

Fisher™ FIELDVUE™ DVC7K Series Digital Valve Controllers

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X1963



This quick start guide provides installation and initial setup information for DVC7K digital valve controllers

Related Documents

The DVC7K instruction manual includes product specifications, reference materials, custom setup information, maintenance procedures, and replacement part details. If a copy of this document is needed scan or click the QR code at the right, contact your [Emerson sales office](#) or visit our website at Fisher.com.



emrsn.co/FieldSupportDVC7K

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Using this Guide

This guide describes how to install the digital valve controller and setup and calibrate using the Local User Interface (LUI). The LUI consists of a display, six pushbuttons, and a multi-color LED indicator. The LUI is field configurable to one of 13 different languages, as shown in table 2 on page 33. The instrument must be powered with at least 10 volts and 4 mA to operate the LUI. Certain procedures require up to 20 mA of current.

You can also setup and calibrate the instrument using an Emerson handheld communicator or with a personal computer with AMS Device Configurator. For information on using the software with a FIELDVUE instrument, refer to the appropriate user guide or help.



Do not install, operate, or maintain a DVC7K digital valve controller without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all contents of this quick start guide, including all safety cautions and warnings. If you have any questions about these instructions, contact your [Emerson sales office](#) before proceeding.

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before proceeding with any Installation procedures:

- Always wear protective clothing, gloves, and eyewear to prevent personal injury or property damage.
- Do not remove the actuator from the valve while the valve is still pressurized.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.
- Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression so the actuator is not applying force to the valve stem; this will allow for the safe removal of the stem connector.

⚠ WARNING

To avoid static discharge from the plastic portion of the cover when flammable gases or dust are present, do not rub or clean the cover with solvents. To do so could result in a spark that may cause the flammable gases or dust to explode, resulting in personal injury or property damage. Clean with a mild detergent and water only.

NOTICE

Do not use sealing tape on pneumatic connections. This instrument contains small passages that may become obstructed by detached sealing tape. Thread sealant paste should be used to seal and lubricate pneumatic threaded connections.

Step 1—Installation

Housing Variations

The DVC7K digital valve controller has a variety of different housing options.

The instrument comes with a Local User Interface (LUI), as shown in figure 1.

Figure 1. Local User Interface



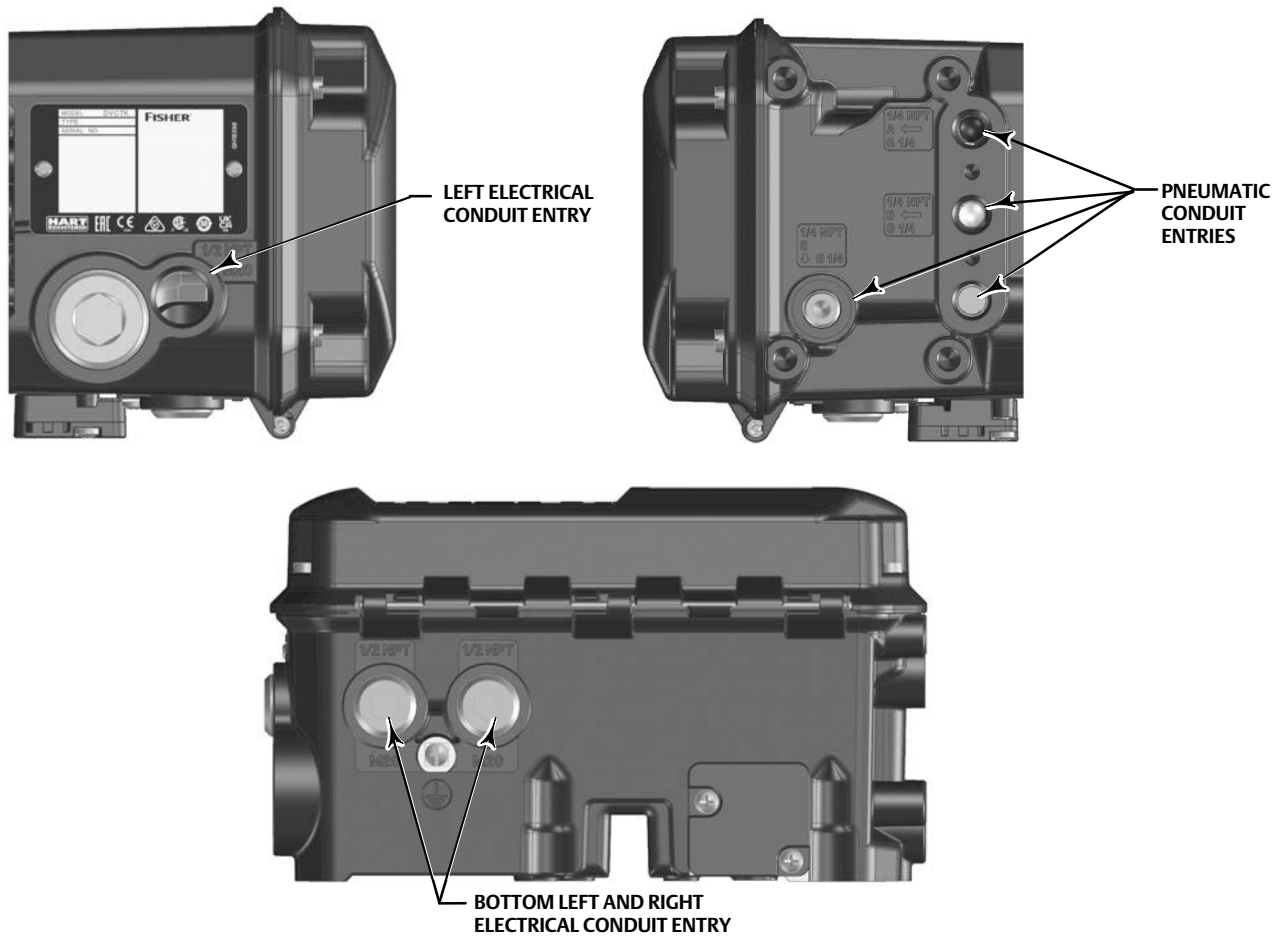
HOUSING WITH LOCAL USER INTERFACE

Additionally, the instrument can be ordered with three different electrical and pneumatic configurations. Table 1 shows the available configurations and figure 2 shows where the electrical conduit entries and pneumatic ports are located on the instrument.

Table 1. Electrical and Pneumatic Configurations

	Electrical Conduit Entry Size	Pneumatic Port Size
Imperial	1/2 NPT	1/4 NPT
Metric	M20	G1/4
Metric/Imperial	M20	1/4 NPT

Figure 2. Electrical and Pneumatic Configuration



Valve/Actuator Mounting

If ordered as part of a control valve assembly, the factory will mount the digital valve controller on the actuator and calibrate the instrument. If you purchased the digital valve controller separately, you will need a mounting kit. The

following procedures are general guidelines. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

NOTICE

The magnet assembly material has been specifically chosen to provide a long-term stable magnetic field.

However, as with any magnet, care must be taken when handling the magnet assembly. Another high powered magnet placed in close proximity (less than 25 mm) can cause permanent damage. Potential sources of damaging equipment include, but are not limited to: transformers, DC motors, stacking magnet assemblies.

General Guidelines for use of High Power Magnets with Positioners

Use of high power magnets in close proximity to any positioner which is operating a process should be avoided. Regardless of the positioner model, high power magnets can affect the positioner’s ability to control the valve.

Use of Magnetic Tools with the DVC7K

- **Magnetic Tip Screw Drivers** – Magnetic tip screw drivers can be used to work on the DVC7K. However, they should not be brought in close proximity to the magnet assembly (located at the back of the instrument) during process operations.
- **Calibrator Strap Magnets** – These are high power magnets used to hold 4-20 mA calibrators. Normally, these calibrators would not be used while an instrument is controlling the process. High power magnets should be kept at least 15 cm (6 inches) from the DVC7K.



Notes

- As a general rule, do not use less than 60% of the magnet assembly travel range for full travel measurement. Performance will decrease as the assembly is increasingly subranged.
- The linear magnet assemblies have a valid travel range indicated by arrows molded into the piece. This means that the hall sensor (the center point of the channel on the back of the DVC7K housing) has to remain within this range throughout the entire valve travel. The linear magnet assemblies are symmetrical. Either end may be up.
- The magnet assembly may be referred to as a magnetic array in user interface tools.
- Mounting the instrument horizontally with the vent pointing down, or vertically with the vent at the bottom of the instrument, is recommended to allow drainage of moisture that may be introduced via the instrument air supply.

For sliding-stem linear actuators proceed to page 6

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For quarter-turn rotary actuators proceed to page 14

Integral Mounted Fisher Actuators	14
Bracket Mounted	15

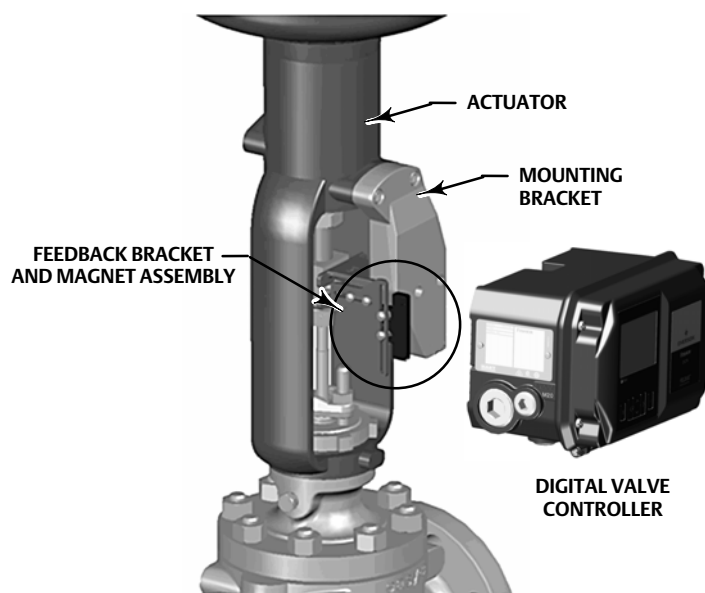
Sliding-Stem Linear Actuators

Bracket Mounted

Fisher 667 and 657

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.

Figure 3. Mounting Parts for Sliding-Stem Actuator with up to 210 mm (8.25 inches) Travel



2. Attach the mounting bracket to the actuator.
3. Loosely attach the feedback pieces and magnet assembly to the valve stem connector. Do not tighten the fasteners until the magnet assembly is positioned and aligned in steps 4 and 5.

⚠ WARNING

Do not install a magnet assembly that is shorter than the physical travel of the actuator. Loss of control will result from the magnet assembly moving outside the range of the index mark in the feedback slot of the DVC7K housing and may result in personal injury or property damage.

4. Using the alignment template (supplied with the mounting kit), position the magnet assembly inside the retaining slot.
5. Align the magnet assembly as follows:
 - For air-to-open actuators (e.g. Fisher 667) vertically align the magnet assembly so that the center line of the alignment template is lined up as close as possible with the upper extreme of the valid travel range on the magnet assembly. The magnet assembly should be positioned so that the index mark in the feedback slot of the DVC7K housing is within the valid range on the magnet assembly throughout the range of travel. See figure 4.

- For air-to-close actuators (e.g. Fisher 657) vertically align the magnet assembly so that the center line of the alignment template is lined up as close as possible with the lower extreme of the valid travel range on the magnet assembly. The magnet assembly should be positioned so that the index mark in the feedback slot of the DVC7K housing is within the valid range on the magnet assembly throughout the range of travel. See figure 5.

