Fisher® FIELDVUE™ DVC6000 SIS Series Digital Valve Controllers for Safety Instrumented System (SIS) Solutions

This manual applies to:

DVC6000 SIS Digital Valve Controllers			*375 Field Communicator*
Device Revision	*Firmware Revision*	*Hardware Revision*	*Device Description Revision*
2	*7*	*1*	*1*

Fast-Key Sequence

Function/Variable	Fast-Key Sequence	Coordinates[1]
Actuator Style	1-2-6-4	4-D
Alert Conditions	2-1	2-E
Alert Record Full Enable	1-2-3-7-2	8-F
Alert Record Not Empty Alert Enable	1-2-3-7-1	8-F
Analog Input	3-1	2-F
Analog Input Calibration	1-3-2-3	4-E
Analog Input Range Hi	1-2-5-3-1	6-H
Analog Input Range Lo	1-2-5-3-2	6-H
Analog Input Units	1-2-5-2-3	6-H
Auto Test Interval	1-2-7-3	3-D
Auto Travel Calibration	1-3-1-1	4-E
Autocalibration in Progress Enable	1-2-4-2-2	8-H
Auxiliary Input	3-6-1	5-G
	1-2-3-3-1-2	10-C
Auxiliary Terminal Alert Enable	1-2-3-3-1-1	10-C
Auxiliary Terminal Mode	1-2-3-3-1-3	10-D
	1-2-5-7	5-F
Burst Command	1-2-1-4-2	6-A
Burst Enable	1-2-1-4-1	6-A
Calibration in Progress Enab	1-2-4-2-1	8-G
Calibration Location	1-2-5-9-2	6-H
Clear Record	1-2-3-7-4	8-G
Command 3 (Trending) Press	1-2-1-4-3	6-A
Control Mode	Hot Key-2	1-A
	1-2-1-2	4-B
Critical NVM Shutdown	1-2-3-1-3-4	11-C
Cycle Count	1-2-3-5-1-2	5-F
	3-6-5	3-H
Cycle Count Alert Enable	1-2-3-5-1-1	10-F
Cycle Count Alert Point	1-2-3-5-1-3	10-F
Date	1-2-5-1-4	6-F
Dead Band (Cycle Count / Travel Accum)	1-2-3-5-2-1	10-F
Define Custom Characteristic	1-2-2-4	4-C
Descriptor	1-2-5-1-3	6-F
Device Description Information	3-8	2-G
Device ID	3-7-2	4-H
Device Revision	3-7-5	4-H
Diagnostic Data Available Enable	1-2-4-2-4	8-H
Diagnostic in Progress Enable	1-2-4-2-3	8-H
Display Record	1-2-3-7-3	8-F
Drive Current Shutdown	1-2-3-1-1	9-C
Drive Signal	3-4	3-F
	1-2-3-1-2-2	10-C
Drive Signal Alert Enable	1-2-3-1-2-1	10-C
DVC Power Up	1-2-7-4	3-D
End Point Control Enable	1-2-2-2-2-1	6-C
Failure Group Enable	1-2-3-7-5-1	10-G
Feedback Connection	1-2-6-5	4-D
Firmware Revision	3-7-6	4-H
Flash ROM Shutdown	1-2-3-1-3-5	11-C
Hardware Revision	3-7-7	4-I
HART Tag	1-2-5-1-1	6-F
	3-7-1	4-H
HART Universal Revision	3-7-9	4-I
Input Characterization	1-2-2-3	4-C
Instrument Date and Time	1-2-4-1-2	8-G
	1-2-5-8	5-F
Instrument Level	3-7-8	4-I
Instrument Mode	Hot Key-1	1-A
	1-2-1-1	4-B
Instrument Serial Number	1-2-5-1-6	6-F
Instrument Time Invalid Enable	1-2-4-1-1	8-G
Integral Dead Zone	1-2-4-4-4	8-I
	1-2-2-1-2-1	9-A
Integral Limit	1-2-4-4-3	8-I
	1-2-2-1-2-2	9-A
Integrator Saturated Hi Enable	1-2-4-4-1	8-H
Integrator Saturated Lo Enable	1-2-4-4-2	8-H
Lag Time	1-2-2-5-3	6-D
Last Calibration Status	1-2-5-9-1	6-H
Manual Travel Calibration	1-3-1-2	4-E
Manufacturer	3-7-3	4-H
	1-2-6-1	4-D
Maximum Supply Pressure	1-2-5-6	5-F
Message	1-2-5-1-2	6-F
Miscellaneous Group Enable	1-2-3-7-5-3	10-G
Model	3-7-4	4-H
Multi-Drop Alert Enable	1-2-4-3-2	8-H
No Free Time Shutdown	1-2-3-1-3-6	11-C
Non-Critical NVM Alert Enable	1-2-3-1-3-3	11-B
Number of Power Ups	2-3-4	4-F
	3-6-9	5-H
Offline/Failed Alert Enable	1-2-3-1-3-1	11-B
Partial Stroke Test	2-5	2-F
Partial Stroke Test Enable	1-2-7-1	3-D
Partial Stroke Test Pressure Limit	1-2-3-6-1	8-F
Partial Stroke Test Start Point	1-2-2-2-2-2	8-C

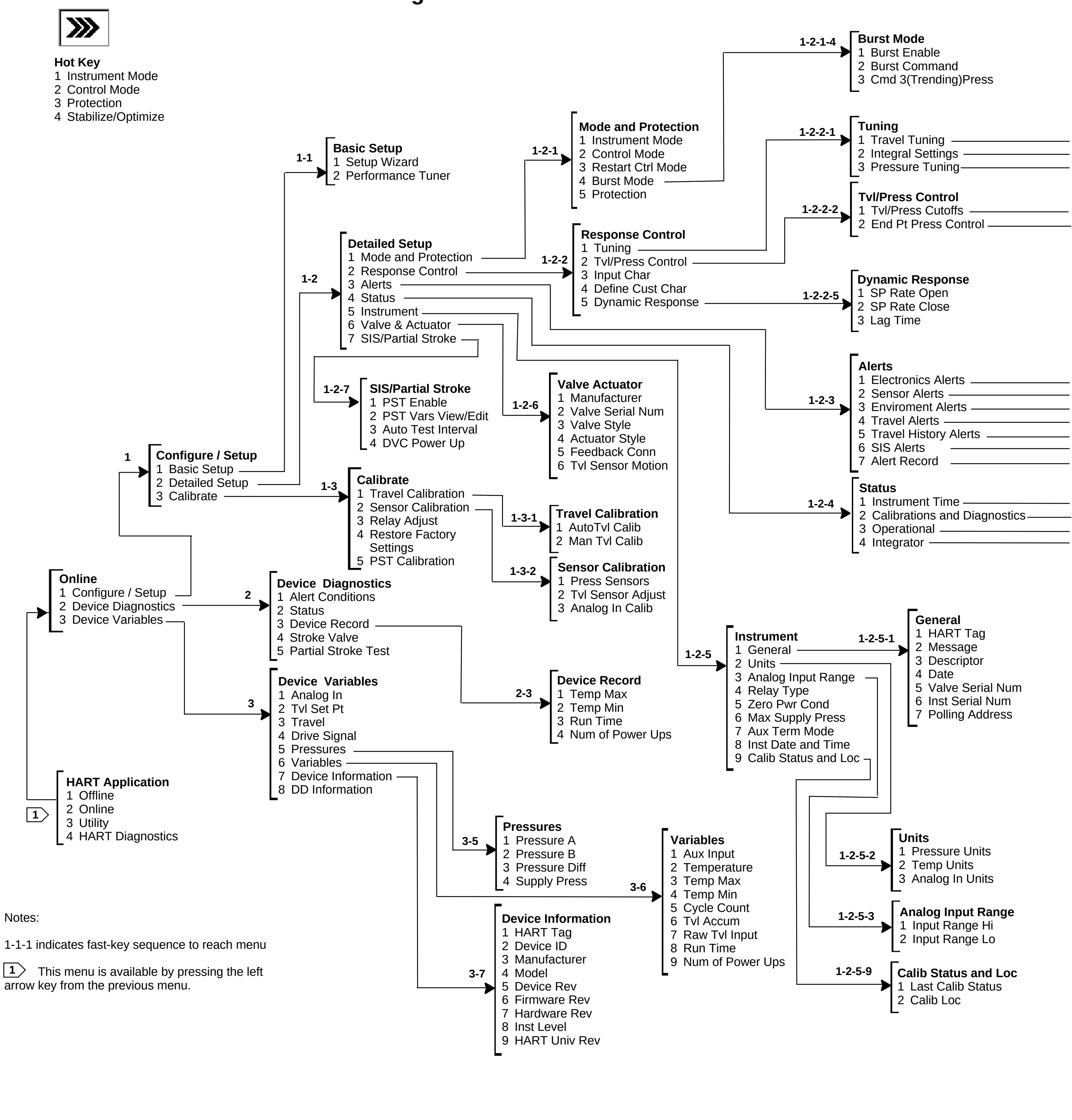
1. Coordinates are to help locate the item on the foldout menu tree.

continued on facing page

Unfold this sheet to see the 375 Field Communicator Menu Tree

DVC6000 SIS

375 Field Communicator Menu Tree for DVC6000 SIS Digital Valve Controllers

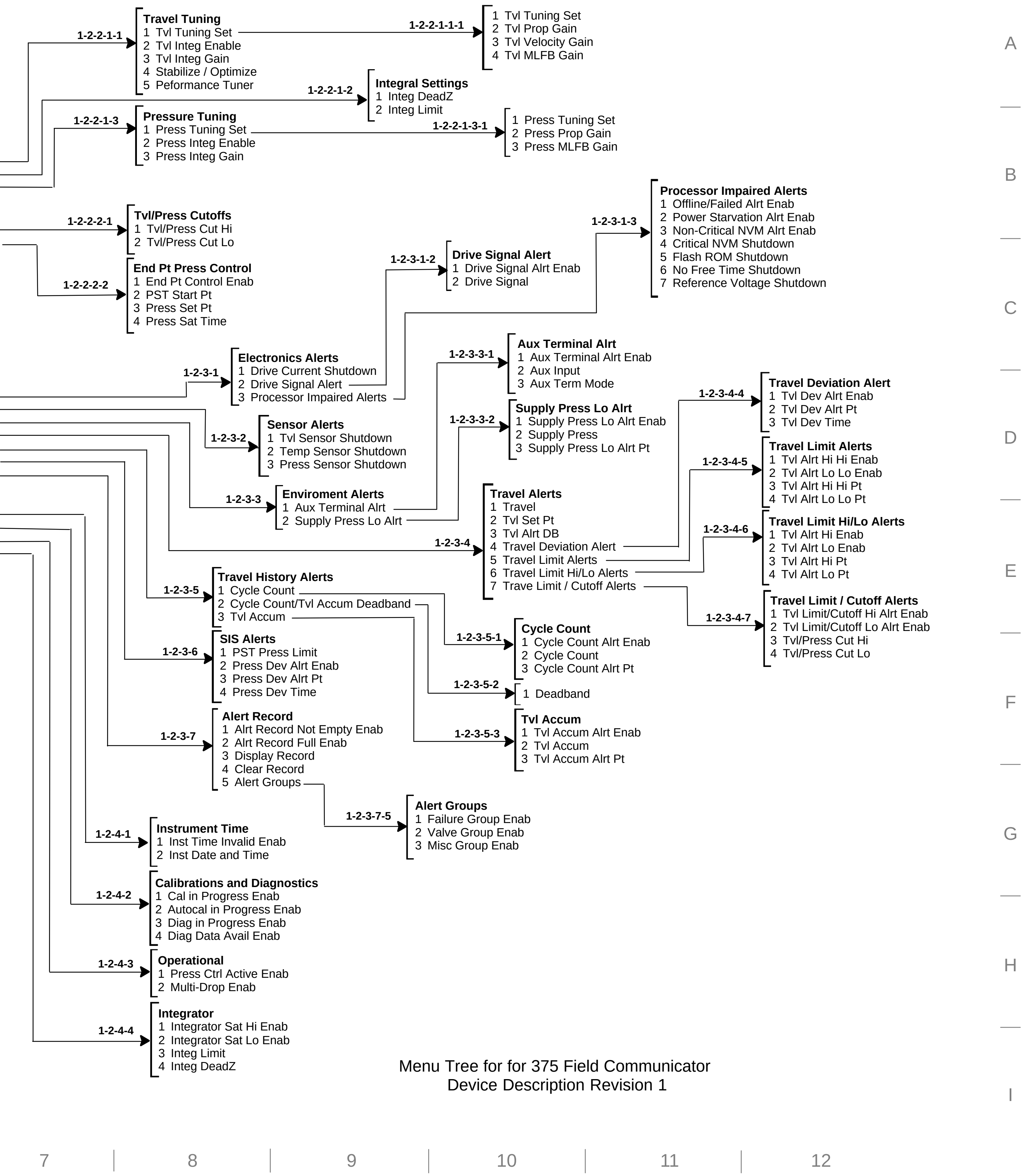


Notes:

1-1-1 indicates fast-key sequence to reach menu

1 This menu is available by pressing the left arrow key from the previous menu.

1 | 2 | 3 | 4 | 5 | 6



Menu Tree for for 375 Field Communicator
Device Description Revision 1

Fast-Key Sequence (continued)

Function/Variable	Fast-Key Sequence	Coord-inates[(1)]
Partial Stroke Test Variables View/Edit	1-2-7-2	3-D
Performance Tuner	1-1-2	2-B
	1-2-2-1-1-5	8-A
Polling Address	1-2-5-1-7	6-F
Power Starvation Alert Enable	1-2-3-1-3-2	11-B
Pressure A	3-5-1	4-G
Pressure B	3-5-2	4-G
Pressure Deviation Alert Enable	1-2-3-6-2	8-F
Pressure Deviation Alert Point	1-2-3-6-3	8-F
Pressure Deviation Time	1-2-3-6-4	8-F
Pressure Differential	3-5-3	4-G
Pressure Integral Control Enable	1-2-2-1-3-2	8-B
Pressure Integral Gain	1-2-2-1-3-3	8-B
Pressure MLFB Gain	1-2-2-1-3-1-3	10-B
Pressure Proportional Gain	1-2-2-1-3-1-2	10-B
Pressure Saturation Time	1-2-2-2-2-4	8-C
Pressure Sensor Shutdown	1-2-3-2-3	9-D
Pressure Sensors—Calibration	1-3-2-1	4-E
Pressure Set Point	1-2-2-2-2-3	8-C
Pressure Tuning Set	1-2-2-1-3-1-1	10-B
Pressure Units	1-2-5-2-1	6-G
Protection	Hot Key-3	1-A
	1-2-1-5	4-B
PST Calibration	1-3-5	3-E
Raw Travel Input	3-6-7	5-H
Reference Voltage Shutdown	1-2-3-1-3-7	11-C
Relay Adjust	1-3-3	3-E
Relay Type	1-2-5-4	5-F
Restart Control Mode	1-2-1-3	4-B
Restore Factory Settings	1-3-4	3-E
Run Time	2-3-3	4-F
	3-6-8	5-H
Set Point Rate Close	1-2-2-5-2	6-C
Set Point Rate Open	1-2-2-5-1	6-C
Setup Wizard	1-1-1	2-B
Stabilize/Optimize	Hot Key-4	1-A
	1-2-2-1-1-4	8-A
Status	2-2	2-F
Stroke Valve	2-4	2-F
Supply Pressure	3-5-4	4-G
	1-2-3-3-2-2	10-D
Supply Pressure Lo Alert Enable	1-2-3-3-2-1	10-D
Supply Pressure Lo Alert Point	1-2-3-3-2-3	10-D
Temperature	3-6-2	5-G
Temperature Maximum	3-6-3	5-G
	2-3-1	4-F
Temperature Minimum	3-6-4	5-H
	2-3-2	4-F
Temperature Sensor Shutdown	1-2-3-2-2	9-D
Temperature Units	1-2-5-2-2	6-G
Travel	3-3	2-F
	1-2-3-4-1	10-D
Travel / Pressure Cutoff Hi	1-2-3-4-7-3	12-F
	1-2-2-2-1-1	9-B
Travel / Pressure Cutoff Lo	1-2-3-4-7-4	12-F
	1-2-2-2-1-2	9-B
Travel Accumulator	3-6-6	6-H
	1-2-3-5-3-2	10-F
Travel Accumulator Alert Enable	1-2-3-5-3-1	10-F
Travel Accumulator Alert Point	1-2-3-5-3-3	10-F
Travel Alert Dead Band	1-2-3-4-3	10-E
Travel Alert Hi Enable	1-2-3-4-6-1	10-E
Travel Alert Hi Hi Enable	1-2-3-4-5-1	12-D
Travel Alert Hi Hi Point	1-2-3-4-5-3	12-D
Travel Alert Hi Point	1-2-3-4-6-3	12-E
Travel Alert Lo Enable	1-2-3-4-6-2	12-E
Travel Alert Lo Lo Enable	1-2-3-4-5-2	12-D
Travel Alert Lo Lo Point	1-2-3-4-5-4	12-D
Travel Alert Lo Point	1-2-3-4-6-4	12-E
Travel Deviation Alert Enable	1-2-3-4-4-1	12-D
Travel Deviation Alert Point	1-2-3-4-4-2	12-D
Travel Deviation Time	1-2-3-4-4-3	12-D
Travel Integral Control Enable	1-2-2-1-1-2	8-A
Travel Integral Gain	1-2-2-1-1-3	8-A
Travel Limit / Cutoff Hi Alert Enable	1-2-3-4-7-1	12-E
Travel Limit / Cutoff Lo Alert Enable	1-2-3-4-7-2	12-E
Travel MLFB Gain	1-2-2-1-1-1-4	10-A
Travel Proportional Gain	1-2-2-1-1-1-2	10-A
Travel Sensor Adjust	1-3-2-2	4-E
Travel Sensor Motion	1-2-6-6	4-D
Travel Sensor Shutdown	1-2-3-2-1	9-D
Travel Set Point	1-2-3-4-2	10-E
	3-2	2-F
Travel Tuning Set	1-2-2-1-1-1-1	10-A
Travel Velocity Gain	1-2-2-1-1-1-3	10-A
Valve Group Enable	1-2-3-7-5-2	10-G
Valve Serial Number	1-2-5-1-5	6-F
	1-2-6-2	4-D
Valve Style	1-2-6-3	4-D
Zero Power Condition	1-2-5-5	5-F

1. Coordinates are to help locate the item on the foldout menu tree.

DVC6000 SIS

THE FIELDVUE DVC6000 SIS SERIES DIGITAL VALVE CONTROLLER IS A CORE COMPONENT OF THE PLANTWEB™ DIGITAL PLANT ARCHITECTURE. THE DIGITAL VALVE CONTROLLER POWERS PLANTWEB BY CAPTURING AND DELIVERING VALVE DIAGNOSTIC DATA. COUPLED WITH VALVELINK™ SOFTWARE, THE DVC6000 SIS PROVIDES USERS WITH AN ACCURATE PICTURE OF VALVE PERFORMANCE, INCLUDING ACTUAL STEM POSITION, INSTRUMENT INPUT SIGNAL AND PNEUMATIC PRESSURE TO THE ACTUATOR. USING THIS INFORMATION, THE DIGITAL VALVE CONTROLLER DIAGNOSES NOT ONLY ITSELF, BUT ALSO THE VALVE AND ACTUATOR TO WHICH IT IS MOUNTED.

FIELDVUE DVC6000 SIS Series Digital Valve Controller

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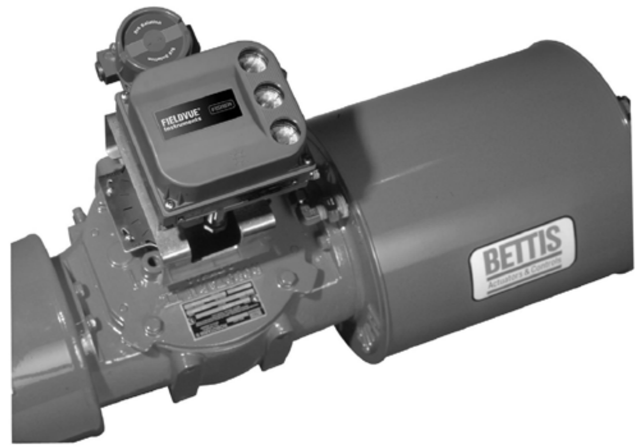
Section 1 Introduction and Specifications

Table 1-1. FIELDVUE DVC6000 SIS Capabilities

Auto Calibration
Custom Characterization
Alerts
Step Response, Drive Signal Test & Dynamic Error Band
Advanced Diagnostics (Valve Signature)
Performance Tuner
Performance Diagnostics(1)
Solenoid Valve Health Monitoring(1)
Partial Stroke Testing
1. Available in Firmware Revision 7 and higher.



W8308-3 SIS

Figure 1-1. FIELDVUE DVC6030 SIS Digital Valve Controller Mounted on a Quarter-Turn Actuator

Scope of Manual

This instruction manual includes specifications, installation, operation, and maintenance information for FIELDVUE DVC6000 SIS Series digital valve controllers for Safety Instrumented System (SIS) Solutions.

This instruction manual describes using the 375 Field Communicator with device description revision 1, used with DVC6000 SIS device revision 2, firmware revision 7, to setup and calibrate the instrument. You can also use Fisher ValveLink™ Software version 7.3 or higher to setup, calibrate, and diagnose the valve and instrument. For information on using ValveLink Software with the instrument, refer to the AMS ValveLink Software help or documentation.

Do not install, operate, or maintain a DVC6000 SIS digital valve controller without first • being fully trained and qualified in valve, actuator, and accessory installation, operation and maintenance, and • carefully reading and understanding the contents of this manual. If you have any questions concerning these instructions, contact your Emerson Process Management sales office before proceeding.

Conventions Used in this Manual

Procedures that require the use of the 375 Field Communicator have the Field Communicator symbol in the heading.

Procedures that are accessible with the Hot Key on the Field Communicator will also have the Hot Key symbol in the heading.

Some of the procedures also contain the sequence of numeric keys required to display the desired Field Communicator menu. For example, to access the *Basic Setup* menu, from the Online menu, press 2 (selects *Configure / Setup*) followed by a 1 (selects *Basic Setup*) followed by a second 1 (selects *Setup Wizard*). The key sequence in the procedure heading is shown as (2-1-1). The path required to accomplish various tasks, the sequence of steps through the Field Communicator menus, is also presented in textual format. Menu selections are shown in italics, e.g., *Calibrate.* An overview of the 375 Field Communicator menu structures are shown at the beginning of this manual.

Description

DVC6000 SIS Series digital valve controllers (figure 1-1) are communicating, microprocessor-based current-to-pneumatic instruments. The DVC6000 SIS Series digital valve controller for Safety Instrumented System (SIS) Solutions monitors the health of final control elements and solenoid valves; the primary function of the DVC6000 SIS digital valve controller is to actuate its pneumatic outputs in response to a demand signal from a logic solver, which should move the valve to the configured safe state.

Using HART™ communications protocol the digital valve controller allows easy access to information critical to process operation. You can gain information from the principal component of the process, the control valve itself, using the Field Communicator at the valve or at a field junction box, or by using a personal computer or operator's console within the control room.

Using DVC6000 SIS Series instruments permits partial stroking of the valve to minimize the chance of valve failure upon a safety demand and, consequently, the possibility of catastrophic situations. A partial stroke test verifies valve movement with a small ramp to the input. This ramp is small enough not to disrupt production, but is large enough to confirm that the valve is working. DVC6000 SIS instruments also provide state-of-the-art testing methods, which reduce testing and maintenance time, improve system performance, and provide diagnostic capabilities.

Using a personal computer and ValveLink software, AMS Suite: Intelligent Device Manager, or a 375 Field Communicator, you can perform several operations with the DVC6000 SIS digital valve controller. You can obtain general information concerning software revision level, messages, tag, descriptor, and date. Diagnostic information is available to aid you when troubleshooting. Input and output configuration parameters can be set, and the digital valve controller can be calibrated. Refer to table 1-1 for details on the capabilities of the DVC6000 SIS.

Using the HART protocol, information from the field can be integrated into control systems or be received on a single loop basis.

exida™ Certification

exida has certified that the DVC6000 SIS digital valve controller, when operating in a Safety Instrumented System with a 4-20 mA, 0-24 VDC, or 0-20 mA input signal from a logic solver, meets the requirements of IEC61508, and can be incorporated into Safety Instrumented Function (SIF) loops that are rated to Safety Integrity Level 3 (SIL3). This certification includes relays A and C, and stainless steel, remote mount, and extreme temperature options. The LCP100 local control panel is covered under this certification as a non-interfering device to the safety function.

