HVAC/BAC ELECTRIC IOM

ELECTRIC ACTUATOR

E024, E025, E026, E029 & E031

Installation Operation and Maintenance Instructions

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WARREN CONTROLS

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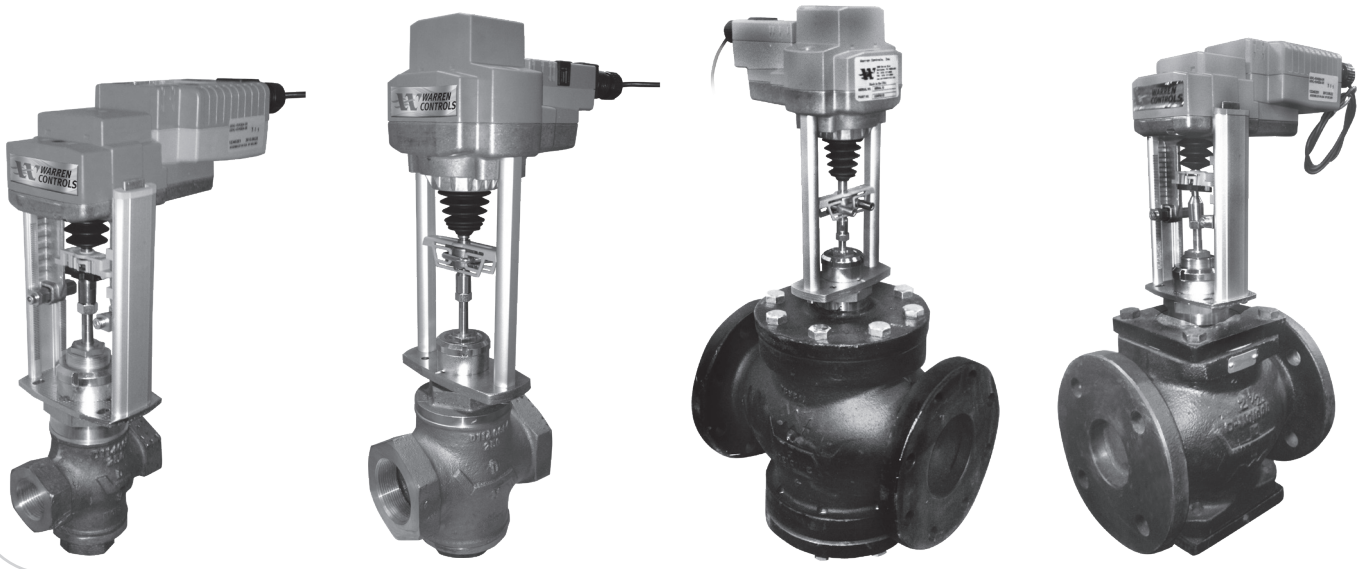
92500115 RevF



ELECTRIC ACTUATOR SPECIFICATIONS*

Valve Usage:
E024, E025 [Valve sizes 1/2 to 4 Inch]
E026 [Valve sizes 1 to 6 Inch]
E029, E031 [Valve sizes 1-1/4 to 10 Inch]

Power supply: 24 VAC ± 20% 50/60 Hz, 24 VDC ± 10%

Power Requirements	E024	E025	E026	E029
Power consumption running	2 W	3 W	5 W	6 W
Power consumption holding	1.5 W	2 W	2 W	1.5 W
Transformer sizing (24 VAC Class 2)	4 VA	7 VA	9.5 VA	11 VA

Power Requirements	E031‡
Power consumption running (Battery charging)	12.84 W
Power consumption running (Battery charged)	7.2 W
Power consumption holding (Battery charging)	8.34 W
Power consumption holding (Battery charged)	2.7 W
Switching Power Supply	24 Vdc 2.0 A
‡ E031 is composed of E029 and VMS-50 BCM, does not include VMS-50 PS	

Timing: 90 seconds full stroke max

Control Signal: 2-10 Vdc (default), 4-20 mAdc [with KR500 (resistor kit)]

Feedback Signal: 2-10 Vdc

Signal Failure Direction:
E024, E029, E031 Fail Closed or Lower Port Closed (default), or Fail Open or Upper Port Closed
E025, E026 Fail Closed or Lower Port Closed (default), or Fail Open or Upper Port Closed

Power Failure Mode:
E024, E029 Fail-In-Place
E031 Fail-Safe to Signal Failure Direction
E025, E026 Fail Closed or Lower Port Closed (default), or Fail Open or Upper Port Closed

Capacitor: E025, E026 Capacitor charge time 5 to 20 seconds

Manual Override: Yes, with supplied Allen Key (4mm E024, E025 / 5mm, E026, E029, E031)

Construction: Aluminum die cast Yoke, plastic Housing

Connections: 3 foot long 4 Conductor 18 gauge wire, pigtail (may include fifth pink colored conductor only used for factory programming. Do Not Use or Connect)

Enclosure Type: NEMA 2, IP54, UL 2

Noise Level:
E024, E025 45 dBA
E026 60 dBA
E029, E031 65 dBA

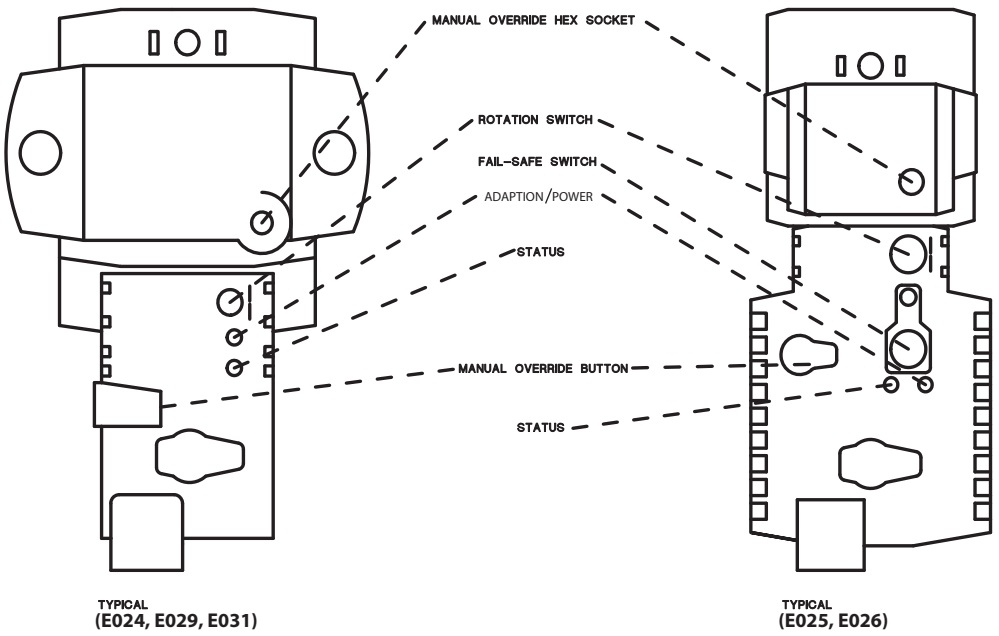
Environmental:
Operating: Ambient + 32°F to +122°F (0 to +50°C)
Humidity: 5 to 95% RH non-condensing
Storage: -40°F to +176°F [-40°C to +80°C]

Orientation: Factory Aligned per drawings

Mounting: Vertical above centerline of valve

Safety Agency Listing: CE, cULus

See page 5 for VMS-50 BCM Specifications

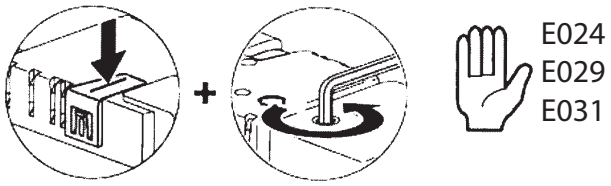


The actuators feature a native 2-10 Vdc Control Signal. Installation of the KR500 Resistor Kit converts the Control Signal input to **4-20 mAdc.** When using 4-20 mA input, terminate the 500 ohm resistor from the KR500 resistor kit between the White and Black actuator wires. When using the VMS-50 BCM, this can be easily done between the **RELAY 1 NO** and 24 Vdc (-) OUT **24 VDC - →** terminals for Actuator 1, the **RELAY 2 NO** and 24 Vdc (-) OUT **24 VDC - →** terminals for Actuator 2, and between the **RELAY 3 NO** and 24 Vdc (-) OUT **24 VDC - →** terminals for Actuator 1 terminals for Actuator 3.

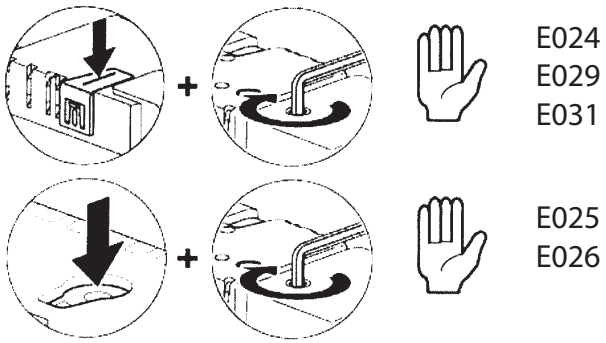
A single wire brings a 2-10 Vdc Feedback Signal. The Feedback Signal is not available using 4-20 mAdc.

Manual Override is possible by turning off the power, pressing the Manual Override button and rotating the supplied Allen key in the Hex Override Socket.

To raise the actuator stem turn the Allen key counter-clockwise.



To lower the actuator stem turn the Allen key clockwise.



Engage the manual override:

- The override button can lock in place for NON-CAPACITOR E024, E029 and E031 actuators. Press the button down and into the actuator to lock. The OVERRIDE BUTTON will remain down and will need to be pressed to return to its original position.
- The button must be continuously pressed completely down throughout travel for E025 AND E026 actuators with CAPACITORS.

WARNING: Do not force or turn the HEX OVERRIDE SOCKET when the OVERRIDE BUTTON is not pressed. Doing so may cause damage to the actuator gears.

DANGER

PRESS THE MANUAL OVERRIDE BUTTON IN FIRMLY WHILE OPERATING THE MANUAL OVERRIDE. FAILURE TO DO SO WHILE THE ACTUATOR IS POWERED OR BEING DRIVEN TO THE POWER FAILURE DIRECTION CAN CAUSE SERIOUS PERSONAL INJURY AND DAMAGE THE ACTUATOR.

The Rotation Switch can be adjusted to set the direction the Control Signal opens and closes the valve (and Loss of Signal direction in some actuators) in the field without actuator removal.