Figure 4. Air-to-Open Magnet Assembly Alignment

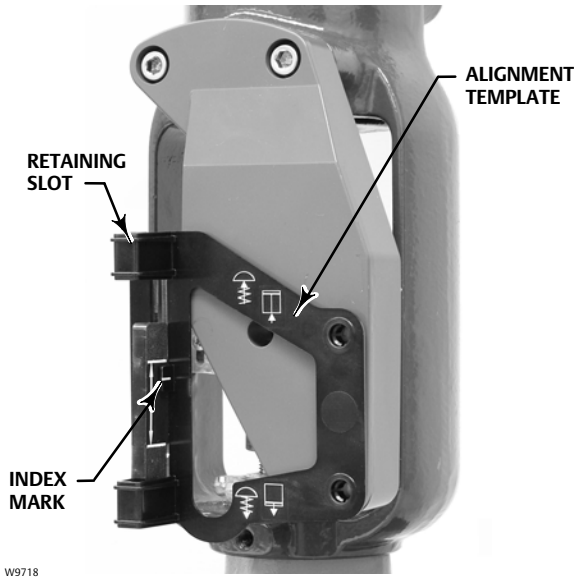
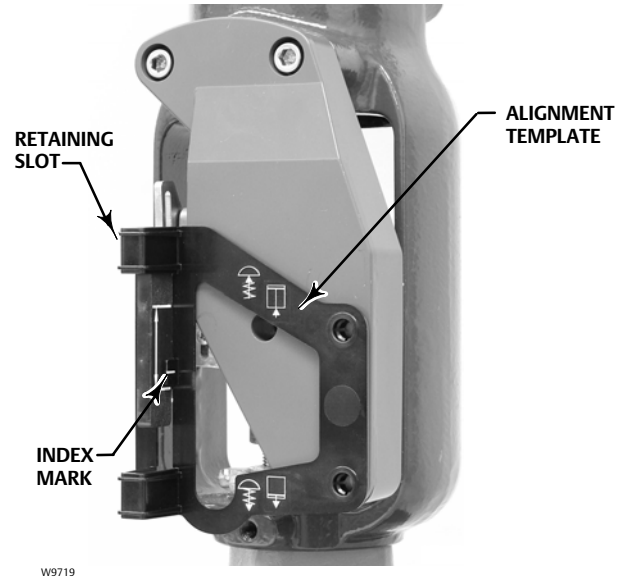


Figure 5. Air-to-Close Magnet Assembly Alignment



6. Tighten the fasteners and remove the alignment template.

Note

Use a flat end hex key to tighten the magnet assembly fasteners to a torque of 2.37 N•m (21 lbf•in) for 4 mm screws, and 5.08 N•m (45 lbf•in) for 5 mm screws. For added security, especially in vibrating services, blue (medium) threadlocker may be used on the fasteners.

7. Mount the digital valve controller to the mounting bracket, using the mounting bolts.

8. Check for clearance between the magnet assembly and the DVC7K feedback slot.

Note

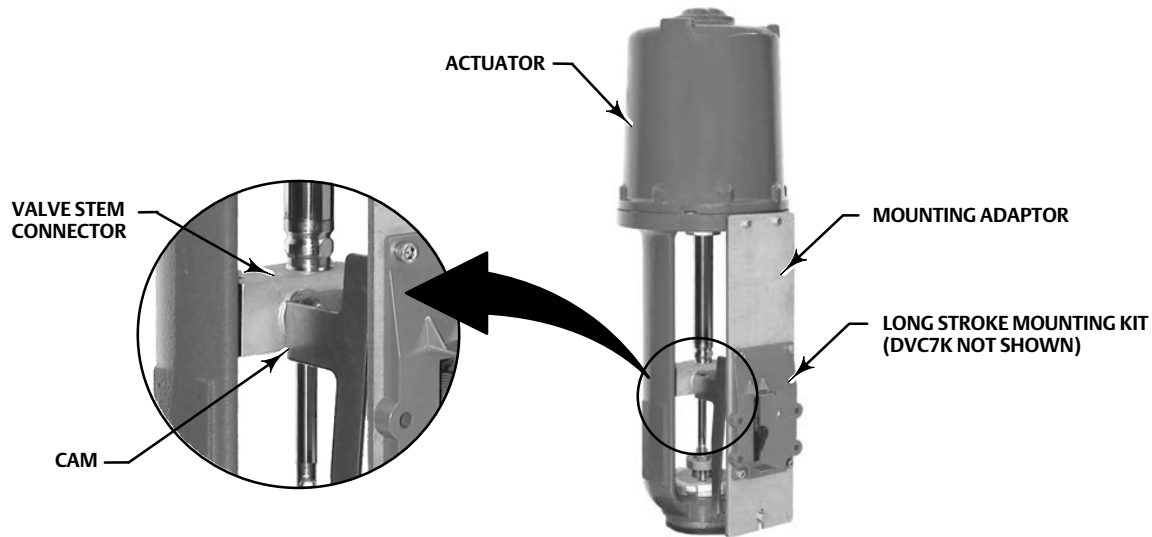
Ensure that there is clearance between the magnet assembly and the DVC7K housing slot throughout the full range of travel.

9. Proceed to Step 2—Connect the Pneumatic Tubing on page 17.

Actuators over 210 mm (8.25 inches) Travel

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.

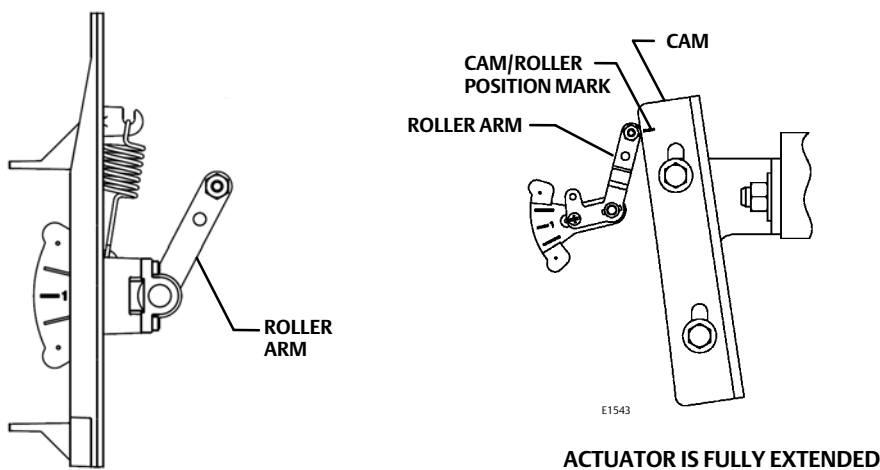
Figure 6. Mounting on Sliding-Stem (Linear) Actuators over 210 mm (8.25 Inches) Travel



W9709

2. Install the cam to the valve stem connector as described in the instructions included with the mounting kit.
3. Install the mounting adaptor to the actuator.
4. Attach the digital valve controller and mounting kit assembly to the mounting adaptor. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.

Figure 7. Roller Arm Variation used for Sliding-Stem (Linear) Actuators over 210 mm (8.25 Inches) Travel



E1229

E1543

5. Proceed to Step 2—Connect the Pneumatic Tubing on page 17.

Integral Mounted Fisher Actuators

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
2. The DVC7K digital valve controller mounts directly to an integral mounted Fisher actuator without the need for a mounting bracket. Make sure you have the correct DVC7K housing for your actuator, as shown in figure 2.
3. For GX actuators, identify the yoke side to mount the DVC7K digital valve controller based on the actuator fail mode. Refer to the GX Control Valve and Actuator System instruction manual ([D103175X012](#)).
4. Loosely attach the feedback pieces and magnet assembly to the valve stem connector. Do not tighten the fasteners until the magnet assembly is positioned and aligned in steps 5 and 6.

⚠ WARNING

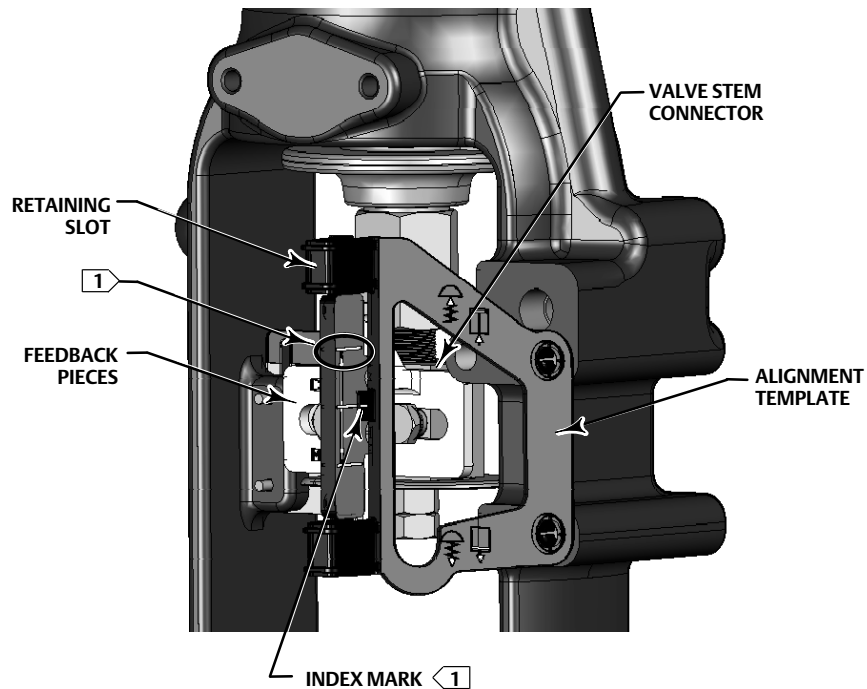
Do not install a magnet assembly that is shorter than the physical travel of the actuator. Loss of control will result from the magnet assembly moving outside the range of the index mark in the feedback slot of the DVC7K housing and may result in personal injury or property damage.

5. Using the alignment template (supplied with the mounting kit), position the feedback assembly inside the retaining slot.
6. Continue on with the appropriate procedure below to align the magnet assembly.

Air-to-Open (667 size 30i - 76i and GX)

Vertically align the magnet assembly so that the center line of the alignment template is lined up as close as possible with the upper extreme of the valid travel range on the magnet assembly. The magnet assembly should be positioned so that the index mark in the feedback slot of the DVC7K housing is within the valid range on the magnet assembly throughout the range of travel. See figure 8.

Figure 8. Air-to-Open Magnet Assembly Alignment



NOTE:

1 IMAGE DENOTES ACTUATOR AT HALF TRAVEL. ALIGN UPPER EXTREME OF MAGNET ASSEMBLY WITH ALIGNMENT TEMPLATE INDEX MARK.

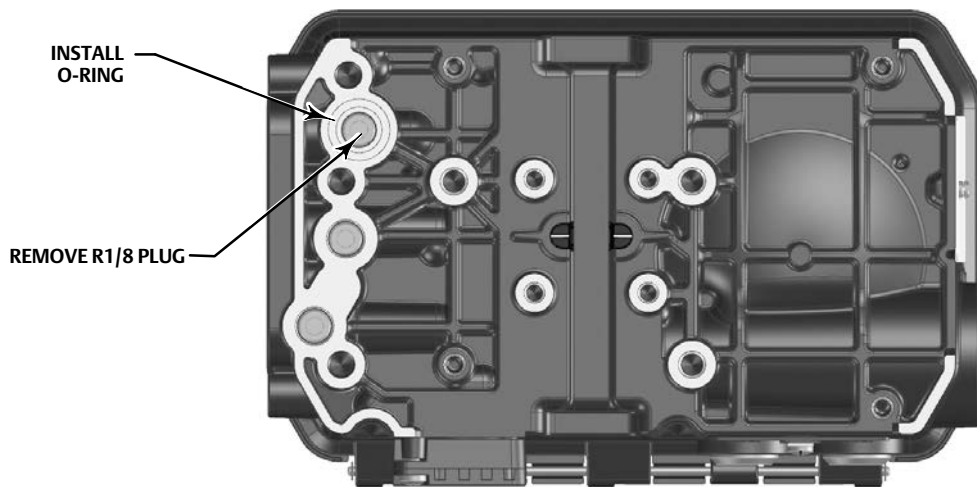
1. Tighten the fasteners and remove the alignment template.