TÜV Certification

TÜV has certified that valve-mounted DVC6000 SIS Series digital valve controller hardware, when operating in a Safety Instrumented System with a 0-24 volt DC or 0-20 mA DC control signal, meets the requirements of IEC 61508, and can be incorporated into Safety Instrumented Function (SIF) loops that are rated to Safety Integrity Level 3 (SIL3).

Specifications

WARNING

Refer to table 1-2 for application specifications. Incorrect configuration of a positioning instrument could result in the malfunction of the product, property damage or personal injury.

Specifications for DVC6000 SIS digital valve controllers are shown in table 1-2. Specifications for the Field Communicator can be found in the product manual for the Field Communicator.

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Related Documents

Other documents containing information related to DVC6000 SIS Series digital valve controllers for safety instrumented systems include:

- Fisher FIELDVUE DVC6000 SIS Series Digital Valve Controllers for Safety Instrumented System (SIS) Solutions (Bulletin 62.1:DVC6000 SIS)
- DVC6000 Series FIELDVUE Digital Valve Controller Dimensions (Bulletin 62.1:DVC6000(S1))
- DVC6000 SIS Series FIELDVUE Digital Valve Controllers for Safety Instrumented System (SIS) Solutions Quick Start Guide (D103307X012)
- Safety Manual for DVC6000 Series FIELDVUE Digital Valve Controllers for Safety Instrumented System (SIS) Solutions – 0–20 mA or 0–24 VDC (D103035X012)
- Safety Manual for DVC6000 Series FIELDVUE Digital Valve Controllers for Safety Instrumented System (SIS) Solutions – 4–20 mA (D103294X012)
- Supplement to DVC6000 Series FIELDVUE Digital Valve Controllers for Safety Instrumented System (SIS) Solutions Instruction Manual, Partial Stroke Test (D103274X012)
- Fisher LCP100 Local Control Panel Instruction Manual (D103272X012)
- FIELDVUE LC340 Line Conditioner Instruction Manual (D102797X012)
- FIELDVUE HF300 Series HART Filters Instruction Manual (D102796X012)
- 2530H1 HART Interchange Multiplexer Instruction Manual (D102237X012)
- ValveLink Software Help or Documentation

All documents are available from your Emerson Process Management sales office. Also visit our website at www.FIELDVUE.com.

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Table 1-2. Specifications

Available Configurations

Valve-Mounted Instruments
DVC6010 SIS: Sliding-stem applications
DVC6020 SIS: Rotary and long-stroke sliding-stem applications [over 102 mm (4 inch) travel]
DVC6030 SIS: Quarter-turn rotary applications

All units can be used in either 4-wire or 2-wire system installations.

DVC6000 SIS Series digital valve controllers must have the Safety Instrumented System Application (SIS) option

Remote-Mounted Instrument(1,2)
DVC6005 SIS: Base unit for 2 inch pipestand or wall mounting
DVC6015: Feedback unit for sliding-stem applications
DVC6025: Feedback unit for rotary or long-stroke sliding-stem applications
DVC6035: Feedback unit for quarter-turn rotary applications

DVC6000 SIS Series digital valve controllers can be mounted on Fisher® and other manufacturers rotary and sliding-stem actuators

Input Signal

Point-to-Point:
Analog Input Signal: 4-20 mA DC, nominal
Minimum voltage available at instrument terminals must be 10.5 VDC for analog control, 11 VDC for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Voltage: 30 VDC
Overcurrent Protection: Input circuitry limits current to prevent internal damage
Reverse Polarity Protection: No damage occurs from reversal of loop current
Multi-drop:
Instrument Power: 11-30 VDC at approximately 8 mA
Reverse Polarity Protection: No damage occurs from reversal of loop current

Output Signal

Pneumatic signal as required by the actuator, up to 95% of full supply pressure.
Minimum Span: 0.4 bar (6 psig)
Maximum Span: 9.5 bar (140 psig)
Action: Double, Single direct, and Single reverse

Supply Pressure(3)

Recommended: 1.7 bar (25 psi) or 0.3 bar (5 psi) plus the maximum actuator requirements, whichever is higher
Maximum: 10 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower
Medium: Air

Air Quality: Supply pressure must be clean, dry air that meets the requirements of ISA Standard 7.0.01. 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

Steady-State Air Consumption(4,5)

Low Bleed Relay
At 1.4 bar (20 psig) supply pressure: Average value 0.056 normal m^3/hr (2.1 scfh)
At 5.5 bar (80 psig) supply pressure: Average value 0.184 normal m^3/hr (6.9 scfh)

The low bleed relay is the standard relay for DVC6000 SIS digital valve controllers, used for On/Off applications. Performance may be affected in throttling applications.

Maximum Output Capacity(4,5)

At 1.4 bar (20 psig) supply pressure: 10.0 normal m^3/hr (375 scfh)
At 5.5 bar (80 psig) supply pressure: 29.5 normal m^3/hr (1100 scfh)

Independent Linearity(6)

±0.50% of output span

Electromagnetic Interference (EMI)

Tested per IEC 61326-1 (Edition 1.1). Complies with European EMC Directive. Meets emission levels for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1 in the IEC specification document). Immunity performance is shown in table 1-3.

Lightning and Surge Protection—The degree of immunity to lightning is specified as Surge immunity in table 1-3. For additional surge protection commercially available transient protection devices can be used.

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Table 1-2. Specifications (continued)

Vibration Testing Method

Tested per ISA-S75.13 Section 5.3.5. A resonant frequency search is performed on all three axes. The instrument is subjected to the ISA specified 1/2 hour endurance test at each major resonance, plus an additional two million cycles.

Input Impedance (Point-to-Point only)

The input impedance of the DVC6000 SIS active electronic circuit is not purely resistive. For comparison to resistive load specifications, an equivalent impedance of 550 ohms may be used. This value corresponds to 11 V @ 20 mA.

Operating Ambient Temperature Limits(3)

−40 to 80°C (−40 to 176°F) for most approved valve-mounted instruments
−60 to 125°C (−76 to 257°F) for remote-mounted feedback unit(2)
−52 to 80°C (−62 to 176°F) for valve-mounted instruments utilizing the Extreme Temperature option (fluorosilicone elastomers)(7)

Humidity Limits

0 to 100% condensing relative humidity

Electrical Classification

Hazardous Area:

CSA	Intrinsic Safety, Explosion proof, Division 2, Dust-Ignition proof
FM APPROVED	Intrinsic Safety, Explosion proof, Non-incendive, Dust-Ignition proof
ATEX	Intrinsic Safety, Flameproof, Type n
IECEx	Intrinsic Safety, Flameproof, Type n
Ex NEPSI	Intrinsic Safety, Flameproof
INMETRO	Intrinsic Safety, Flameproof

Refer to Special Instructions for Safe Use and Installation in Hazardous Locations in Section 2, tables 1-4, 1-5, 1-6, 1-7, 1-8, and 1-9, and figures C-1, C-2, C-3, C-4, C-5, C-6, C-7, C-8, C-9, C-10, and C-11 for specific approval information.

Pollution Degree 2, Overvoltage Category III per ANSI/ISA-82.02.01 (IEC 61010-1 Mod).

Electrical Housing: Meets NEMA 4X, CSA Type 4X, IEC 60529 IP66

Auxiliary Terminal Contact: Nominal Electrical Rating 5 V, <1 mA; It is recommended that the switch be sealed or have gold plated contacts to avoid corrosion.

For proper operation of the auxiliary input terminal capacitance should not exceed 18000pF.

Other Classifications/Certifications

TIIS	Japan
KISCO	Korea Industrial Safety Corp.
PCT	Russian GOST-R
FSETAN	Russian – Federal Service of Technological, Ecological and Nuclear Inspectorate

Contact your Emerson Process Management sales office for classification/certification specific information

IEC 61010 Compliance Requirements (Valve-Mounted Instruments only)

Power Source: The loop current must be derived from a Separated Extra-Low Voltage (SELV) power source.
Environmental Conditions: Installation Category I

Connections

Supply Pressure: 1/4 NPT internal and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal
Tubing: 3/8-inch metal, recommended
Vent: 3/8 NPT internal
Electrical: 1/2 NPT internal conduit connection

Stem/Shaft Travel

Linear Actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Rotary Actuators with rated travel between 50 degrees and 180 degrees.

–continued–

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Table 1-2. Specifications (continued)

Mounting

Designed for direct actuator mounting or remote pipestand or wall mounting. Mounting the instrument vertically, with the vent at the bottom of the assembly, or horizontally, with the vent pointing down, is recommended to allow drainage of moisture that may be introduced via the instrument air supply.

Weight

Valve-Mounted Instruments
Aluminum: 3.5 kg (7.7 lbs)
Stainless Steel(8): 7.7 kg (17 lbs)

Remote-Mounted Instruments(2)
DVC6005 SIS Base Unit: 4.1 kg (9 lbs)
DVC6015 Feedback Unit: 1.3 kg (2.9 lbs)
DVC6025 Feedback Unit: 1.4 kg (3.1 lbs)
DVC6035 Feedback Unit: 0.9 kg (2.0 lbs)

Options

■ Supply and output pressure gauges or ■ Tire valves, ■ Integral mounted filter regulator, ■ Stainless steel housing, module base, and terminal box(8), ■ Extreme Temperature(7), ■ Beacon Indicator, ■ LCP100 local control panel

Declaration of SEP

Fisher Controls International LLC declares this product to be in compliance with Article 3 paragraph 3 of the Pressure Equipment Directive (PED) 97 / 23 / EC. It was designed and manufactured in accordance with Sound Engineering Practice (SEP) and cannot bear the CE marking related to PED compliance.

However, the product *may* bear the CE marking to indicate compliance with *other* applicable European Community Directives.

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 − Process Instrument Terminology.
1. 3-conductor shielded cable, 22 AWG minimum wire size, is required for connection between base unit and feedback unit. Pneumatic tubing between base unit output connection and actuator has been tested to 15 meters (50 feet) maximum without performance degradation.
2. The remote mount option is available for the DVC6000 SIS with exida approval.
3. The pressure/temperature limits in this document and any applicable code or standard should not be exceeded.
4. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
5. Normal m^3/hour − Normal cubic meters per hour at 0°C and 1.01325 bar, absolute. Scfh − Standard cubic feet per hour at 60°F and 14.7 psia
6. Typical value. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also, not applicable to DVC6020 SIS digital valve controllers in long-stroke applications.
7. The extreme temperature option is available for the DVC6000 SIS with exida approval.
8. The stainless steel option is available for the DVC6000 SIS with exida approval.

Table 1-3. Electromagnetic Immunity Performance

Port	Phenomenon	Basic Standard	Test Level	Performance Criteria(1)	
				Point-to-Point Mode	Multi-drop Mode
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	4 kV contact 8 kV air	A(2)	A
	Radiated EM field	IEC 61000-4-3	80 to 1000 MHz @ 10V/m with 1 kHz AM at 80%	A	A
	Rated power frequency magnetic field	IEC 61000-4-8	60 A/m at 50 Hz	A	A
I/O signal/control	Burst	IEC 61000-4-4	1 kV	A(2)	A
	Surge	IEC 61000-4-5	1 kV (line to ground only, each)	A(2)	A
	Conducted RF	IEC 61000-4-6	150 kHz to 80 MHz at 3 Vrms	A	A

Specification limit = ±1% of span
1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.
2. Excluding auxiliary switch function, which meets Performance Criteria B.

Table 1-4. Hazardous Area Classifications—CSA (Canada)

Certification Body	Type	Certification Obtained	Entity Rating	Temperature Code	Enclosure Rating
CSA	DVC60x0 DVC60x0S (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D,E, F,G per drawing 29B3428	V_{max} = 30 VDC I_{max} = 226 mA C_i = 5 nF L_i = 0.55 mH	T5(T_{amb} ≤ 80°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP B,C,D	– – –	T6(T_{amb} ≤ 80°C)	4X
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	– – –	T6(T_{amb} ≤ 80°C)	4X
	DVC6005	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3520	V_{max} = 30 VDC I_{max} = 226 mA C_i = 5 nF L_i = 0.55 mH V_{oc} = 9.6 VDC I_{sc} = 3.5 mA C_a = 3.6 µF L_a = 100 mH	T6(T_{amb} ≤ 60°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP C,D	– – –	T6(T_{amb} ≤ 60°C)	4X
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	– – –	T6(T_{amb} ≤ 60°C)	4X
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3520	V_{max} = 10 VDC I_{max} = 4 mA C_i = 0 nF L_i = 0 mH	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP B,C,D	– – –	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	4X
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	– – –	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	4X

Educational Services

For information on available courses for the DVC6000 SIS Series digital valve controller, as well as a variety of other products, contact:

Emerson Process Management
Educational Services, Registration
P.O. Box 190; 301 S. 1st Ave.
Marshalltown, IA 50158–2823
Phone: 800–338–8158 or
Phone: 641–754–3771
FAX: 641–754–3431
e-mail: education@emersonprocess.com

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Table 1-5. Hazardous Area Classifications—FM (United States)

Certification Body	Type	Certification Obtained	Entity Rating	Temperature Code	Enclosure Rating
FM	DVC60x0 DVC60x0S (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3427	V_{max} = 30 VDC I_{max} = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W	T5(T_{amb} ≤ 80°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP B,C,D	– – –	T6(T_{amb} ≤ 80°C)	4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	– – –	T6(T_{amb} ≤ 80°C)	4X
	DVC6005	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D,E, F,G per drawing 29B3521	V_{max} = 30 VDC I_{max} = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W V_{oc} = 9.6 VDC I_{sc} = 3.5 mA C_a = 3.6 µF L_a = 100 mH P_o = 8.4 mW	T6(T_{amb} ≤ 60°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP C,D	– – –	T6(T_{amb} ≤ 60°C)	4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	– – –	T6(T_{amb} ≤ 60°C)	4X
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D, E,F,G per drawing 29B3521	V_{max} = 10 VDC I_{max} = 4 mA C_i = 0 nF L_i = 0 mH P_i = 10 mW	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP A,B,C,D	– – –	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	– – –	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	4X

Table 1-6. Hazardous Area Classifications—ATEX

Certificate	Type	Certification Obtained	Entity Rating		Temperature Code	Enclosure Rating
ATEX	DVC60x0 DVC60x0S (x = 1,2,3)	II 1 G D Gas Ex ia IIC T5/T6—Intrinsic Safety Dust Ex iaD 20 T100°C (Tamb ≤ 80°C) Ex iaD 20 T85°C (Tamb ≤ 75°C)	U_i = 30 VDC I_i = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W		T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤75°C)	IP66
		II 2 G D Gas Ex d IIB+H2 T5/T6 —Flameproof Dust Ex tD A21 IP66 T90°C (Tamb ≤ 85°C) Ex tD A21 IP66 T80°C (Tamb ≤ 75°C)	– – –		T5(T_{amb} ≤ 85°C) T6(T_{amb} ≤ 75°C)	IP66
		II 3 G D Gas Ex nCL IIC T5/T6 —Type n Dust Ex tD A22 IP66 T85°C (Tamb ≤ 80°C) Ex tD A22 IP66 T80°C (Tamb ≤ 75°C)	– – –		T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66
	DVC6005	II 1 G D Gas Ex ia IIC T5/T6 —Intrinsic Safety Dust Ex iaD 20 T100°C (Tamb ≤ 80°C) Ex iaD 20 T85°C (Tamb ≤ 75°C)	U_i = 30 VDC I_i = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 mW	U_o = 9.6 VDC I_o = 3.5 mA C_o = 3.6 uF L_o = 100 mH P_o = 8.4 mW	T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66
		II 2 G D Gas Ex d IIB T5/T6 —Flameproof Dust Ex tD A21 IP66 T85°C (Tamb ≤ 80°C) Ex tD A21 IP66 T75°C (Tamb ≤ 70°C)	– – –		T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 70°C)	IP66
		II 3 G D Gas Ex nL IIC T5/T6 —Type n Dust Ex tD A22 IP66 T85°C (Tamb ≤ 80°C) Ex tD A22 IP66 T80°C (Tamb ≤ 75°C)	– – –		T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66
	DVC60x5 (x = 1,2,3)	II 1 G D Gas Ex ia IIC T4/T5/T6 —Intrinsic Safety Dust Ex iaD 20 T135°C (Tamb ≤ 125°C) Ex iaD 20 T100°C (Tamb ≤ 95°C) Ex iaD 20 T85°C (Tamb ≤ 80°C)	U_i = 10 VDC I_i = 4 mA C_i = 0 nF L_i = 0 mH P_i = 10 mW		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		II 2 G D Gas Ex d IIC T4/T5/T6 —Flameproof Dust Ex tD A21 IP66 T130°C (Tamb ≤ 125°C) Ex tD A21 IP66 T100°C (Tamb ≤ 95°C) Ex tD A22 IP66 T85°C (Tamb ≤ 80°C)	– – –		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		II 3 G D Gas Ex nA IIC T4/T5/T6 —Type n Dust Ex tD A22 IP66 T130°C (Tamb ≤ 125°C) Ex tD A22 IP66 T100°C (Tamb ≤ 95°C) Ex tD A22 IP66 T85°C (Tamb ≤ 80°C)	– – –		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66

Table 1-7. Hazardous Area Classifications—IECEx

Certificate	Type	Certification Obtained	Entity Rating	Temperature Code	Enclosure Rating
IECEx	DVC60x0 DVC60x0S (x = 1,2,3)	Gas Ex ia IIC T5/T6 —Intrinsic Safety	U_i = 30 VDC I_i = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W	T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66
		Gas Ex d IIB+H2 T5/T6 —Flameproof	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		Gas Ex nC IIC T5/T6 —Type n	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC6005	Gas Ex ia IIC T5/T6 —Intrinsic Safety	U_i = 30 VDC I_i = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W U_o = 9.6 VDC I_o = 3.5 mA C_o = 3.6 µF L_o = 100 mH P_o = 8.4 mW	T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66
		Gas Ex d IIB T5/T6 —Flameproof	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		Gas Ex nC IIC T5/T6 —Type n	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC60x5 (x = 1,2,3)	Gas Ex ia IIC T4/T5/T6 —Intrinsic Safety	U_i = 10 VDC I_i = 4 mA C_i = 0 nF L_i = 0 mH P_i = 10 mW	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		Gas Ex d IIC T4/T5/T6 —Flameproof	– – –	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		Gas Ex nA IIC T4/T5/T6 —Type n	– – –	T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66

Table 1-8. Hazardous Area Classifications—NEPSI

Certificate	Type	Certification Obtained	Entity Rating	Temperature Code	Enclosure Rating
NEPSI	DVC60x0 (x = 1,2,3)	Gas Ex ia IIC T5/T6 —Intrinsic Safety Dust DIP A21 T5	U_i = 30 V I_i = 226 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W	T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66
		Gas Ex d IIC T5/T6(1) —Flameproof Dust DIP A21 T5	– – –	T5(T_{amb} ≤ 80°C) T6(T_{amb} ≤ 75°C)	IP66

1. Except acetylene.

Table 1-9. Hazardous Area Classifications—INMETRO

Certificate	Type	Certification Obtained	Entity Rating	Temperature Code	Enclosure Rating
INMETRO	DVC60x0 (x = 1,2,3)	BR–Ex ia IIC T5	U_i = 30 V I_i = 180 mA C_i = 5 nF L_i = 0.55 mH P_i = 1.4 W	T5(T_{amb} ≤ 80°C)	– – –
		BR–Ex d IIB+H2 T6	– – –	T6(T_{amb} ≤ 75°C)	– – –

Section 2 Installation

Special Instructions for “Safe Use” and Installations in Hazardous Areas

Mounting

Pneumatic Connections

Electrical Connections

Installation

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.**
- **If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section of this instruction manual.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

WARNING

To avoid static discharge from the plastic cover, do not rub or clean the cover with solvents. To do so could result in an explosion. Clean with a mild detergent and water only.

Special Instructions for “Safe Use” and Installations in Hazardous Locations

Certain nameplates may carry more than one approval, and each approval may have unique installation/wiring requirements and/or conditions of “safe use”. These special instructions for “safe use” are in addition to, and may override, the standard installation procedures. Special instructions are listed by approval.

WARNING

Failure to follow these conditions of safe use could result in personal injury or property damage from fire or explosion, or area re-classification.

CSA

Special Conditions of Safe Use

Intrinsic Safety, Explosion proof, Division 2, Dust-Ignition proof

No special conditions for safe use.

Refer to table 1-4 for approval information, figure C-1 and C-2 for CSA loop schematics, and figure C-3 for CSA nameplates.

FM

Special Conditions of Safe Use

Intrinsic Safety, Explosion proof, Non-incendive, Dust-Ignition proof

No special conditions for safe use.

Refer to table 1-5 for approval information, figure C-4 and C-5 for FM loop schematics, and figure C-6 for FM nameplates.

ATEX

Special Conditions for Safe Use

Intrinsic Safety, Dust

1. This apparatus can only be connected to an intrinsically safe certified equipment and this combination must be compatible as regards the intrinsically safe rules.

2. The electrical parameters of this equipment must not exceed any following values:
$U_O \leq$ 30 V; $I_O \leq$ 226 mA; $P_O \leq$ 1.4 W

3. Operating ambient temperature: −40°C to + 80°C

Refer to table 1-6 for additional approval information, and figure C-7 for ATEX Intrinsic Safety, Dust nameplates.

Flameproof, Dust

Operating ambient temperature: −40°C to + 85°C

Refer to table 1-6 for additional approval information, and figure C-8 for ATEX Flameproof, Dust nameplates.

ATEX Type n, Dust

Operating ambient temperature: −40°C to + 80°C

Refer to table 1-6 for additional approval information, and figure C-9 for ATEX Type n, Dust nameplates.

2

IECEx

Conditions of Certification

Intrinsic Safety, Type n, Flameproof

Ex ia / Ex d / Ex n

1. **Warning: Electrostatic charge hazard. Do not rub or clean with solvents. To do so could result in an explosion.**

EX d / Ex n

2. Do not open while energized.

Refer to table 1-7 for additional approval information, and figure C-10 for the IECEx nameplates.

NEPSI

Notes for Safe Use of the Certified Product

Intrinsic Safety, Dust and Flameproof, Dust

DVC6000 Series digital valve controllers (designated as controller hereafter) have been proved to be in conformity with the requirements specified in the national standards GB3836.1-2000, GB3836.2-2000, GB3836.4-2000, and GB12476.1-2000 through inspections conducted by National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (NEPSI). The Ex markings for the products are Ex d II CT5 (acetylene not included), DIPA21T5 or Ex ia II CT5, DIPA21T5 respectively and their Ex certificate numbers are GYJ04504 and GYJ04505. When using the product, the user should pay attention to the items stated below:

1. The specific product types of approved DVC6000 Series digital valve controllers this time are DVC6010, DVC6020 and DVC6030.

2. The enclosure of the controller provides a grounding terminal, and the user should install a reliable grounding wire connected to it when mounting and using the controller.

3. The controller's cable entrance (1/2 NPT) must be fitted with a cable entry device which is Ex-approved through inspection of explosion protection, in conformity with relevant standards of GB3836 and has a corresponding rating of explosion protection.

4. The maximum operating ambient temperature range of the controller is –40°C to +80°C.

5. The principle of "Opening equipment's cover is allowed only after the power is off " must be abided by when using and maintaining the controller in the field.

6. The values for intrinsically safe parameters of the controller (Intrinsically safe type) are as follow: U_i = 30V, I_i = 226mA, P_i = 1.4W, C_i = 5nF, L_i = 0.55mH

7. While the controller forms an intrinsically safe explosion protection system together with a corresponding associated equipment safety barrier, the following requirements must be met: $U_o \le U_i$, $I_o \le I_i$, $P_o \le P_i$, $C_o \ge C_i + C_c$, $L_o \ge L_i + L_c$

Note

Where Cc and Lc represent distributing capacitance and inductance of the connecting cable respectively.

8. The safety barrier must be placed at safety location, and the instruction manuals of both the product and fitted safety barrier must be followed while conducting system wiring and using the product; The connecting cable should be a shield cable with the area of core section being greater than 0.5mm^2 and its shield (or insulation screen) being grounded at a safe location and insulated from the product enclosure; The cable should be routed so that the electro-magnetic interference can be eliminated as much as possible and that the cable distributing parameters of capacitance and inductance can be controlled within 0.06μF/1mH.

9. The user must not be allowed to replace the internal electric components of the product and change the condition of system wiring at will and on his own.

10. The user must follow the relevant rules specified by the product instruction manual, the "15th Section of Electric Equipment Used in Explosive Gaseous Environment: Electric Installation in Hazardous Locations (except for coal mine)" of GB3836.15-2000 standard, the "Design Code for Electric Power Installation in Explosive and Fire-hazardous Environment" of GB50058-1992 standard, and the "Safety Regulations against dust explosion" of GB15577-1995 standard while performing installation, operation, and maintenance for the product.