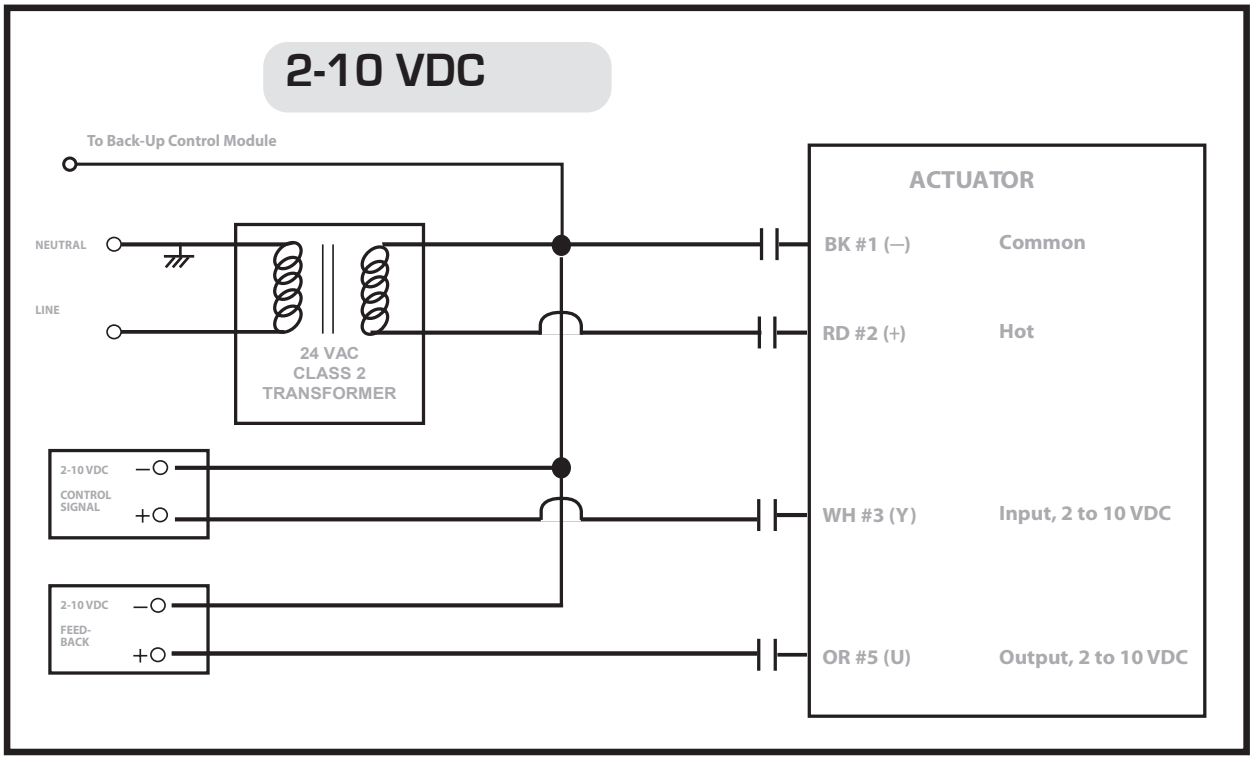
Adaption (Auto-Calibration - green LED), a combined Adaption/ Power button to reset and relearn the valve stroke as well as indicate the actuator is powered. When the Button is pressed, the actuator will drive one full cycle to its mechanical end stops OR the valves mechanical seats. Upon completion of this cycle the actuators working range (Control Signal, Feedback Signal and running time) will be adjusted to the actual stroke of the actuator.

Status (yellow LED) to confirm communication.

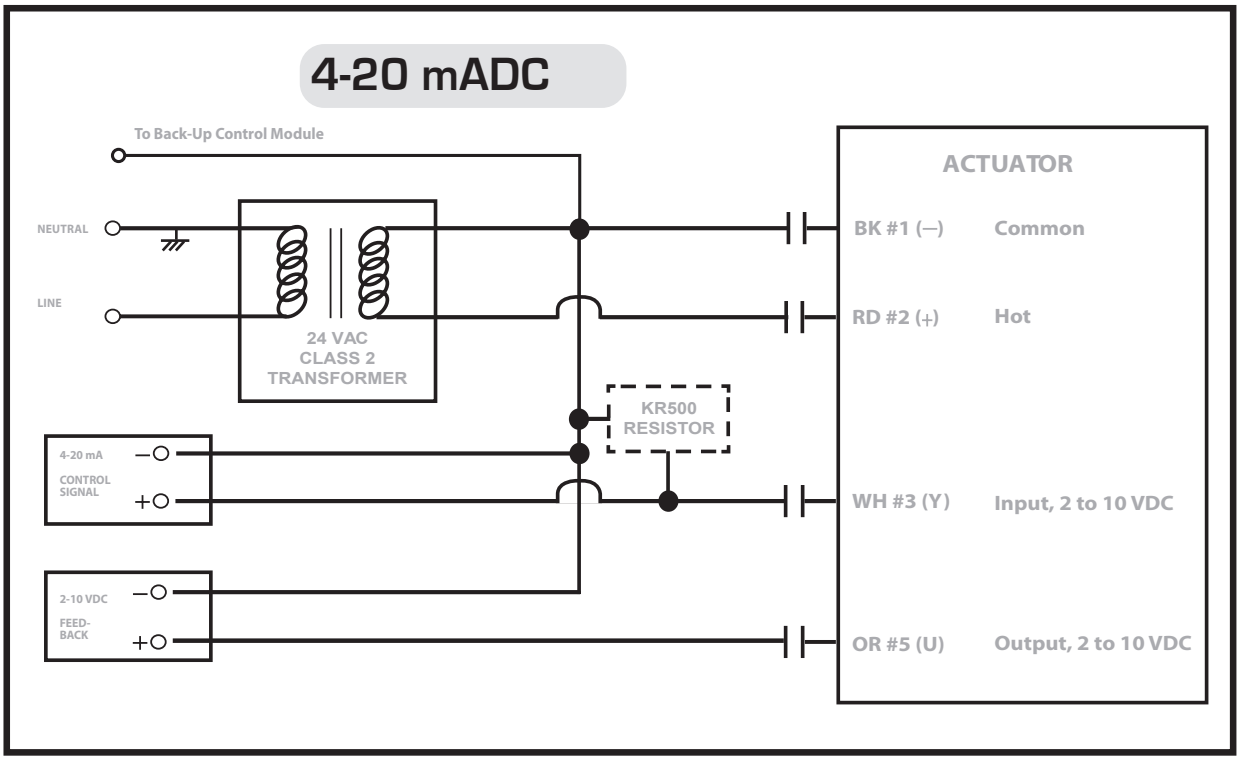
ACTUATOR WIRING DIAGRAMS - PROPORTIONAL CONTROL

Note: For On-Off Control see Pages 21-25

2-10 VDC



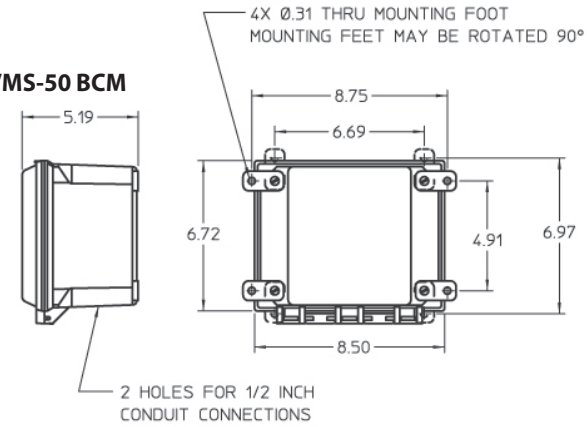
4-20 mADC



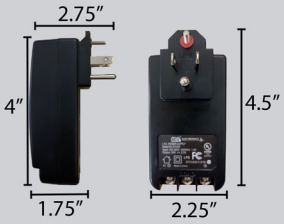
VMS-50 BCM SPECIFICATIONS

Actuator Usage:	Models E024, E029 or E031 *(NOTE: E031 is an E029 Actuator with a VMS-50-BCM. This does not include the VMS-50-PS.)*
Power Requirement:	24 Vdc 2.0 A from Separate External; Switching Power Supply
Power Output:	24 Vdc 48W Total
Number Actuators:	One, Two or Three
Construction:	Battery w/Circuit Board and Charger
Circuit Board Protection:	Fuse Littelfuse T6.3AH250VP
Enclosure Type:	NEMA 4X, IP66, UL 4X, CSA 4X
Flame Retardant:	UL 50
Construction:	UV Stabilized Fiberglass Reinforced Polyester, Polycarbonate Hinge and Closed Cell Neoprene Gasket
Connections:	Two 1/2 IN conduit with one plug
Number Batteries:	One
Initial Charge:	2-4 hours
Output Cycle Time:	6.0 Minutes from loss of power until circuit board times out
Battery Life:	Up to 5 years … Replacement battery model SP12-1.2 (12V1.4AH/T1)
Indication:	Red REPLACE BATTERY LED ON indicates Replace Battery (See REPLACE BATTERY LED Function)
Dimensions:	8.75" (W) x 6.97" (H) x 5.19" (D)
Mounting:	Feet for Wall Mount (4.91" x 8.75" centers)
Environmental:	Operating/ Storage: Ambient +32°F to +104°F (0 to +40°C) – due to battery
Weight:	4.15 lbs (1.9 kg)
Safety Agency Listing:	Not listed

VMS-50 BCM

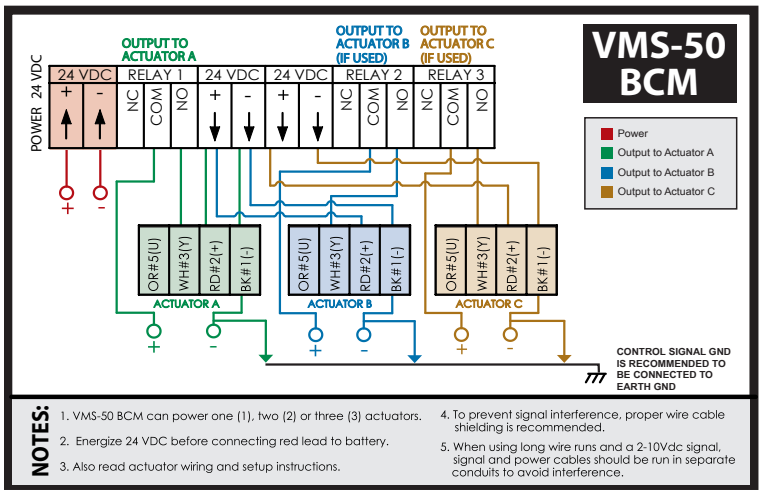


VMS-50 PS SEPARATE EXTERNAL SWITCHING POWER SUPPLY



Usage:	VMS-50 BCM (VMS-50 BCM does not include VMS-50 PS)
Input:	115 VAC 50/60 Hz 1.5A
Indication:	Red LED ON indicates Input Line Voltage Present
Output:	24 Vdc 2.0 A
Input Connector:	Three Pin Input Plug
Construction:	Molded Plastic)
Environmental: *Operating/ Storage:*	Ambient +32°F to +113°F (0 to +45°C)/ -40°F to +185°F/(-40 to +85°C)
Weight:	0.5 lbs (0.2 kg)
Safety Agency Listing:	UL listed

VMS-50 WIRING DIAGRAM - PROPORTIONAL CONTROL



VMS-50 BCM	
TERMINAL IDENTIFICATION	**CONNECTION/DESCRIPTION**
24 VDC + ←	24 Vdc (+) IN
24 VDC - ←	24 Vdc (-) IN
RELAY 1 NC	Normally Closed Relay Contact 1st Actuator
RELAY 1 COM	Common Relay Contact/Control Signal (+) 1st Actuator
RELAY 1 NO	Normally Open Relay Contact 1st Actuator
24 VDC + →	24 Vdc (+) OUT
24 VDC - →	24 Vdc (-) OUT
RELAY 2 NC	Normally Closed Relay Contact 2nd Actuator
RELAY 2 COM	Common Relay Contact/Control Signal (+) 2nd Actuator
RELAY 2 NO	Normally Open Relay Contact 2nd Actuator
RELAY 3 NC	Normally Closed Relay Contact 3rd Actuator
RELAY 3 COM	Common Relay Contact/Control Signal (+) 3nd Actuator
RELAY 3 NO	Normally Open Relay Contact 3nd Actuator

Operation:

Proportional Normal:

24 Vdc External Power Supply LOAD connected to 24 Vdc IN terminals of VMS-50 BCM. Building Power Source, 115 VAC 50/60 Hz required for VMS-50 PS , connected to 24 Vdc External Power Supply LINE. Actuator responds to modulating input signal.

Power Failure: 24 Vdc OUT from VMS-50 BCM changes from 24 Vdc from External Power Supply to 24 Vdc from battery/inverter. Relay(s) break the connection between Common and Normally Open Contact terminals forcing the actuator(s) to go to the signal failure direction for their rotation switch position (See page 13 for explanation of rotation switch position).