Note

Use a flat end hex key to tighten the magnet assembly fasteners to a torque of 2.37 N•m (21 lbf•in) for 4 mm screws, and 5.08 N•m (45 lbf•in) for 5 mm screws. For added security, especially in vibrating services, blue (medium) threadlocker may be used on the fasteners.

2. Remove the plug (R1/8) from the back of the DVC7K housing as shown in figure 9. This pneumatic output port on the DVC7K lines up with the integral actuator pneumatic port

Figure 9. Integral Actuator Pneumatic Port



3. Install the plug (1/4 NPT or G1/4, included in the mounting kit) to the external output pneumatic port A.
4. Attach the digital valve controller to the actuator mounting pad on the side that has the open pneumatic port. Be sure to place the O-ring between the digital valve controller's pneumatic output and the actuator mounting pad. Pneumatic tubing is not required because the air passages are internal to the actuator.

Note

Use a 5 mm hex key to attach the digital valve controller to the GX actuator mounting pad.

Use a 13 mm socket or box end wrench to attach the digital valve controller to the 667 size 30i -76i actuator mounting pad.

5. Check for clearance between the magnet assembly and the DVC7K feedback slot.
6. If not already installed, install a vent in the port on the upper diaphragm casing.
7. Proceed to Step 2—Connect the Pneumatic Tubing on page 17.

Note

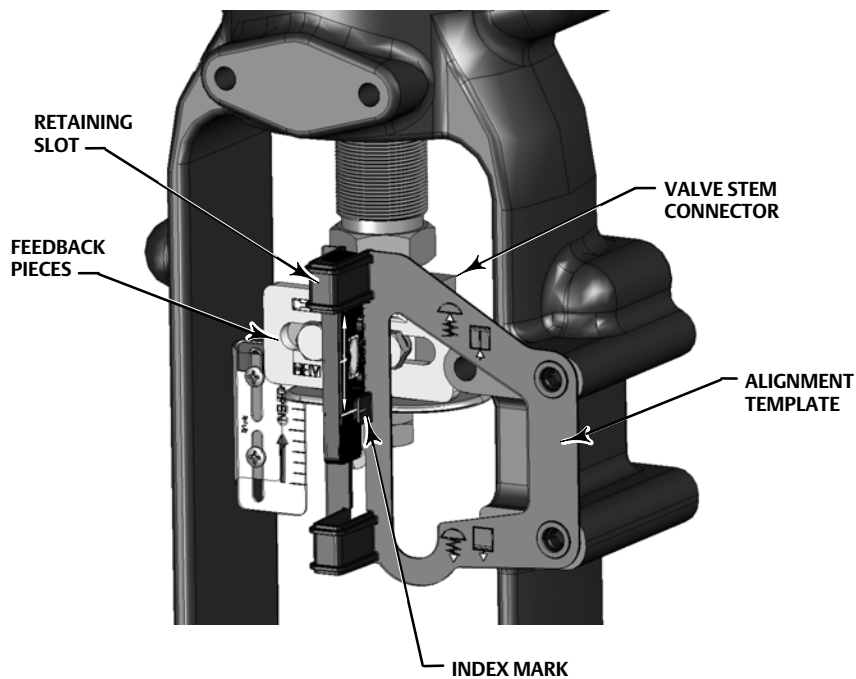
Refer to the 667 Diaphragm Actuator Sizes 30/30i - 76/76i and 87 instruction manual ([D100310X012](#)) for 667 product information.

Refer to the GX instruction manual ([D103175X012](#)) for GX product information.

Air-to-Close (657 size 30i - 70i and GX)

Vertically align the magnet assembly so that the center line of the alignment template is lined up as close as possible with the lower extreme of the valid travel range on the magnet assembly. The magnet assembly should be positioned so that the index mark on the pole pieces (back of the DVC7K housing) is within the valid range on the magnet assembly throughout the range of travel. See figure 10.

Figure 10. Air-to-Close Magnet Assembly Alignment



1. Tighten the fasteners and remove the alignment template.

Note

Use a flat end hex key to tighten the magnet assembly fasteners to a torque of 2.37 N•m (21 lbf•in) for 4 mm screws, and 5.08 N•m (45 lbf•in) for 5 mm screws. For added security, especially in vibrating services, blue (medium) threadlocker may be used on the fasteners.

2. Attach the digital valve controller to the actuator mounting pad.

Note

The plug (R1/8) from the back of the DVC7K housing must be installed for this application.

Use a 5 mm hex key to attach the digital valve controller to the GX actuator mounting pad.

Use a 13 mm socket or box end wrench to attach the digital valve controller to the 657 size 30i -70i actuator mounting pad.

3. Check for clearance between the magnet assembly and the DVC7K feedback slot.
4. Install tubing between the actuator casing and the appropriate DVC7K pneumatic output port.
5. If not already installed, install a vent in the port on the lower diaphragm casing or yoke.
6. Proceed to Step 2—Connect the Pneumatic Tubing on page 17.

Note

When field converting a GX actuator from air-to-close to air-to-open (or vice-versa), you will need to change the plugs for the pneumatic passages in the DVC7K housing.

- To convert to air-to-open, remove the R1/8 pneumatic plug on the back of the DVC7K housing and install an O-ring. Plug the external pneumatic output with a pipe plug (1/4 NPT for imperial, R 1/4 for metric). Refer to figure 9.
 - To convert to air-to-close, remove the external pneumatic plug. Install an R1/8 plug on the back of the DVC7K housing. Install tubing between the pneumatic output connection of the DVC7K to the pneumatic port on top of the actuator casing.
-

Note

Refer to the 657 Diaphragm Actuator Sizes 30/30i through 70/70i and 87 instruction manual ([D100306X012](#)) for 657 product information.

Refer to the GX instruction manual ([D103175X012](#)) for GX product information.

Quarter-Turn Rotary Actuators

Integral Mounted Fisher Actuators

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.
2. Verify that the appropriate cam is installed on the actuator as described in the instructions included with the mounting kit.

Figure 11. Mounting on Rotary Actuators

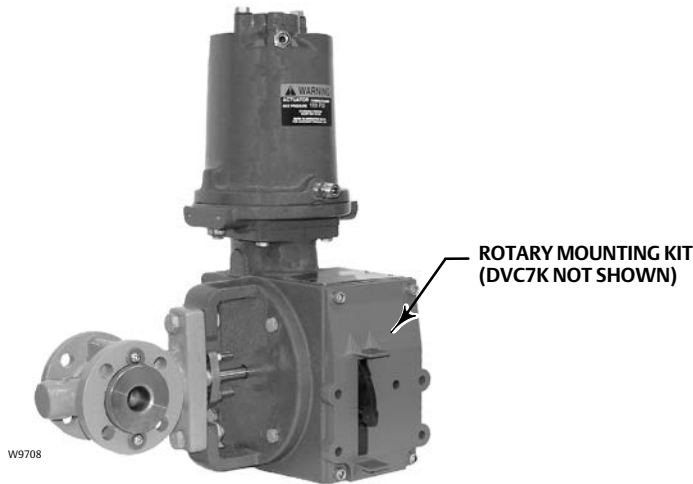
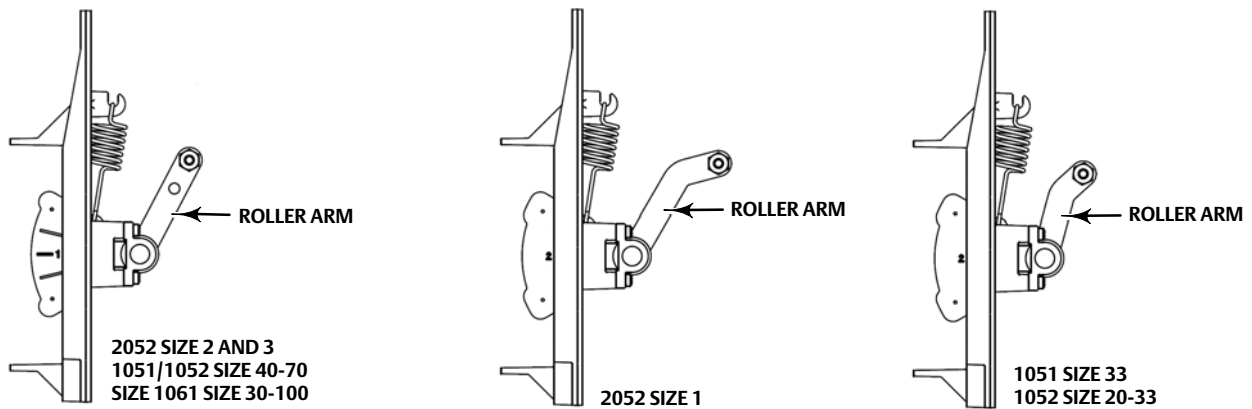


Figure 12. Rotary Actuator Mounting Variations



NOTE THE DIFFERENCE IN THE SHAPE AND LENGTH OF THE ROLLER ARM
E1229

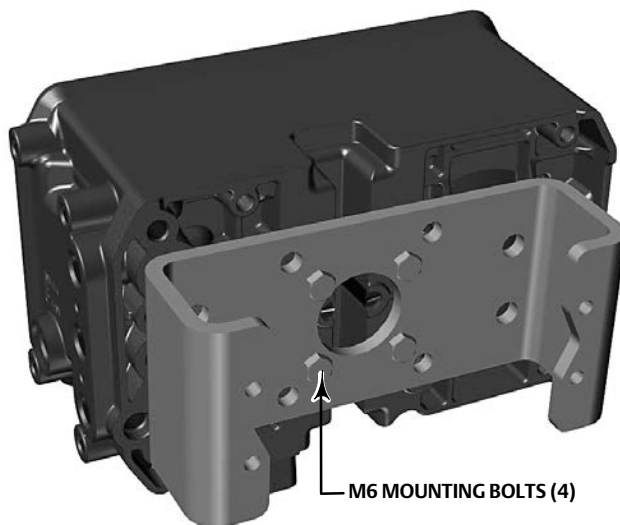
3. Mount the DVC7K on the actuator as follows:
 - If required, a mounting adaptor is included in the mounting kit. Attach the adaptor to the digital valve controller, then attach the digital valve controller assembly to the actuator. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.
 - If no mounting adaptor is required, attach the digital valve controller and mounting kit assembly to the actuator. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.
4. Proceed to Step 2—Connect the Pneumatic Tubing on page 17.

Bracket Mounted

The DVC7K digital valve controller can be mounted to any quarter-turn rotary actuator, as well as those that comply with the NAMUR guidelines. A mounting bracket and associated hardware are required. Refer to figure 13.