Refer to table 1-8 for additional approval information, and figure C-11 for the NEPSI nameplate.

INMETRO

Special Conditions of "Safe Use"

Intrinsic Safety, Flameproof

Refer to table 1-9 for approval information.

Contact your Emerson Process Management sales office for additional "safe use" information.

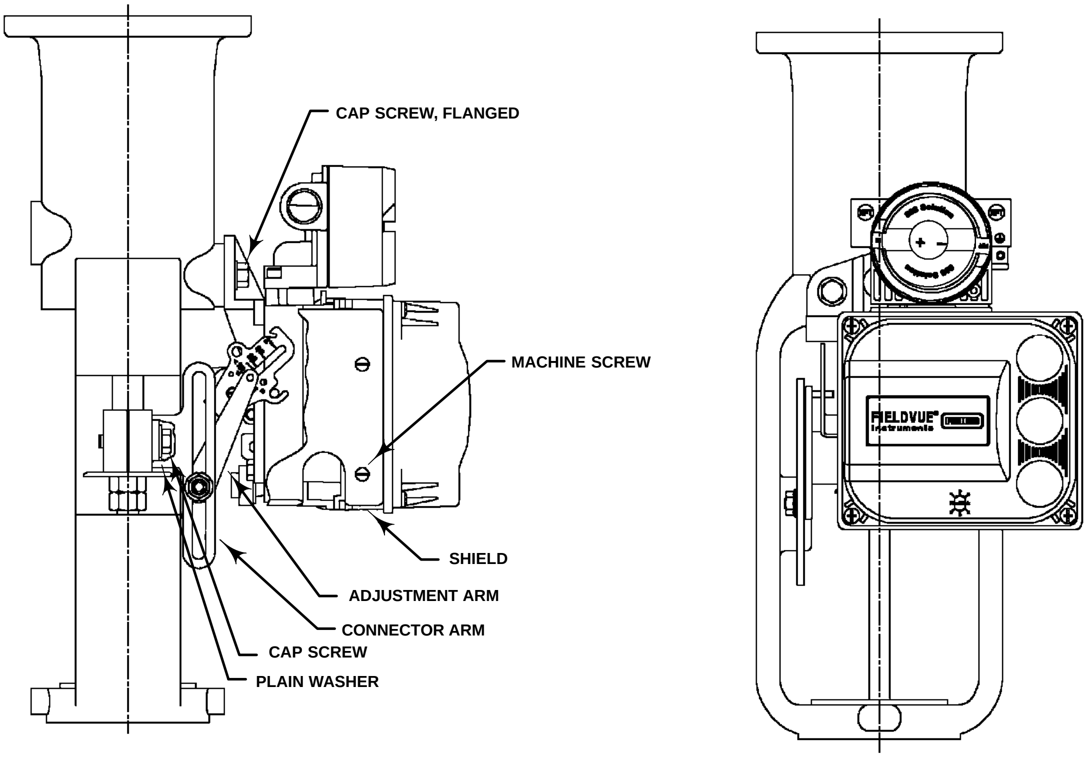


Figure 2-1. FIELDVUE DVC6010 SIS Digital Valve Controller Mounted on Sliding-Stem Actuators with up to 2 Inches Travel

Mounting

DVC6010 SIS on Sliding-Stem Actuators Up to 102 mm (4 Inches) of Travel

If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve controller on the actuator. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

The DVC6010 SIS digital valve controller mounts on sliding-stem actuators with up to 102 mm (4 inch) travel. Figure 2-1 shows a typical mounting on an actuator with up to 51 mm (2 inch) travel. Figure 2-2 shows a typical mounting on actuators with 51 to 102 mm (2 to 4 inch) travel. For actuators with greater than 102 mm (4-inch) travel, see the guidelines for mounting a DVC6020 SIS digital valve controller.

Note

Do not use the stainless steel DVC6010S SIS in high vibration service where the mounting bracket uses standoffs (spacers) to mount to the actuator.

Refer to the following guidelines when mounting on sliding-stem actuators with up to 4 inches of travel. Where a key number is referenced, refer to figure 8-1.

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. Attach the connector arm to the valve stem connector.

3. Attach the mounting bracket to the digital valve controller housing.

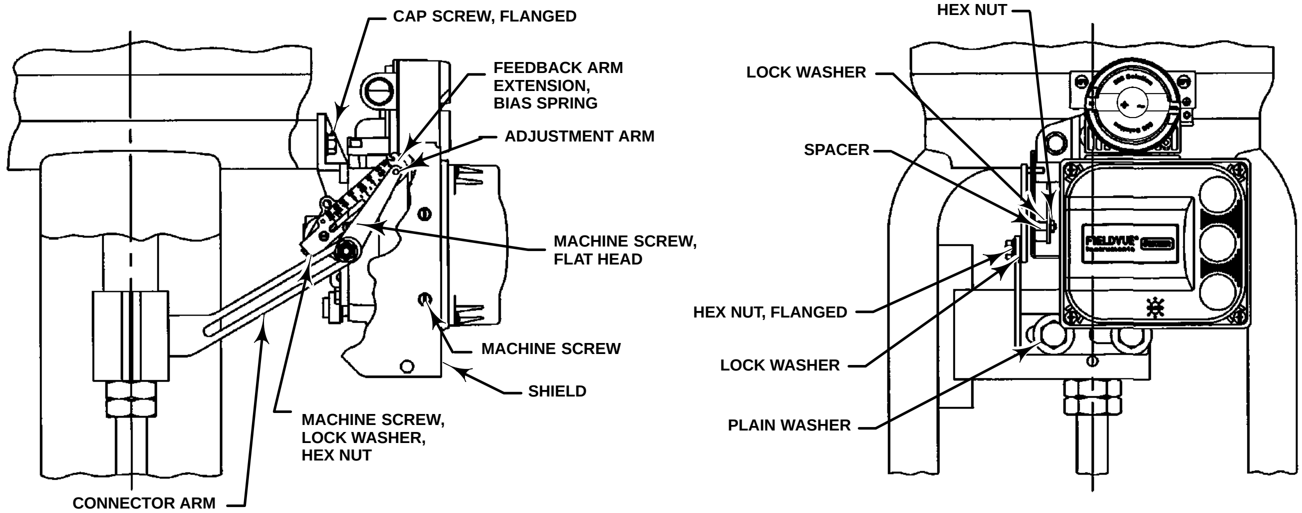


Figure 2-2. FIELDVUE DVC6010 SIS Digital Valve Controller Mounted on Sliding-Stem Actuators with 2 to 4 Inches Travel

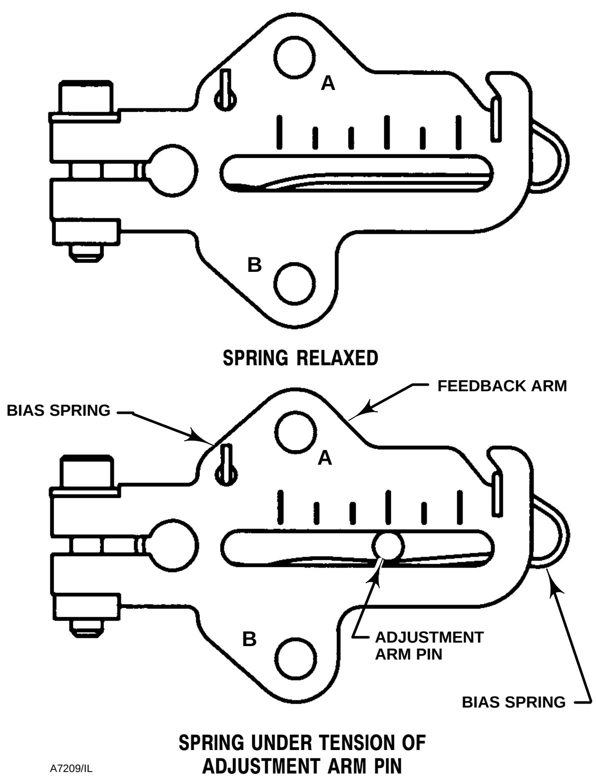


Figure 2-3. Locating Adjustment Arm Pin in Feedback Arm

4. If valve travel exceeds 2 inches, a feedback arm extension is attached to the existing 2-inch feedback arm. Remove the existing bias spring (key 78) from the 2-inch feedback arm (key 79). Attach the feedback arm extension to the feedback arm (key 79) as shown in figure 2-2.

5. Mount the digital valve controller on the actuator as described in the mounting kit instructions.

6. Set the position of the feedback arm (key 79) on the digital valve controller to the no air position by inserting the alignment pin (key 46) through the hole on the feedback arm as follows:

- **For air-to-open actuators** (i.e., the actuator stem retracts into the actuator casing or cylinder as air pressure to the casing or lower cylinder increases), insert the alignment pin into the hole marked ''A''. For this style actuator, the feedback arm rotates counterclockwise, from A to B, as air pressure to the casing or lower cylinder increases.

- **For air-to-close actuators** (i.e., the actuator stem extends from the actuator casing or cylinder as air pressure to the casing or upper cylinder increases), insert the alignment pin into the hole marked ''B''. For this style actuator, the feedback arm rotates clockwise, from B to A, as air pressure to the casing or upper cylinder increases.

Note

When performing the following steps, ensure there is enough clearance between the adjustment arm and the feedback arm to prevent interference with the bias spring.

7. Apply anti-seize (key 64) to the pin of the adjustment arm. As shown in figure 2-3, place the pin into the slot of the feedback arm or feedback arm extension so that the bias spring loads the pin against the side of the arm with the valve travel markings.

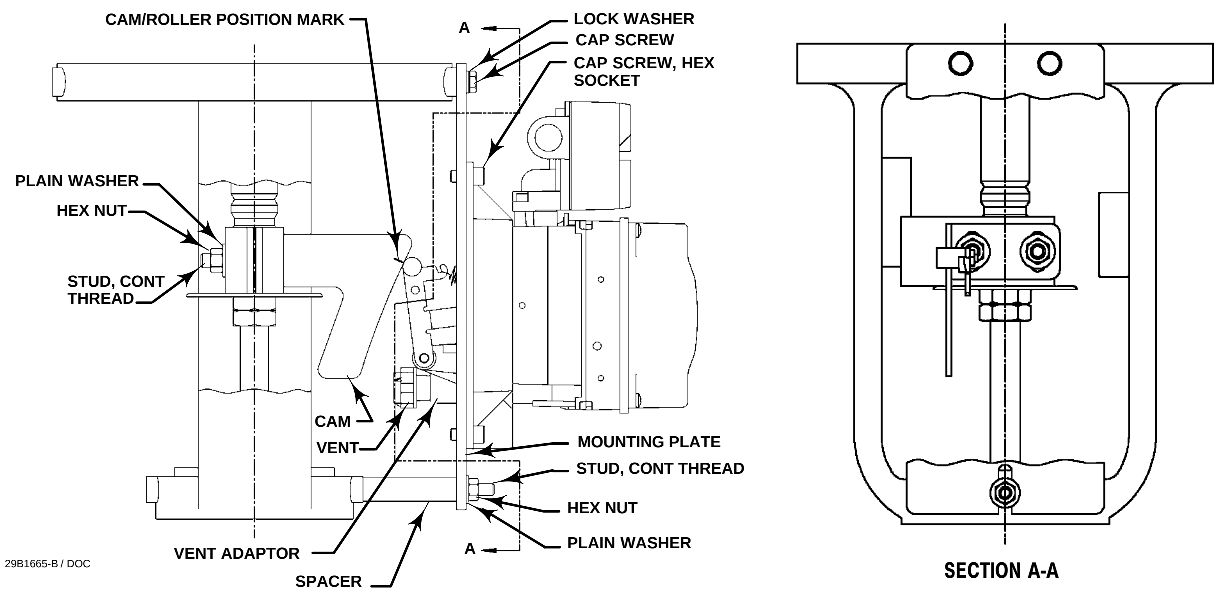


Figure 2-4. FIELDVUE DVC6020 SIS Digital Valve Controller Mounted on Long-Stroke Sliding-Stem Actuator.

8. Install the external lock washer on the adjustment arm. Position the adjustment arm in the slot of the connector arm and loosely install the flanged hex nut.

9. Slide the adjustment arm pin in the slot of the connector arm until the pin is in line with the desired valve travel marking. Tighten the flanged hex nut.

10. Remove the alignment pin (key 46) and store it in the module base next to the I/P assembly.

11. After calibrating the instrument, attach the shield with two machine screws.

Note

All cams supplied with FIELDVUE mounting kits are characterized to provide a linear response.

Note

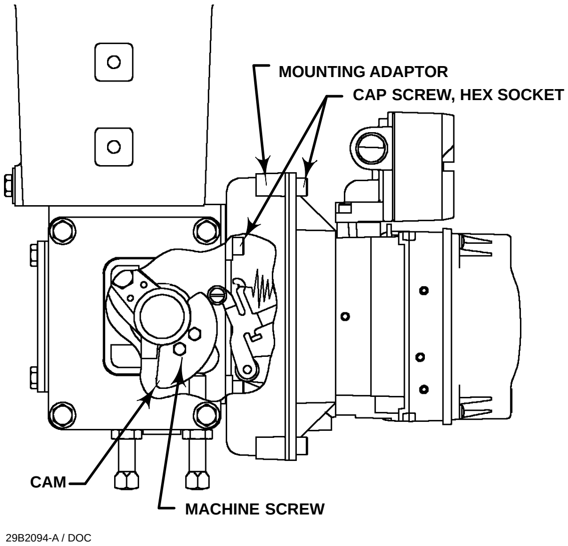
Do not use the stainless steel DVC6020S SIS in high vibration service where the mounting bracket uses standoffs (spacers) to mount to the actuator.

DVC6020 SIS on Long-Stroke (4 to 24 Inch Travel) Sliding-Stem Actuators and Rotary Actuators

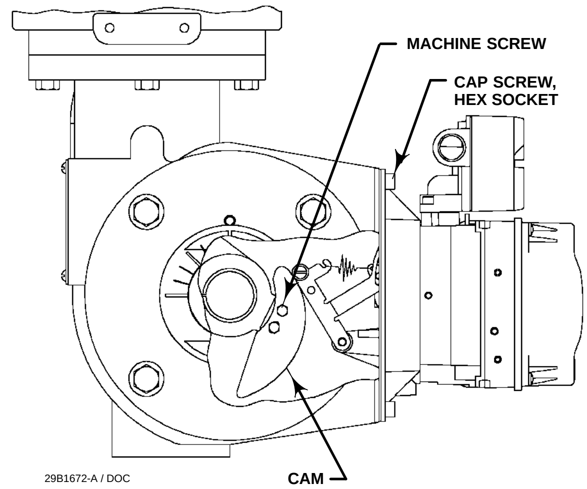
If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve controller on the actuator. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

DVC6020 SIS digital valve controllers use a cam (designed for linear response) and roller as the feedback mechanism. Figure 2-4 shows an example of mounting on sliding-stem actuators with travels from 4 inches to 24 inches. Some long-stroke applications will require an actuator with a tapped lower yoke boss. Figures 2-5 and 2-6 show the DVC6020 SIS mounted on rotary actuators.

As shown in figure 2-5, two feedback arms are available for the digital valve controller. Most long-stroke sliding-stem and rotary actuator installations use the long feedback arm [62 mm



TYPICAL MOUNTING WITH SHORT FEEDBACK ARM
(FISHER 1052 SIZE 33 ACTUATOR SHOWN)



TYPICAL MOUNTING WITH LONG FEEDBACK ARM
(FISHER 1061 SIZE 30–68 ACTUATOR SHOWN)

Figure 2-5. FIELDVUE DVC6020 SIS Digital Valve Controller Mounted on Rotary Actuator

(2.45 inches) from roller to pivot point]. Installations on Fisher 1051 size 33 and 1052 size 20 and 33 actuators use the short feedback arm [54 mm (2.13 inches) from roller to pivot point]. Make sure the correct feedback arm is installed on the digital valve controller before beginning the mounting procedure.

Refer to figures 2-4, 2-5, and 2-6 for parts locations. Also, where a key number is referenced, refer to figure 8-2. Refer to the following guidelines when mounting on sliding-stem actuators with 4 to 24 inches of travel or on rotary 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. If a cam is not already installed on the actuator, install the cam as described in the instructions included with the mounting kit. For sliding-stem actuators, the cam is installed on the stem connector.

3. If a mounting plate is required, fasten the mounting plate to the actuator.

4. For applications that require remote venting, a pipe-away bracket kit is available. Follow the instructions included with the kit to replace the existing mounting bracket on the digital valve controller with the pipe-away bracket and to transfer the feedback parts from the existing mounting bracket to the pipe-away bracket.

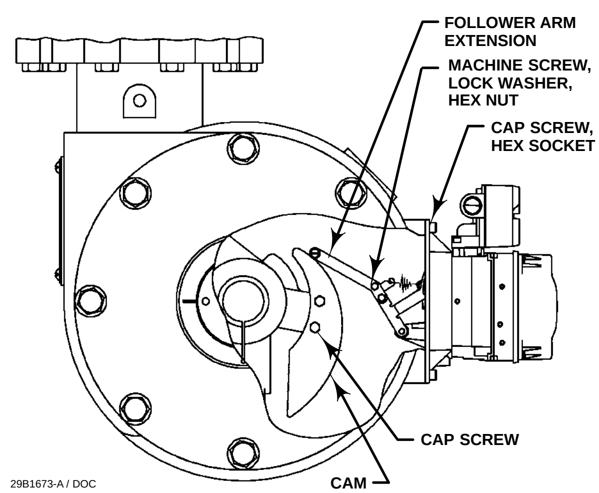


Figure 2-6. FIELDVUE DVC6020 SIS Digital Valve Controller with Long Feedback Arm and Follower Arm Extension Mounted on a Rotary Actuator

5. Larger size actuators may require a follower arm extension, as shown in figure 2-6. If required, the follower arm extension is included in the mounting kit. Follow the instructions included with the mounting kit to install the follower arm extension.

6. Apply anti-seize (key 64) to the pin of the adjustment arm as shown in figure 2-7.

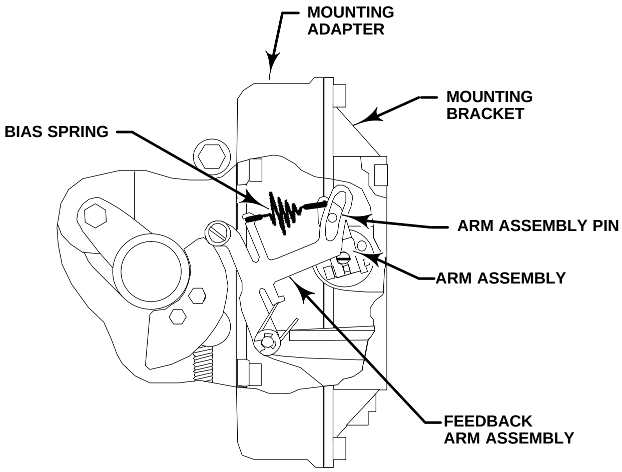


Figure 2-7. Locating Adjustment Arm Pin in Feedback Arm of a FIELDVUE DVC6020 SIS Digital Valve Controller

7. Mount the DVC6020 SIS on the actuator as follows:

- If required, a mounting adaptor is included in the mounting kit. Attach the adaptor to the actuator as shown in figure 2-5. Then attach the digital valve controller assembly to the adaptor. 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 assembly to the actuator or mounting plate. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.

8. For long-stroke sliding-stem actuators, after the mounting is complete, check to be sure the roller aligns with the position mark on the cam (see figure 2-4). If necessary, reposition the cam to attain alignment.

DVC6030 SIS on Quarter-Turn Actuators

If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve controller on the actuator. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

Figure 2-8 shows the DVC6030 SIS digital valve controller mounted on a quarter-turn actuator. Refer to figure 2-8 for parts locations. Refer to the following guidelines when mounting on quarter-turn actuators:

Note

Due to NAMUR mounting limitations, do not use the stainless steel DVC6030S SIS in high vibration service.

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. If necessary, remove the existing hub from the actuator shaft.

3. If a positioner plate is required, attach the positioner plate to the actuator as described in the mounting kit instructions.

4. If required, attach the spacer to the actuator shaft.

Refer to figures 2-9 and 2-10. The travel indicator assembly can have a starting position of 7:30 or 10:30. Determine the desired starting position then proceed with the next step. Considering the top of the digital valve controller as the 12 o'clock position, in the next step attach the travel indicator, so that the pin is positioned as follows:

- **If increasing pressure from the digital valve controller output A rotates the potentiometer shaft clockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 10:30 position, as shown in figure 2-9.

- **If increasing pressure from the digital valve controller output A rotates the potentiometer shaft counterclockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 7:30 position, as shown in figure 2-10.

2

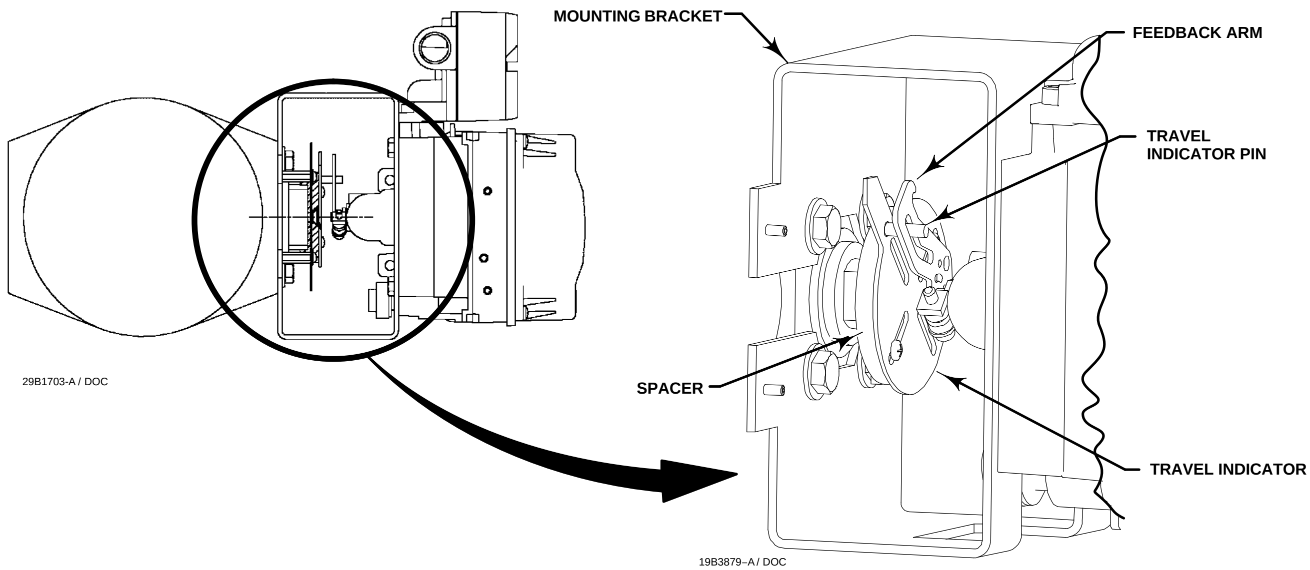
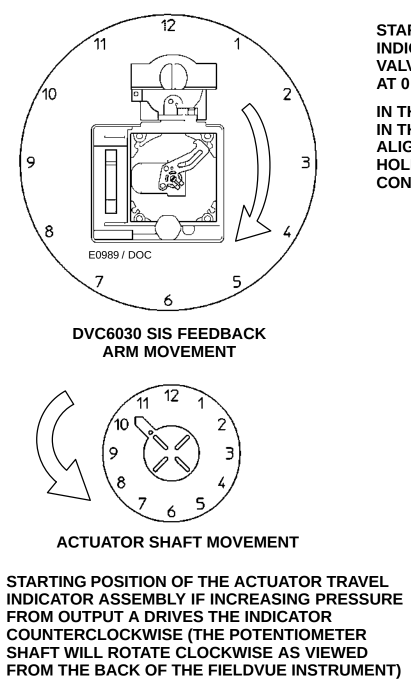


Figure 2-8. Mounting a FIELDVUE DVC6030 SIS Digital Valve Controller on a Rotary Actuator (1032 Size 425A Shown)