Loss of Signal: 24 Vdc External Power Supply connected to 24 Vdc IN terminals of VMS-50 BCM. Building Power Source, 115 VAC 50/60 Hz required for VMS-50 PS, connected to 24 Vdc External Power Supply. The control signal is broken forcing the actuator(s) to go to the signal failure direction for their rotation switch position (See page 13 for explanation of rotation switch position).

INSTALLATION - PROPORTIONAL CONTROL

1. Disengage the building power circuit before wiring. Verify that the battery inside the VMS-50 BCM has its wires disconnected and leave them that way for now. Disconnect them if they are connected.

2. Connect the VMS-50 BCM to the actuator(s) as shown on wiring diagram. The VMS-50 BCM can power one, two or three actuators.

Actuator A: Connect Relay 1 Normally Open Contact **RELAY 1 NO** to white wire from actuator to drive the valve stem in the direction determined by the actuator rotation switch position. Connect 24 Vdc (+) OUT **24 VDC + →** to red wire from actuator to provide power. Connect grounded reference - negative/black wire from actuator to 24 Vdc (-) OUT **24 VDC - →**. Also connect the control signal (-) to the black wire from the actuator. Connect Relay 1 Common Contact **RELAY 1 COM** to the control signal positive (+). If the control signal is 4-20mADC a KR500 500 ohm resistor is required. Terminate the resistor between Relay 1 Normally Open Contact **RELAY 1 NO** and 24 Vdc (-) OUT **24 VDC - →**.

Actuator B: Connect Relay 2 Normally Open Contact **RELAY 2 NO** to white wire from actuator to drive the valve stem in the direction determined by the actuator rotation switch position. Connect 24 Vdc (+) OUT **24 VDC + →** to red wire from actuator to provide power. Connect grounded reference - negative/black wire from actuator to 24 Vdc (-) OUT **24 VDC - →**. Also connect the control signal (-) to the black wire from the actuator. Connect Relay 2 Common Contact **RELAY 2 COM** to the control signal positive (+). If the control signal is 4-20mADC a KR500 500 ohm resistor is required. Terminate the resistor between Relay 2 Normally Open Contact **RELAY 2 NO** and 24 Vdc (-) OUT **24 VDC - →**.

Actuator C: Connect Relay 3 Normally Open Contact **RELAY 3 NO** to white wire from actuator to drive the valve stem in the direction determined by the actuator rotation switch position. Connect 24 Vdc (+) OUT **24 VDC + →** to red wire from actuator to provide power. Connect grounded reference - negative/black wire from actuator to 24 Vdc (-) OUT **24 VDC - →**. Also connect the control signal (-) to the black wire from the actuator. Connect Relay 3 Common Contact **RELAY 3 COM** to the control signal positive (+). If the control signal is 4-20mADC a KR500 500 ohm resistor is required. Terminate the resistor between Relay 3 Normally Open Contact **RELAY 3 NO** and 24 Vdc (-) OUT **24 VDC - →**.

3. While still disconnected, wire the 24 Vdc External Power Supply LOAD to the VMS-50 BCM. Connect the POSITIVE (+) lead to the 24 Vdc (+) IN **24 VDC+ ←** terminal, then connect the NEGATIVE (-) lead to the 24 Vdc (-) IN **24 VDC - ←** terminal.

4. Connect the 24 Vdc External Power Supply LINE into the building power source. For the VMS-50 PS plug the three pin LINE input plug into the 115 VAC 50/60 Hz building power source.

5. Verify that building power is live then connect the loose red wire inside the VMS-50 BCM enclosure to the positive (+) battery terminal and the black wire to the negative (-) battery terminal.

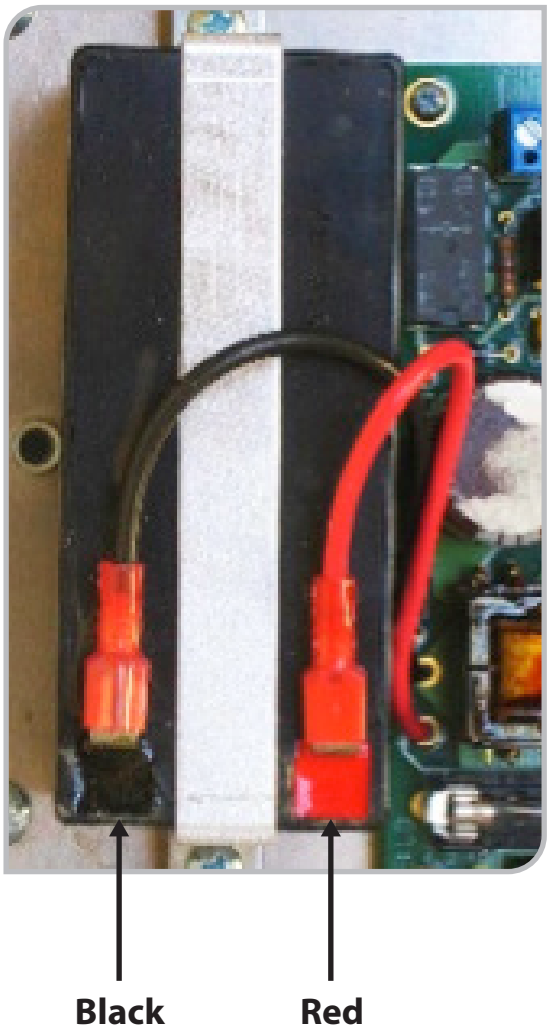
NOTE: Engage the building power to the VMS-50 BCM before connecting the battery. Connecting the battery first causes the VMS-50 BCM to go into the power failure mode.

For On-Off control see pages 21-25.

REPLACE BATTERY LED FUNCTION

Under normal conditions of 24Vdc power supplied to the VMS-50 BCM, a battery requiring an initial charge should become fully charged in 2 to 4 hours and remain charged until a building power failure occurs. The VMS-50 BCM has a red REPLACE BATTERY LED. For the LED to illuminate the VMS-50 BCM must be powered by a 24Vdc external power supply. The LED will illuminate if the circuit board is unable to charge or maintain the charge of the battery. The LED will also illuminate if the battery terminals are not connected to the circuit board. If the REPLACE BATTERY LED illuminates and the battery is connected to the circuit board replace the battery. Typical battery life is 5 years. This common gel cell battery is available from most battery supply houses.

VMS-50 BCM (SP12-1.2 (12V1.4 AH/T1)) BATTERY REPLACEMENT



PROCEDURE:

NOTE: Normal valve operation under 24 Vdc power need not be interrupted during battery replacement; however, the fail-safe function will not be available until the new battery is in place, connected and sufficiently charged (typically 2-4 hours).

1. Refer to the picture (left) to locate and disconnect the Red and Black wires from the battery.
2. Remove the two battery mounting bracket screws and remove the battery and bracket.
3. Place the bracket over the new battery and install the assembly as shown, using the two screws removed in step 2 (above).
4. Connect the Black wire to the black (unmarked) terminal.
5. With 24 Vdc power present, connect the Red wire to the red terminal. VMS-50 BCM circuitry will automatically charge the battery. (If 24 Vdc is not present, the valve may move to its fail-safe position, depending upon residual charge in the new battery.)
6. Recycle or dispose of the old battery properly. Do not incinerate!

REMOVAL OF E024 & E025 ACTUATORS FROM VALVE

SEE DRAWING D3400024 on page 16

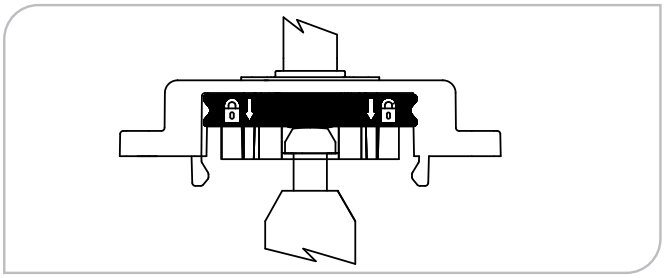
THESE INSTRUCTIONS TREAT THE ACTUATOR (ITEM 1) AND LINKAGE BASE (ITEM 17) AS AN ASSEMBLY. FOR INSTRUCTIONS ON HOW TO REMOVE THE ACTUATOR AND THE LINKAGE BASE AS SEPARATE ITEMS SEE ADDENDUM A ON PAGE 18.

1) Remove line pressure and isolate valve in piping.

2) Operate actuator so plug is off seat(s) or travel stop in valve.

3) Remove power and signal from actuator. For E025, after power is removed, cycle Fail-Safe Switch from Up Arrow to Down Arrow until actuator stem no longer moves. Adaption/Power (green LED) changes from blinking to off. Return Fail-Safe Switch to original position. If necessary use the manual override to operate actuator so plug is off seat(s) or travel stop in valve. (See manual override on page 3)

WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.



4) Unlock stem connector clamp, use fingers on the front and back sides of black lock assembly to evenly raise the lock assembly.

WARNING: WHEN HANDLING THE ACTUATOR TAKE CARE NOT TO DAMAGE THE STEM CONNECTOR CLAMP AND CROSS BAR ASSEMBLY.

5) Use actuator manual override to raise the stem connector until the stem adapter is disengaged (See manual override on page 3).

WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

WARNING: DO NOT LOOSEN THE FACTORY SET ADJUSTABLE HEIGHT SCREWS ON THE SIDES OF THE ACTUATOR YOKE LINKAGE.

6) Loosen yoke locknut (Item 3) until it is free of bonnet.

7) Remove spacer ring (Item 2).

8) Remove actuator from valve.

WARNING: DO NOT LOOSEN THE FACTORY SET ADJUSTABLE HEIGHT SCREWS ON THE SIDES OF THE ACTUATOR YOKE.

9) Hold jam nut (Item 4) on valve stem and turn the stem adapter (Item 5) to disengage from valve stem.

WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED VOIDING THE WARRANTY.

10) Remove stem adapter from valve stem.

11) Remove jam nut from valve stem.

INSTALLATION OF E024 & E025 ACTUATORS ON THE VALVE

SEE DRAWING D3400024 on page 16

THESE INSTRUCTIONS TREAT THE ACTUATOR (ITEM 1) AND LINKAGE BASE (ITEM 17) AS AN ASSEMBLY. FOR INSTRUCTIONS ON HOW TO INSTALL THE ACTUATOR AND THE LINKAGE BASE AS SEPARATE ITEMS SEE ADDENDUM A ON PAGE 19.

THE SILVER SPACER RING THAT COMES WITH THE ACTUATOR MUST BE ASSEMBLED ON TOP SIDE OF YOKE WITH TURNED DOWN (MACHINED) SIDE FACING DOWN AS SHOWN ON DRAWING.

1) Push valve stem down until plug is seated. Note stem location.

2) Unlock stem connector clamp, use fingers on the front and back sides of black lock assembly to evenly raise the lock assembly.

WARNING: WHEN HANDLING THE ACTUATOR TAKE CARE NOT TO DAMAGE THE STEM CONNECTOR CLAMP AND CROSS BAR ASSEMBLY.

3) Install hex jam nut (Item 4) on valve stem. Thread jam nut so that one inch of threads are exposed between jam nut and top of stem.

4) Hold jam nut on valve stem and turn the stem adapter (Item 5) until it bottoms out on the valve stem. Tighten jam nut to the bottom of the stem adapter to secure valve stem to stem adapter.

WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED VOIDING THE WARRANTY.

5) Place actuator, spacer ring (Item 2) and yoke locknut (Item 3) over valve stem and onto bonnet. Watch orientation of spacer ring and yoke locknut. Actuator base must rest on bonnet. If necessary, use the manual override to raise the stem connector (See manual override on page 3).