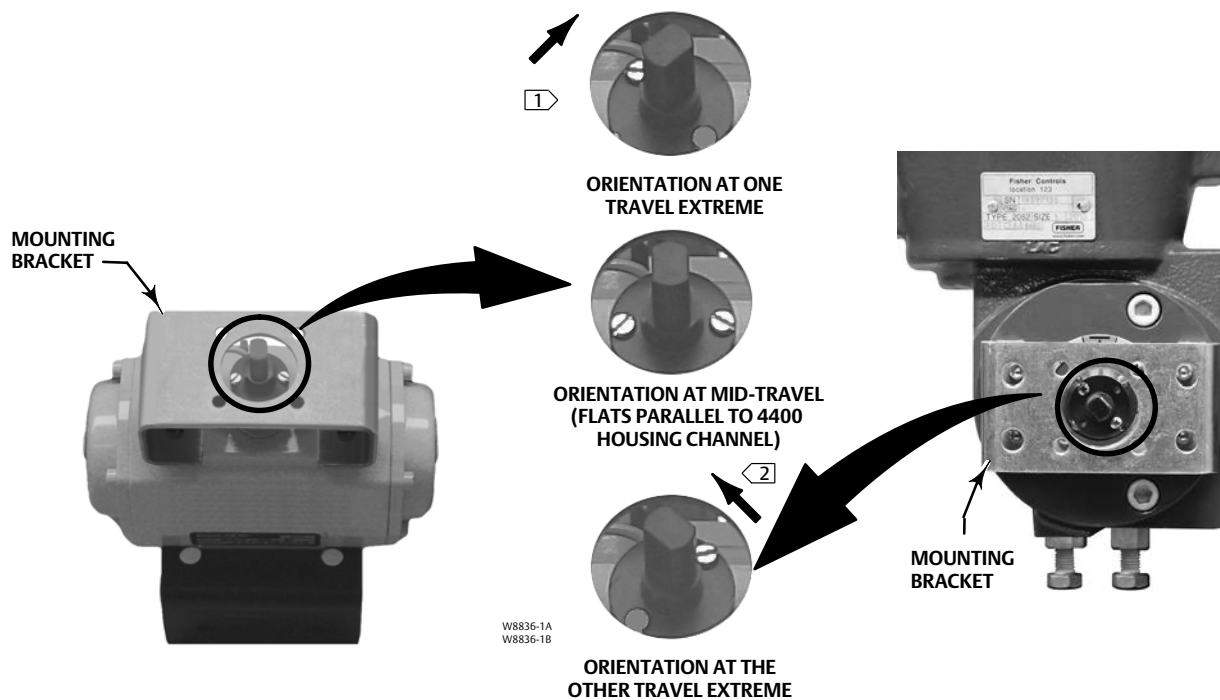
1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.

Figure 13. Mounting on Quarter-Turn Actuators



2. Attach the magnet assembly to the actuator shaft. At mid-travel, the flats on the magnet assembly should be approximately parallel to the channel on the back of the DVC7K housing, as shown in figure 14.
3. Install the mounting bracket on the actuator.
4. Attach the digital valve controller to the mounting bracket using the 4 mounting bolts, as shown in figure 13.
5. Check for clearance between the magnet assembly and the DVC7K feedback slot.
6. Proceed to Step 2—Connect the Pneumatic Tubing on page 17.

Figure 14. Magnet Assembly Orientation

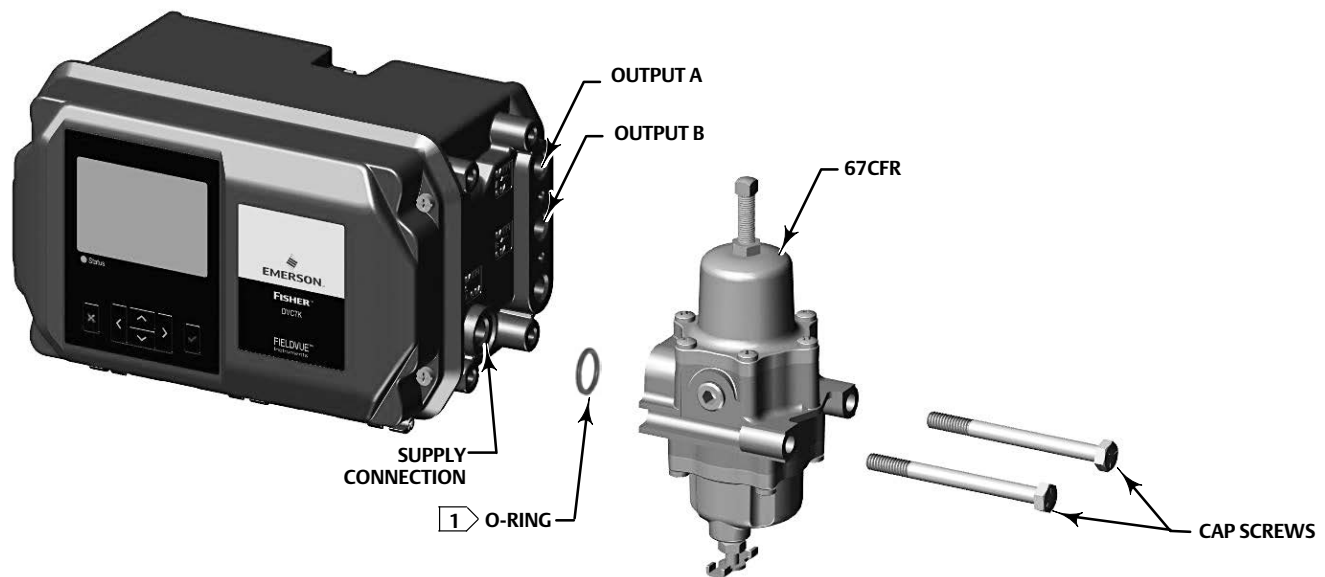


NOTES:

- 1 IF THE ACTUATOR IS STROKED ALL THE WAY TO THE RIGHT OR CLOCKWISE, ATTACH THE MAGNET ASSEMBLY SO IT POINTS TO THE UPPER RIGHT CORNER OF THE INSTRUMENT.
- 2 IF THE ACTUATOR IS STROKED ALL THE WAY TO THE LEFT OR COUNTERCLOCKWISE, ATTACH THE MAGNET ASSEMBLY SO IT POINTS TO THE UPPER LEFT CORNER OF THE INSTRUMENT.

Step 2—Connect the Pneumatic Tubing

Figure 15. Integral Mounting of a Fisher 67CFR Regulator on a FIELDVUE DVC7K Digital Valve Controller



NOTE:

1 APPLY LUBRICANT

NOTICE

Do not use sealing tape on pneumatic connections. This instrument contains small passages that may become obstructed by detached sealing tape. Thread sealant paste should be used to seal and lubricate pneumatic threaded connections.

1. If installing the optional pneumatic gauge block, ensure only the alternate supply port is plugged. If direct-acting, the output B port must also be plugged and if reverse-acting, the output A port must also be plugged. The remaining pneumatic ports must be plugged. Refer to figure 16.

Attach the pneumatic gauge block with the four socket head cap screws. Refer to figure 17.

Lastly, screw on the gauges.

If direct-acting, the output B port must be plugged and if reverse-acting, the output A port must be plugged. Refer to figure 18. Additionally, the alternative output A and alternative output B ports must also be plugged. Refer to figures 19, 20, and 21.