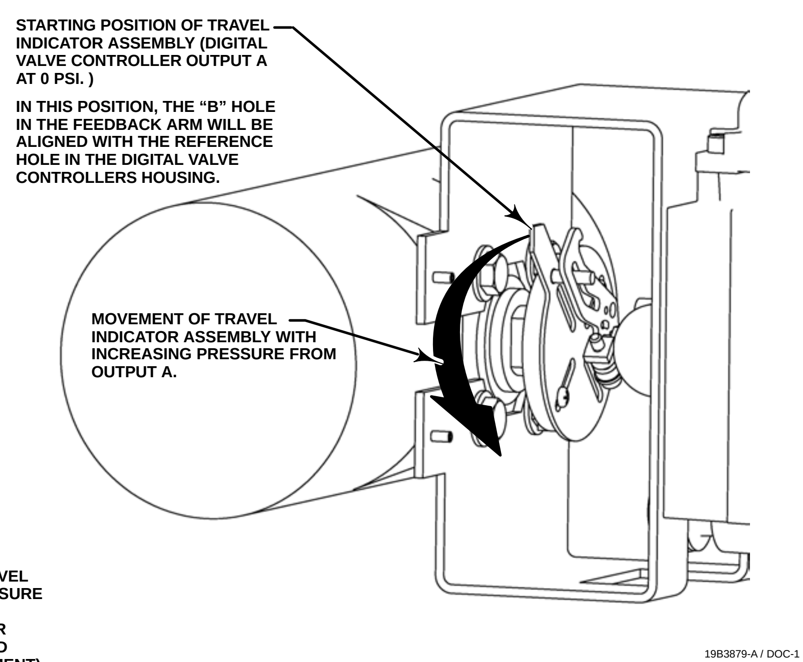


*Figure 2-9. Explanation of Travel Indicator Starting Position and Movement, if **Clockwise** Orientation is Selected for “Travel Sensor Motion” in ValveLink Software or the 375 Field Communicator*

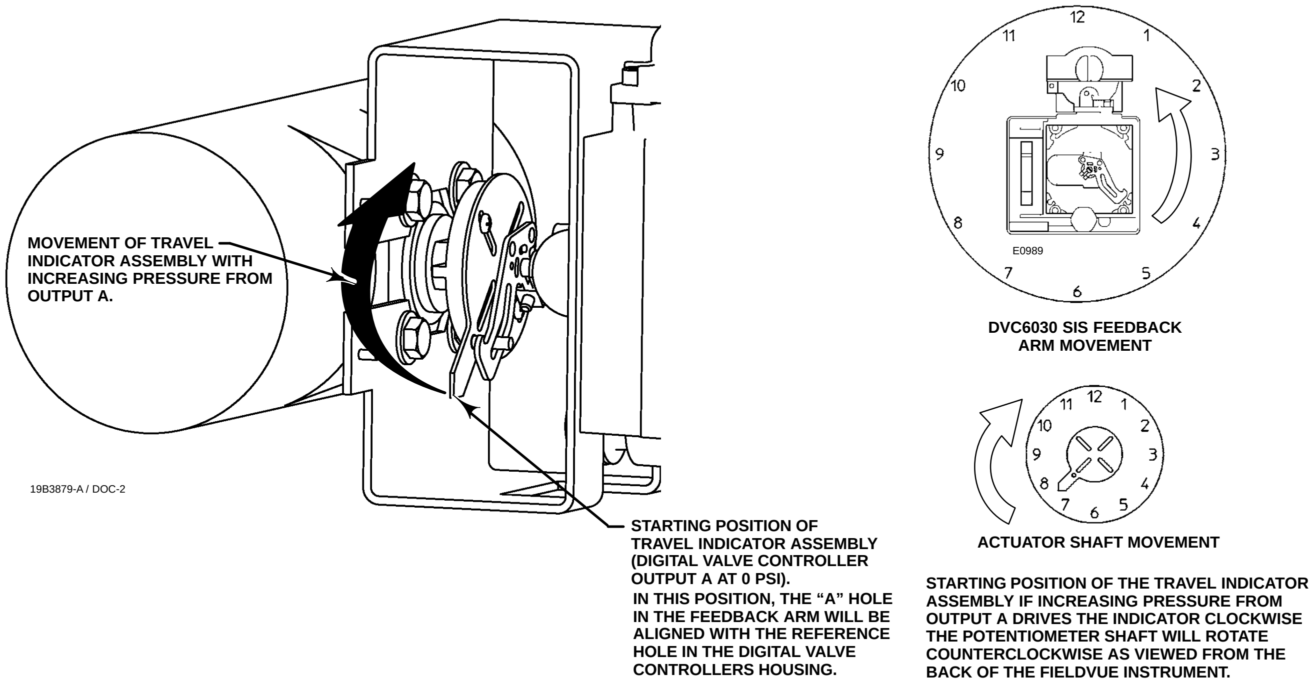


*Figure 2-10. Explanation of Travel Indicator Starting Position and Movement if **Counterclockwise** Orientation is Selected for “Travel Sensor Motion” in ValveLink Software or the 375 Field Communicator*

Note

ValveLink Software and the 375 Field Communicator use the convention of clockwise (figure 2-9) and counterclockwise (figure 2-10) when viewing the potentiometer shaft from the back of the FIELDVUE instrument.

5. Attach the travel indicator, to the shaft connector or spacer as described in the mounting kit instructions.

6. Attach the mounting bracket to the digital valve controller.

7. Position the digital valve controller so that the pin on the travel indicator engages the slot in the feedback arm and the bias spring loads the pin as shown in figure 2-11. Attach the digital valve controller to the actuator or positioner plate.

8. If a travel indicator scale is included in the mounting kit, attach the scale as described in the mounting kit instructions.

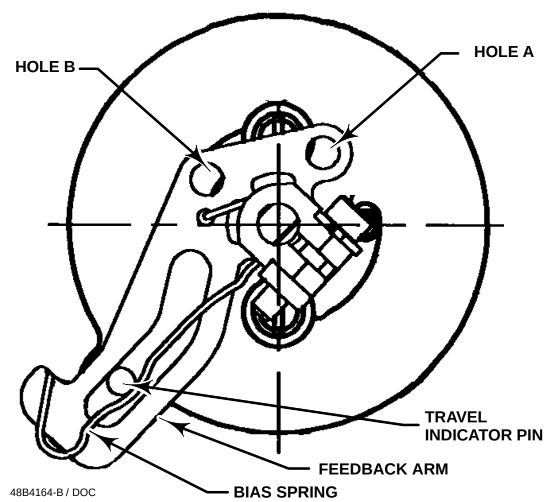


Figure 2-11. Positioning Travel Indicator Pin in the Feedback Arm (Viewed as if Looking from the FIELDVUE DVC6030 SIS toward the Actuator)

Guidelines for Mounting the DVC6005 SIS Base Unit

For remote-mounted digital valve controllers, the DVC6005 SIS base unit ships separately from the control valve and does not include tubing, fittings or wiring.

2

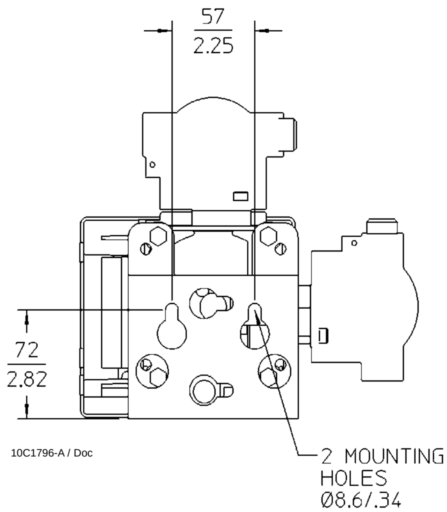


Figure 2-12. FIELDVUE DVC6005 SIS Base Unit with Mounting Bracket (Rear View)

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

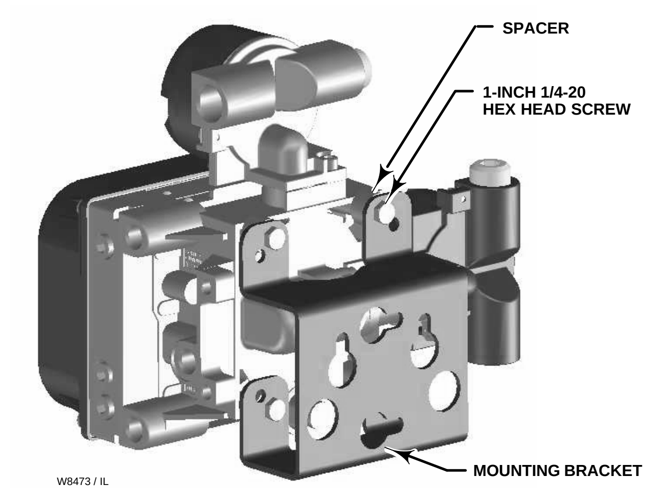
For remote-mounted instruments, mount the DVC6005 SIS base unit on a 50.8 mm (2 inch) pipestand or wall. The included bracket is used for either mounting method.

Wall Mounting

Refer to figures 2-12 and 2-13. Drill two holes in the wall using the dimensions shown in figure 2-12. Attach the mounting bracket to the base unit using four spacers and 25.4 mm (1-inch) 1/4-20 hex head screws. Attach the base unit to the wall using suitable screws or bolts.

Pipestand Mounting

Refer to figure 2-13. Position a standoff on the back of the base unit. Using two 101.6 mm (4-inch) 1/4-20 hex head screws loosely attach the base unit to the pipestand with the mounting bracket. Position the second standoff, then using the remaining 101.6 mm (4-inch) hex head screws, securely fasten the base unit to the pipe stand.



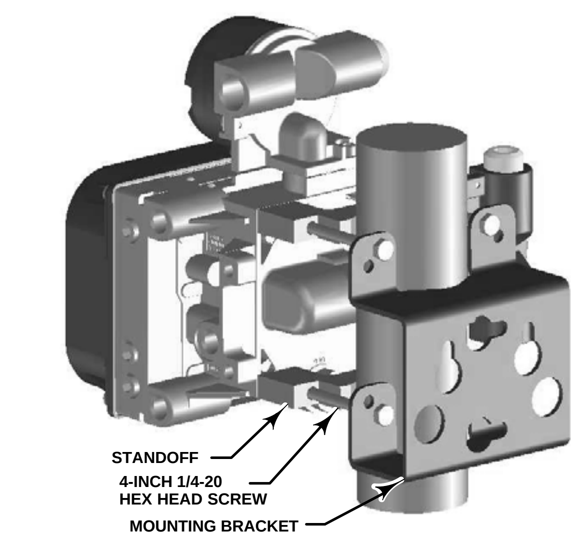


Figure 2-13. FIELDVUE DVC6005 SIS Base Unit Mounting

DVC6015 on Sliding-Stem Actuators Up to 102 mm (4 Inches) of Travel

If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve controller on the actuator. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

Note

Refer to Guidelines for Mounting the DVC6005 SIS Base Unit on page 2-11 when installing a DVC6015 remote feedback unit.

The DVC6015 remote feedback unit mounts on sliding-stem actuators with up to 102 mm (4-inch) travel. Figure 2-1 shows a typical mounting on an actuator with up to 51 mm (2 inch) travel. Figure 2-2 shows a typical mounting on actuators with 51 to 102 mm (2 to 4 inch) travel. For actuators with greater than 102 mm (4 inch) travel, see the guidelines for mounting a DVC6025 remote feedback unit.

Note

While the housing differs on the DVC6015 and the DVC6010 SIS, feedback parts are the same.

Refer to the following guidelines when mounting on sliding-stem actuators with up to 4 inches of travel. Where a key number is referenced, figure 8-6.

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. Attach the connector arm to the valve stem connector.

3. Attach the mounting bracket to the digital valve controller housing.

4. If valve travel exceeds 2 inches, a feedback arm extension is attached to the existing 2-inch feedback arm. Remove the existing bias spring (key 78) from the 2-inch feedback arm (key 79). Attach the feedback arm extension to the feedback arm (key 79) as shown in figure 2-2.

5. Mount the digital valve controller on the actuator as described in the mounting kit instructions.

6. Set the position of the feedback arm (key 79) on the digital valve controller to the no air position by inserting the alignment pin (key 46) through the hole on the feedback arm as follows:

- **For air-to-open actuators** (i.e., the actuator stem retracts into the actuator casing or cylinder as air pressure to the casing or lower cylinder increases), insert the alignment pin into the hole marked ‘‘A’’. For this style actuator, the feedback arm rotates counterclockwise, from A to B, as air pressure to the casing or lower cylinder increases.

- **For air-to-close actuators** (i.e., the actuator stem extends from the actuator casing or cylinder as air pressure to the casing or upper cylinder increases), insert the alignment pin into the hole marked ‘‘B’’. For this style actuator, the feedback arm rotates clockwise, from B to A, as air pressure to the casing or upper cylinder increases.

Note

When performing the following steps, ensure there is enough clearance between the adjustment arm and the feedback arm to prevent interference with the bias spring.

7. Apply anti-seize (key 64) to the pin of the adjustment arm. As shown in figure 2-3, place the pin into the slot of the feedback arm or feedback arm extension so that the bias spring loads the pin against the side of the arm with the valve travel markings.

8. Install the external lock washer on the adjustment arm. Position the adjustment arm in the slot of the connector arm and loosely install the flanged hex nut.

9. Slide the adjustment arm pin in the slot of the connector arm until the pin is in line with the desired valve travel marking. Tighten the flanged hex nut.

10. Remove the alignment pin (key 46) and store it in the module base next to the I/P assembly.

11. After calibrating the instrument, attach the shield with two machine screws.

DVC6025 on Long-Stroke (4 to 24 Inch Travel) Sliding-Stem Actuators and Rotary Actuators

If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve controller on the actuator. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

Note

Refer to Guidelines for Mounting the DVC6005 SIS Base Unit on page 2-11 when installing a DVC6025 remote feedback unit.

DVC6025 remote feedback units use a cam and roller as the feedback mechanism. Figure 2-4 shows an example of mounting on sliding-stem actuators with travels from 4 inches to 24 inches. Some long-stroke applications will require an actuator with a tapped lower yoke boss. Figures 2-5 and 2-6 show examples of mounting on rotary actuators.

Note

While the housing differs on the DVC6025 and the DVC6020 SIS, feedback parts are the same.

As shown in figure 2-5, two feedback arms are available for the digital valve controller. Most long-stroke sliding-stem and rotary actuator installations use the long feedback arm [62 mm (2.45 inches) from roller to pivot point]. Installations on 1051 size 33 and 1052 size 20 and 33 actuators use the short feedback arm [54 mm (2.13 inches) from roller to pivot point]. Make sure the correct feedback arm is installed on the digital valve controller before beginning the mounting procedure.

Refer to figures 2-4, 2-5, and 2-6 for parts locations. Refer to the following guidelines when mounting on sliding-stem actuators with 4 to 24 inches of travel or on rotary 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. If a cam is not already installed on the actuator, install the cam as described in the instructions included with the mounting kit. For sliding-stem actuators, the cam is installed on the stem connector.

3. If a mounting plate is required, fasten the mounting plate to the actuator.

4. For applications that require remote venting, a pipe-away bracket kit is available. Follow the instructions included with the kit to replace the existing mounting bracket on the digital valve controller with the pipe-away bracket and to transfer the feedback parts from the existing mounting bracket to the pipe-away bracket.

5. Larger size actuators may require a follower arm extension, as shown in figure 2-6. If required, the follower arm extension is included in the mounting kit. Follow the instructions included with the mounting kit to install the follower arm extension.

6. Apply anti-seize (key 64) to the pin of the adjustment arm as shown in figure 2-7.

7. Mount the DVC6025 on the actuator as follows:

- If required, a mounting adaptor is included in the mounting kit. Attach the adaptor to the actuator as shown in figure 2-5. Then attach the digital valve controller assembly to the adaptor. 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 assembly to the actuator or mounting plate. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.

8. For long-stroke sliding-stem actuators, after the mounting is complete, check to be sure the roller aligns with the position mark on the cam (see figure 2-4). If necessary, reposition the cam to attain alignment.

DVC6035 on Quarter-Turn Actuators

If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve controller on the actuator. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

Note

Refer to Guidelines for Mounting the DVC6005 SIS Base Unit on page 2-11 when installing a DVC6035 remote feedback unit.

Figure 2-8 shows an example of mounting on a quarter-turn actuator. Refer to figure 2-8 for parts locations. Refer to the following guidelines when mounting on quarter-turn actuators:

Note

While the housing differs on the DVC6035 and the DVC6030 SIS, feedback parts are the same.

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. If necessary, remove the existing hub from the actuator shaft.

3. If a positioner plate is required, attach the positioner plate to the actuator as described in the mounting kit instructions.

4. If required, attach the spacer to the actuator shaft.

Refer to figure 2-14. The travel indicator assembly can have a starting position of 7:30 or 10:30. Determine the desired starting position then proceed with the next step. Considering the top of the remote travel sensor as the 12 o'clock position, in the next step attach the travel indicator, so that the pin is positioned as follows:

- **If increasing pressure from the digital valve controller output A rotates the digital valve controllers potentiometer shaft counterclockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 7:30 position, as shown in figures 2-10 and 2-14.

- **If increasing pressure from the digital valve controller output A rotates the digital valve controllers potentiometer shaft clockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 10:30 position, as shown in figures 2-9 and 2-14.

Note

AMS ValveLink Software and the 375 Field Communicator use the convention of clockwise (figure 2-9) and counterclockwise (figure 2-10) when viewing the potentiometer shaft from the back of the FIELDVUE instrument.

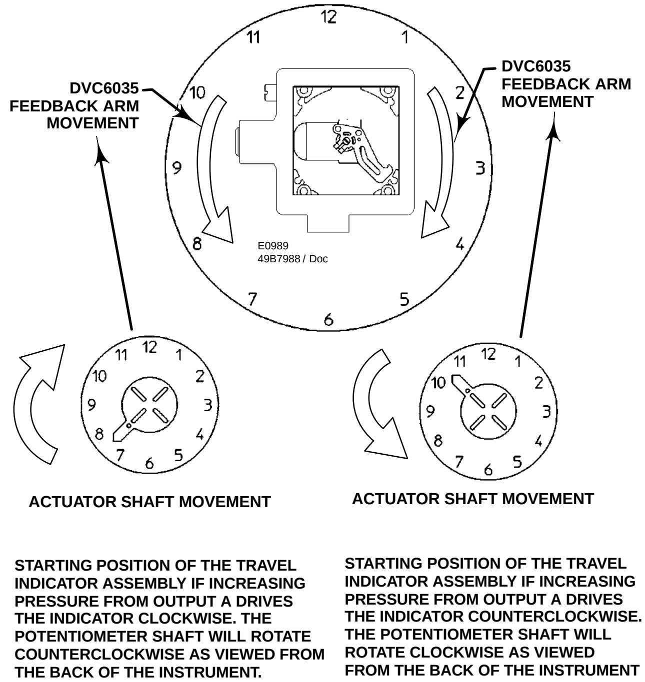


Figure 2-14. FIELDVUE DVC6035 Travel Indicator Installation

5. Attach the travel indicator, to the shaft connector or spacer as described in the mounting kit instructions.

6. Attach the mounting bracket to the digital valve controller.

7. Position the digital valve controller so that the pin on the travel indicator engages the slot in the feedback arm and the bias spring loads the pin as shown in figure 2-11. Attach the digital valve controller to the actuator or positioner plate.

8. If a travel indicator scale is included in the mounting kit, attach the scale as described in the mounting kit instructions.

Mounting the 67CFR Filter Regulator

A 67CFR filter regulator, when used with the DVC6000 SIS digital valve controllers, can be mounted three ways.

Integral-Mounted Regulator

Refer to figure 2-15. Lubricate an O-ring and insert it in the recess around the SUPPLY connection on the digital valve controller. Attach the 67CFR 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.

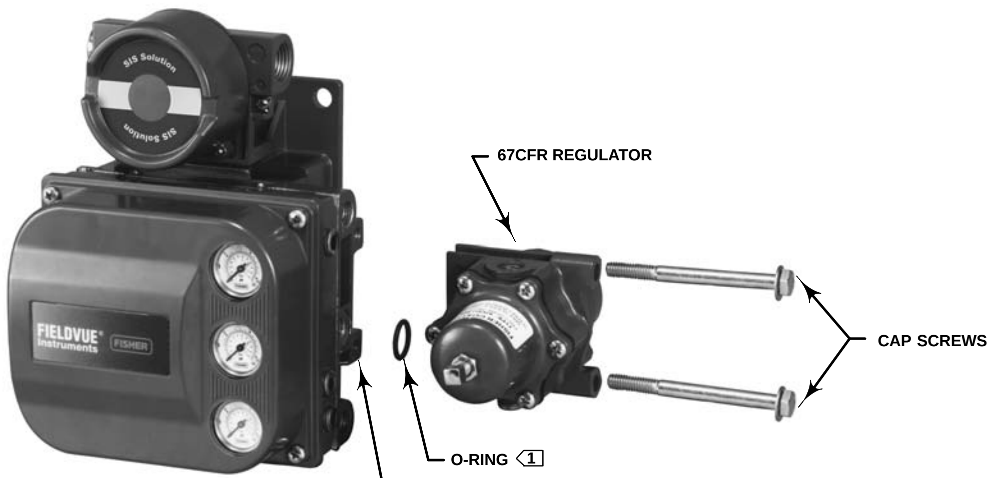


Figure 2-15. Mounting the Fisher 67CFR Regulator on a FIELDVUE DVC6000 SIS Series Digital Valve Controller

Yoke-Mounted Regulator

Mount the filter regulator with 2 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. The O-ring is not required.

Casing-Mounted Regulator

Use the separate 67CFR filter regulator casing mounting bracket provided with the filter regulator. Attach the mounting bracket to the 67CFR 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. The O-ring is not required.

Pressure Connections

Note

Make pressure connections to the digital valve controller using tubing with at least 3/8-inch diameter.

Pressure connections are shown in figure 2-16. All pressure connections on the digital valve controller are 1/4 NPT internal connections. Use 10 mm (3/8-inch) tubing for all pneumatic connections. If remote venting is required, refer to the vent subsection.

Supply Connections

WARNING

To avoid personal injury and property damage resulting from bursting of parts, do not exceed maximum supply pressure.

WARNING

Severe personal injury or property damage may occur from an uncontrolled process if the instrument air supply is not clean, dry and oil-free. While use and regular maintenance of a filter that removes particles larger than 40 microns in diameter will suffice in most applications, check with an Emerson Process Management field office and industry instrument air quality standards for use with corrosive air or if you are unsure about the proper amount or method of air filtration or filter maintenance.

Supply pressure must be clean, dry air that meets the requirements of ISA Standard 7.0.01. 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.

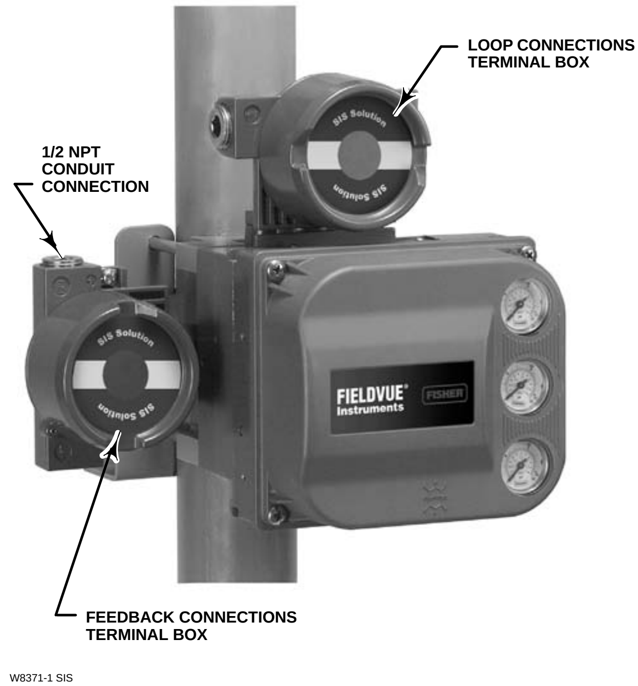
For additional information on air quality refer to the appropriate safety manual:

- Safety Manual for DVC6000 Series FIELDVUE Digital Valve Controllers for Safety Instrumented System (SIS) Solutions 0–20 mA or 0–24 VDC (D103035X012) ***or***

- Safety Manual for DVC6000 Series FIELDVUE Digital Valve Controllers for Safety Instrumented System (SIS) Solutions 4–20 mA (D103294X012)

A 67CFR filter regulator with standard 5 micron filter, or equivalent, may be used to filter and regulate supply air. A filter regulator can be integrally mounted onto the side of the digital valve controller, casing mounted separate from the digital valve controller, or mounted on the actuator mounting boss. Supply and output pressure gauges may be supplied on the digital valve controller. The output pressure gauges can be used as an aid for calibration.

Connect the nearest suitable supply source to the 1/4 NPT IN connection on the filter regulator (if furnished) or to the 1/4 NPT SUPPLY connection on the digital valve controller housing (if 67CFR filter regulator is not attached).