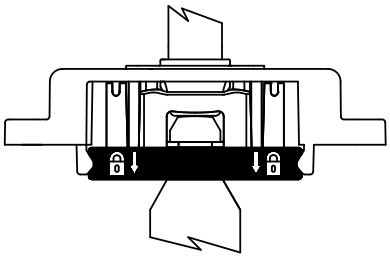
WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

WARNING: DO NOT LOOSEN THE FACTORY SET ADJUSTABLE HEIGHT ADJUSTMENT SCREWS ON THE SIDES OF THE ACTUATOR YOKE LINKAGE.

6) Rotate actuator to desired orientation. For the factory default actuator position the motor electrical wire end of the actuator faces the outlet side of a 2-way valve, common "C" port on a 3-way mixing valve, and lower "L" port on a 3-way diverting valve. Thread yoke locknut onto bonnet and tighten securely. Use blunt chisel and hammer for tightening.

7) Push valve stem down until plug is seated. Refer to position noted in Step 1.

8) Use actuator manual override to lower the stem connector over the stem adapter (See manual override on page 3). Lock stem connector clamp, use fingers on the front and back sides of black lock assembly to evenly lower the lock assembly.



WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

WARNING: WHEN HANDLING THE ACTUATOR TAKE CARE NOT TO DAMAGE THE STEM CONNECTOR CLAMP AND CROSS BAR ASSEMBLY.

9) Push orange travel indicators (Item 8) together against both sides of stem connector travel indicator.

10) Connect power and signal to actuator.
(See also **Set-Up**, page 12)

11) Press the Adaption (Auto-Calibration) button on the actuator and wait until the cycle is complete.

12) Stroke valve several times to check operation.

13) Return line pressure to valve.

REMOVAL OF E026 & E029/E031 ACTUATORS FROM VALVE

SEE DRAWING D3400025 on page 17

1) Remove line pressure and isolate valve in piping.

2) Operate actuator so plug is off seat(s) or travel stop in valve.

3) Remove power and signal from actuator. For E026, after power is removed, cycle Fail-Safe Switch from Up Arrow to Down Arrow until actuator stem no longer moves. Adaption/ Power (green LED) changes from blinking to off. Return Fail-Safe Switch to original position. If necessary use the manual override to operate actuator so plug is off seat(s) or travel stop in valve (See manual override on page 3).

   WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

4) Remove stem connector socket head nuts, remove stem connector U-bolt.

5) While carefully manually holding stem connector clamp open on the lower portion, use actuator manual override to raise the stem connector until the stem adapter (Item 2) is disengaged (See manual override on page 3).

   WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

6) Loosen yoke locknut (Item 4) until it is free of bonnet.

7) Remove spacer ring (Item 3).

8) Remove actuator from valve.

9) Hold jam nut (Item 5) on valve stem and turn the stem adapter to disengage from valve stem.

   WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED VOIDING THE WARRANTY.

10) Remove stem adapter from valve stem.

11) Remove jam nut from valve stem.

INSTALLATION OF E026 & E029/ E031 ACTUATORS ON THE VALVE

SEE DRAWING D3400025 on page 17

THE SILVER SPACER RING THAT COMES WITH THE ACTUATOR MUST BE ASSEMBLED ON TOP SIDE OF YOKE AS SHOWN ON DRAWING.

1) Push valve stem down until plug is seated. Note stem location.

2) Remove stem connector socket head nuts, remove stem connector U-bolt.

3) Install hex jam nut (Item 5) on valve stem. Thread jam nut so that one inch of threads are exposed between jam nut and top of stem.

4) Hold jam nut on valve stem and turn the stem adapter (Item 2) until it bottoms out on the valve stem. Tighten jam nut to the bottom of the stem adapter to secure valve stem to stem adapter.

   WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED VOIDING THE WARRANTY.

5) Place actuator, spacer ring (Item 3) and yoke locknut (Item 4) over valve stem and onto bonnet. Watch orientation of spacer ring and yoke locknut. Actuator base must rest on bonnet. If necessary, use the manual override to raise the stem connector (See manual override on page 3).

   WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

6) Rotate actuator to desired orientation. For the factory default actuator position the motor electrical wire end of the actuator faces the outlet side of a 2-way valve, common "C" port on a 3-way mixing valve, and lower "L" port on a 3-way diverting valve. Thread yoke locknut onto bonnet and tighted securely. Use blunt chisel and hammer for tightening.

7) Push valve stem down until plug is seated. Refer to position noted in Step 1.

8) While holding the bottom of the stem connector open, use the actuator manual override to lower the stem connector over the stem adapter (See manual override on page 3). Install stem connector U-bolt through stem connector. Watch orientation. The socket head nuts when installed on the U-bolt must face away from the electrical wire end of the motor. Install the socket head nuts on the U-bolt. Evenly torque the socket head nuts to 44 in-lbf torque.

   WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

   WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED.

9) Connect power and signal to actuator. (See also **Set-Up**, page 12)

10) Press the Adaption (Auto-Calibration) button on the actuator and wait until the cycle is complete.

11) Stroke valve several times to check operation.

12) Return line pressure to valve.

SET-UP

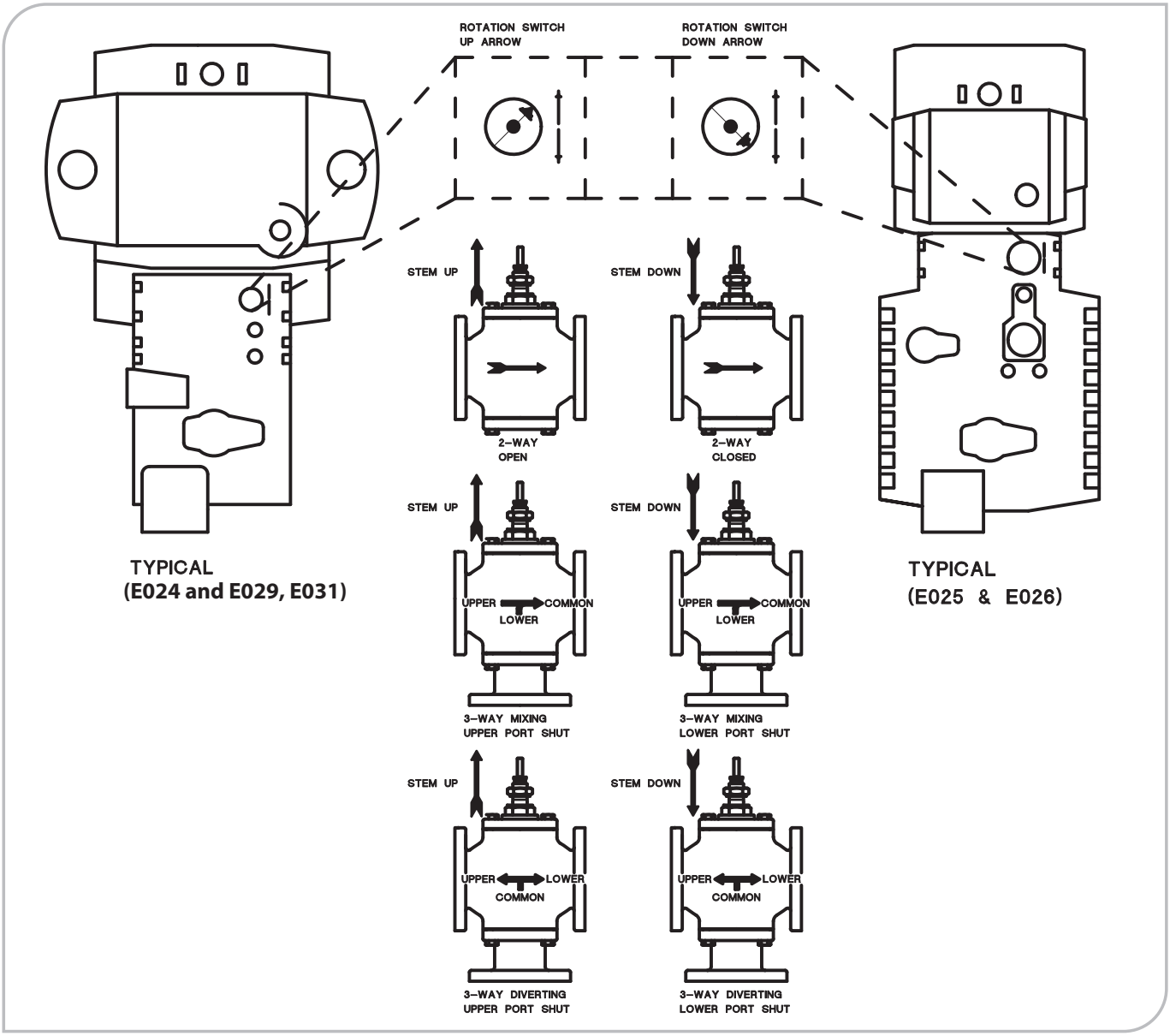
Prior to enabling the power perform the following check:

1. Verify the Control Signal. The default Control Signal is 2-10 Vdc (see the wiring diagram for 4-20 mAdc).
2. Review the Control Action by inspecting the Rotation Switch position.
3. Confirm the Power Failure mode by inspecting the Fail-Safe switch.
4. Verify that the actuator is correctly installed on the valve body
5. Enable the Power Source.
6. Perform manual Adaption (Auto-Calibration).

CONTROL ACTION - PROPORTIONAL CONTROL

E024, E025, E026, E029 & E031 Actuators - Rotation Switch position. How the valve and actuator react to the Control Signal. The Fail-Safe position during Loss of Power and Loss of Signal are identical for an E024 and E029/E031 with VMS-50 BCM. For on-off control see Addendum B on pages 21-25.

FACING	DESCRIPTION
Up Arrow (E024 and E029/E031)	Increasing Control Signal Closes, 2-way valves and Lower port for 3-way valve. Signal Failure Direction is Fail Open (FO) 2-way valves and Fail Upper Port Closed for 3-way vales.
Down Arrow (E024 and E029/E031)	Decreasing Control Signal Closes, 2-way valves and Lower Port for 3-way valves. Signal Failure Direction is Failed Closed (FC) for 2-way valves and Fail Lower Port Closed for 3-way valves.
Up Arrow (E024 and E029/E031 w/VMS-50 BCM)	Increasing Control Signal Closes, 2-way valves and Lower port for 3-way valve. Signal and Power Failure Direction is Fail Open (FO) 2-way valves and Fail Upper Port Closed for 3-way vales.
Down Arrow (E024 and E029/E031 w/VMS-50 BCM)	Decreasing Control Signal Closes, 2-way valves and Lower Port for 3-way valves. Signal and Power Failure Direction is Fail Closed (FC) for 2-way valves and Fail Lower Port Closed for 3-way valves.
Up Arrow (E025 & E026)	Increasing Control Signal Closes 2-way valves and Lower Port for 3-way valves. Signal Failure Direction is Fail Open (FO) 2-way valves and Fail Upper Port Closed for 3-way valves.
Down Arrow (E025 & E026)	Decreasing Control Signal Closes 2-way valves and Lower Port for 3-way valves. Signal Failure Direction is Fail Closed (FC) for 2-way valves and Fail Lower Port Closed for 3-way valves.