Figure 16. DVC7K Digital Valve Controller Pneumatic Port Schematic

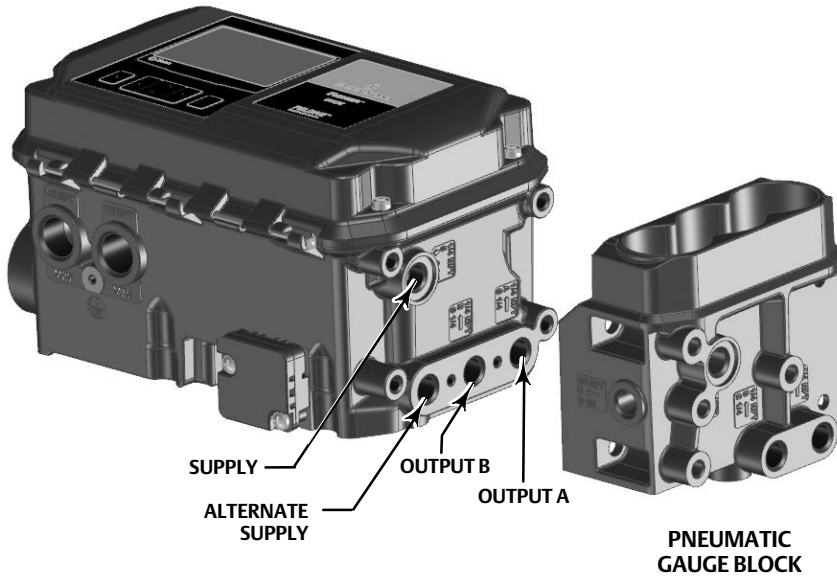


Figure 17. Pneumatic Gauge Block Mounting Screws

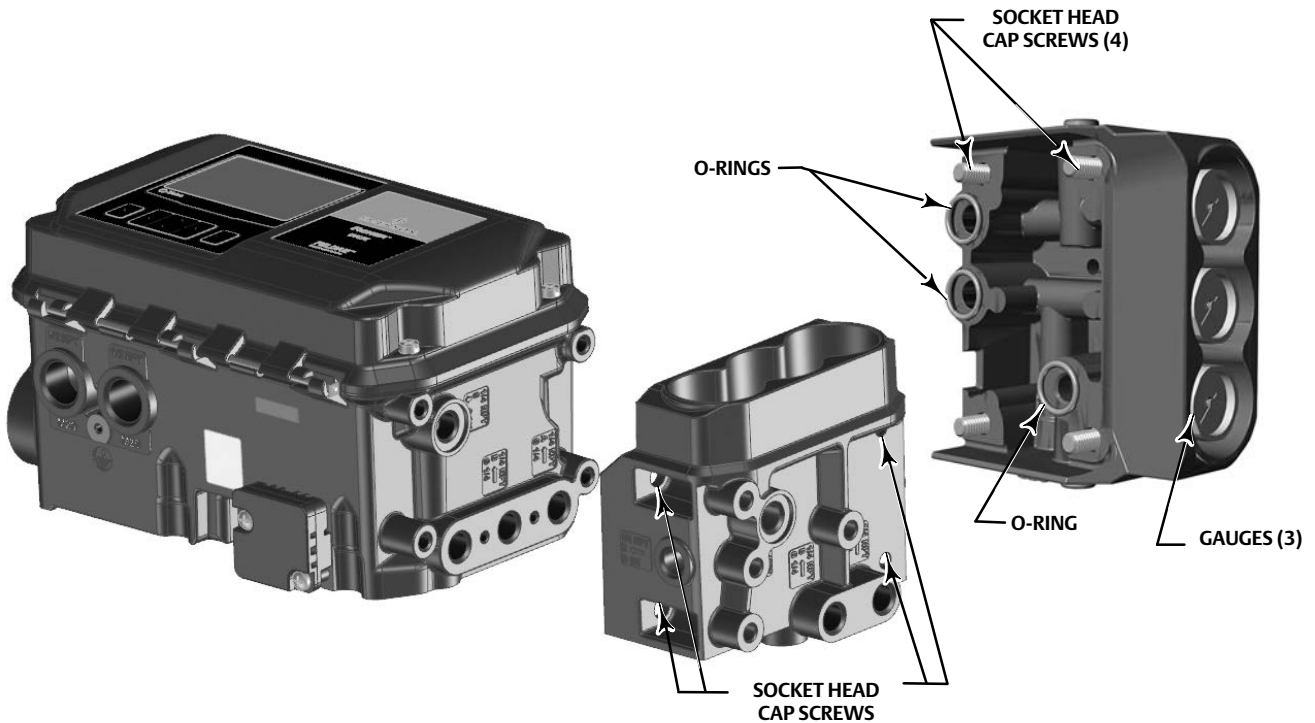


Figure 18. Pneumatic Gauge Block Pneumatic Port Schematic

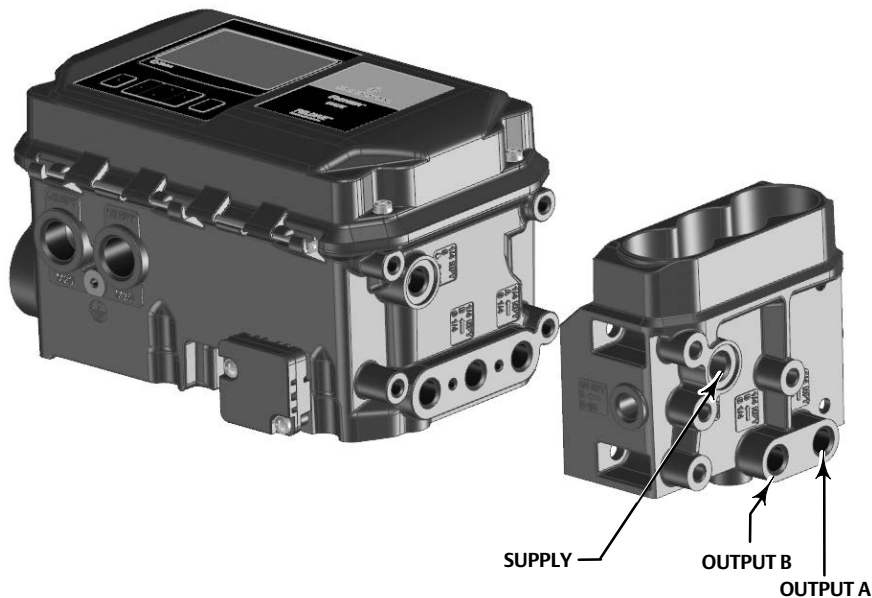


Figure 19. Top View: Pneumatic Port, Alternative Output A

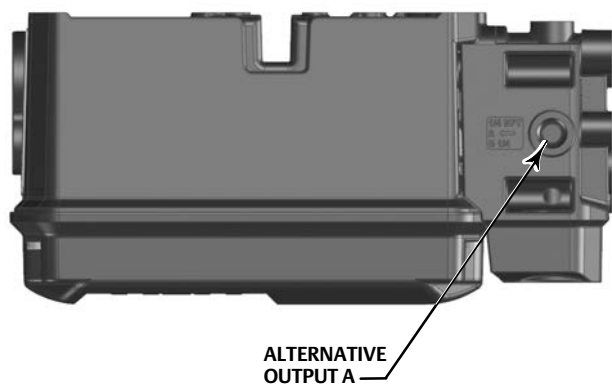


Figure 20. Back View: Alternative Output A and Output B Ports

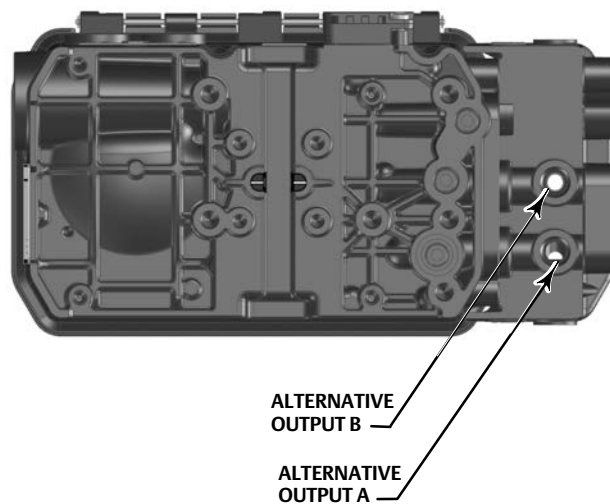
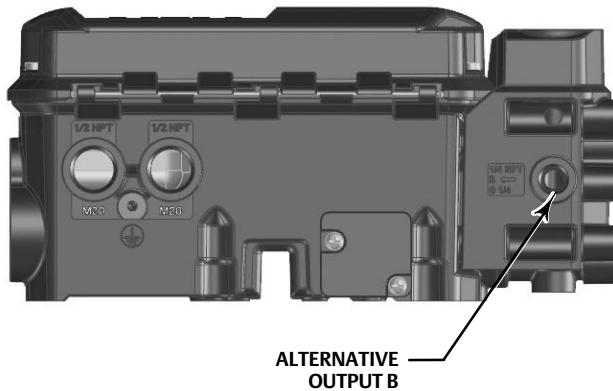


Figure 21. Bottom View: Pneumatic Port, Alternative Output B



2. Connect the DVC7K pneumatic output to the actuator input using at least 10 mm (3/8-inch) diameter tubing.
 - When using a single-acting direct digital valve controller (relay A or C) on a single-acting actuator, connect OUTPUT A to the actuator pneumatic input.
 - When using a single-acting reverse digital valve controller (relay B) on a single-acting actuator, connect OUTPUT B to the actuator diaphragm casing.
 - When using a double-acting digital valve controller (relay A) on a double-acting actuator, connect OUTPUT A and OUTPUT B to the appropriate actuator pneumatic input. With no input current to the DVC7K, OUTPUT A is at zero pressure and OUTPUT B is at full supply pressure when the relay is properly adjusted.

Note

To have the actuator stem extend from the cylinder with increasing input signal, connect OUTPUT A to the actuator cylinder connection farthest from the actuator stem. Connect OUTPUT B to the cylinder connection closest to the actuator stem. To have the actuator stem retract into the cylinder with increasing input signal, connect OUTPUT A to the actuator cylinder connection closest to the actuator stem. Connect OUTPUT B to the cylinder connection farthest from the actuator stem.

Note

Solenoid valves placed between the output of a DVC7K digital valve controller and the input to an actuator require a minimum C_v of 0.49. Greater restrictions can affect the response of the assembly.

⚠ WARNING

Supply medium must be clean, dry, oil-free, and noncorrosive and meet the requirements of ISA Standard 7.0.01 or ISO 8573-1.

Severe personal injury or property damage may occur from an uncontrolled process if the instrument supply medium is not clean, dry, oil-free, and noncorrosive. While use and regular maintenance of a filter that removes particles larger than 40 micrometers in diameter will suffice in most applications, further filtration down to 5 micrometer particle size is recommended. Lubricant content is not to exceed 1 ppm weight (w/w) or volume (v/v) basis. Condensation in the air supply should be minimized.

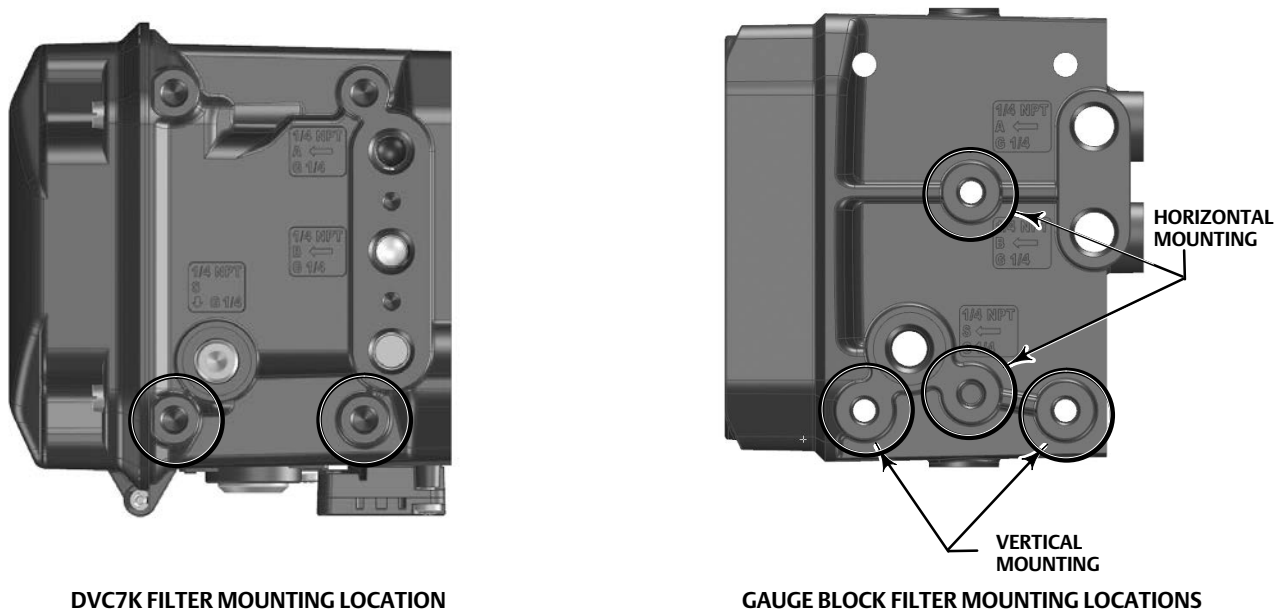
Check with an Emerson field office and industry instrument air quality standards for use with corrosive air or if you are unsure about the amount of air filtration or filter maintenance.

When using natural gas as the supply medium, or for hazardous location applications, the following warnings also apply:

- Remove electrical power before removing the housing cap. Personal injury or property damage from fire or explosion may result if power is not disconnected before removing the cap.
- Remove electrical power before disconnecting any of the pneumatic connections.
- When disconnecting any of the pneumatic connections or any pressure retaining part, natural gas will seep from the unit and any connected equipment into the surrounding atmosphere. Personal injury or property damage may result from fire or explosion if natural gas is used as the supply medium and appropriate preventive measures are not taken. Preventive measures may include, but are not limited to, one or more of the following: ensuring adequate ventilation and the removal of any ignition sources.
- Ensure that all caps and covers are correctly installed before putting this unit back into service. Failure to do so could result in personal injury or property damage from fire or explosion.

3. Connect a filter or filter regulator to the DVC7K supply input using at least 10 mm (3/8-inch) diameter tubing. Integral mounted 67CFR filter regulators will be mounted vertically. However, if the pneumatic gauge block is installed, you are able to mount a 67CFR filter regulator vertically or horizontally. Filter mounting locations are shown in figure 22.

Figure 22. Filter Mounting Locations



- When using an integral mounted 67CFR filter regulator, lubricate an O-ring and insert it in the recess around the SUPPLY connection on the digital valve controller. Attach the filter regulator to the side of the digital valve controller. Thread a 1/4-inch socket-head pipe plug into the unused outlet on the filter regulator. This is the standard method of mounting the filter regulator. No tubing is required.
- When using a yoke mounted 67CFR filter regulator, mount the filter regulator with two cap screws to the pre-drilled and tapped holes in the actuator yoke. Thread a 1/4-inch socket-head pipe plug into the unused outlet on the filter regulator. No O-ring is required.
- When using a casing mounted filter regulator, use a separate casing mounting bracket (typically provided with the filter regulator). Attach the mounting bracket to the filter regulator and then attach this assembly to the actuator casing. Thread a 1/4-inch socket-head pipe plug into the unused outlet on the filter regulator. No O-ring is required.
- If the supply pressure is less than the maximum actuator and instrument pressure rating, a regulator is not required. However, a filter is always required. Attach the filter securely to the actuator or instrument.

⚠ WARNING

Personal injury or property damage can occur from cover failure due to overpressure. Ensure that the housing vent opening is open and free of debris to prevent pressure buildup under the cover.

This unit vents the supply medium into the surrounding atmosphere. When installing this unit in a non-hazardous (non-classified) location in a confined area, with natural gas as the supply medium, you must remotely vent this unit to a safe location. Failure to do so could result in personal injury or property damage from fire or explosion, and area re-classification.

When installing this unit in a hazardous (classified) location remote venting of the unit may be required, depending upon the area classification, and as specified by the requirements of local, regional, and national codes, rules and regulations. Failure to do so when necessary could result in personal injury or property damage from fire or explosion, and area re-classification.