DVC6005 SIS BASE UNIT

Output Connections

A factory mounted digital valve controller has its output piped to the pneumatic input connection on the actuator. If mounting the digital valve controller in the field, connect the 1/4 NPT digital valve controller output connections to the pneumatic actuator input connections.

Single-Acting Actuators

When using a single-acting direct digital valve controller (relay A or C) on a single-acting actuator always connect OUTPUT A to the actuator pneumatic input. Only when using relay C in the special application (i.e. solenoid health monitoring) do you need to connect OUTPUT B to the monitoring line.

When using a single-acting reverse digital valve controller (relay B) on a single-acting actuator always connect OUTPUT B to the actuator pneumatic input. Only when using relay type B in the special application (i.e. solenoid health monitoring) do you need to connect OUTPUT A to the monitoring line.

NOTE:
PNEUMATIC CONNECTIONS APPLICABLE TO BOTH VALVE-MOUNTED INSTRUMENTS AND DVC6005 SIS BASE UNIT.

Figure 2-16. FIELDVUE DVC6000 SIS Digital Valve Controller Connections

W9131-1 SIS

Figure 2-17. FIELDVUE DVC6010 SIS Mounted on a Fisher 585C Piston Actuator

Double-Acting Actuators

DVC6000 SIS Series digital valve controllers on double-acting actuators always use relay A. When the relay adjustment disc is properly set, OUTPUT A will vent to the atmosphere and OUTPUT B will fill to supply pressure when power is removed from the positioner.

For example, to have the actuator stem extend from the cylinder with increasing input current on a vertically mounted sliding-stem valve with a piston actuator, connect OUTPUT A to the upper actuator cylinder connection and connect OUTPUT B to the lower cylinder connection. Figure 2-17 shows a digital valve controller connected to a double-acting piston actuator that will extend the stem with increasing input current.

To have the actuator stem retract into the cylinder with increasing input current, connect OUTPUT A to the lower cylinder connection and OUTPUT B to the upper cylinder connection.

Special Construction to Support Logic Solver Initiated Solenoid Valve Health Monitoring

In single-acting actuator applications with a solenoid valve installed, the DVC6000 SIS can be configured to monitor the health of the solenoid valve test, which is initiated by the Logic Solver. This is accomplished by connecting the unused output port B from the DVC6000 SIS to the pneumatic monitoring line between the solenoid valve and the actuator, as shown in figure 2-18. When single-acting, direct relay C is installed, the “unused” output port is port B. When single-acting, reverse relay B is used, the unused port is port A.

Note

This application is called “special application” in the Setup Wizard relay selection.

This configuration is not possible with a double-acting actuator or when using relay A in single-acting mode.

Vent

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.

The relay output constantly bleeds supply air into the area under the cover. The vent opening at the back of the housing should be left open to prevent pressure buildup under the cover. If a remote vent is required, the vent line must be as short as possible with a minimum number of bends and elbows.

To connect a remote vent to DVC6010 SIS and DVC6030 SIS digital valve controllers and DVC6005 SIS base unit— remove the plastic vent (key 52, figure 8-1). The vent connection is 3/8 NPT internal. At a minimum, 12.7 mm (1/2-inch) tubing should be used when installing a remote vent to prevent excessive pressure from building up under the cover.

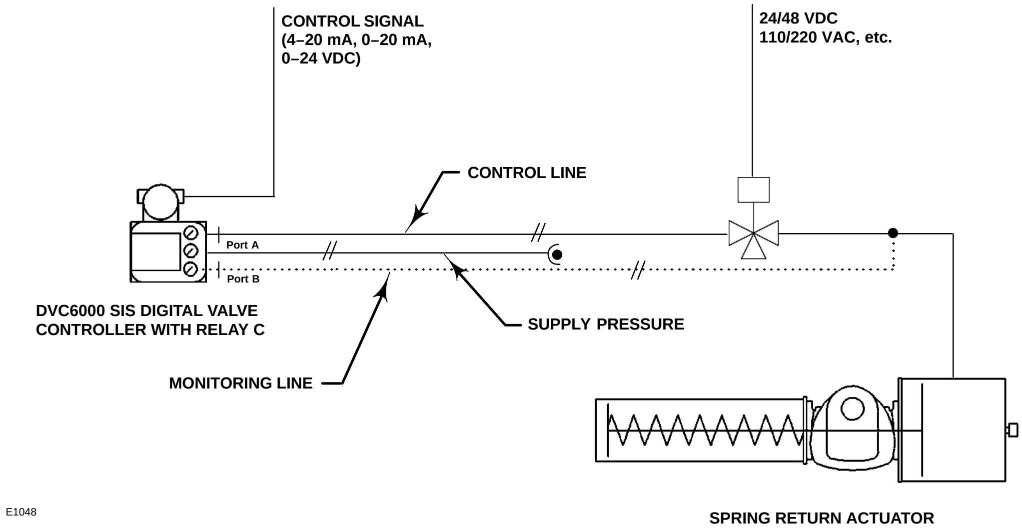


Figure 2-18. Pneumatic Hookup for Solenoid Testing

To connect a remote vent to DVC6020 SIS digital valve controllers— Replace the standard mounting bracket (key 74, figure 8-2) with the vent-away bracket (key 74). Install a pipe plug in the vent-away mounting bracket (key 74). Mount the digital valve controller on the actuator as described in the Installation section of this manual. The vent connection is 3/8 NPT internal. At a minimum, 12.7 mm (1/2-inch) tubing should be used when installing a remote vent to prevent excessive pressure from building up under the cover.

Electrical Connections

WARNING

Refer to the Installation WARNING at the beginning of this section.

To avoid personal injury resulting from electrical shock, do not exceed the maximum input voltage specified in table 1-2 of this instruction manual, or on the product nameplate. If the input voltage specified differs, do not exceed the lowest specified maximum input voltage.

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

WARNING

To avoid personal injury or property damage caused by fire or explosion, remove power to the instrument before removing the terminal box cover in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

4-20 mA Loop Connections

The digital valve controller is normally powered by a control system output card. The use of shielded cable will ensure proper operation in electrically noisy environments.

WARNING

To avoid personal injury or property damage from the sudden release of process pressure, be sure the valve is not controlling the process. The valve may move when the source is applied.

Wire the digital valve controller as follows: (unless indicated otherwise, refer to figures 8-1 through 8-3 for identification of parts).

1. Remove the terminal box cap (key 4) from the terminal box (key 3).

2. Bring the field wiring into the terminal box. When applicable, install conduit using local and national electrical codes which apply to the application.

3. Refer to figure 2-19. Connect the control system output card positive wire ''current output'' to the LOOP + screw terminal in the terminal box. Connect the control system output card negative (or return) wire to the LOOP − screw terminal.

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 mm^2) 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.

To avoid static discharge from the plastic cover, do not rub or clean the cover with solvents. Clean with a mild detergent and water only.

4. As shown in figure 2-19, two ground terminals are available for connecting a safety ground, earth ground, or drain wire. These ground terminals are electrically identical. Make connections to these terminals following national and local codes and plant standards.

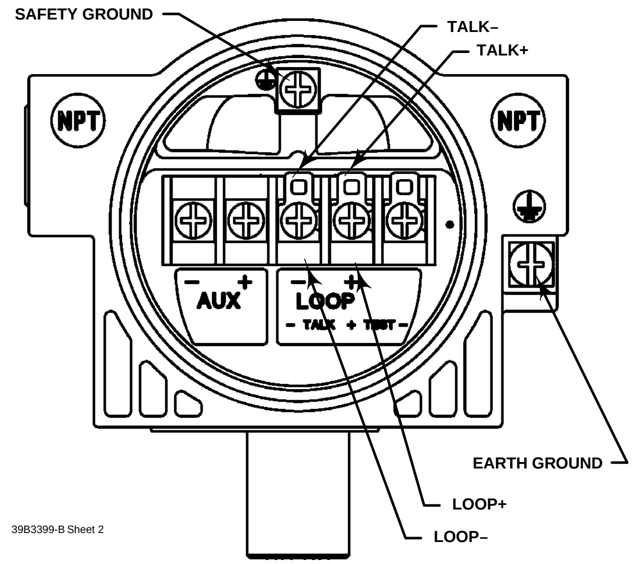


Figure 2-19. FIELDVUE DVC6000 SIS Series Digital Valve Controller Terminal Box

5. Replace and hand tighten the terminal box cap. When the loop is ready for startup, apply power to the control system output card.

Note

When the DVC6000 SIS is operating under normal conditions at 4 mA (trip condition is 20 mA) be sure to apply no less than 4 mA.

Remote Travel Sensor Connections

The DVC6005 SIS base unit is designed to receive travel information via a remote sensor. The remote sensor can be any of the following:

- Emerson Process Management supplied DVC6015, DVC6025 or DVC6035 feedback unit,
- An under-traveled 10 kOhm potentiometer used in conjunction with onboard 30 kOhm resistor, or
- A potentiometer used in conjunction with two fixed resistors (potentiometer travel is the same as actuator travel).

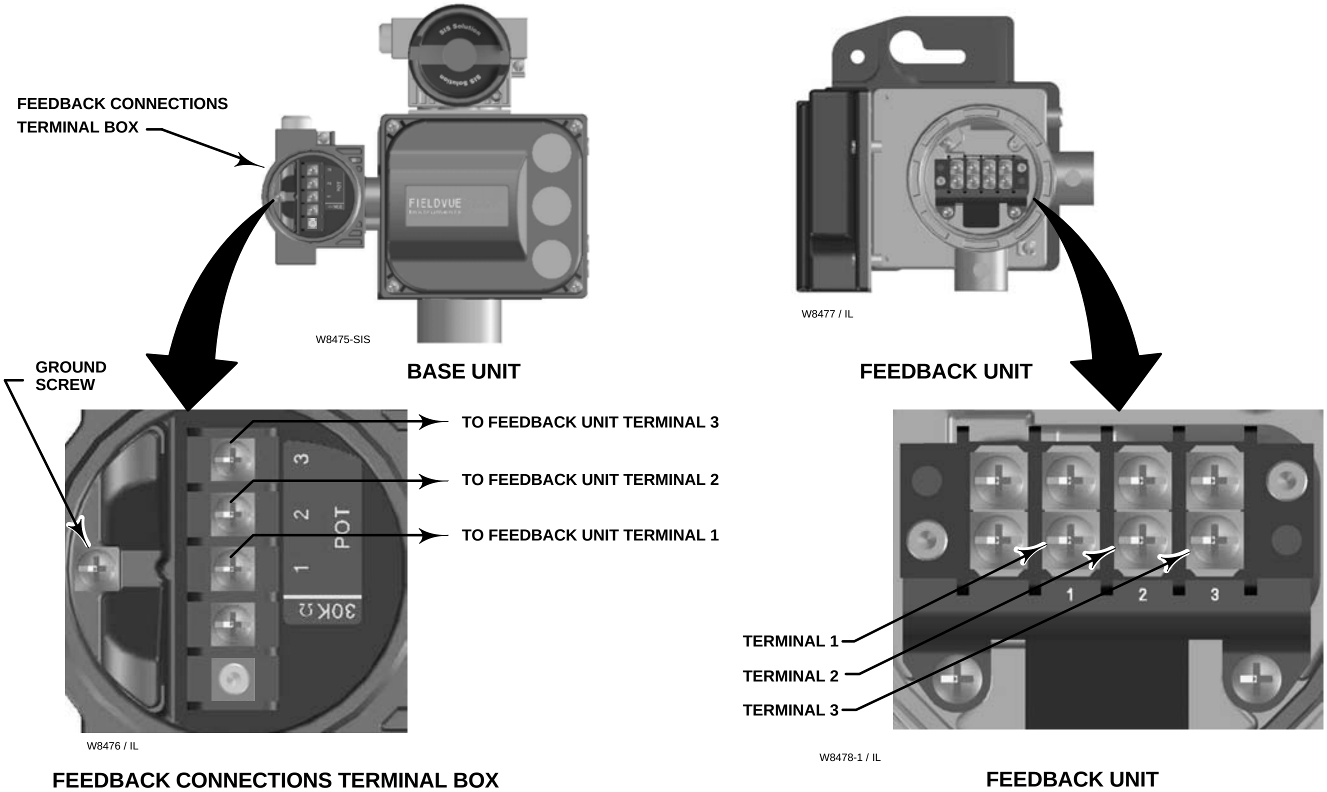


Figure 2-20. Terminal Details for Connecting Base Unit and Feedback Units of Remote-Mounted Digital Valve Controllers

Note

3-conductor shielded cable, 22 AWG minimum wire size, is required for connection between base unit and feedback unit. Pneumatic tubing between base unit output connection and actuator has been tested to 15 meters (50 feet) maximum without performance degradation.

WARNING

Personal injury or property damage, caused by wiring failure, can result if the feedback wiring connecting the base unit with the remote feedback unit shares a conduit with any other power or signal wiring.

Do not place feedback wiring in the same conduit as other power or signal wiring.

Using the DVC6015, DVC6025 & DVC6035 Feedback Unit as a Remote Travel Sensor

1. On the feedback unit, remove the housing cap.

2. On the base unit, remove the feedback connections terminal box cap (see figure 2-16).

3. If necessary, install conduit between the feedback unit and the base unit following applicable local and national electrical codes. Route the 3-conductor shielded cable between the two units (refer to figure 2-20).

4. Connect one wire of the 3-conductor shielded cable between terminal 1 on the feedback unit and terminal 1 on the base unit.

5. Connect the second wire of the 3-conductor shielded cable between terminal 2 on the feedback unit and terminal 2 on the base unit.

6. Connect the third wire of the 3-conductor shielded cable between terminal 3 on the feedback unit and terminal 3 on the base unit.

7. Connect the cable shield or drain wire to the ground screw in the feedback connections terminal box of the base unit.

Note

Do not connect the shield or drain wire to any terminal on the feedback unit, to the earth ground, or any other alternative ground.

8. Replace and hand tighten all covers.

Using an External 10 kOhm External Potentiometer as a Remote Travel Sensor

Note

Potentiometer travel must be between 1.3 and 1.6 times greater than the actuator travel. For example: if an actuator has a travel of 9 inches, then a linear potentiometer must be selected with a rated travel between 11.7 and 14.4 inches. The resistive element must be tapered from 0 kOhm to 10 kOhm over rated travel of the potentiometer. The actuator will only use 63 to 76 % of the potentiometer rated travel.

Note

The digital valve controller must be configured using the SStem/Roller selection on the menu of the appropriate setup device.

The base unit (DVC6005 SIS) was designed to work with a 40 kOhm potentiometer for travel feedback. However, there are linear potentiometers that are readily available with a rated resistance of 10 kOhm. Therefore, the feedback terminal box of the DVC6005 SIS contains an additional 30 kOhm fixed resistor that may be added to the circuit. This brings the total resistance up to the required 40 kOhm.

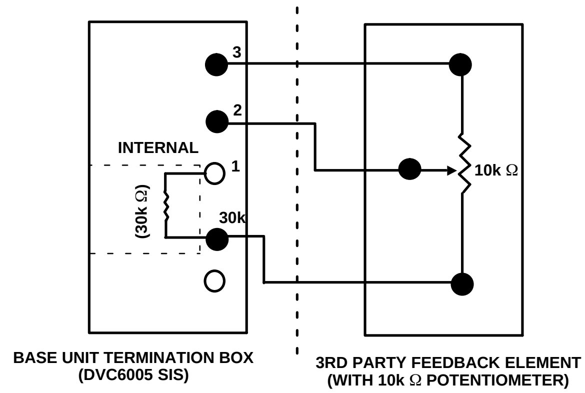


Figure 2-21. Terminal Details for Connecting a FIELDVUE DVC6005 SIS Base Unit and a 10k Ohm External Potentiometer

1. Mount the external 10 kOhm potentiometer to the actuator such that the mid-travel position of the potentiometer (5 kOhm) corresponds to the mid-travel position of the actuator. This will leave an equal amount of unused resistive element on both ends of the travel, which is required by the digital valve controller to function properly.

2. On the base unit, remove the feedback connections terminal box cap (see figure 2-16).

3. If necessary, install conduit between the potentiometer and the base unit following applicable local and national electrical codes. Route the 3-conductor shielded cable between the two units (refer to figure 2-21).

4. Connect one wire of the 3-conductor shielded cable between the Terminal labeled “30kΩ” on the base unit and one end lead of the potentiometer.

5. Connect the second wire of the 3-conductor shielded cable between the middle lead (wiper) of the 10 kOhm potentiometer to Terminal 2 on the base unit.

6. Connect the third wire of the 3-conductor shielded cable between Terminal 3 on the base unit and the other end-lead of the 10 kOhm potentiometer.

7. Connect the cable shield or drain wire to the ground screw in the feedback connections terminal box of the base unit. Do not connect the shield or drain wire to the external potentiometer.

8. Replace and tighten the base unit cover.

Using a Potentiometer with Two Fixed Resistors as a Remote Travel Sensor

Perform the following procedure if a potentiometer is used with the same, or slightly longer travel than the actuator's travel.

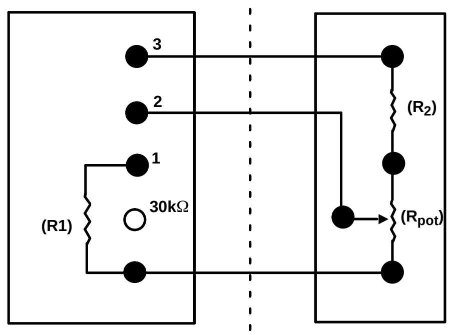


Figure 2-22. Terminal Details for Connecting a FIELDVUE DVC6005 SIS Base Unit and a Three-Resistor Series

Note

The potentiometer must be capable of resistance close to 0 Ohms.

CAUTION

To prevent damage to the potentiometer, ensure that it is free to travel the entire length of the actuator's travel.

Note

The digital valve controller must be configured using the SStem/Roller selection on the menu of the appropriate setup device.

This procedure uses three resistors connected in series, two fixed resistors and one potentiometer. Three conditions must be met for the resistor combination to correctly operate the digital valve controller:

- The maximum resistance of the potentiometer ($R_{pot(max)}$) must be between 3.9 kOhm and 10 kOhm.
- The resistance of R_1 is 4.25 times greater than $R_{pot(max)}$.
- The resistance of R_2 is 4 times less than $R_{pot(max)}$.

WARNING

To avoid personal injury or property damage from an uncontrolled process ensure that the R1 resistor is properly insulated before installing it in the terminal box.

1. On the base unit, remove the feedback connections terminal box cap (see figure 2-16).
2. If necessary, install conduit between the two-resistor series and the base unit following applicable local and national electrical codes. Route the 3-conductor shielded cable between the two units (refer to figure 2-22).
3. Install the fixed resistor (R_1) across the unlabeled bottom Terminal and Terminal #1. The bottom terminal does not have a screw. The screw on the 30 kOhm terminal can be used. R1 must be properly insulated when installed in the terminal box to prevent personal injury or property damage.
4. Connect one wire of the 3-conductor shielded cable between the unlabeled bottom Terminal on the base unit and an end-lead of the external potentiometer (R_{pot}).
5. Connect the second wire of the 3-conductor shielded cable between the middle lead (wiper) of the external potentiometer (R_{pot}) and Terminal 2 on the base unit.
6. Connect the third wire of the 3-conductor shielded cable between between a lead on fixed resistor (R_2) and terminal #3 of the base unit.
7. Connect the available end-lead on the potentiometer (R_{pot}) with the available lead on fixed resistor (R_2).
8. Connect the cable shield or drain wire to the ground screw in the feedback connections terminal box of the base unit. Do not connect the shield or drain wire to the two-resistor series.
9. Replace and tighten the base unit cover.

Example: Using a linear potentiometer rated at 400 Ohms/inch on an actuator with 16" of travel.

- $R_{pot(max)}$ is 400 Ohms/in x 16" = 6.4 kOhm
- R_1 = 6.4 kOhm x 4.25 = 27.2 kOhm
- R_2 = 6.4 kOhm / 4 = 1.6 kOhm

2

Test Connections

WARNING

Personal injury or property damage caused by fire or explosion may occur if this connection is 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 cap before proceeding.

Test connections inside the terminal box can be used to measure loop current across a 1 ohm resistor.

1. Remove the terminal box cap.

2. Adjust the test meter to measure a range of 0.001 to 0.1 volts.

3. Connect the positive lead of the test meter to the TEST + connection and the negative lead to the TEST − connection inside the terminal box.

4. Measure Loop current as:

Voltage (on test meter) × 1000 = milliamps

example:

Test meter Voltage X 1000 = Loop Milliamps

0.004 X1000 = 4.0 milliamperes

0.020 X 1000 = 20.0 milliamperes

5. Remove test leads and replace the terminal box cover.

Communication Connections

WARNING

Personal injury or property damage caused by fire or explosion may occur if this connection is 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 cap before proceeding.

A HART communicating device, such as a 375 Field Communicator or a personal computer running ValveLink Software communicating through a HART modem, interfaces with the DVC6000 SIS Series digital valve controller from any wiring termination point in the 4–20 mA loop. If you choose to connect the HART communicating device directly to the instrument, attach the device to the LOOP + and LOOP − terminals or to the TALK + and TALK − connections inside the terminal box to provide local communications with the instrument.

Wiring Practices

Logic Solver or Control System Requirements

There are several parameters that should be checked to ensure the Logic Solver or control system are compatible with the DVC6000 SIS Series digital valve controller.

Voltage Available

The voltage available at the DVC6000 SIS Series digital valve controller must be at least 11 VDC. The voltage available at the instrument is not the actual voltage measured at the instrument when the instrument is connected. The voltage measured at the instrument is limited by the instrument and is typically less than the voltage available.

As shown in figure 2-23, the voltage available at the instrument depends upon:

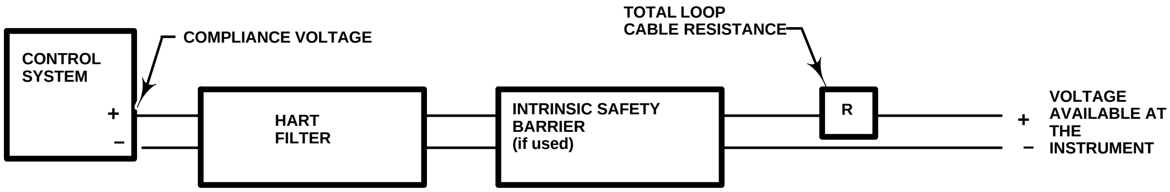
- the control system compliance voltage
- if a filter or intrinsic safety barrier is used, and
- the wire type and length.

The control system compliance voltage is the maximum voltage at the control system output terminals at which the control system can produce maximum loop current.

The voltage available at the instrument may be calculated from the following equation:

Voltage Available = [Control System Compliance Voltage (at maximum current)] − [filter voltage drop (if a HART filter is used)] − [total cable resistance × maximum current] − [barrier resistance x maximum current].

The calculated voltage available should be greater than or equal to 11 VDC.



Calculate Voltage Available at the Instrument as follows:	Example Calculation
Control system compliance voltage	18.5 volts (at 21.05 mA)
– Filter voltage drop (if used) (1)	– 2.3 volts (for HF300 series filter)
– Intrinsic safety barrier resistance (if used) x maximum loop current	– 2.55 volts (121 ohms x 0.02105 amps)
– Total loop cable resistance x maximum loop current	– 1.01 volts (48 ohms x 0.02105 amps for 1000 feet of Belden 9501 cable)
= Voltage available at the instrument (2)	= 15.19 volts available—if safety barrier (2.55 volts) is not used

NOTES:

1. Obtain filter voltage drop. The measured drop will be different than this value. The measured filter voltage drop depends upon control system output voltage, the intrinsic safety barrier (if used), and the instrument. See note 2.

2. The voltage available at the instrument is not the voltage measured at the instrument terminals. Once the instrument is connected, the instrument limits the measured voltage to approximately 9.0 to 10.5 volts.

Figure 2-23. Determining Voltage Available at the Instrument

Table 2-1 lists the resistance of some typical cables.

The following example shows how to calculate the voltage available for a Honeywell™ TDC2000 control system with a HF340 HART filter, and 1000 feet of Belden™ 9501 cable:

Voltage available = [18.5 volts (at 21.05 mA)] – [2.3 volts] – [48 ohms × 0.02105 amps]

Voltage available = [18.5] – [2.3] – [1.01]

Voltage available = 15.19 volts

Compliance Voltage

If the compliance voltage of the control system is not known, perform the following compliance voltage test.

1. Disconnect the field wiring from the control system and connect equipment as shown in figure 2-24 to the control system terminals.

2. Set the control system to provide maximum output current.

3. Increase the resistance of the 1 KΩ potentiometer, shown in figure 2-24, until the current observed on the milliammeter begins to drop quickly.