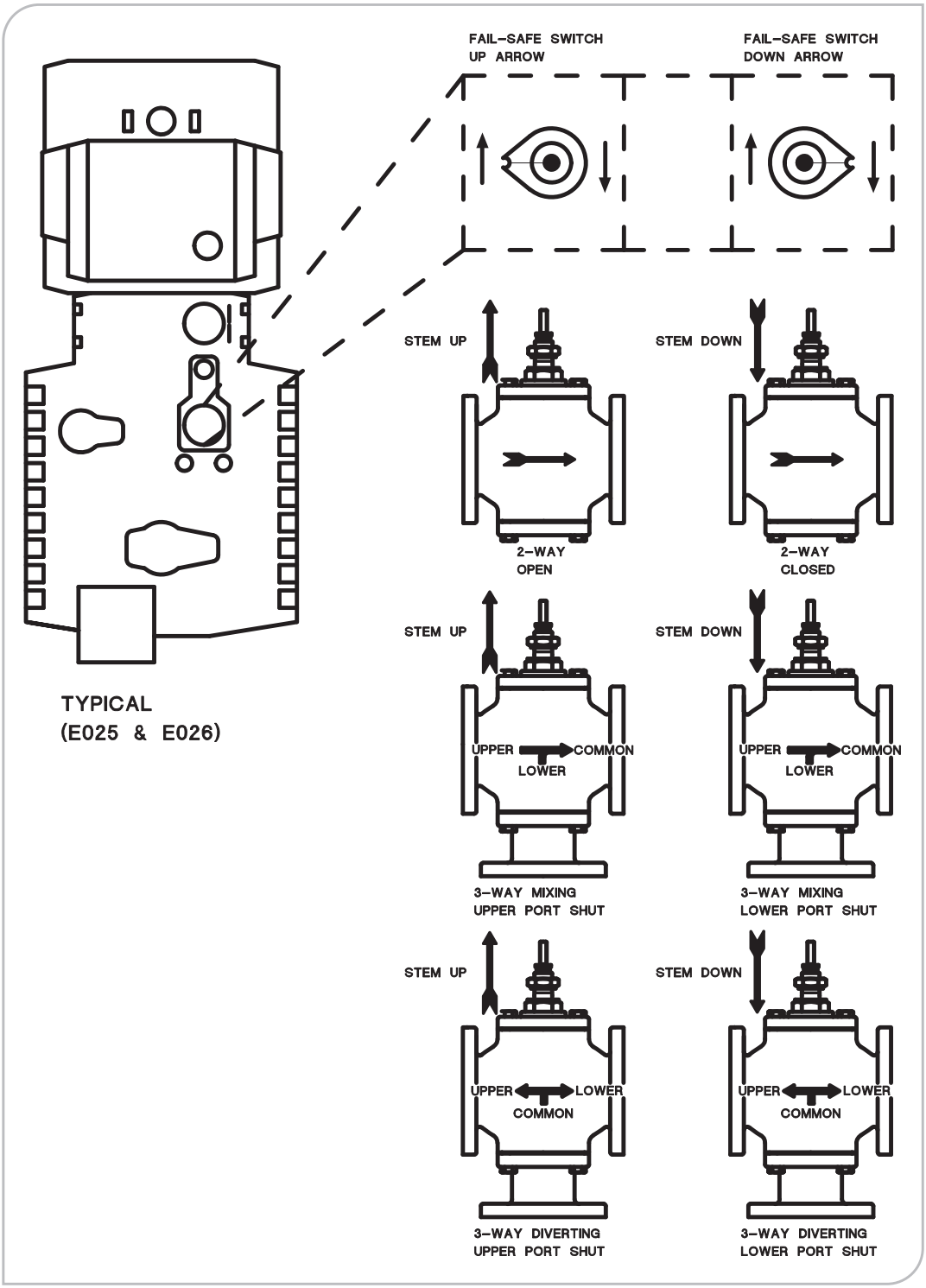


POWER FAILURE

E025 & E026 Actuators - Fail-Safe Switch position: Valve and actuator Power Failure Direction.

FACING	DESCRIPTION
Up Arrow (E025 & E026)	Power Failure Direction is Fail Open (FO) 2-way valves and Upper Port Closed for 3-way valves.
Down Arrow (E025 & E026)	Power Failure Direction is Fail Closed (FC) for 2-way valves and Lower Port Closed for 3-way valves.

Switch must be fully in position shown or actuator will go to intermediate position on loss of power.

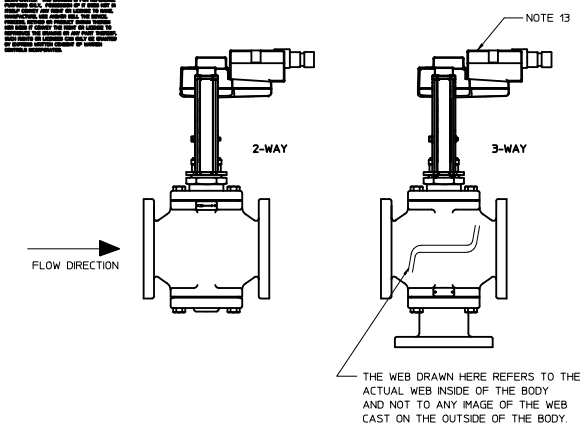


STATUS (yellow LED)	ADAPTION/ POWER (green LED)	DESCRIPTION
OFF	ILLUMINATED	Normal (no faults)
OFF	BLINKING	Power Failure is active (E025 & E026 only)
ILLUMINATED	OFF	Fault is detected [1]
OFF	OFF	No Power or Capacitors charging
ILLUMINATED	ILLUMINATED	Auto-Calibration is running

NOTE:

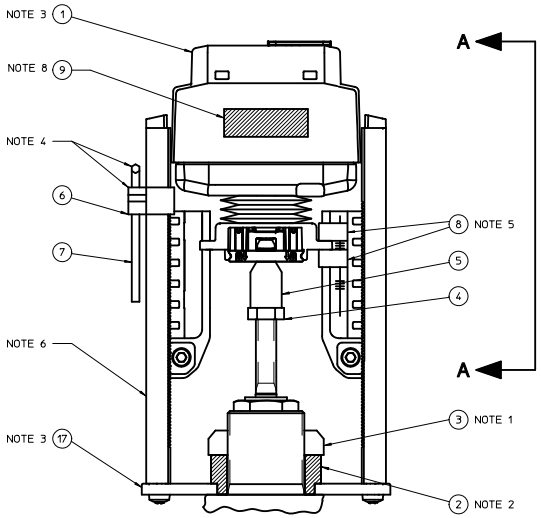
1) Verify Control and Feedback Wiring and Signals if a Fault is detected.

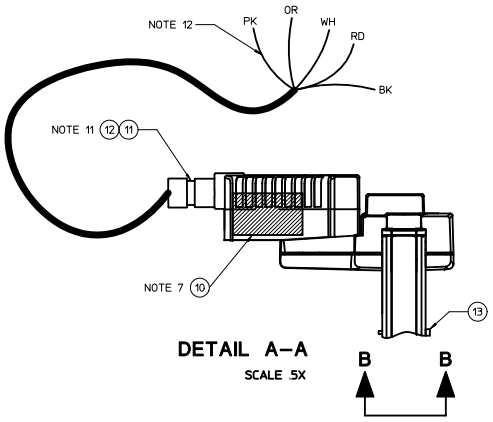
D3400024



DEFAULT ACTUATOR ORIENTATION

NO SCALE





DETAIL A–A

SCALE .5X

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	REDRAWN WITH CHANGES ECN 2750	DGS 01-30-14	

13) THE MOTOR ELECTRICAL WIRE END OF THE ACTUATOR FACES THE OUTLET SIDE OF A 2-WAY VALVE, C PORT ON A 3-WAY MIXING AND L PORT ON A 3-WAY DIVERTER VALVE.

12) PUR1225 ONLY: CUT END OF FIFTH PINK WIRE DOWN TO JACKET INSULATION.

11) THREAD APPROXIMATELY 6 IN OF WIRE TIE THROUGH RESISTOR KIT BAG HOLE AND ATTACH TO NARROW DIAMETER AS SHOWN.

10) ALL PARTS EXCEPT ITEMS 9, 10, 11 AND 12 ARE INCLUDED IN PURCHASED KIT PUR1224 OR PUR1225.

9) SEE WORK INSTRUCTION W1100016 FOR DETAILS.

8) CENTER DOME TAG AS SHOWN.

7) LOCATE SERIAL TAG ON LOWER LEFT CORNER AS SHOWN.

6) WITH ACTUATOR IN STEM UP POSITION, SLIDE LINKAGE BASE ONTO ACTUATOR LINKAGE LEGS, ADJUST LINKAGE HEIGHT TO THE NEXT TOOTH ABOVE LINKAGE GAGE B6020013. TORQUE SOCKET HEAD CAP SCREWS TO 44 IN-LBF.

5) AFTER THE ACTUATOR IS MOUNTED, AND BEFORE IT IS SET UP AND TESTED, THE ORANGE TRAVEL INDICATORS SHALL BE PUSHED TO CONTACT THE TRAVEL INDICATOR CROSS BAR.

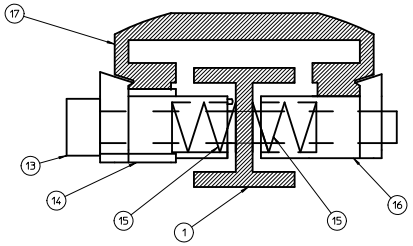
4) ATTACH CLIP AND ALLEN KEY AS SHOWN.

3) VBA MUST MEET NS INTERFACE, B3760073.

2) THE NICKEL PLATED SPACER RING (A/K/A COLLAR) INCLUDED WITH THE ACTUATOR LINKAGE KIT (WCGVL) MUST BE PLACED FROM ABOVE WITH THE TURNED DOWN SIDE FACING THE HOLE IN THE LINKAGE BASE AS SHOWN.

1) YOKE LOCKNUT MUST BE ORIENTED WITH THE FLAT SIDE DOWN AS SHOWN.

NOTES:



DETAIL B–B

NO SCALE

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
17	1		LINKAGE BASE WITH TRACKS	
16	2		LINKAGE NUT THREADED	
15	4		SPRINGS	
14	2		FRONT LINKAGE LOCK NUT	
13	2		SOCKET HEAD CAP SCREW 4mm	
12	A/R	PUR1232	WIRE TIE	
11	1	KR500	RESISTOR KIT	
10	1		SERIAL TAG	
9	1	B1670075	DOME TAG	
8	1		TWO (2) ORANGE TRAVEL INDICATORS	
7	1		4 MM ALLEN KEY	
6	1		KEY CLIP	
5	1		STEM ADAPTER	
4	1		3/8-24 JAMNUT	
3	1		YOKE LOCKNUT (SAME AS B1640034-01)	
2	1		SPACER RING	
1	1	PER B/M	LINEAR ELECTRONIC ACTUATOR WITH RAILS	

UNLESS OTHERWISE SPECIFIED | MATERIAL | TREATMENT | FINISH | NEXT ASSEMBLY | ALL DIMENSIONS ARE IN INCHES

DRAWN DGS 10-15-13 | CHECKED | APPROVED

WARREN CONTROLS INCORPORATED
BETHLEHEM, PENNSYLVANIA 18020-8010

INSTALLATION OF E024 & E025 ACTUATOR ON VBA

SIZE D | PICH NO 03847 | DWG NO D3400024 | REV A

SCALE | SHEET

D3400024

D3400025

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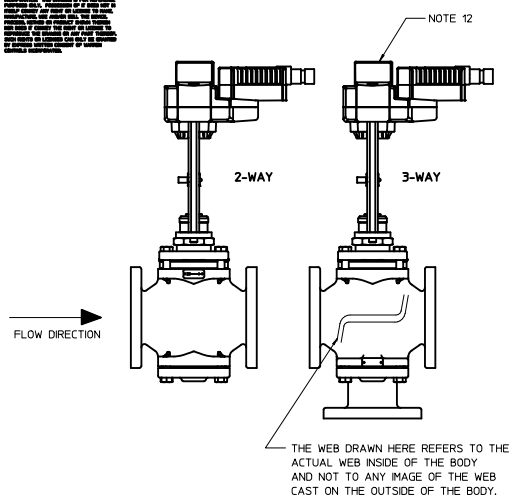


DEFAULT ACTUATOR ORIENTATION

NO SCALE

13) TORQUE SOCKET HEAD CAP SCREWS TO 177 IN-LBS TO SECURE ACTUATOR (ITEM 1) TO EACH LEG OF LINKAGE BASE (ITEM 14) IN 2 PLACES THROUGH ACTUATOR RECESS AS SHOWN.