In addition to remote venting of the unit, ensure that all caps and covers are correctly installed. Failure to do so could result in personal injury or property damage from fire or explosion, and area re-classification.

4. If necessary, remove the vent assembly (figure 23) on the DVC7K and install a pipe-away block over the existing O-ring. Then install a pipe-away vent line using at least 12.7 mm (1/2-inch) diameter tubing. The vent line must be as short as possible with a minimum number of bends and elbows to prevent back pressure build-up.

Note

Ensure that a bug screen is installed at the open end of the pipe-away vent.

Figure 23. Vent Connections



STANDARD VENT

PIPE-AWAY BLOCK

⚠ WARNING

To avoid personal injury or property damage resulting from bursting or parts, do not exceed maximum supply pressure. Personal injury or property damage may result from fire or explosion if natural gas is used as the supply medium and appropriate preventive measures are not taken. Preventive measures may include, but are not limited to, one or more of the following: Remote venting of the unit, re-evaluating the hazardous area classification, ensuring adequate ventilation, and the removal of any ignition sources.

5. Connect the pneumatic supply line to the filter regulator.

Note

If using a solenoid valve in addition to the digital valve controller, install the solenoid valve in the pneumatic path between the digital valve controller output and the actuator input.

6. Proceed to Step 3—Connect the Electrical Wires on page 24.

Step 3—Connect the Electrical Wires

⚠ WARNING

Select wiring and/or cable glands that are rated for the environment of use (such as hazardous area, ingress protection and temperature). Failure to use properly rated wiring and/or cable glands can result in personal injury or property damage from fire or explosion.

Wiring connections must be in accordance with local, regional, and national codes for any given hazardous area approval. Failure to follow the local, regional, and national codes could result in personal injury or property damage from fire or explosion.

To avoid personal injury resulting from electrical shock, do not exceed maximum input voltage specified on the product nameplate. If the input voltage specified differs, do not exceed the lowest specified maximum input voltage.

Personal injury or property damage caused by fire or explosion may occur if electrical connections are attempted in a potentially explosive atmosphere or in an area that has been classified as hazardous. Confirm that area classification and atmosphere conditions permit safely exposing the terminal box before proceeding

The valve may move in an unexpected direction when power is applied to the digital valve controller. To avoid personal injury and property damage caused by moving parts, keep hands, tools, and other objects away from the valve/actuator assembly when applying power to the instrument.

Refer to the DVC7K instruction manual (D104767X012) for additional information.

The digital valve controller is normally powered by a control system output channel. Shielded cable will ensure proper operation in electrically noisy environments.

Wire the digital valve controller as follows, refer to figure 24 and 26:

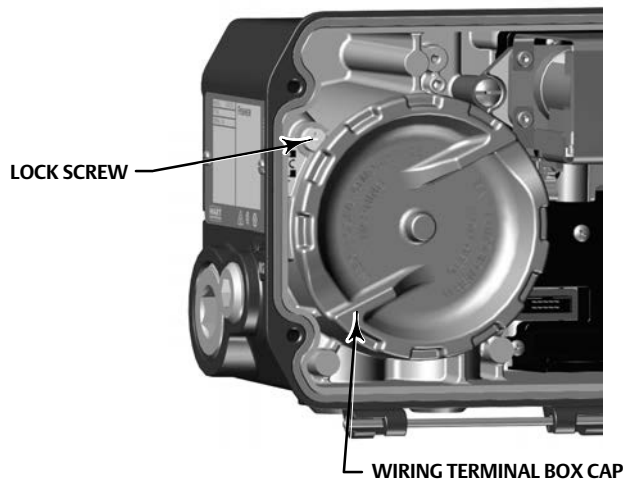
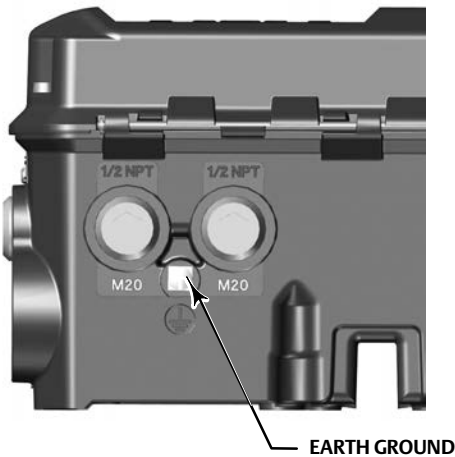
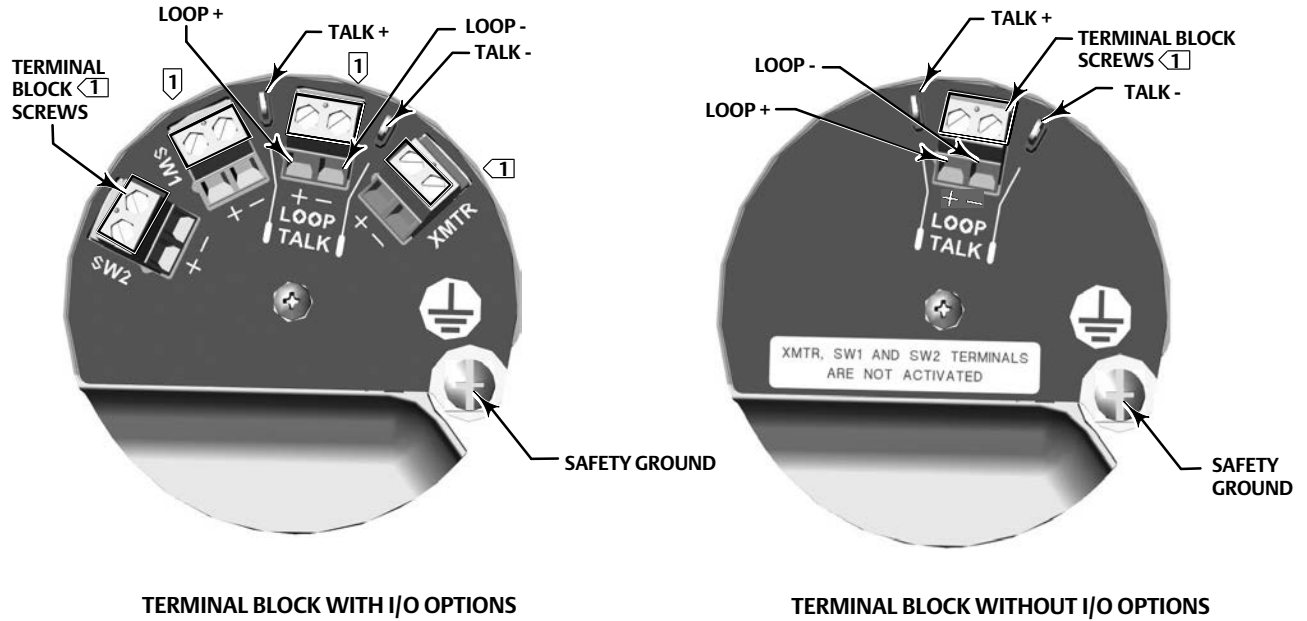
1. Unscrew the four screws and open the front cover.
2. If your digital valve controller is explosion proof (ExD) turn the lock screw counterclockwise to unlock the cap so the cap can be unscrewed from the terminal box. For intrinsically safe (IS) digital valve controllers, there is no terminal box cap to remove.
3. Bring the field wiring into the terminal box. When applicable, install conduit using local and national electrical codes which apply to the application. Ensure all unused conduit entries are plugged.
4. Connect the control system output channel positive wire to the LOOP + screw terminal in the terminal box. Connect the control system output channel negative (or return) wire to the LOOP - screw terminal in the terminal box.

⚠ WARNING

Personal injury or property damage, caused by fire or explosion, can result from the discharge of static electricity. Connect a 14 AWG (2.08 mm²) ground strap between the digital valve controller and earth ground when flammable or hazardous gases are present. Refer to national and local codes and standards for grounding requirements.

5. As shown in figure 24, two ground terminals are available for connecting a safety ground, earth ground, or drain wire. The safety ground is electrically identical to the earth ground. Make connections to these terminals following national and local codes and plant standards.

Figure 24. Connections and Grounds



NOTE:
 [1] TIGHTEN TERMINAL BLOCK SCREWS TO A MAXIMUM TORQUE OF 0.79 N•m (7 lbf•in).

Note

Depending on the control system you are using, an HF340 HART® filter may be needed to allow HART communication. The HART filter is a passive device that is inserted in field wiring from the HART loop. The filter is normally installed near the field wiring terminals of the control system I/O. Its purpose is to effectively isolate the control system output from modulated HART communication signals and raise the impedance of the control system to allow HART communication. For more information on

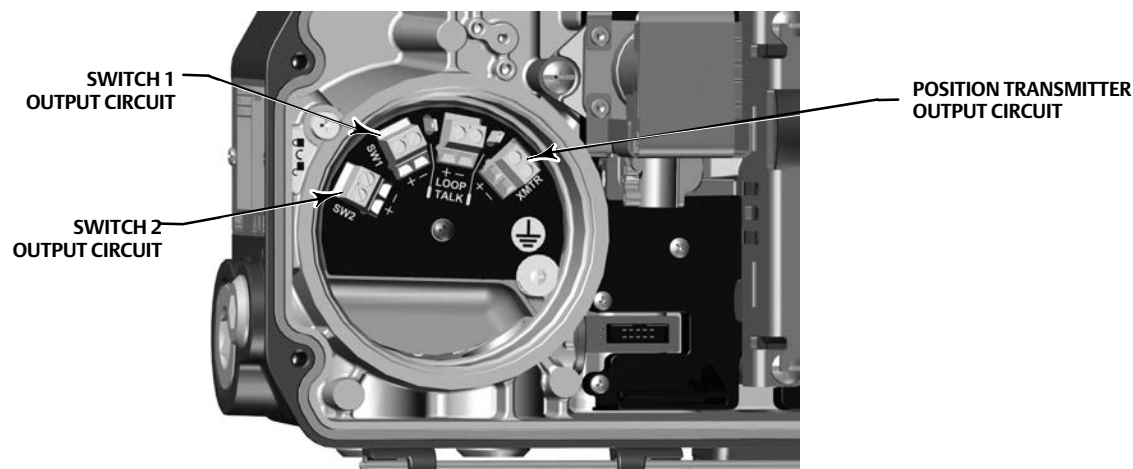
the description and use of the HART filter, refer to the HF340 HART filter instruction manual ([D102796X012](#)). To determine if your system requires a HART filter refer to the DVC7K instruction manual (D104767X012) or contact your [Emerson sales office](#).

6. If your digital valve controller is explosion proof (ExD) screw the terminal cap back onto the terminal box until no gap remains and then tighten the lock screw (clockwise).
7. Close the front cover and screw in the four screws.
8. For applications that require a Position Transmitter or Discrete Switch continue below. If a THUM Adapter is required, proceed to page 28. Otherwise, proceed to Step 4—Configure the Digital Valve Controller on page 31.

I/O Options: Position Transmitter and Two Discrete Switches

If the DVC7K HART communicating device was purchased with I/O options, the device has an optional output circuit for a 4-20 mA position transmitter and two solid state dry contact switches that can be configured as limit or alert switches. Switch 1 is a normally open circuit and Switch 2 is a normally closed circuit. The output circuits must be enabled with a user interface tool or the Local User Interface (LUI).