4. Record the voltage shown on the voltmeter. This is the control system compliance voltage.

For specific parameter information relating to your control system, contact your Emerson Process Management sales office.

Maximum Cable Capacitance

The maximum cable length for HART communication is limited by the characteristic capacitance of the cable. Maximum length due to capacitance can be calculated using the following formulas:

Length(ft) = [160,000 – C_{master}(pF)] ÷ [C_{cable}(pF/ft)]

Length(m) = [160,000 – C_{master}(pF)] ÷ [C_{cable}(pF/m)]

where:

160,000 = a constant derived for FIELDVUE instruments to insure that the HART network RC time constant will be no greater than 0.65 µs (per the HART specification).

C_{master} = the capacitance of the control system or HART filter

C_{cable} = the capacitance of the cable used (see table 2-1)

Table 2-1. Cable Characteristics

Cable Type	Capacitance(1) pF/ft	Capacitance(1) pF/m	Resistance(2) Ohms/ft	Resistance(2) Ohms/m
BS5308/1, 0.5 sq mm	61.0	200	0.022	0.074
BS5308/1, 1.0 sq mm	61.0	200	0.012	0.037
BS5308/1, 1.5 sq mm	61.0	200	0.008	0.025
BS5308/2, 0.5 sq mm	121.9	400	0.022	0.074
BS5308/2, 0.75 sq mm	121.9	400	0.016	0.053
BS5308/2, 1.5 sq mm	121.9	400	0.008	0.025
BELDEN 8303, 22 awg	63.0	206.7	0.030	0.098
BELDEN 8441, 22 awg	83.2	273	0.030	0.098
BELDEN 8767, 22 awg	76.8	252	0.030	0.098
BELDEN 8777, 22 awg	54.9	180	0.030	0.098
BELDEN 9501, 24 awg	50.0	164	0.048	0.157
BELDEN 9680, 24 awg	27.5	90.2	0.048	0.157
BELDEN 9729, 24 awg	22.1	72.5	0.048	0.157
BELDEN 9773, 18 awg	54.9	180	0.012	0.042
BELDEN 9829, 24 awg	27.1	88.9	0.048	0.157
BELDEN 9873, 20 awg	54.9	180	0.020	0.069

1. The capacitance values represent capacitance from one conductor to all other conductors and shield. This is the appropriate value to use in the cable length calculations.
2. The resistance values include both wires of the twisted pair.

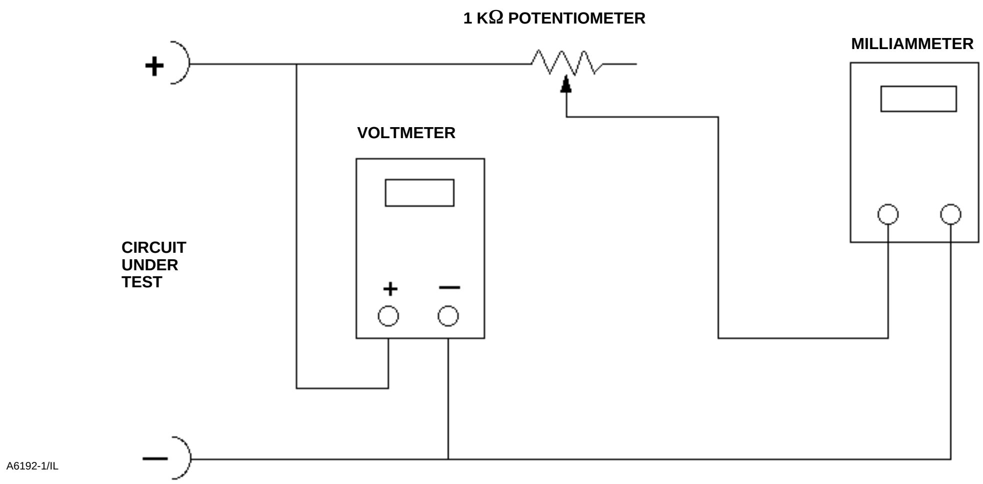


Figure 2-24. Voltage Test Schematic

The following example shows how to calculate the cable length for a Foxboro™ I/A control system (1988) with a C_{master} of 50, 000 pF and a Belden 9501 cable with characteristic capacitance of 50pF/ft.

Length(ft) = [160,000 − 50,000pF] ÷ [50pF/ft]

Length = 2200 ft.

The HART communication cable length is limited by the cable characteristic capacitance. To increase cable length, select a wire with lower capacitance per foot. Contact your Emerson Process Management sales office for specific information relating to your control system.

Installation in a Safety Instrumented System

A DVC6000 SIS instrument may be used in a Safety Instrumented System (SIS) to control operation of a safety block valve or vent valve. The actuator may be either single-acting or double-acting with spring return. DVC6000 SIS instruments will have the label shown in figure 2-25 on the terminal box cover.

The digital valve controller may be installed with a solenoid valve in either a 4-wire system, (figure 2-27), in a 2-wire system (figure 2-28), or a 2-wire system without a solenoid valve (figure 2-29). The digital valve controller ships from the factory with the DIP switch on the printed wiring board set to the correct position per the ordered option.

When operating with a 4-20 mA current signal, the digital valve controller must be setup for point-to-point operation. When operating with a voltage signal, the digital valve controller must be setup for multi-drop operation. The operational mode is determined by a DIP switch on the printed wiring board. As shown in figure 2-26, the nameplate indicates the operational mode set on the printed wiring board at the factory. For information on verifying or changing the switch position, refer to Replacing the PWB Assembly and Setting the DIP Switch and table 7-2 in the Maintenance section.

Installation in a 4-Wire System

Figure 2-27 is an example of the digital valve controller installed in a 4-wire system. In this installation, two separate signals are used: a 4-20 mA DC signal (from the Logic Solver or DCS) for the digital valve controller and a 24 VDC signal (from the Logic Solver) for the solenoid valve.

Note

When a solenoid valve operated by an independent power supply is used pneumatically in series with a DVC6000 SIS, the power source could be 24/48 VDC, 110/220 VAC, etc. Power supply is dependent on customer specifications.

The digital valve controller control mode is set to "analog". When a shutdown condition exists, the logic solver (or DCS) activates the solenoid valve and also cuts the current to the digital valve controller to 0 or 4 mA, thus causing the valve to move to its zero travel

Figure 2-25. Terminal Box Cover Label on FIELDVUE DVC6000 SIS Digital Valve Controllers

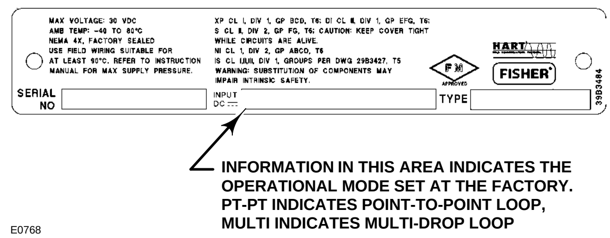


Figure 2-26. Typical Digital Valve Controller Nameplate

position. In this installation, the switch on the digital valve controller printed wiring board must be set for point-to-point operation. To set the digital valve controller control mode in an SIS 4-wire system, from the *Online* menu select *Setup, Basic Setup,* and *Setup Wizard.*

The Setup Wizard will automatically setup the instrument for a 4-wire installation based upon the printed wiring board DIP switch setting.

Note

Using the digital valve controller in a 4-wire system with an ASCO™ low-power solenoid valve EF8316G303, EF8316G304, EFX8553G305 103594 or EFX8551G305 103594 (or an equivalent low-power solenoid valve) requires a separate external air supply for pilot. Ensure that the solenoid valve's "selection gasket" is in the "External Position".

The use of external piloting when using an EF8316G303 or EF8316G304 requires the pilot pressure to be at least 15 psig higher than the main line pressure.

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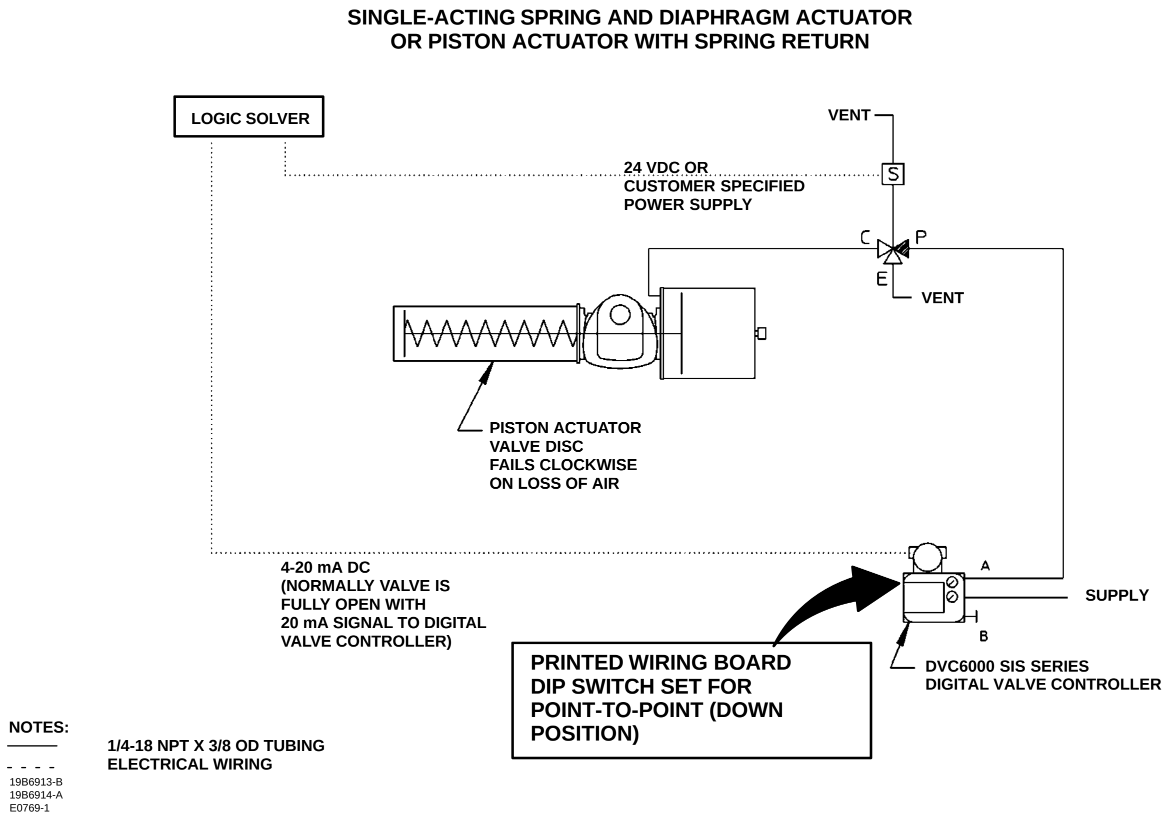

Figure 2-27. Example of FIELDVUE DVC6000 SIS Series Digital Valve Controller Installed in a 4-Wire SIS System

ASCO EFX8553G305 103594 or EFX8551G305 103594 low-powered solenoid valves with aluminum bodies can be used where the application requires zero differential pressure and when the solenoid valve exhaust port is connected to another solenoid valve used as a selector or diverter.

For more information, refer to the ASCO catalog or contact your Emerson Process Management sales office.

Installation in a 2-Wire System

Figures 2-28 and 2-29 are examples of the digital valve controller installed in a 2-wire system. In these installations the logic solver provides a single 24 VDC signal that powers both the digital valve controller and the optional solenoid valve (a low power consumption model such as the ASCO EF8316G303, EF8316G304, EFX8553G305 103594, or EFX8551G305 103594). The digital valve controller's control mode is set to “digital”. When a shutdown condition exists, the logic solver cuts power to both the digital valve controller and the solenoid valve (if connected), causing the valve to move to it's zero travel position. A Fisher LC340 line conditioner is required to allow HART communications over the segment. Alternatively, an impedance boosting multiplexer (available from MTL, Pepperl+Fuchs/Elcon and others) may be used, eliminating the need for a line conditioner when installed as per figure 2-29.

Note

Use of a solenoid valve is optional, and dependent on stroking speed and other operating conditions.

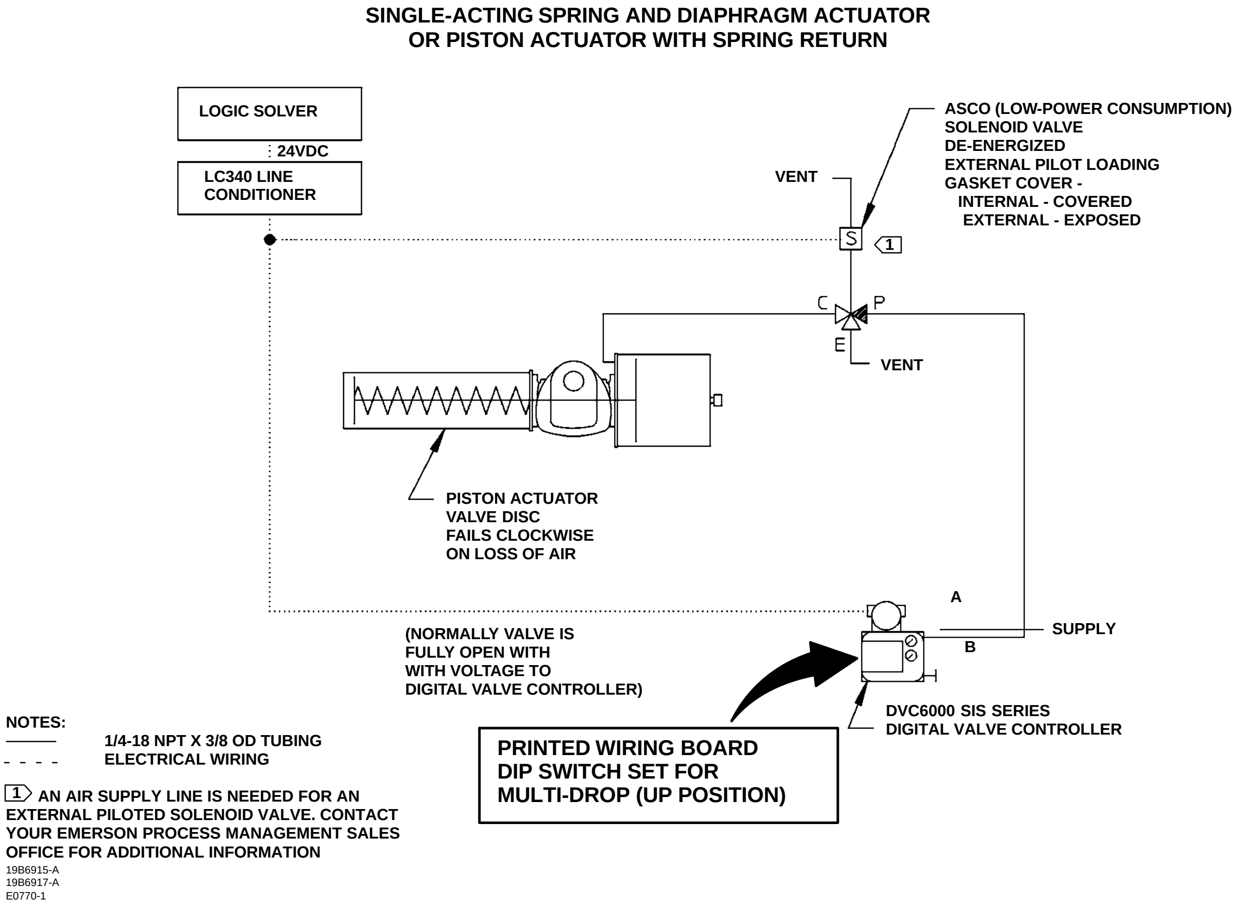

Figure 2-28. Example of FIELDVUE DVC6000 SIS Series Digital Valve Controller Installed in a 2-Wire SIS System

Table 2-2. Maximum Loop Wire Resistance per Logic Solver Output Voltage(1)

Logic Solver Output Voltage (VDC)	Maximum Loop Wire Resistance (Ohms)	Maximum Wire Length (feet)(2)			
		22 AWG	20 AWG	18 AWG	16 AWG
24.00	32.0	952	1429	2381	3175
23.75	27.0	804	1205	2009	2679
23.50	22.0	655	982	1637	2183
23.25	17.0	506	759	1265	1687
23.00	12.0	357	536	893	1190
22.75	7.0	208	313	521	694
22.50	2.0	60	89	149	198

1. Maximums in this table assume a line conditioner and a solenoid that requires a minimum of 20.4 V and 42 mA to engage.
2. Wire length includes both wires in a twisted pair.

The line conditioner introduces an approximate 2.0 volt drop in the SIS system wiring with a 50 mA load. If used with a solenoid valve (such as the ASCO EF8316G303, EF8316G304, EFX8553G305 103594, or EFX8551G305 103594) the guaranteed engagement voltage at maximum temperature must be ensured.

ASCO EF8316 or EF8553 solenoid valves (if connected) require up to 42 mA to pull in. The digital valve controller set for multi-drop operation draws approximately 8 mA. Based on these conditions, table 2-2 lists the maximum loop wire resistance permitted for various logic solver output voltages. The table also lists maximum length of wire of various gauges that may be used.

The line conditioner is intended for installation in a control or marshalling cabinet near the logic solver field wiring terminals. In some installations, such as shown in figure 2-29, where no solenoid is used, an impedance boosting multiplexer may be used in place of a line conditioner. The LC340 line conditioner will be needed when a low-power solenoid is connected to the same 2-wire loop as the digital valve controller as shown in figure 2-28.

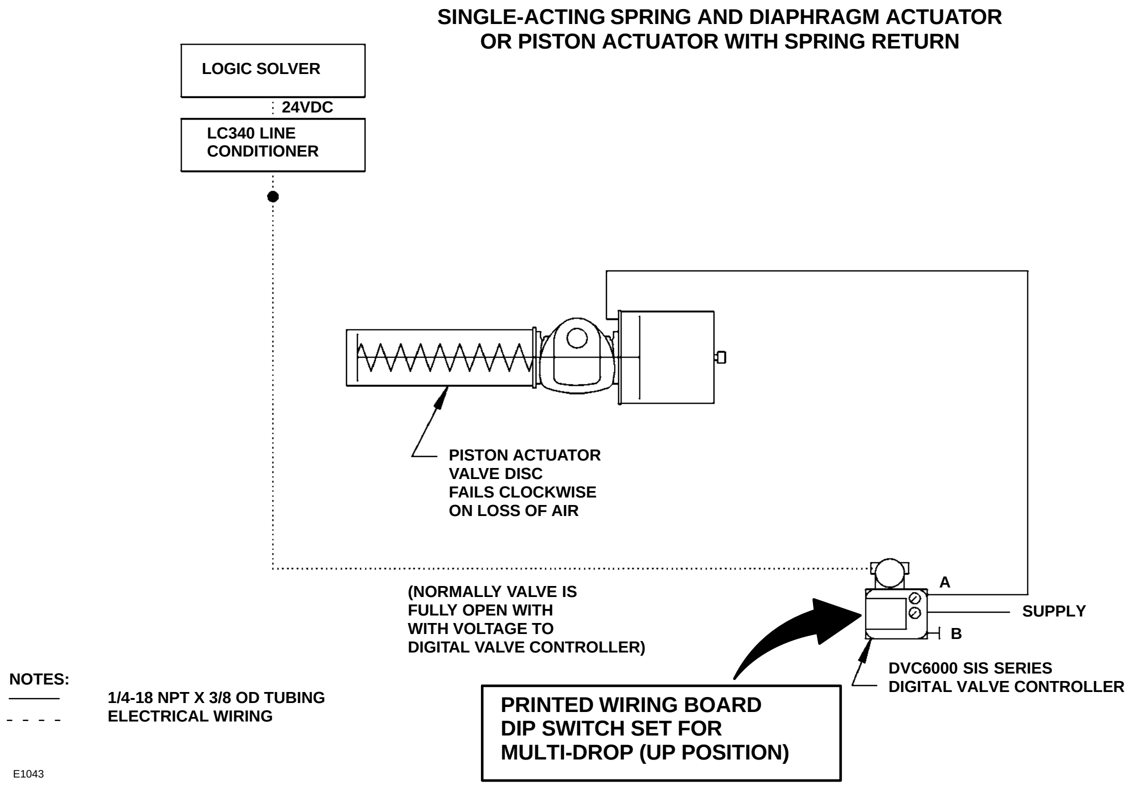

Figure 2-29. Example of FIELDVUE DVC6000 SIS Series Digital Valve Controller Installed in a 2-Wire SIS System (without a Solenoid Valve)

Make connections to the line conditioner as follows:

CAUTION

Do not overtighten the wiring connection terminals or subject them to heavy lateral (pushing) loads. This could damage the line conditioner.

1. Be sure the digital valve controller DIP switch is set for multi-drop operation.

2. Connect the digital valve controller LOOP + terminal to the line conditioner FLD + terminal.

3. Connect the digital valve controller LOOP – terminal to the line conditioner FLD – terminal.

4. Connect the solenoid valve field terminals to the line conditioner FLD + and – terminals.

5. Connect the logic solver output to the line conditioner SYS + and – terminals.

Note

Using the digital valve controller in a 2-wire system (multi-drop operation) with an ASCO low-power solenoid valve EF8316G303, EF8316G304, EFX8553G305 103594 or EFX8551G305 103594 (or an equivalent low-power solenoid valve) requires a line conditioner. Using a low-power piloted solenoid valve requires a separate air supply.

When using an EF8316G303 or EF8316G304 ensure that the solenoid valve's "selection gasket" is in the "External Position". The use of external piloting requires the pilot pressure to be at least 15 psig higher than the main line pressure.

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EFX8553G305 103594 or EFX8551G305 103594 low-powered solenoid valves with aluminum bodies can be used where the application requires zero differential pressure and when the solenoid valve exhaust port is connected to another solenoid valve used as a selector or diverter.

For more information, refer to the ASCO catalog or contact your Emerson Process Management sales office

See the separate FIELDVUE LC340 Line Conditioner Instruction Manual (D102797X012) for detailed installation information.

To set the digital valve controller Control Mode for operation in an SIS 2-wire system select *Configure / Setup, Basic Setup,* and *Setup Wizard* from the *Online* menu.

The Setup Wizard will automatically setup the instrument for a 2-wire installation based upon the printed wiring board DIP switch setting.

Note

To ensure correct installation, follow the Basic Setup procedures as described in Section 3.

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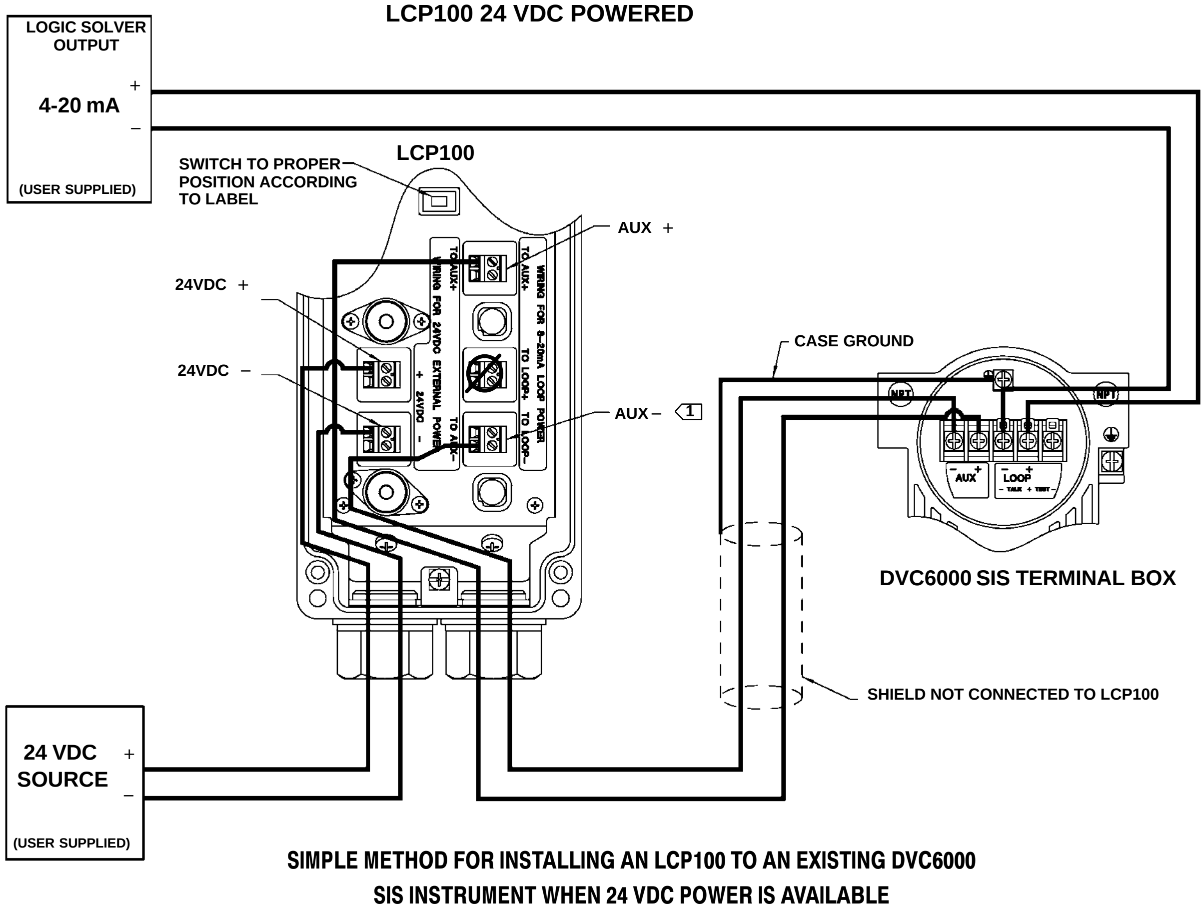


NOTE: DO NOT CONNECT THE LOOP + TERMINAL IN THE LCP100 TO THE LOOP + TERMINAL IN THE DVC6000 SIS. THIS WILL CAUSE THE LCP100 TO UNNECESSARILY CONSUME 4 mA AT THE EXPENSE OF THE DVC6000 SIS.