12) THE MOTOR ELECTRICAL WIRE END OF THE ACTUATOR FACES THE OUTLET SIDE OF A 2-WAY VALVE, C PORT ON A 3-WAY MIXING AND L PORT ON A 3-WAY DIVERTER VALVE.

11) THREAD APPROXIMATELY 6 IN OF WIRE TIE THROUGH RESISTOR KIT BAG HOLE AND ATTACH TO NARROW DIAMETER WHERE SHOWN.

10) SEE WORK INSTRUCTION W1100017 FOR DETAILS.

9) TORQUE 5MM HEX SOCKET TO 44 IN-LBF.

8) CENTER DOME TAG AS SHOWN.

7) LOCATE SERIAL TAG ON LOWER LEFT CORNER AS SHOWN.

6) ATTACH TRAVEL SCALE LABEL AS SHOWN.

5) ALL PARTS EXCEPT ITEMS 2, 8, 9, 10, 11 AND 12 ARE INCLUDED IN PURCHASE KIT PUR1226 OR PUR1227.

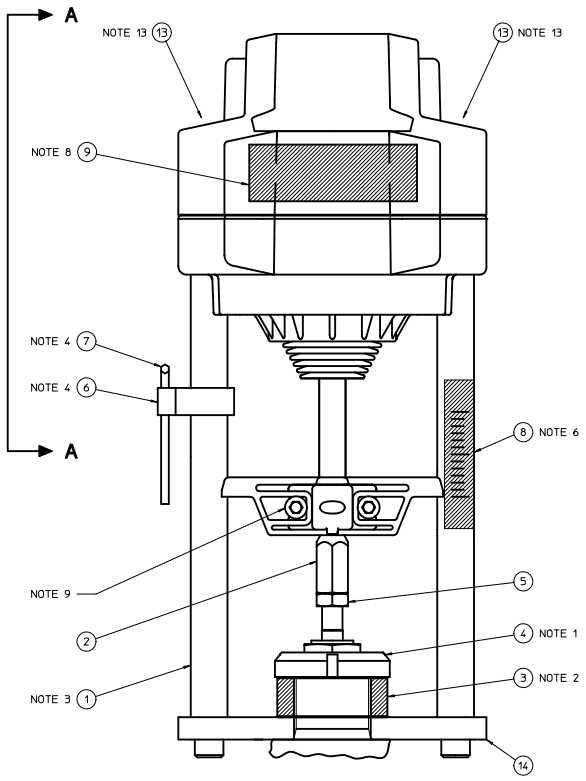
4) ATTACH CLIP AND ALLEN KEY AS SHOWN.

3) VBA MUST MEET NS INTERFACE, B3760073.

2) THE NICKEL PLATED SPACER RING (A/K/A COLLAR) INCLUDED WITH THE ACTUATOR LINKAGE KIT (WGVL) INSTALLED FROM ABOVE.

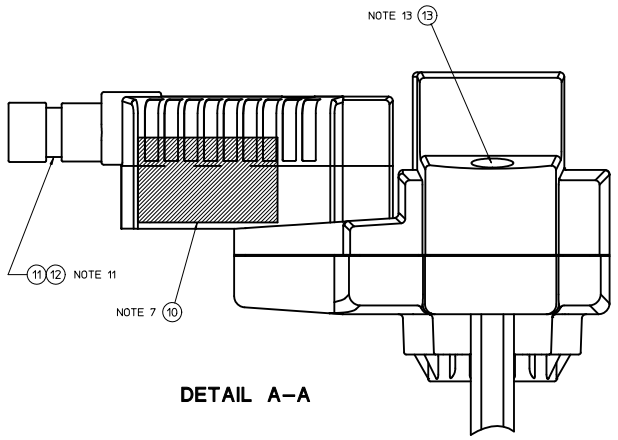
1) YOKE LOCKNUT MUST BE ORIENTED WITH THE FLAT SIDE FACING DOWN AS SHOWN.

NOTES:



FRONT VIEW

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
C	REDRAWN WITH CHANGES ECN 2764	DGS 4-3-14	



DETAIL A–A

ITEM	QTY	PART NO	DESCRIPTION	MATL SPEC
14	1		LINKAGE BASE	
13	2		SOCKET HEAD CAP SCREW 6mm	
12	A/R	PUR1232	WIRE TIE	
11	1	KR500	RESISTOR KIT	
10	1		SERIAL TAG	
9	1		DOME TAG	
8	1	SEE TABLE	TRAVEL SCALE LABEL	
7	1		5 MM ALLEN KEY	
6	1		KEY CLIP	
5	1		3/8-24 JAMNUT	
4	1		YOKE LOCKNUT (SAME AS B1640034-01)	
3	1		SPACER RING	
2	1	C1010075-01	STEM ADAPTER "ANTI-ROTATION"	
1	1	PER B/M	LINEAR ELECTRONIC ACTUATOR AND WGVL LINKAGE KIT	

VBA USED ON	PART NO.
1 1/2 MOVE ALL	B1590066
1 3/8 MOVE ALL	B1590065
1 1/4 MOVE ALL	B1590064
1 1/8 MOVE ALL	B1590063
3/4 MOVE ALL	B1590062
9/16 MOVE ALL	B1590067

TRAVEL SCALES

UNLESS OTHERWISE SPECIFIED | NEXT ASSEMBLY | ALL DIMENSIONS ARE IN INCHES | MATERIAL | TREATMENT | FINISH

DRAWN DGS DATE 11-6-13 | CHECKED | APPROVED

WARREN CONTROLS INCORPORATED
BETHLEHEM, PENNSYLVANIA 18020-8010

INSTALLATION OF E026 & E029 ACTUATOR ON VBA

SIZE D | PROD NO 03847 | DWG NO D3400025 | REV C | SCALE FULL | WT | SHEET

REMOVAL & INSTALLATION OF ACTUATOR & LINKAGE BASE

READ ALL INSTRUCTIONS CAREFULLY BEFORE BEGINNING.

SEE DRAWING D3400024 on page 16

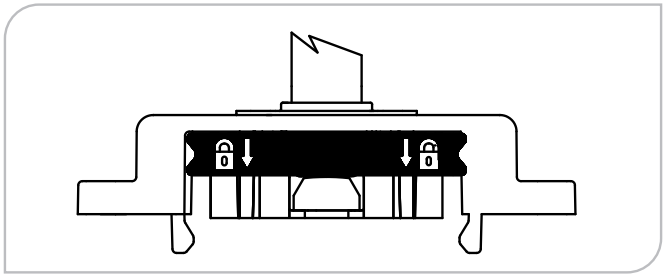
THESE INSTRUCTIONS SHOULD ONLY BE USED IF THE SOCKET HEAD CAP SCREWS (ITEM 13) HAVE BEEN LOOSENED AND THE POSITION OF THE ACTUATOR (ITEM 1) RELATIVE TO THE LINKAGE BASE (ITEM 17) HAS BEEN CHANGED. OTHERWISE USE THE REMOVAL AND INSTALLATION INSTRUCTIONS ON PAGE 8 & 9.

1) Remove line pressure and isolate valve in piping.

2) Operate actuator (Item 1) so plug is off seat(s) or travel stop in valve.

3) Remove power and signal from actuator. For E025, after power is removed, cycle Fail-Safe Switch from Up Arrow to Down Arrow until actuator stem no longer moves. Adaption/ Power (green LED) changes from blinking to off. Return Fail-Safe Switch to original position. If necessary use the manual override to operate actuator so plug is off seat(s) or travel stop in valve (See manual override on page 3).

WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.



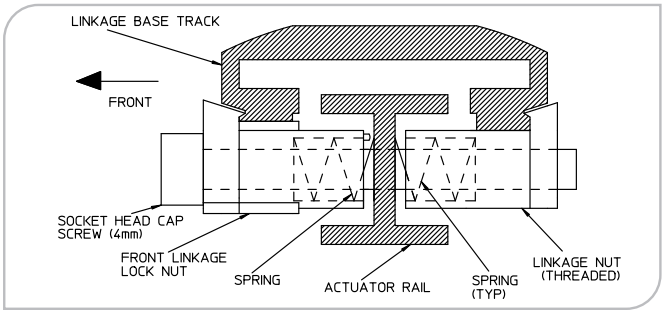
4) Unlock stem connector clamp, use fingers on the front and back sides of black lock assembly to evenly raise the lock assembly.

WARNING: WHEN HANDLING THE ACTUATOR TAKE CARE NOT TO DAMAGE THE STEM CONNECTOR CLAMP AND CROSS BAR ASSEMBLY.

5) Press the manual override button then use the actuator manual override to raise the stem connector until the stem adapter (Item 5) is disengaged (See manual override on page 3).

WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

6) Adjust the socket head cap screws (Item 13) so the teeth of the front linkage lock nuts (Item 14) will not interfere with the teeth of linkage base tracks (Item 17).



7) Press together the linkage base tracks and slide the actuator rails out of the tracks until the actuator is separate from the linkage base.

8) Thread the socket head cap screws out of the threaded linkage nuts (Item 16). Remove and separate the threaded linkage nuts and springs (Item 15).

9) Remove the socket head cap screws, front linkage lock nuts, and springs together from the actuator rails. Separate the socket head cap screws, front linkage nuts, and springs.

10) Remove the orange travel indicators (Item 8) from the actuator rail.

11) Loosen yoke locknut (Item 3) until it is free of bonnet.

12) Remove spacer ring (Item 2).

13) Remove linkage base from valve.

14) Hold jam nut (Item 4) on valve stem and turn the stem adapter (Item 5) to disengage from valve stem.

WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED VOIDING THE WARRANTY.

15) Remove stem adapter from valve stem.

16) Remove jam nut from valve stem.

REMOVAL & INSTALLATION OF ACTUATOR & LINKAGE BASE

READ ALL INSTRUCTIONS CAREFULLY BEFORE BEGINNING.

SEE DRAWING D3400024 on page 16

THESE INSTRUCTIONS SHOULD ONLY BE USED IF THE SOCKET HEAD CAP SCREWS (ITEM 13) HAVE BEEN LOOSENED AND THE POSITION OF THE ACTUATOR (ITEM 1) RELATIVE TO THE LINKAGE BASE (ITEM 17) HAS BEEN CHANGED. OTHERWISE USE THE REMOVAL AND INSTALLATION INSTRUCTIONS ON PAGE 8 & 9.

THE SILVER SPACER RING THAT COMES WITH THE ACTUATOR MUST BE ASSEMBLED ON TOP SIDE OF YOKE WITH TURNED DOWN (MACHINED) SIDE FACING DOWN AS SHOWN ON DRAWING D340024.

1) Push valve stem down until plug is seated. Note stem location.

2) Install hex jamnut (Item 4) on valve stem. Thread jamnut so that one inch of threads are exposed between jamnut and top of stem.

3) Hold jamnut on valve stem and turn the stem adapter (Item 5) until it bottoms out on the valve stem. Tighten jamnut to the bottom of the stem adapter to secure valve stem to stem adapter.