Figure 25. I/O Options: 4-20 mA Position Transmitter and Two Solid State Dry Contact Switches



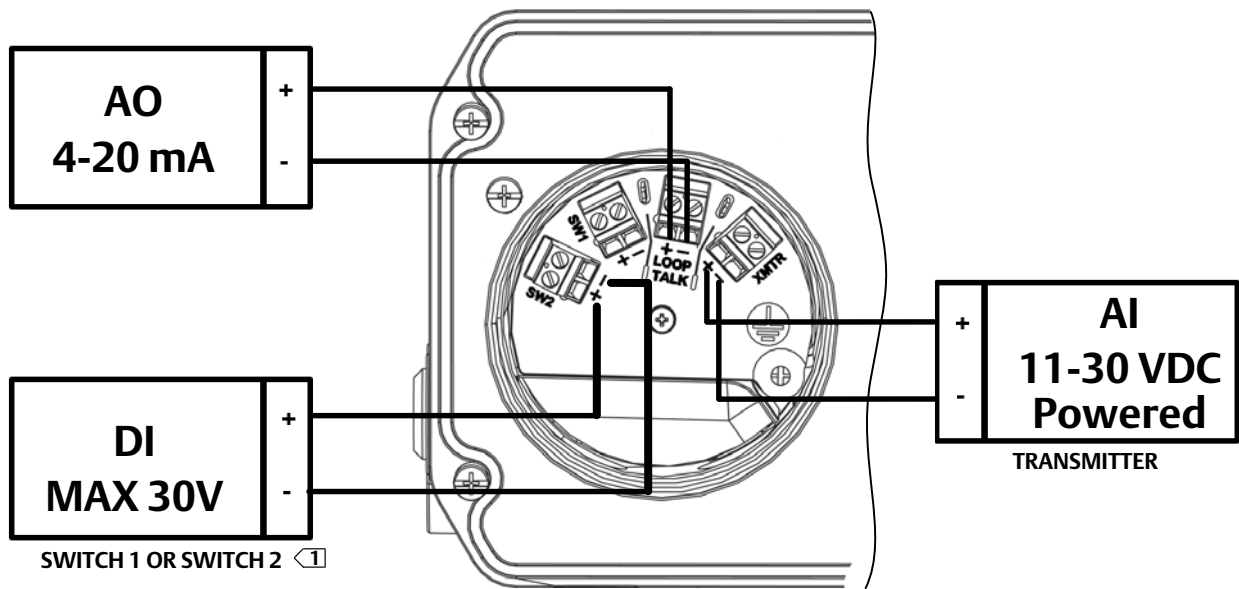
The position transmitter circuit derives its operating power from the control system input channel in the same manner as a 2-wire transmitter.

Each discrete switch is a solid state circuit (1-amp maximum) which opens and closes based on a user configurable trip point. The trip point can be based on valve travel anywhere within the calibrated travel range, or based on a device alert. In order for the switch output to function, the digital valve controller must be powered. If power is lost, Switch 1 will always go to the open state and Switch 2 will always go to the closed state. The output circuit, whether operating as a transmitter or switch, is galvanically isolated from the position control loop circuit such that different ground references between the two circuits are allowed.

Wire the position transmitter and two output switch terminals as follows (refer to figure 26):

1. Route the field wiring into the terminal box through the conduit connection.
2. When applicable, install conduit using any local and national electrical codes that apply to the connection.
3. If adding a position transmitter, connect the control system input channel positive wire to the XMTR (+) terminal. Connect the control system input channel negative wire to the XMTR (-) terminal.
4. If adding a switch for a normally open circuit, connect the control system input channel positive wire to the SW1 (+) terminal. Connect the control system input channel negative wire to the SW1 (-) terminal.
5. If adding a switch for a normally closed circuit, connect the control system input channel positive wire to the SW2 (+) terminal. Connect the control system input channel negative wire to the SW2 (-) terminal.
6. Replace and hand tighten the cover on the terminal box.
7. Proceed to Step 4—Configure the Digital Valve Controller on page 31.

Figure 26. FIELDVUE DVC7K with Position Transmitter and Discrete Switch, Field Wiring Schematic



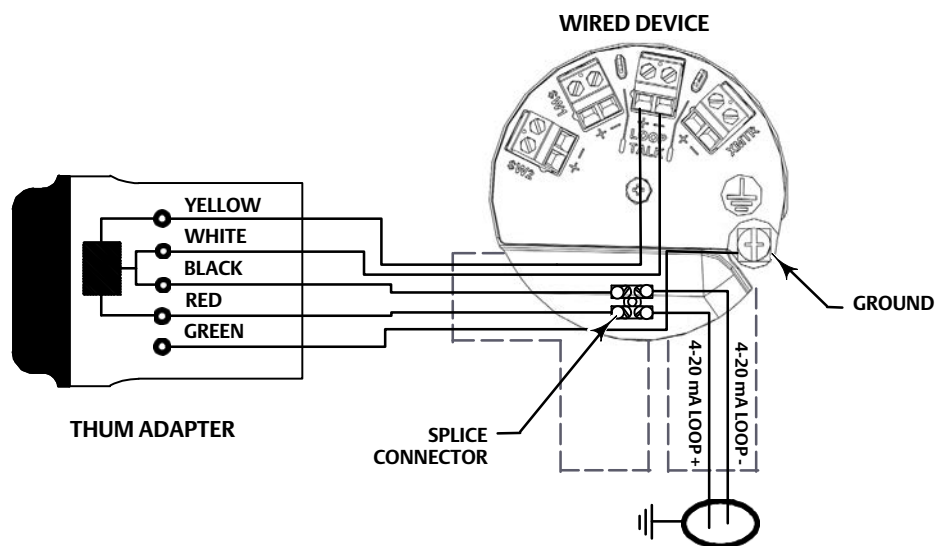
NOTE:
1 SWITCH 2 WIRING SHOWN

Smart Wireless THUM Adapter

Refer to the Smart Wireless THUM Adapter quick installation guide ([00825-0100-4075](#)) for additional information.

1. Remove the DVC7K terminal box plug from the conduit entrance.
2. Thread the THUM Adapter into the conduit entrance.
3. Using the wire splice included with the THUM Adapter (or other suitable wire splice), connect the wires as shown in figure 27 below.

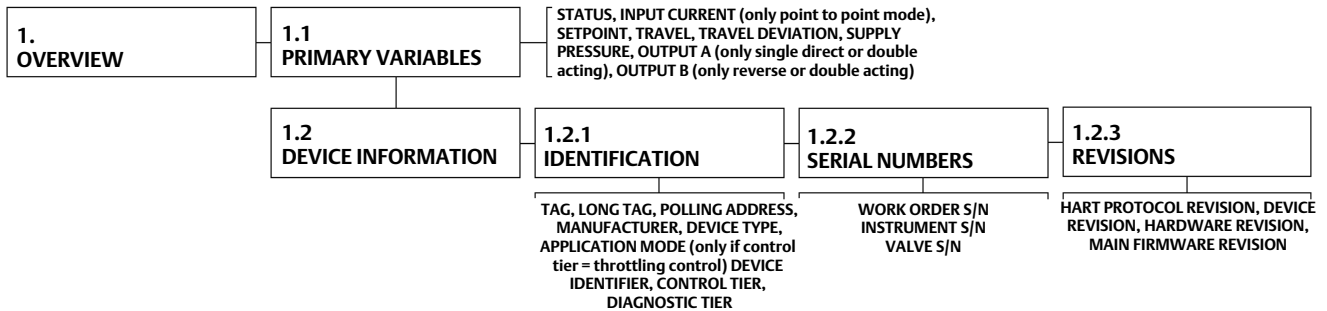
Figure 27. Wiring the THUM Adapter



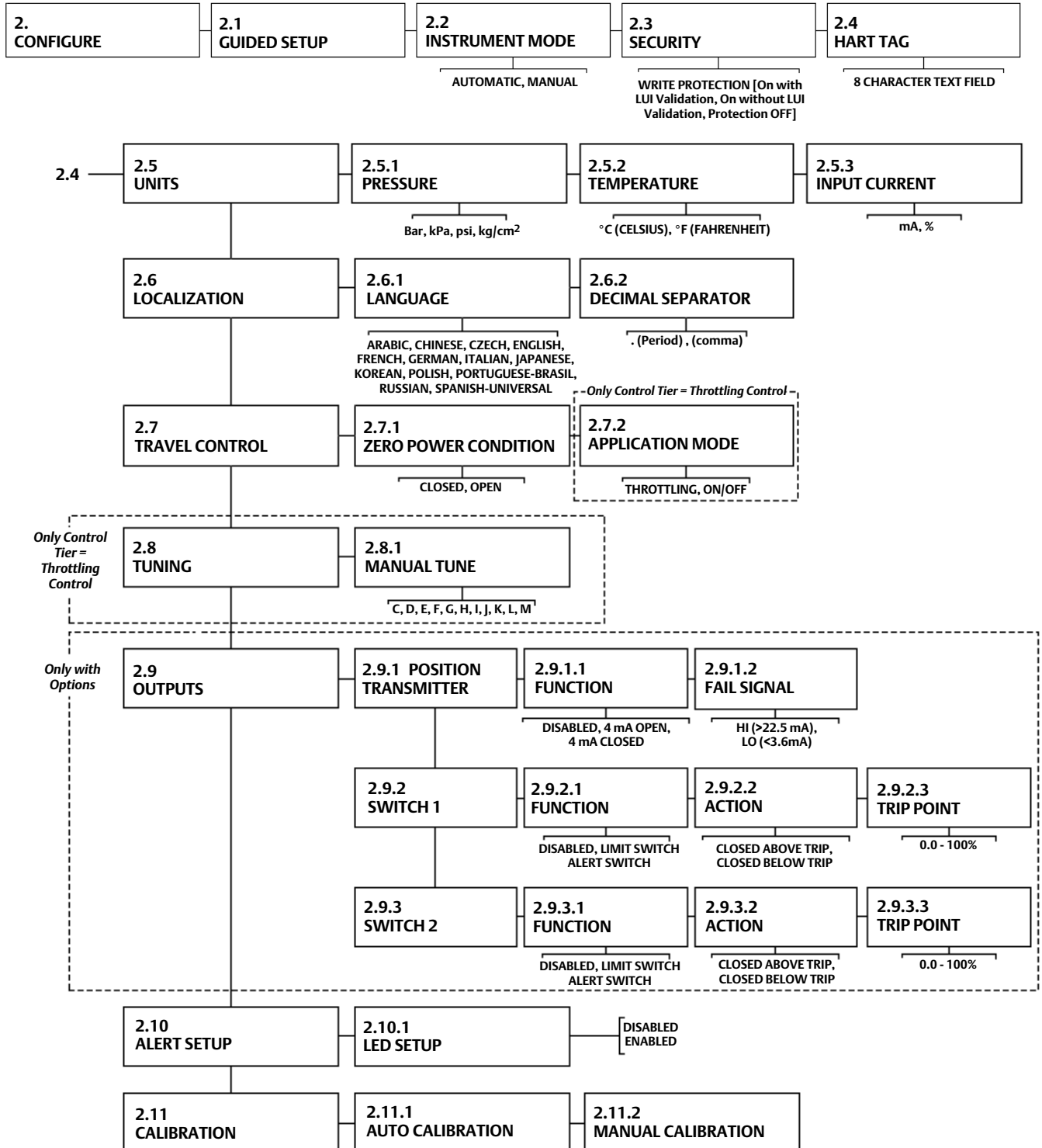
4. Carefully coil the wires inside the terminal box.
5. Replace and hand tighten the cover on the terminal box (if an explosion proof digital valve controller).
6. Close and screw on the front cover.
7. Proceed to Step 4—Configure the Digital Valve Controller on page 31.