1 THIS CONNECTION IS ALSO LABELED LOOP –.

GE26881-B, Sheet 3
E1082-2

Figure 2-30. Wiring for 24 VDC External Power Configuration

LCP100 Local Control Panel

Installation

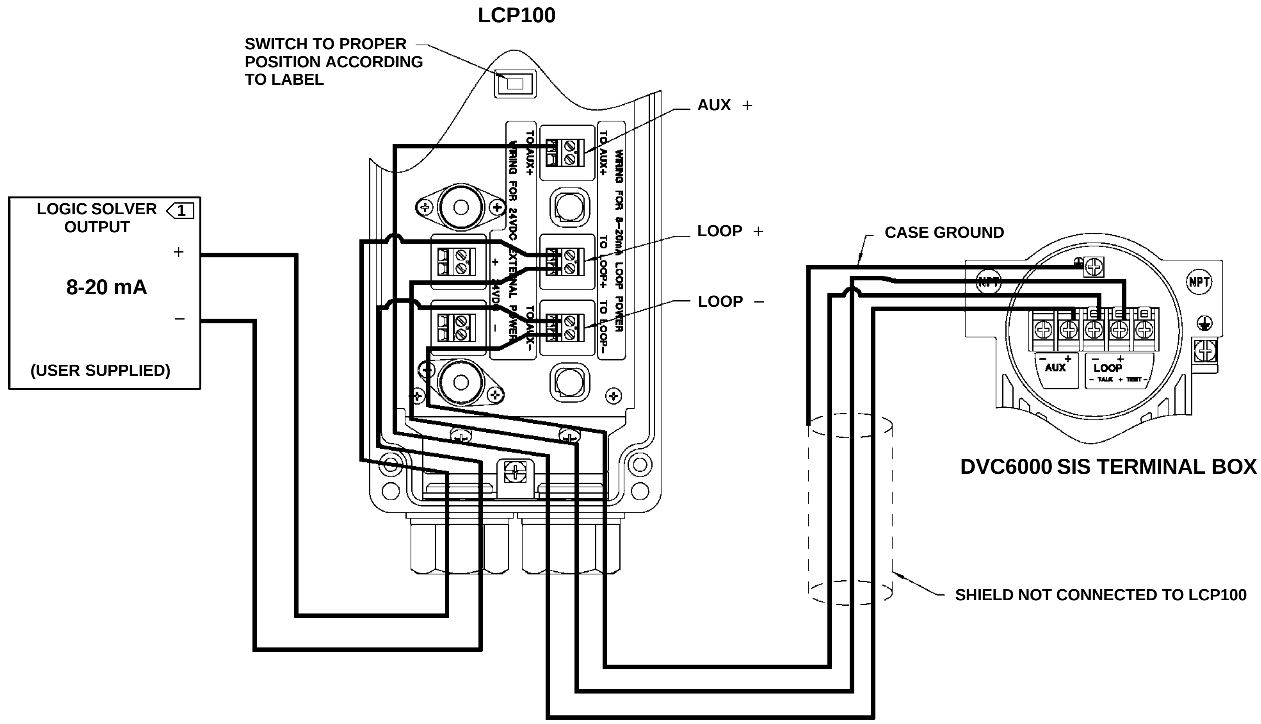
The Fisher LCP100 Local Control Panel has four (4) mounting holes for on-site mounting of the device. The LCP100 must be installed so that the wiring connections are on the bottom to prevent accumulation of moisture inside the box.

Electrical Connections

WARNING

Select wiring and/or cable glands that are rated for the environment of use (such as hazardous location, 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.

LOOP POWERED
(LOGIC SOLVER WIRED TO LCP100 FIRST)



NOTE:
1 THE LOGIC SOLVER MINIMUM OUTPUT MUST BE AT LEAST 8 mA. THE LCP100, WHEN POWERED BY THE LOOP, CONSUMES APPROXIMATELY 4 mA.

GE26881-B, Sheet 2
E1084-1

Figure 2-31. Wiring for 8-20 mA Loop-Powered Configuration; Logic Solver Wired to the Fisher LCP100 then the FIELDVUE DVC6000 SIS

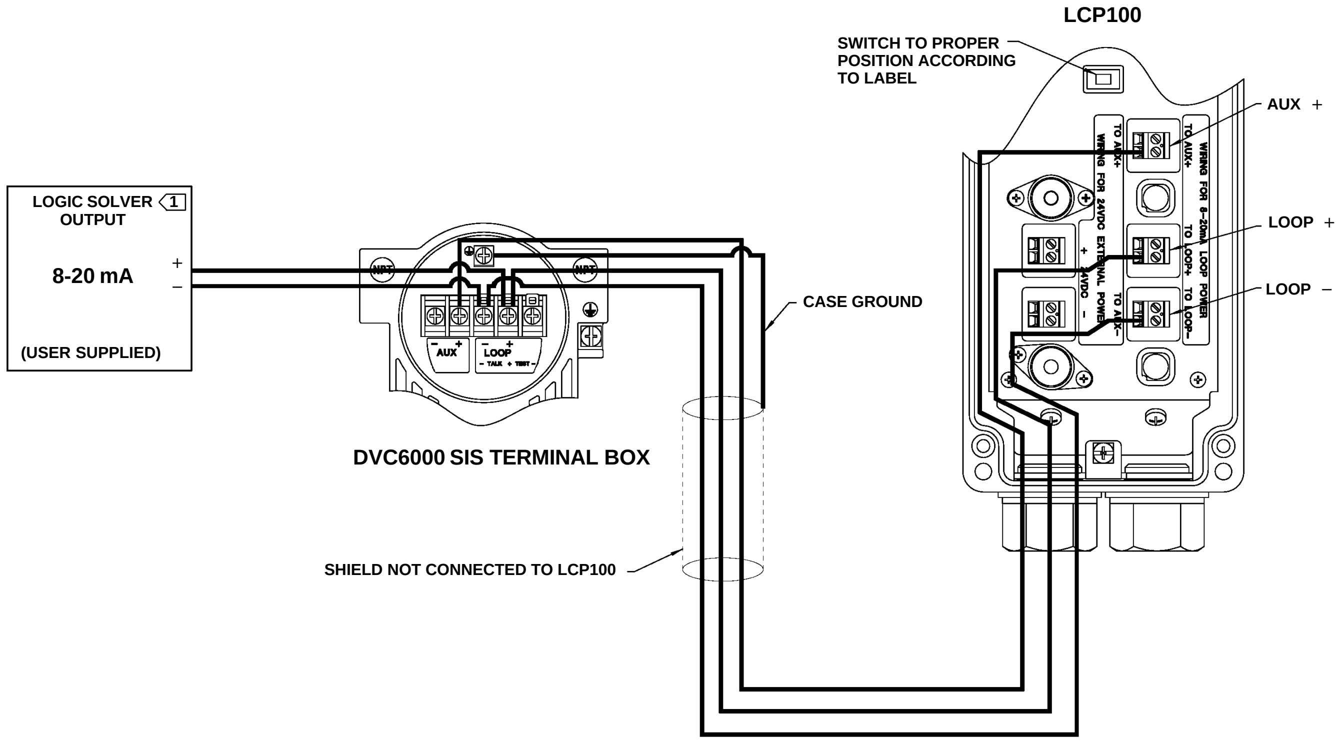
Wiring connections must be in accordance with local, regional, and national codes for any given hazardous area approval. Failure to follow the local, regional, and national codes could result in personal injury or property damage from fire or explosion

Electrical connections are shown in figures 2-31, 2-32, and 2-30. There are two different ways to power the LCP100. Method one requires an external 24 VDC source to power the LCP100. Method two uses loop power wiring in series.

In method one, shown in figure 2-30, signal wiring is brought to the enclosure through a 3/4 NPT or M20 housing conduit connection (connection type is identified on nameplate.

The second method uses loop current to power the LCP100. This can be accomplished in two ways: with the wiring going first to the LCP100, then to the DVC6000 SIS, as shown in in figure 2-31, or with the

LOOP POWERED
(LOGIC SOLVER WIRED TO DVC6000 SIS FIRST)



NOTE:
1 THE LOGIC SOLVER MINIMUM OUTPUT MUST BE AT LEAST 8 mA. THE LCP100, WHEN POWERED BY THE LOOP, CONSUMES APPROXIMATELY 4 mA.

GE26881-B, Sheet 1
E1083-1

Figure 2-32. Wiring for 8-20 mA Loop-Powered Configuration; Logic Solver Wired to the FIELDVUE DVC6000 SIS then the Fisher LCP100

wiring going first to the DVC6000 SIS, then to the LCP100, as shown in figure 2-32. However, because the LCP100 consumes energy to drive the lights and microprocessor, minimum current signal from the logic solver must be 8 mA. If the logic solver cannot provide an output range of 8-20 mA then method one must be used.

Ensure that the DIP switch position is properly set for the desired mode of operation (loop powered or 24 VDC powered).

When installing the cover tighten the screws evenly in a criss-cross pattern to help ensure the cover is properly installed.

Section 3 Basic Setup 

Configuration Protection

To setup and calibrate the instrument, the protection must be set to *None* with the Field Communicator. If the protection is not *None*, changing the protection requires placing a jumper across the Auxiliary terminals in the terminal box.

Note

When a Fisher LCP100 control panel is used, changing protection does not require placing the jumper across the Auxiliary terminals in the terminal box.

To remove protection:

1. Connect a 4-20 mA source to the instrument.

2. Connect the Field Communicator to the instrument and turn it on.

3. Press the Hot key on the Field Communicator and select *Protection.*

4. From the *Protection* menu, select *None.* When prompted by the Field Communicator, temporarily attach the jumper to the AUX + and AUX – terminals in the instrument terminal box.

Instrument Mode

To setup and calibrate the instrument, the instrument mode must be *Out Of Service*.

To view/change the instrument mode, press the Hot Key and select *Instrument Mode.* If the mode is not *Out Of Service*, select *Out Of Service* from the *Instrument Mode* menu and press ENTER.

Instrument Mode allows you to either take the instrument Out of Service or place it In Service. Taking the instrument Out of Service allows you to perform instrument calibration and also allows you to change setup variables that affect control. See Setting Protection to ensure protection is set correctly prior to operation.

Basic Setup

WARNING

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 could result in personal injury or property damage.

WARNING

To avoid personal injury or equipment damage caused by the release of process pressure, always use the Setup Wizard to perform setup and calibration before placing the DVC6000 SIS Series instrument in operation for the first time. The Setup Wizard sets up the required parameters for SIS solutions.

Note

To setup and calibrate the instrument, the protection must be None and the Instrument Mode must be Out Of Service. See Configuration Protection and Instrument Mode at the beginning of this section for information on removing instrument protection and changing the instrument mode.

Note

In the event of a power failure the DVC6000 SIS automatically restores the device to In Service upon restoration of power. This is to provide greater availability of the safety function.

If power is inadvertently interrupted while performing set up or maintenance, you may need to return the DVC6000 SIS to out of service if the interrupted task requires that mode of operation.

When the DVC6000 SIS Series 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.

Before beginning Basic Setup, be sure the instrument is correctly mounted as described in the Installation section.

Setup Wizard (1-1-1)

Note

The Setup Wizard must be run for first time installations before placing the DVC6000 SIS in service.

Use the Setup Wizard in the 375 Field Communicator to setup the digital valve controller for operation in an SIS solution. The Setup Wizard automatically sets up the instrument using specified actuator information. To access the Setup Wizard, from the *Online* Menu select *Configure/Setup, Basic Setup,* and *Setup Wizard*.

1. When prompted by the Setup Wizard, enter the pressure units (psi, bar, kPa, or kg/cm^2).

2. Enter the maximum instrument supply pressure.

After entering the maximum instrument supply pressure, the Setup Wizard prompts you for actuator information.

3. Enter the partial stroke test start point.

4. Indicate if the DVC6000 SIS is connected to an LCP100.

5. Enter the manufacturer of the actuator on which the instrument is mounted. If the actuator manufacturer is not listed, select Other.

6. Enter the actuator model or type. If the actuator model is not listed, select Other.

7. Enter the actuator size.

8. Enter the Relay Type.

9. Select whether the valve is open or closed under the zero power condition, if prompted.

Note

When completing steps 3 through 9, refer to table 3-1 for possible configurations for a digital valve controller operated by a 4-20 mA input current (point-to-point mode), and table 3-2 for possible configurations for a digital valve controller operated by a 0-24 VDC power supply (multi-drop mode).

WARNING

If you answer YES to the prompt for permission to move the valve when the Field Communicator is determining the travel sensor motion, the instrument will move the valve through its full travel range. To avoid personal injury and property damage caused by the release of pressure or process fluid, provide some temporary means of control for the process.

10. Indicate if a volume booster or quick release is present.

Table 3-1. Possible Configurations for a FIELDVUE DVC6000 SIS Digital Valve Controller operated by 4-20 mA

Setup Wizard Configuration			Operating Conditions		Status Monitoring	
Relay Type	**Partial Stroke Start Point**	**Zero Power Condition**	**Input Current**	**Actual Valve Travel**	**Travel Set Point**	**Travel**
A or C	Open	Close	Common Application			
			20 mA	Open	100%	100%
		Open	Less Common Application			
			4 mA	Open	100%	100%
	Close	Close	Less Common Application			
			4 mA	Close	0%	0%
		Open	Common Application			
			20 mA	Close	0%	0%
B	Open	Close	Less Common Application			
			20 mA	Open	100%	100%
		Open	Common Application			
			4 mA	Open	100%	100%
	Close	Close	Common Application			
			4 mA	Close	0%	0%
		Open	Less Common Application			
			20 mA	Close	0%	0%

Table 3-2. Possible Configurations for a FIELDVUE DVC6000 SIS Digital Valve Controller operated by 0-24 VDC

Setup Wizard Configuration			Operating Conditions		Status Monitoring	
Relay Type	**Partial Stroke Start Point**	**Zero Power Condition**	**Power Supply**	**Actual Valve Travel**	**Travel Set Point**	**Travel**
A or C	Open	Close	Common Application			
			24 VDC	Open	100%	100%
		Open(1)	Less Common Application			
			24 VDC	Open	100%	100%
	Close	Close(1)	Less Common Application			
			24 VDC	Close	0%	0%
		Open	Common Application			
			24 VDC	Close	0%	0%
B	Open	Close	Less Common Application			
			24 VDC	Open	100%	100%
		Open(1)	Common Application			
			24 VDC	Open	100%	100%
	Close	Close(1)	Common Application			
			24 VDC	Close	0%	0%
		Open	Less Common Application			
			24 VDC	Close	0%	0%

1. In these configurations, the DVC6000 SIS is used as a diagnostic device, the safety function is provided by other devices in the pneumatic loop, e.g. a solenoid valve.

Note

The use of a Quick Exhaust Valve (QEV) is not recommended for safety instrumented system applications. The use of a QEV in an SIS application may cause the valve to cycle.

11. Specify if factory defaults should be used for basic setup. If you select YES for factory default, the Field Communicator sets the setup parameters to the values listed in table 3-3. If you select NO for the factory defaults, the setup parameters listed in the table remain at their previous settings.

Typically the Setup Wizard determines the required setup information based upon the actuator manufacturer and model specified. However, if you enter other for the actuator manufacturer or the actuator model, then you will be prompted for setup parameters such as:

Actuator Style (select spring & diaphragm, piston single-acting with spring, piston double-acting with spring)

Valve Style (select the valve style, rotary or sliding stem)

On Loss of Instrument Signal, (valve opens or closes). See Zero Power Condition in the Detailed Setup section.

Feedback Connection *(*select Rot-All, SS-roller, or SStem-Standard). See Feedback Connection in the Detailed Setup section.

Partial Stroke Start Point (select the start point for the Partial Stroke Test; either Valve Open or Valve Close).

LCP100 Local Control Panel (indicate if the instrument is connected to an LCP100 local control panel).

Travel Sensor Motion (increasing air pressure causes the travel sensor shaft to rotate clockwise or counterclockwise), The Setup Wizard will ask if it can move the valve to determine travel sensor motion.

If you answer yes, the instrument may stroke the valve the full travel span to determine travel sensor rotation. If you answer No, then you will have to specify the rotation for increasing air pressure (determine the rotation by viewing the end of the travel sensor shaft). See Travel Sensor Motion in the Detailed Setup section.

Tuning Set (see Tuning Set in the Detailed Setup section).

After choosing the appropriate tuning set, a message appears on the display, asking if you would like to download factory defaults for Setup. Yes is recommended for Initial Setup. Refer to table 3-3 for factory download defaults.

Follow the prompts on the Field Communicator display. The calibration procedure uses the valve and actuator stops as the 0% and 100% calibration points. For additional information, refer to Auto Calibrate Travel in the Calibration section.

Once Auto Calibration is complete, you will be asked to enter the desired stroke test speed (default is 0.25%/sec). An additional automatic PST calibration is run to determine the default value or the partial stroke pressure limit for single acting actuators (this will be differential pressure for double acting) and pressure set point for End Point Pressure Control.

When calibration is complete, you are asked if you wish to adjust the relay (double-acting only). Select yes to adjust the relay. For additional information, refer to Relay Adjustment in the Calibration section.

Table 3-3. Factory Download Default Settings

Setup Parameter	Default Setting
Analog Input Units[1]	mA
Analog In Range High[1]	20.0 mA
Analog In Range Low[1]	4.0 mA
Control Mode	Analog[1] Digital[2]
Restart Control Mode	Analog[1] Digital[2]
Lag Time	0 secs
Input Characteristic	Linear
Travel Limit High	125%
Travel Limit Low	−25%
Travel Cutoff High	50%
Travel Cutoff Low	50%
Travel Deviation Alert Point	5.0%
Travel Deviation Time	10.0 seconds
Set Point Rate Open	0%/sec
Set Point Rate Close	0%/sec
Polling Address	0
Pressure Deviation Alert Pt	5.0 psi[3]
Pressure Deviation Alert Time	30.0 seconds
Command #3 (Trending) Pressure	
For double-acting actuators	differential output pressure
For single-acting actuators	actuator pressure
Valve Set Point[2]	100% if ZPC = Open 0% if ZPC = Closed
Restart Travel Set Point[2]	100% if ZPC = Open 0% if ZPC = Closed
Self-Test Shutdown[2]	All Failures Disabled

1. Analog mode only − DIP switch set to Pt-Pt.
2. Digital mode only. − DIP switch set to Multi.
3. Adjust to bar, kPa, or kg/cm^2 if necessary.

Note

Relay Adjustment is only available for the double-acting relay (Relay A).

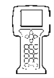
After instrument setup is completed, and you have placed the instrument in service, if End Point Pressure Control not enabled, you will be prompted to enable it. Select yes. Refer to Partial Stroke Variables in the Detailed Setup section for more information.

If after completing auto setup and auto calibration the valve seems slightly unstable or unresponsive, you can improve operation by selecting *Performance Tuner* from the *Basic Setup* menu. For additional information on using the Performance Tuner to optimize digital valve controller tuning, refer to the Performance Tuner information below.

Performance Tuner (1-1-2)

The Performance Tuner is used to optimize digital valve controller tuning. It can be used with digital valve controllers mounted on most sliding-stem and rotary actuators, including Fisher and other manufacturers' products. Moreover, because the Performance Tuner can detect internal instabilities before they become apparent in the travel response, it can generally optimize tuning more effectively than manual tuning. Typically, the Performance Tuner takes 3 to 5 minutes to tune an instrument, although tuning instruments mounted on larger actuators may take longer.

Access the Performance Tuner by selecting *Performance Tuner* from the *Basic Setup* menu. Follow the prompts on the Field Communicator display to optimize digital valve controller tuning.

Section 4 Detailed Setup 

Detailed Setup

The *Detailed Setup* selection from the *Configure/Setup* menu allows you to configure the digital valve controller to your application. Table 4-1 lists the default settings for a standard factory configuration. You can adjust actuator response, set the various modes, alerts, ranges, travel cutoffs and limits. You can also restart the instrument and set the protection.

Note

In the event of a power failure the DVC6000 SIS automatically restores the device to In Service upon restoration of power. This is to provide greater availability of the safety function.

If power is inadvertently interrupted while performing set up or maintenance, you may need to return the DVC6000 SIS to out of service if the interrupted task requires that mode of operation.

Mode and Protection (1-2-1)

Mode

- **Instrument Mode**

You can change the instrument mode by selecting *Mode and Protection, Instrument Mode* from the *Detailed Setup* menu, or press the Hot Key and select *Instrument Mode.*

Instrument Mode allows you to either take the instrument Out Of Service or place it In Service. Taking the instrument Out Of Service allows you to perform instrument calibration and also allows you to change setup variables that affect control, provided the calibration/configuration protection is properly set. See Setting Protection.

Table 4-1. Factory Default Detailed Setup Parameters

Setup Parameter		Default Setting(1)
Instrument Configuration	Control Mode	Analog / Digital(2)
	Restart Control Mode(3) Multi-drop Point-to-Point	 DIGITAL ANALOG
	Zero Power Condition	Valve Closed(2)
	Analog In Range Low	4 mA
	Analog In Range High	20 mA
	Analog Input Units	mA
	Feedback Connection	Rotary – All(2)
	Travel Sensor Motion	Clockwise(2)
	Auxiliary Terminal Mode	Push Button Partial Stroke Test
	Max Supply Pressure	50(2)
	Pressure Units	PSI
	Temperature Units	F
	Polling Address	0
	Burst Mode Enable	No
	Burst Command	3
	Cmd #3 (Trending) Pressure For double-acting actuators For single-acting actuators	 differential output pressure actuator pressure
Dynamic Response and Tuning	Tuning Set	F(2)
	Input Characteristic	Linear
	Travel Limit High	125%
	Travel Limit Low	−25%
	Travel/Pressure Cutoff High	50%
	Travel/Pressure Cutoff Low	50%
	Set Point Rate Open	0%/sec
	Set Point Rate Close	0%/sec
	Set Point Filter Lag Time	0 sec
	Partial Stroke Start Point	Valve Open(2)
Travel History Alerts	Cycle Count Alert Enable	No
	Cycle Count Alert Deadband	1%
	Cycle Count Alert Point	1,000,000
	Travel Accumulator Alert Enable	No
	Travel Accumulator Deadband	1%
	Travel Accumulator Alert Point	1000000%
Deviation & Other Alerts	Travel Deviation Alert Enable	Yes
	Travel Deviation Alert Point	5%
	Travel Deviation Time	10 sec
	Pressure Deviation Alert Enable	Yes
	Pressure Deviation Alert Point	5 psi
	Pressure Deviation Alert Time	30 sec
	Drive Signal Alert Enable	Yes
	Supply Pressure Alert Enable	Yes
	Supply Pressure Alert Point	19 psi
Travel Alerts	Travel Alert Lo Enable	No
	Lo Point	−25%
	Travel Alert Hi Enable	No
	Hi Point	125%
	Travel Alert Lo Lo Enable	No
	Lo Lo Point	−25%(4)
	Travel Alert Hi Hi Enable	No
	Hi Hi Point	125%(5)
	Deadband	5%

−continued on next page−

Table 4-1. Factory Default Detailed Setup Parameters (continued)

Setup Parameter		Default Setting(1)
Electronic Alerts	Shutdown Activated	Yes
	Power Starvation Alert Enable	No
	Non-Critical NVM Alert Enable	No
Informational Status	Instrument Time Invalid Enable	Yes
	Calibration in Progress Enable	No
	Autocalibration in Progress Enable	No
	Diagnostics in Progress Enable	No
	Diagnostics Data Available Enable	Yes
	Integrator Saturated Hi Enable	Yes
	Integrator Saturated Lo Enable	Yes
	Pressure Control Active Enable	Yes
	Multi-Drop Alert Enable	No
Alert Record	Valve Alerts Enable	Yes
	Failure Alerts Enable	Yes
	Misc Alerts Enable	No
	Alert Record Not Empty Enable	Yes
	Alert Record Full Enable	Yes

1. The settings listed are for standard factory configuration. DVC6000 SIS Series instruments can also be ordered with custom configuration settings. For the default custom settings, refer to the order requisition.
2. If the instrument is shipped mounted on an actuator, these values depend upon the actuator on which the instrument is mounted.
3. Based on DIP switch setting.
4. Lo Lo point is 1% when used with LCP100.
5. Hi Hi point is 99% when used with LCP100.