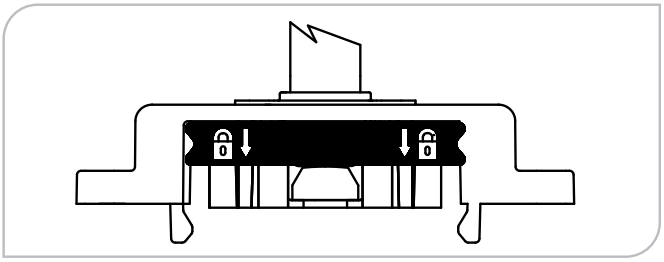
WARNING: THE VALVE STEM SHOULD NEVER BE TURNED WHILE THE PLUG IS IN CONTACT WITH THE SEAT OTHERWISE THE SEATING SURFACES WILL BE DAMAGED VOIDING THE WARRANTY.

4) Place linkage base (Item 17), spacer ring (Item 2), and yoke locknut (Item 3) over valve stem and onto bonnet. Watch orientation of spacer ring and yoke locknut. Linkage base must rest on bonnet.

5) Rotate linkage base to desired orientation. For the factory default actuator position, when the actuator (Item 1) is installed in the linkage base, the motor electrical wire end of the actuator faces the outlet side of a 2-way valve, common "C" port on a 3-way mixing, and lower "L" port on a 3-way diverting valve. Thread yoke locknut onto bonnet and tighten securely. Use a blunt chisel and hammer for final tightening.

6) Unlock stem connector clamp on the actuator, use fingers on the front and back sides of black lock assembly to evenly raise the lock assembly.

WARNING: WHEN HANDLING THE ACTUATOR TAKE CARE NOT TO DAMAGE THE STEM CONNECTOR CLAMP AND CROSS BAR ASSEMBLY.



7) Press the manual override button then use the actuator manual override to lower the stem connector until a slight resistance is felt. Then raise the stem connector approximately 2-1/4 turns of the manual override (approximately 0.086 inch) (See manual override on page 3).

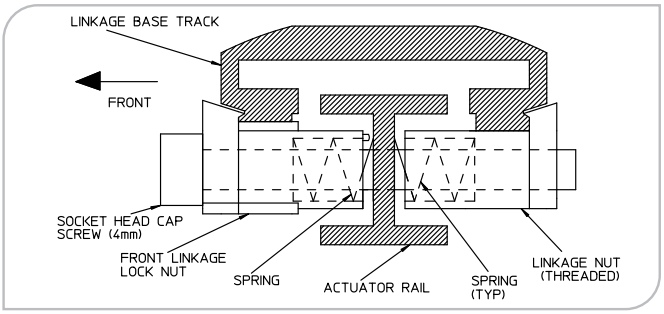
WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

8) Insert first socket head cap screw (Item 13) through front linkage lock nut (Item 14). Watch orientation. Install first spring (Item 15) over threaded end of socket head cap screw into spring bore of front linkage lock nut. Insert threaded end of socket head cap screw into hole in socket for front linkage lock nut in one of the actuator rails. The socket for the front linkage lock nut is oriented away from the motor electrical wire end of the actuator. Press front linkage lock nut into socket. The teeth on the front linkage lock nut must face the teeth on the closest linkage base track when the actuator is installed on the linkage base. Install second spring on exposed threaded end of the socket head cap screw. Install threaded linkage nut (Item 16) over threaded end of socket head cap screw so second spring is captured in spring bore of threaded linkage nut. The dovetail on the threaded linkage nut must face the groove in the closest linkage base track when the actuator is installed on the linkage base. Thread the socket head cap screw into the threaded linkage nut. Adjust the socket head cap screw so the teeth of the front linkage lock nut will not interfere with the teeth of linkage base track when the actuator is installed in the linkage base in the next step. Repeat this step with second socket head cap screw

9) Verify the valve stem is down and the plug is seated. Refer to location noted in Step 1. Position the actuator (Item 1) in the desired orientation. For the factory default actuator position, the motor electrical wire end of the actuator faces the outlet side of a 2-way valve, common "C" port on a 3-way mixing valve, and lower "L" port on a 3-way diverting valve. Verify that the teeth of both front linkage lock nuts will face the teeth in the closest linkage base track when the actuator is installed in the linkage base. Verify that the dovetail of both threaded linkage nuts will face the groove in the closest linkage base track when the actuator is installed in the linkage base. Press together the linkage base tracks and insert the actuator rails into the tracks. Slide the actuator rails into the actuator base tracks until the metal actuator stem touches the top of the stem adapter.

READ ALL INSTRUCTIONS CAREFULLY BEFORE BEGINNING.

10) Press the first threaded linkage nut into the socket on the actuator rail and hold. The dovetail on the threaded linkage nut must fully engage the groove on the linkage base track. Press the front linkage lock nut into the socket on the actuator rail and hold. The teeth on the front linkage lock nut must engage the lowest teeth possible on the linkage base track. The dovetail on the front linkage lock nut must fully engage the groove on the linkage base track. Tighten the socket head cap screw hand tight. Repeat for the second threaded linkage nut. The number of teeth visible on the linkage base tracks below the front linkage lock nuts should be the same on both sides. If the number of teeth visible on the linkage base tracks below the front linkage lock nuts is not the same on both sides, loosen the socket head cap screws then repeat this step.

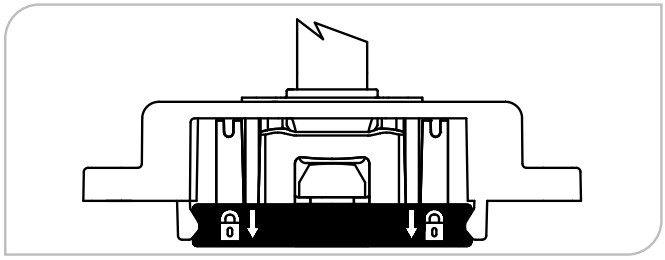


11) Tighten both 4 mm socket head cap screws to 44 in-lbf torque.

12) Use actuator manual override to verify the metal actuator stem touches the top of the stem adapter (See manual override on page 3).

WARNING: DO NOT FORCE OR TURN THE MANUAL OVERRIDE WHEN THE MANUAL OVERRIDE BUTTON IS NOT PRESSED. DOING SO MAY CAUSE DAMAGE TO THE ACTUATOR GEARS.

13) Lock stem connector clamp, use fingers on the front and back sides of black lock assembly to evenly lower the lock assembly.



WARNING: WHEN HANDLING THE ACTUATOR TAKE CARE NOT TO DAMAGE THE STEM CONNECTOR CLAMP AND CROSS BAR ASSEMBLY.

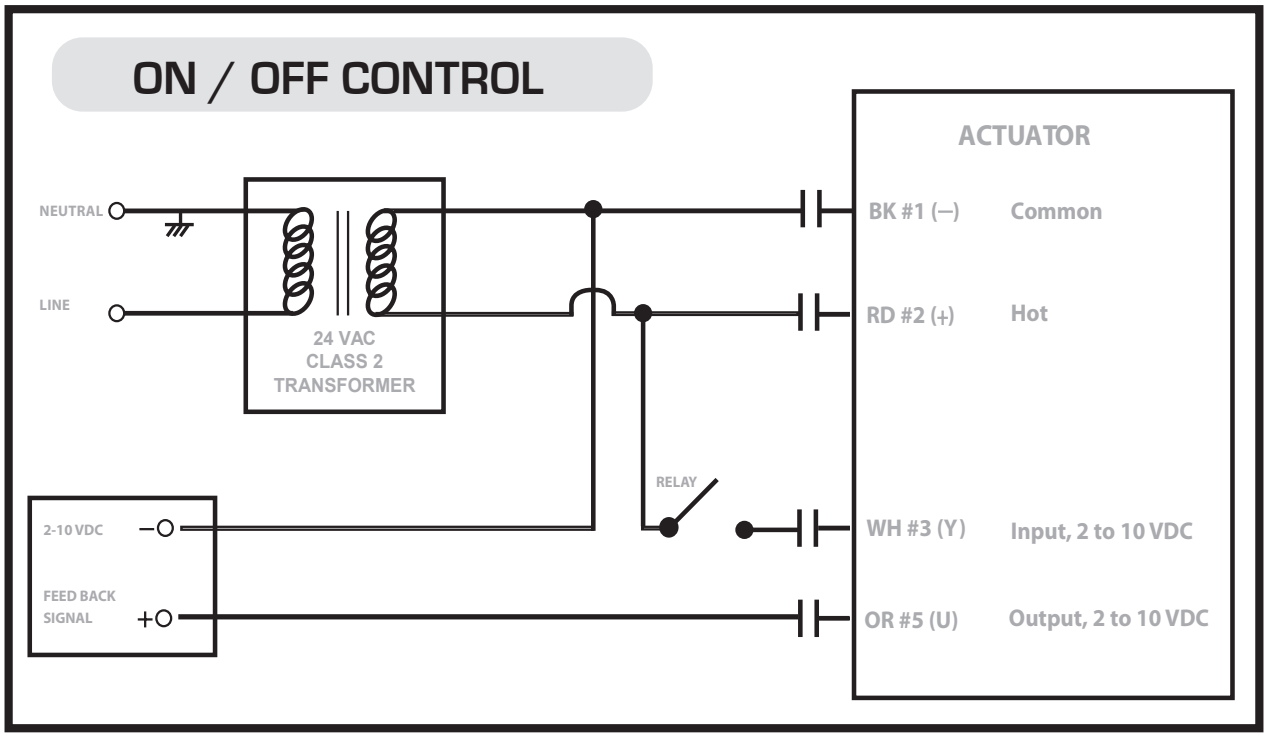
14) Install orange travel indicators (Item 8) on embossed actuator rail above and below travel indicator cross bar. Push orange travel indicators on leg of actuator to contact cross bar.

15) Connect power and signal to actuator. (See also **Set-Up** on page 12)

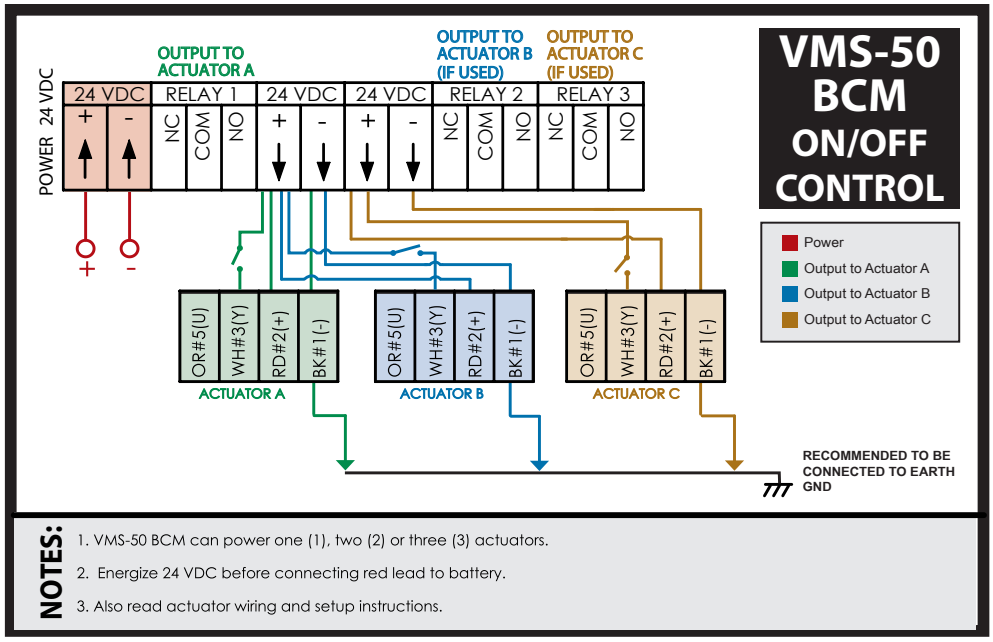
16) Press the Adaption (Auto Calibration) button on the actuator and wait until the cycle is complete.

17) Stroke valve several times to check operation.

18) Return line pressure to valve.