Local User Interface (LUI) Flow Chart

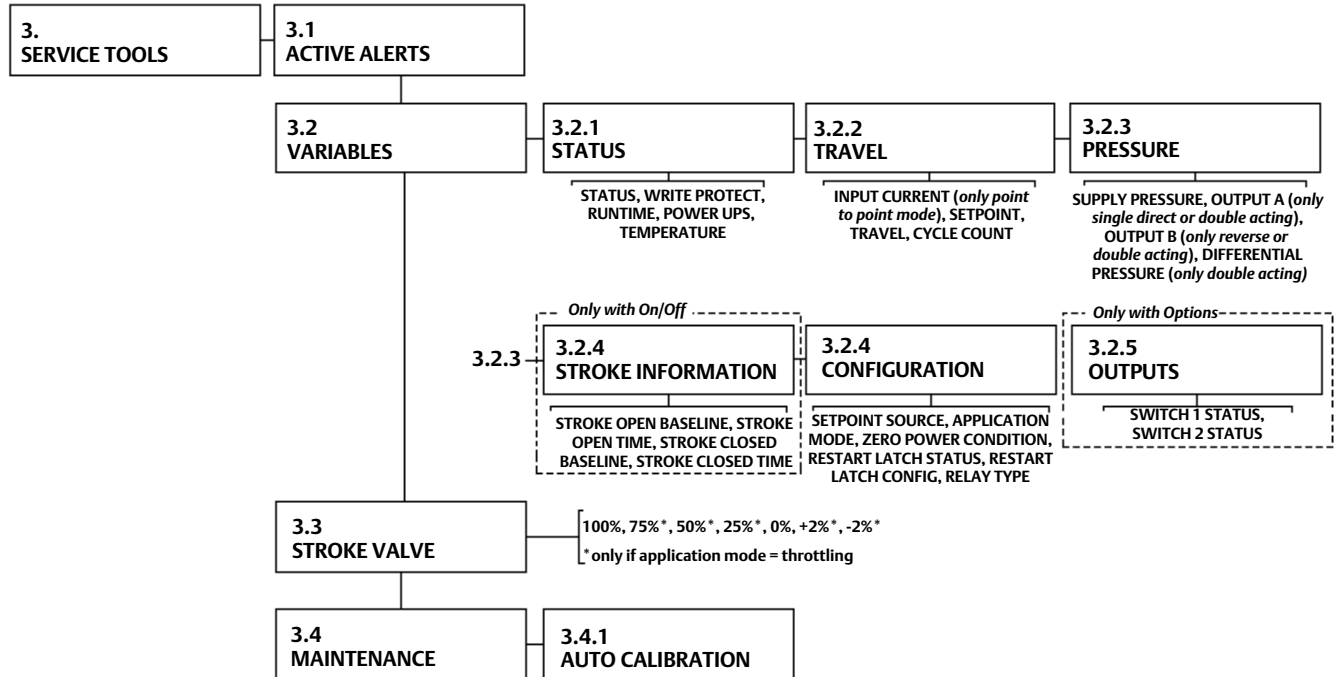
Overview



Configure



Service Tools



Step 4—Configure the Digital Valve Controller

Configuration Using the LUI

The LUI consists of a display, six pushbuttons, and a multi-color LED indicator. The LUI is field configurable to one of 13 different languages (shown in table 2.) The instrument must be powered with at least 10 volts and 3.8 mA to operate the LUI.

Note

The instrument must be powered with at least 10.5 volts for HART communication.

⚠ WARNING

When accessing the terminals or pushbuttons, proper means of electrostatic discharge protection is required. Failure to provide appropriate protection can cause the valve to move and may result in personal injury or property damage.

Status Information

The first (home) screen on the LUI that is displayed after applying power to the instrument contains basic status information. On an instrument that is calibrated and operating properly, the home screen, shown in figure 28, displays the following information:

1. Status Icon
2. Tag
3. Instrument Mode
4. Travel Setpoint
5. Travel

Figure 28. LUI Home Screen



Guided Setup

Local User Interface	2. Configure > 2.1 Guided Setup
----------------------	---------------------------------

⚠ WARNING

- Select wiring and/or cable glands that are rated for the environment of use (such as hazardous area, ingress protection and temperature). Failure to use properly rated wiring and/or cable glands can result in personal injury or property damage from fire or explosion.
- Wiring connections must be in accordance with local, regional, and national codes for any given hazardous area approval. Failure to follow the local, regional, and national codes could result in personal injury or property damage from fire or explosion.
- To avoid personal injury resulting from electrical shock, do not exceed maximum input voltage specified on the product nameplate. If the input voltage specified differs, do not exceed the lowest specified maximum input voltage.
- Personal injury or property damage caused by fire or explosion may occur if electrical connections are attempted in a potentially explosive atmosphere or in an area that has been classified as hazardous. Confirm that area classification and atmosphere conditions permit the safe removal of the terminal box cover before proceeding.

- **The valve may move in an unexpected direction when power is applied to the digital valve controller. To avoid personal injury and property damage caused by moving parts, keep hands, tools, and other objects away from the valve/actuator assembly when applying power to the instrument.**
- **While configuring the digital valve controller the valve may move, causing process fluid or pressure to be released. To avoid personal injury and property damage caused by the release of process fluid or pressure, isolate the valve from the process and equalize pressure on both sides of the valve or bleed off the process fluid.**
- **Changes to the instrument setup may cause changes in the output pressure or valve travel. Depending on the application, these changes may upset process control, which may result in personal injury or property damage.**

Note

Before proceeding, check that all pressure connections, fasteners, and plugs are installed and tightened.

Note

The Instrument Mode must be in Manual and Write Protect must be disabled to run Guided Setup.

When the DVC7K digital valve controller is ordered as part of a control valve assembly, the factory mounts the digital valve controller and sets up the instrument as specified on the order. When mounting to a valve in the field, the instrument needs to be setup to match the instrument to the valve and actuator. Ensure the instrument is correctly mounted and powered electrically and pneumatically before beginning Guided Setup.

To quickly set up the instrument, Guided Setup walks you through the following procedures:

1. Select the Language (LUI only)

You will be prompted to select the preferred language for the LUI only when Guided Setup is run from restart. The DVC7K digital valve controller is field configurable to one of 13 different languages, shown in table 2. Units are selected based on the language selected.

Table 2. Language Options

Language	Firmware Revision 1
Arabic	X
Chinese	X
Czech	X
English	X
French	X
German	X
Italian	X
Japanese	X
Korean	X
Polish	X
Portuguese	X
Russian	X
Spanish	X

2. Provide Construction Information

You will be prompted to remove Write Protection if it's enabled and then set the Instrument Mode to Manual if currently in Automatic.

Configure the unique parameters for the actuator, instrument, and accessory construction. Select if factory defaults should be applied.

3. Relay Adjustment (Relay A only)

If the digital valve controller has a Relay A (for double-acting or single-acting direct applications) and needs a relay adjustment, you will be led through a guided Relay Adjust method. For double-acting actuators, the valve must be near mid-travel to properly adjust the relay.

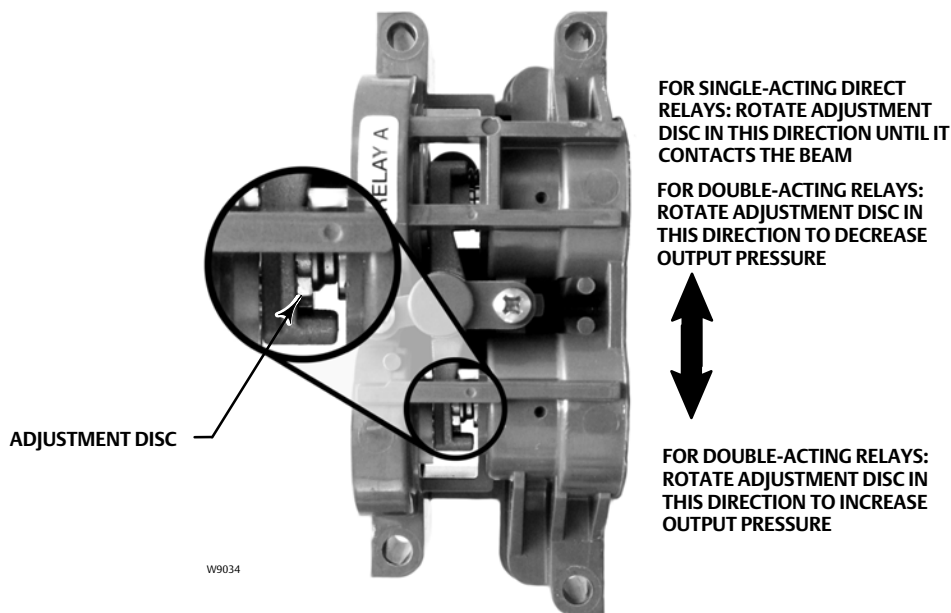
Note

A label affixed to the relay itself will specify the relay type.

Relay B (for single-acting reverse applications) and Relay C (for single-acting direct applications) are calibrated at the factory and requires no further adjustment.

Rotate the adjustment disc, shown in figure 4-1, until the output pressure displayed is between 50 and 70% of supply pressure. This adjustment is very sensitive. Be sure to allow the pressure reading to stabilize before making another adjustment (stabilization may take up to 30 seconds or more for large actuators). If the low bleed relay option has been ordered stabilization may take approximately two minutes longer than the standard relay.

Figure 29. Relay A Adjustment (Shroud Removed for Clarity)



Note

Care should be taken during relay adjustment as the adjustment disc may disengage if rotated too far.

4. Calibrate

⚠ WARNING

During calibration the valve will move full stroke. To avoid personal injury and property damage caused by the release of pressure or process fluid, isolate the valve from the process and equalize pressure on both sides of the valve or bleed off the process fluid.

Auto Calibration is then used to establish the limits of physical travel. During this process, the valve will fully stroke from one travel extreme to the other. If the Zero Power Condition is not known, at the low drive endpoint you will be prompted to input whether the valve is closed to determine the Zero Power Condition.

If Auto Calibration fails to find the travel endpoints, you will be prompted to manually calibrate them.

5. Apply Custom Configuration

If a custom configuration was purchased when the digital valve controller was ordered, you have the option to apply those custom defaults.

Note

This only applies to Custom Configuration specified at time of order.

6. Return to the Previous State

If the Instrument Mode was changed to Manual to perform Guided Setup, you will be prompted to return the Instrument Mode to Automatic. If Write Protection was disabled, you will be prompted to reenable the Write Protection.

Configuration using an Emerson Handheld Communicator

Handheld Communicator | Device Setting > Setup Overview > Guided Setup

1. Install the latest version of the communication software on the user interface tool. This may include Device Descriptions (DD, EDD), or Device Type Manager (DTM).

Contact your [Emerson sales office](#) to ensure that you have the latest software version or for information on locating the necessary files.

2. Apply pneumatic supply pressure to the digital valve controller and adjust the supply pressure regulator according to the actuator requirements and limitations.
3. Apply electrical power to the digital valve controller.
4. Establish communication with the digital valve controller and commission the instrument as described in the host system documentation.

Note

If the TALK terminals on the digital valve controller are to be used for communication, remove the front cover and terminal box cap (if Explosion Proof) to access the terminals.

5. Launch the user interface tool.
6. Perform Guided Setup to configure and calibrate the instrument on the control valve assembly.
7. Enter any additional custom configuration items (optional).

Note

On HART devices with the optional transmitter and switch options, you must enable and configure the output terminals. The configuration is disabled by default from the factory.

8. To enable the digital valve controller to follow set point, place the instrument in Automatic (HART devices).

For information on installation and usage of DVC7K digital valve controllers, visit the Fisher channel on YouTube and search for FIELDVUE.

<http://www.youtube.com/user/FisherControlValve>

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