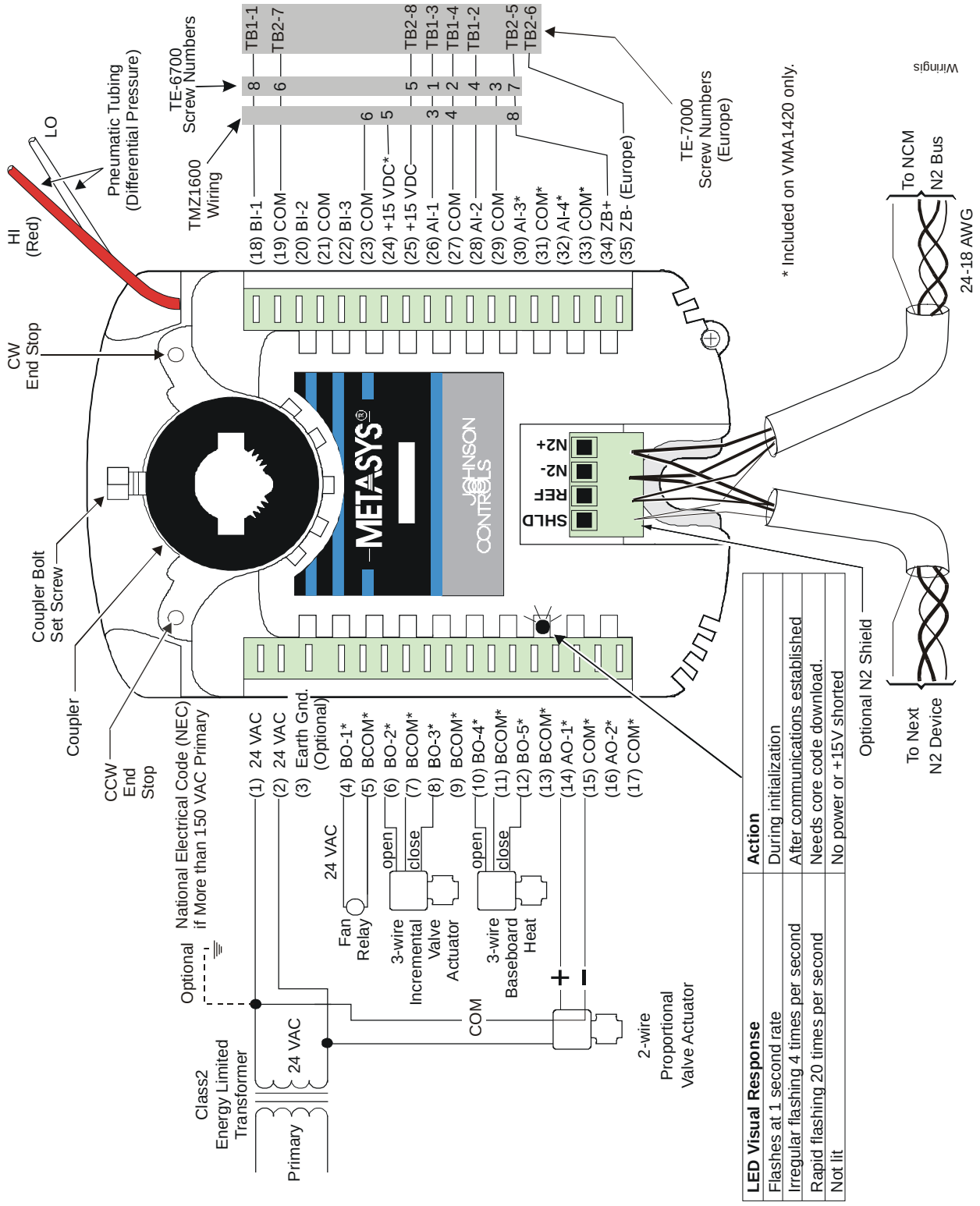

Figure 3: Typical VMA1410/1420 Wiring Interface

Technical Specifications

Product Name	Variable Air Volume Modular Assembly (VMA)		
Product Code Number		Cooling Only Models	Cooling with Reheat and/or Fan Powered Models
	Single Unit	AP-VMA1410-0	AP-VMA1420-0
	Bulk Pack	AP-VMA1410-0D	AP-VMA1420-0D
	Buy American	AP-VMA1410-0G	AP-VMA1420-0G
Supply Voltage	20-30 VAC at 50 or 60 Hz		
Power Consumption	10 VA maximum (relay and valve requirements not included)		
Optional 24 VAC Fuse Current	VMA1410 = 0.6 ampere, VMA1420 = 2.0 ampere		
Ambient Operating Conditions	0 to 50°C (32 to 122°F)		
Ambient Storage Conditions	-40 to 70°C (-40 to 158°F)		
Terminations	6.3 mm (1/4 in.) spade lugs except communications, which are screw terminals		
Optional Terminations	2 or 3 position screw terminals that plug onto spade lugs (optional accessories) 2-position screw terminal: AP-TBK1002-0 3-position screw terminal: AP-TBK1003-0 Replacement N2 Communications Bus terminal: AP-TBK4N2-0		
Controller Addressing	DIP switch set (1-253) Address 254 is reserved (0 or 255 is used for software addressing). Software addressable with HVAC PRO Release 8.01 or later		
Communications Bus	N2 Bus between VMA controller and supervisory controller (3-wire) Zone Bus between VMA controller and room sensor (8-pin phone jack or wire to spade lugs or optional plug-on terminals)		
Mounting	Mounts to damper shaft using single set screw and to duct with single mounting screw.		
Actuator Rating	4 N·m (35 lb·in) minimum Minimum shaft length = 44 mm (1 3/4 in.)		
Standards Compliance	IEEE 472, IEEE518, IEEE587 Category A/B, ANSI C62.41 FCC Part 15, Subpart J, Class A/B CISPR 22, Class B	UL 916 Listed UL 94-5VB CSA 22.2 No. 205 IEC-950, IEC 801 CE Directive (89/336/EEC, EN50081-1, EN50082-2)	

FCC Part 15 Label - Note: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their own expense.

European Single Point of Contact:
JOHNSON CONTROLS
WESTENDHOF 3
45143 ESSEN
GERMANY

NA/SA Single Point of Contact:
JOHNSON CONTROLS
507 E MICHIGAN ST
MILWAUKEE WI 53202
USA

APAC Single Point of Contact:
JOHNSON CONTROLS
C/O CONTROLS PRODUCT MANAGEMENT
NO. 22 BLOCK D NEW DISTRICT
WUXI JIANGSU PROVINCE 214142
CHINA

JOHNSON CONTROLS

Controls Group
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53201

Published in U.S.A.
www.johnsoncontrols.com