ON / OFF CONTROL
ACTUATOR
NEUTRAL
LINE
24 VAC
CLASS 2
TRANSFORMER
BK #1 (–)
Common
RD #2 (+)
Hot
RELAY
2-10 VDC
FEED BACK
SIGNAL
WH #3 (Y)
Input, 2 to 10 VDC
OR #5 (U)
Output, 2 to 10 VDC

ON-OFF CONTROL



VMS-50 BCM ON-OFF	
TERMINAL IDENTIFICATION	**CONNECTION/DESCRIPTION**
24 VDC + ←	24 Vdc (+) IN
24 VDC - ←	24 Vdc (-) IN
RELAY 1 NC	Not Used
RELAY 1 COM	Not Used
RELAY 1 NO	Not Used
24 VDC + →	24 Vdc (+) OUT
24 VDC - →	24 Vdc (-) OUT
RELAY 2 NC	Not Used
RELAY 2 COM	Not Used
RELAY 2 NO	Not Used
RELAY 3 NC	Not Used
RELAY 3 COM	Not Used
RELAY 3 NO	Not Used

Operation:

On- Off Normal: 24 Vdc External Power Supply LOAD connected to 24 Vdc IN terminals of VMS-50 BCM. Building Power Source, 115 VAC 50/60 Hz required for VMS-50 PS , connected to 24 Vdc External Power Supply LINE. Actuator responds to opening and closing of contact between WH# 3(Y) white wire and 24 Vdc (+) OUT **24 VDC + →** terminal.

Power Failure: 24 Vdc OUT from VMS-50 BCM changes from 24 Vdc from External Power Supply to 24 Vdc from battery/ inverter. Actuator responds to position of contact between WH# 3(Y) white wire and 24 Vdc (+) OUT **24 VDC + →** terminal.

1. Disengage the building power circuit before wiring. Verify that the battery inside the VMS-50 has its wires disconnected and leave them that way for now. Disconnect them if they are connected.

2. Connect the VMS-50 BCM to the actuator(s) as shown on wiring diagram. The VMS-50 BCM can power one, two or three actuators.

Actuator A: Connect 24 Vdc (+) OUT **24 VDC + →** to red wire from actuator to provide power. Connect grounded reference - negative/black wire from actuator to 24 Vdc (-) OUT **24 VDC - →**. Connect 24 Vdc (+) OUT **24 VDC + →** to white wire from actuator to drive the valve stem in the direction determined by the actuator rotation switch position. Disconnect 24 Vdc (+) OUT **24 VDC + →** from white wire from actuator to drive the valve stem in the opposite.
Actuator B: Connect 24 Vdc (+) OUT **24 VDC + →** to red wire from actuator to provide power. Connect grounded reference - negative/black wire from actuator to 24 Vdc (-) OUT **24 VDC - →**. Connect 24 Vdc (+) OUT **24 VDC + →** to white wire from actuator to drive the valve stem in the direction determined by the actuator rotation switch position. Disconnect 24 Vdc (+) OUT **24 VDC + →** from white wire from actuator to drive the valve stem in the opposite.
Actuator C: Connect 24 Vdc (+) OUT **24 VDC + →** to red wire from actuator to provide power. Connect grounded reference - negative/black wire from actuator to 24 Vdc (-) OUT **24 VDC - →**. Connect 24 Vdc (+) OUT **24 VDC + →** to white wire from actuator to drive the valve stem in the direction determined by the actuator rotation switch position. Disconnect 24 Vdc (+) OUT **24 VDC + →** from white wire from actuator to drive the valve stem in the opposite.

3. While still disconnected, wire the 24 Vdc External Power Supply LOAD to the VMS-50 BCM. Connect the POSITIVE (+) lead to the 24 Vdc (+) IN **24 VDC+ ←** terminal, then connect the NEGATIVE (-) lead to the 24 Vdc (-) IN **24 VDC - ←** terminal.

4. Connect the 24 Vdc External Power Supply LINE into the building power source. For the VMS-50 PS plug the three pin LINE input plug into the 115 VAC 50/60 Hz building power source.

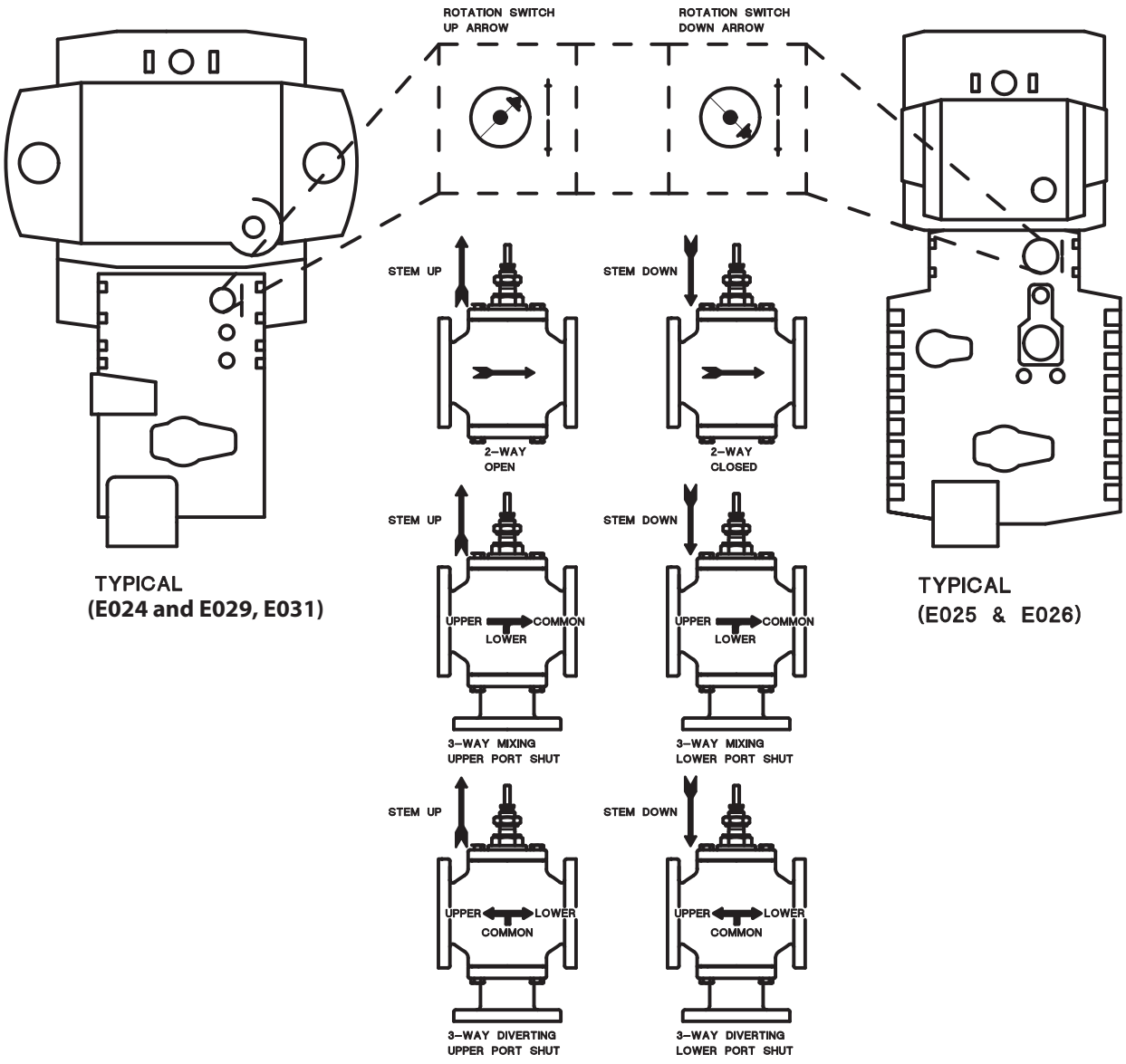
5. Verify that building power is live then connect the loose red wire inside the VMS-50 BCM enclosure to the positive (+) battery terminal and the black wire to the negative (-) battery terminal.

NOTE: Engage the building power to the VMS-50 BCM before connecting the battery. Connecting the battery first causes the VMS-50 BCM to go into the power failure mode.

ON-OFF CONTROL

Rotation Switch Position	On-Off Control Action
Facing Up Arrow (E024 & E029 without VMS-50 BCM)	WH#3(Y) connected to RD#2(+) Closes 2-way valves and Closes Lower port 3-way valves. WH#3(Y) not connected to RD#2(+) Opens 2-way valves and Closes Upper port 3-way valves.
Facing Up Arrow (E024 and E029/31 with VMS-50 BCM)	WH#3(Y) connected to Terminal **24 VDC +** → Closes 2-way valves and Closes Lower port 3-way valves. WH#3(Y) not connected to Terminal **24 VDC +** → Opens 2-way valves and Closes Upper port 3-way valves.
Facing Down Arrow (E024 & E029 without VMS-50 BCM)	WH#3(Y) connected to RD#2(+) Opens 2-way valves and Closes Upper port 3-way valves. WH#3(Y) not connected to RD#2(+) Closes 2-way valves and Closes Lower port 3-way valves.
Facing Down Arrow (E024 and E029/31 with VMS-50 BCM)	WH#3(Y) connected to Terminal **24 VDC +** → Opens 2-way valves and Closes Upper port 3-way valves. WH#3(Y) not connected to Terminal **24 VDC +** → Closes 2-way valves and Closes Lower port 3-way valves.
Facing Up Arrow (E025 & E026)	WH#3(Y) connected to RD#2(+) Closes 2-way valves and Closes Lower port 3-way valves. WH#3(Y) not connected to RD#2(+) Opens 2-way valves and Closes Upper port 3-way valves.
Facing Down Arrow (E025 & E026)	WH#3(Y) connected to RD#2(+) Opens 2-way valves and Closes Upper port 3-way valves. WH#3(Y) not connected to RD#2(+) Closes 2-way valves and Closes Lower port 3-way valves.

Rotation Switch Position	On-Off Power Failure Action
Facing Up Arrow (E024 & E029 without VMS-50 BCM)	LAST POSITION
Facing Up Arrow (E024 and E029/31 with VMS-50 BCM)	WH#3(Y) connected to Terminal **24 VDC +** → Closes 2-way valves and Closes Lower port 3-way valves. WH#3(Y) not connected to Terminal **24 VDC +** → Opens 2-way valves and Closes Upper port 3-way valves.
Facing Down Arrow (E024 & E029 without VMS-50 BCM)	LAST POSITION
Facing Down Arrow (E024 and E029/31 with VMS-50 BCM)	WH#3(Y) connected to Terminal **24 VDC +** → Opens 2-way valves and Closes Upper port 3-way valves. WH#3(Y) not connected to Terminal **24 VDC +** → Closes 2-way valves and Closes Lower port 3-way valves.
Facing Up Arrow (E025 & E026)	See POWER FAILURE E025 & E026 actuators – Fail-Safe Switch position PG 14
Facing Down Arrow (E025 & E026)	See POWER FAILURE E025 & E026 actuators – Fail-Safe Switch position PG 14


ROTATION SWITCH
UP ARROW
ROTATION SWITCH
DOWN ARROW
STEM UP
2-WAY
OPEN
STEM DOWN
2-WAY
CLOSED
STEM UP
UPPER
COMMON
LOWER
3-WAY MIXING
UPPER PORT SHUT
STEM DOWN
UPPER
COMMON
LOWER
3-WAY MIXING
LOWER PORT SHUT
STEM UP
UPPER
LOWER
COMMON
3-WAY DIVERTING
UPPER PORT SHUT
STEM DOWN
UPPER
LOWER
COMMON
3-WAY DIVERTING
LOWER PORT SHUT
TYPICAL
(E024 and E029, E031)
TYPICAL
(E025 & E026)

NOTES

NOTES

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