Note

Some changes that require the instrument to be taken Out Of Service will not take effect until the instrument is placed back In Service or the instrument is restarted.

- **Control Mode**

You can change the control mode by selecting *Control Mode* from the *Mode and Protection* menu, or press the Hot Key and select *Control Mode.*

Control Mode lets you define where the instrument reads its set point. Follow the prompts on the Field Communicator display to choose one of the following control modes: Analog or Digital.

Choose Analog control mode if the instrument is to receive its set point over the 4-20 mA loop. Normally the instrument control mode is Analog.

Choose Digital control mode if the instrument is to receive its set point digitally by a 0-24 VDC control signal, via the HART communications link.

A third mode, Test, is also displayed. Normally the instrument should not be in the Test mode. The Field Communicator automatically switches to this mode whenever it needs to stroke the valve during calibration or stroke valve, for example. However, if you abort from a procedure where the instrument is in the Test mode, it may remain in this mode. To take the instrument out of the Test mode, select *Control Mode* then select either Analog or Digital.

- **Restart Ctrl Mode**

Restart Control Mode lets you choose which operating mode you want the instrument to be in after a restart. Access Restart Control mode by selecting *Restart Ctrl Mode* from the *Mode and Protection* menu. Follow the prompts on the Field Communicator display to define the restart control mode as Resume Last, Analog, or Digital.

- **Burst Mode**

Enabling burst mode provides continuous communication from the digital valve controller. Burst mode applies only to the transmission of burst mode data (analog input, travel target, pressure, and travel) and does not affect the way other data is accessed.

Access to information in the instrument is normally obtained through the poll/response of HART communication. The 375 Field Communicator or the control system may request any of the information that is normally available, even while the instrument is in burst mode. Between each burst mode transmission sent by the instrument, a short pause allows the Field Communicator or control system to initiate a request. The instrument receives the request, processes the response message, and then continues “bursting” the burst mode data.

Note

Do not use burst mode while using the HART Loop Interface Monitor (HIM) from Moore Industries with DVC6000 SIS digital valve controllers.

To enable burst mode, select *Burst Mode,* and *Burst Enable* from the *Mode and Protection* menu.

- *Burst Enable*—Yes or no. Burst mode must be enabled before you can change the burst mode command.

- *Burst Command*—There are four burst mode commands. Command 3 is recommended for use with the Rosemount Model 333 HART Tri-Loop HART-to-analog signal converter. The other three are not used at this time.

- *Cmd 3(Trending)Press*—Command 3 provides the following variables:

Primary variable—analog input in % or ma,

Secondary variable—travel target in % of ranged travel,

Tertiary variable—supply or output pressure in psig, bar, kPa, or kg/cm^2. Select *Select Cmd 3 Press* from the *Burst* menu to select if the output A, output B, differential (A−B), or supply pressure is sent.

4

Quaternary variable—travel in % of ranged travel.

Protection

- **Protection** ≫

When the digital valve controller is in SIS mode, and protection is on, the instrument cannot be taken Out of Service. Protection must be turned off to change the instrument mode.

To change an instrument's protection, press the Hot key on the Field Communicator and select *Protection* or select *Protection* from the *Detailed Setup* menu.

Two levels of protection are available:

- *None*—Neither setup nor calibration is protected. Allows changing calibration and setup parameters.

- *Config & Calib*—Both setup and calibration are protected. Prohibits changing calibration and protected setup parameters.

Table 4-3 lists configurable parameters in the instrument and the requirements for modifying these parameters, in terms of instrument mode and protection.

To change an instrument's protection, press the Hot key on the Field Communicator and select *Protection* or from the *Online* menu, select *Configure/Setup, Detailed Setup, Mode and Protection,* and *Protection.* Select the desired level of protection. Follow the prompts on the Field Communicator display to set the protection level.

Table 4-2. Gain Values for Preselected Travel Tuning Sets

Tuning Set	Proportional Gain	Velocity Gain	Minor Loop Feedback Gain
B	2.0	3.0	35
C	4.4	3.0	35
D	4.8	3.0	35
E	5.5	3.0	35
F	6.2	3.1	35
G	7.2	3.6	34
H	8.4	4.2	31
I	9.7	4.8	27
J	11.3	5.6	23
K	13.1	6.0	18
L	15.5	6.0	12
M	18.0	6.0	12
X (Expert)	User Adjusted	User Adjusted	User Adjusted

Response Control (1-2-2)

Select *Configure/Setup, Detailed Setup,* and *Response Control.* Follow the prompts on the Field Communicator display to configure the following response control parameters: *Tuning, Tvl/Press Control* (Travel/Pressure Control), *Input Char* (Input Characteristic) *Define Custom Char* (Define Custom Characteristic), and *Dynamic Response*.

Tuning

Travel Tuning (1-2-2-1-1)

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. To avoid personal injury and property damage caused by moving parts, keep hands, tools, and other objects away from the valve/actuator assembly.

- **Tvl Tuning Set (1-2-2-1-1-1)**

Tvl Tuning Set— There are twelve tuning sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings. Tuning set B provides the slowest response and M provides the fastest response. Table 4-2 lists the proportional gain, velocity gain and minor loop feedback gain values for preselected tuning sets.

In addition, you can select User Adjusted or Expert, which allows you to modify tuning of the digital valve controller. With User Adjusted, you specify the proportional gain; an algorithm in the Field Communicator calculates the velocity gain and minor loop feedback gain. With Expert you can specify the proportional gain, velocity gain, and minor loop feedback gain.

Note

Use Expert tuning only if standard tuning has not achieved the desired results.

Stabilize/Optimize or Performance Tuner may be used to achieve the desired results more rapidly than Expert tuning.

Table 4-4 provides tuning set selection guidelines for Fisher actuators. These tuning sets are only recommended starting points. After you finish setting up and calibrating the instrument, you may have to select either a higher or lower tuning set to get the desired response. You can use the Performance Tuner to optimize tuning.

For an actuator not listed in the tables, you can estimate a starting tuning set by calculating the casing or cylinder volume. Then, in the tables, find an actuator with the closest equivalent volume and use the tuning set suggested for that actuator.

Tvl Prop Gain—Travel Proportional Gain is the proportional gain for the travel control tuning set. Changing this parameter will also change the tuning set to Expert.

Tvl Velocity Gain—Travel Velocity Gain is the velocity gain for the travel control tuning set. Changing this parameter will also change the tuning set to Expert.

Tvl MLFB Gain—Travel MLFB Gain is the minor loop feedback gain for the travel control tuning set. Changing this parameter will also change the tuning set to Expert.

- **Tvl Integ Enable**—Yes or No. Enable the integral setting to improve static performance by correcting for error that exists between the travel target and actual travel. Travel Integral Control is disabled by default.

- **Tvl Integ Gain**—Travel Integral Gain is the ratio of the change in output to the change in input, based on the control action in which the output is proportional to the time integral of the input.

- **Stabilize/Optimize**—Stabilize/Optimize permits you to adjust valve response by changing the digital valve controller tuning.

If the valve is unstable, select *Decrease Response* to stabilize valve operation. This selects the next lower tuning set (e.g., F to E). If the valve response is sluggish, select *Increase Response* to make the valve more responsive. This selects the next higher tuning set (e.g., F to G).

If after selecting *Decrease Response* or *Increase Response* the valve travel overshoot is excessive, select *Decrease Damping* to select a damping value that allows more overshoot. Select *Increase Damping* to select a damping value that will decrease the overshoot. When finished, select *done.*

- **Performance Tuner**

The Performance Tuner is used to optimize digital valve controller tuning. It can be used with digital valve controllers mounted on most sliding-stem and rotary actuators, including Fisher and other manufacturers' products. Moreover, because the Performance Tuner can detect internal instabilities before they become apparent in the travel response, it can generally optimize tuning more effectively than manual tuning. Typically, the Performance Tuner takes 3 to 5 minutes to tune an instrument, although tuning instruments mounted on larger actuators may take longer.

Integral Settings (1-2-2-1-2)

- **Integ DeadZ**—Integral Dead Zone is a window around the Primary Setpoint in which integral action is disabled. This feature is used to eliminate friction induced limit cycles around the Primary Setpoint when the integrator is active. The Dead Zone is configurable from 0% to 2%, corresponding to a symmetric window from 0% to +/−2% around the Primary Setpoint. Default value is 0.25%.

- **Integ Limit**—The Integral Limit provides an upper limit to the integrator output. The high limit is configurable from 0 to 100% of the I/P drive signal.

4

Table 4-3. Conditions for Modifying FIELDVUE DVC6000 SIS Series Digital Valve Controller Parameters

Parameters		In Service		Out of Service	
		Protected	Unprotected	Protected	Unprotected
Mode and Protection	Instrument Mode	- - -	✓	- - -	✓
	Control Mode(1)	- - -	- - -	- - -	- - -
	Restart Cont. Mode(1)	- - -	- - -	- - -	- - -
	Burst Mode Enable	✓	✓	✓	✓
	Burst Command	✓	✓	✓	✓
	Cmd #3 (Trending) Pressure	✓	✓	✓	✓
	Protection	✓	✓	✓	✓
Response and Control	Travel Tuning Set	- - -	✓	- - -	✓
	Travel Proportional Gain	- - -	✓	- - -	✓
	Travel Velocity Gain	- - -	✓	- - -	✓
	Travel MLFB Gain	- - -	✓	- - -	✓
	Travel Integral Enable	- - -	✓	- - -	✓
	Travel Integral Gain	- - -	✓	- - -	✓
	Stabilize / Optimize	- - -	- - -	- - -	✓
	Performance Tuner	- - -	- - -	- - -	✓
	Integral Dead Zone	- - -	✓	- - -	✓
	Integral Limit	- - -	✓	- - -	✓
	Pressure Tuning Set	- - -	✓	- - -	✓
	Pressure Proportional Gain	- - -	✓	- - -	✓
	Pressure MLFB	- - -	✓	- - -	✓
	Pressure Integral Enable	- - -	✓	- - -	✓
	Pressure Integral Gain	- - -	✓	- - -	✓
	Travel / Pressure Cutoff Hi	- - -	- - -	- - -	✓
	Travel / Pressure Cutoff Lo	- - -	- - -	- - -	✓
	End Point Pressure Control Enable	- - -	- - -	- - -	✓
	Partial Stroke Start Point	- - -	- - -	- - -	✓
	Pressure Set Point	- - -	✓	- - -	✓
	Pressure Saturation Time	- - -	✓	- - -	✓
	Input Characteristic	- - -	- - -	- - -	✓
	Define Custom Char.	- - -	- - -	- - -	✓
	Set Point Rate Open	- - -	- -	- -	✓
	Set Point Rate Close	- - -	- - -	- - -	✓
	Lag Time	- - -	- - -	- - -	✓
Alerts	Drive Current Shutdown	- - -	- - -	- - -	✓
	Drive Signal Alert	✓	✓	✓	✓
	Drive Signal(1)	- - -	- - -	- - -	- - -
	Offline/Failed Alert Enable	✓	✓	✓	✓
	Power Starvation Alert Enable	✓	✓	✓	✓
	Non-Critical NVM Alert Enable	✓	✓	✓	✓
	Critical NVM Shutdown	- - -	- - -	- - -	✓
	Flash ROM Shutdown	- - -	- - -	- - -	✓
	No Free Time Shutdown	- - -	- - -	- - -	✓
	Reference Voltage Shutdown	- - -	- - -	- - -	✓
	Temp Sensor Shutdown	- - -	- - -	- - -	✓
	Travel Sensor Shutdown	- - -	- - -	- - -	✓
	Press Sensor Shutdown	- - -	- - -	- - -	✓
	Aux Terminal Alert Enable	✓	✓	✓	✓
	Aux Input(1)	- - -	- - -	- - -	- - -
	Aux Terminal Mode	- - -	✓	- - -	✓
	Supply Pressure Lo Alert Enable	✓	✓	✓	✓
	Supply Pressure(1)	- - -	- - -	- - -	- - -
	Supply Press Lo Alert Point	✓	✓	✓	✓
	Travel(1)	- - -	- - -	- - -	- - -
	Travel Set Point(1)	- - -	- - -	- - -	- - -
	Travel Alert Deadband	✓	✓	✓	✓
	Travel Deviation Alert Enable	✓	✓	✓	✓
	Travel Deviation Alert Point	✓	✓	✓	✓
	Travel Deviation Time	✓	✓	✓	✓

✓—indicates parameter may be modified for instrument mode and protection shown.
1. Information only.

–Continued–

Table 4-3. Conditions for Modifying FIELDVUE DVC6000 SIS Series Digital Valve Controller Parameters (Continued)

Parameters		In Service		Out of Service	
		Protected	**Unprotected**	**Protected**	**Unprotected**
Alerts	Travel Alert Hi Hi Enable	✓	✓	✓	✓
	Travel Alert Lo Lo Enable	✓	✓	✓	✓
	Travel Alert Hi Hi Point	✓	✓	✓	✓
	Travel Alert Lo Lo Point	✓	✓	✓	✓
	Travel Alert Hi Enable	✓	✓	✓	✓
	Travel Alert Lo Enable	✓	✓	✓	✓
	Travel Alert Hi Point	✓	✓	✓	✓
	Travel Alert Lo Point	✓	✓	✓	✓
	Travel Limit / Cutoff Hi Alert Enable	✓	✓	✓	✓
	Travel Limit / Cutoff Lo Alert Enable	✓	✓	✓	✓
	Travel / Pressure Cutoff Hi	- - -	- - -	- - -	✓
	Travel / Pressure Cutoff Lo	- - -	- - -	- - -	✓
	Cycle Count Alert Enable	✓	✓	✓	✓
	Cycle Count	✓	✓	✓	✓
	Cycle Count Alert Point	✓	✓	✓	✓
	Cycle Count / Tvl Accum Deadband	✓	✓	✓	✓
	Travel Accumulator Alert Enable	✓	✓	✓	✓
	Travel Accumulator	✓	✓	✓	✓
	Travel Accumulator Alert Point	✓	✓	✓	✓
	Partial Stroke Pressure Limit	✓	✓	✓	✓
	Pressure Deviation Alert Enable	✓	✓	✓	✓
	Pressure Deviation Alert Point	✓	✓	✓	✓
	Pressure Deviation Time	✓	✓	✓	✓
	Alert Record Not Empty Enable	✓	✓	✓	✓
	Alert Record Full Enable	✓	✓	✓	✓
	Display Record(1)	- - -	- - -	- - -	- - -
	Clear Record	✓	✓	✓	✓
	Failure Group Enable	✓	✓	✓	✓
	Valve Group Enable	✓	✓	✓	✓
	Misc Group Enable	✓	✓	✓	✓
Status	Instrument Time Invalid Enable	✓	✓	✓	✓
	Instrument Time and Date	✓	✓	✓	✓
	Calibration in Progress Enable	✓	✓	✓	✓
	Autocalibration in Progress Enable	✓	✓	✓	✓
	Diagnostics in Progress Enable	✓	✓	✓	✓
	Diagnostic Data Available Enable	✓	✓	✓	✓
	Pressure Control Active Enable	✓	✓	✓	✓
	Multi-Drop Enable	✓	✓	✓	✓
	Integrator Saturated Hi Enable	✓	✓	✓	✓
	Integrator Saturated Lo Enable	✓	✓	✓	✓
	Integrator Limit	- - -	✓	- - -	✓
	Integrator DeadZ	- - -	✓	- - -	✓
Instrument	HART Tag	✓	✓	✓	✓
	Message	✓	✓	✓	✓
	Descriptor	✓	✓	✓	✓
	Date	✓	✓	✓	✓
	Valve Serial Number	- - -	✓	- - -	✓
	Instrument Serial Number	- - -	✓	- - -	✓
	Polling Address	- - -	- - -	- - -	✓
	Pressure Units	- - -	- - -	- - -	✓
	Temperature Units	✓	✓	✓	✓
	Analog Input Units	- - -	- - -	- - -	✓
	Analog Input Range High	- - -	- - -	- - -	✓
	Analog Input Range Low	- - -	- - -	- - -	✓

✓—indicates parameter may be modified for instrument mode and protection shown.
1. Information only.

–Continued–

Table 4-3. Conditions for Modifying FIELDVUE DVC6000 SIS Series Digital Valve Controller Parameters (Continued)

Parameters		In Service		Out of Service	
		Protected	**Unprotected**	**Protected**	**Unprotected**
Valve & Actuator	Relay Type	- - -	- - -	- - -	✓
	Zero Power Condition	- - -	- - -	- - -	✓
	Max Supply Pressure	- - -	- - -	- - -	✓
	Aux Terminal Mode	- - -	- - -	- - -	✓
	Inst Date and Time	✓	✓	✓	✓
	Last Calibration Status(1)	- - -	- - -	- - -	- - -
	Calibration Location(1)	- - -	- - -	- - -	- - -
	Manufacturer(1)	- - -	- - -	- - -	- - -
	Valve Serial Number	- - -	✓	- - -	✓
	Valve Style	- - -	- - -	- - -	✓
	Actuator Style	- - -	- - -	- - -	✓
	Feedback Connection	- - -	- - -	- - -	✓
	Travel Sensor Motion	- - -	- - -	- - -	✓
SIS / Partial Stroke	Partial Stroke Test Enable	- - -	- - -	- - -	✓
	Partial Stroke Press Limit	- - -	- - -	- - -	✓
	Max Travel Movement	- - -	- - -	- - -	✓
	Test Speed	- - -	- - -	- - -	✓
	Test Pause Time	- - -	- - -	- - -	✓
	Auto Test Interval	- - -	✓	- - -	✓
	DVC Power Up	- - -	- - -	- - -	✓

✓—indicates parameter may be modified for instrument mode and protection shown.
1. Information only.

Pressure Tuning (1-2-2-1-3)

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. To avoid personal injury and property damage caused by moving parts, keep hands, tools, and other objects away from the valve/actuator assembly.

- **Press Tuning Set (1-2-2-1-3-1)**

Press Tuning Set—There are twelve Pressure Tuning Sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings. Tuning set B provides the slowest response and M provides the fastest response.

Tuning set B is appropriate for controlling a pneumatic positioner. Table 4-6 lists the proportional gain, pressure integrator gain and minor loop feedback gain values for preselected tuning sets.

In addition, you can specify Expert tuning and individually set the pressure proportional gain, pressure integrator gain, and pressure minor loop feedback gain. Individually setting or changing any tuning parameter will automatically change the tuning set to X (expert).

Note

Use Expert tuning only if standard tuning has not achieved the desired results.

Stabilize/Optimize and performance tuner may be used to achieve the desired results more rapidly than Expert tuning.

Table 4-4. Actuator Information for Basic Setup

Actuator Manufacturer	Actuator Model	Actuator Size	Actuator Style	Starting Tuning Set	Feedback Connection	Travel Sensor Motion	
						Relay A or C	Relay B
Fisher	585C & 585CR	25 50, 60 60, 80 100, 130	Piston Dbl w/ or w/o Spring. See actuator instruction manual and nameplate.	F J L M	SStem-Standard for travels up to 4 inches. SStem-Roller for longer travels	Depends upon pneumatic connections. See description for Travel Sensor Motion	
	657	30 34, 40 45, 50 46, 60, 70, 76, & 80-100	Spring & Diaphragm	H K L M	SStem-Standard	Clockwise	Counterclockwise
	667	30 34, 40 45, 50 46, 60, 70, 76, & 80-100	Spring & Diaphragm	H K L M	SStem-Standard	Counterclockwise	Clockwise
	1051 & 1052	20, 30 33 40 60, 70	Spring & Diaphragm	H I K M	Rotary	Clockwise	Counterclockwise
	1061	30 40 60 68, 80, 100, 130	Piston Dbl w/o Spring	J K L M	Rotary	Depends upon pneumatic connections. See description for Travel Sensor Motion	
	1066	20, 27, 75	Piston Dbl w/o Spring	Specify	Rotary	Depends upon pneumatic connections. See description for Travel Sensor Motion	
	1066SR	20 27, 75	Piston Sgl w/Spring	G L	Rotary	Depends upon mounting style, see actuator instruction manual and table 4-5	

Table 4-5. Travel Sensor Motion Selections for the FIELDVUE DVC6030 SIS on 1066SR Actuators

Mounting Style	Travel Sensor Motion	
	Relay A or C	Relay B
A	Clockwise	Counterclockwise
B	Counterclockwise	Clockwise
C	Counterclockwise	Clockwise
D	Clockwise	Counterclockwise

Press Prop Gain—Pressure Proportional Gain is the proportional gain for the pressure control tuning set. Changing this parameter will also change the tuning set to Expert.

Press MLFB Gain—Pressure MLFB Gain is the minor loop feedback gain for the pressure control tuning set. Changing this parameter will also change the tuning set to Expert.

Table 4-6. Gain Values for Preselected Pressure Tuning Sets

Tuning set	Pressure Proportional Gain	Pressure Integrator Gain	Pressure Minor Loop Feedback Gain
B	0.5	0.3	35
C	2.2	0.1	35
D	2.4	0.1	35
E	2.8	0.1	35
F	3.1	0.1	35
G	3.6	0.1	34
H	4.2	0.1	31
I	4.8	0.1	27
J	5.6	0.1	23
K	6.6	0.1	18
L	7.8	0.1	12
M	9.0	0.1	12
X (Expert)	User Adjusted	User Adjusted	User Adjusted

- **Press Integ Enable**—Yes or No. Enable the pressure integral setting to improve static performance by correcting for error that exists between the pressure target and actual pressure. Pressure Integral Control is disabled by default.

- **Press Integ Gain**—Pressure Integral Gain (also called reset) is the gain factor applied to the time integral of the error signal between desired and actual pressure. Changing this parameter will also change the tuning set to Expert.

Tvl/Press Control (1-2-2-2)

Tvl/Press Cutoffs (1-2-2-2-1)

- *Tvl/Press Cut Hi*—Travel Cutoff High defines the high cutoff point for the travel in percent (%) of ranged input current.

- *Tvl/Press Cut Lo*—Travel Cutoff Low defines the low cutoff point for the travel set point.

Travel cutoffs are adjustable when the DVC6000 SIS is operating with a 4-20 mA current input. The Setup Wizard automatically sets travel cutoffs at 50%, making the DVC6000 SIS work like an on-off device. At current levels from 4.0 to 11.99 mA, the DVC6000 SIS will provide minimum output pressure, and at 12 to 20 mA, the DVC6000 SIS will provide full output pressure.

You can customize valve response to the control signal by changing the travel cutoffs. For example, it is possible to have the valve throttle between 10 and 90% travel, but work as an on-off valve between 0% to 10% and 90% to 100% travel. The user now has a standard throttling control valve between 10% and 90% travel. Outside of this range, the valve will move to its travel extreme (0% or 100%).

Note

If you run the Setup Wizard after adjusting the Travel Cutoffs, they will revert back to the default values. You will need to reset the Travel Cutoffs to the desired settings.

Note

The partial stroke test cannot be conducted by the Field Communicator or AMS ValveLink Software while the digital valve controller is in its normal travel control mode (with adjustable cutoffs set to a different value than the default).

WARNING

Using the auxiliary terminal (push button) for partial stroke testing while the DVC6000 SIS digital valve controller is in point-to-point mode may cause changes in output pressure and travel, resulting in process instability. Depending on the application, these changes may upset the process, which may result in personal injury or property damage.

If the auxiliary terminal button is pressed for more than 3 seconds, but less than 5 seconds, the digital valve controller will drive the valve from its existing travel position to 100% travel condition for a fail close valve (or 0% travel for a fail open valve) and perform the partial stroke test. Once the partial stroke test is completed, the digital valve controller will bring the valve back to its original travel, corresponding to the control set point.

Note

In a typical 0-24 VDC de-energize-to-trip operating system, a digital valve controller with the single-acting direct relay will provide full output pressure to port A when 24 VDC is applied, and minimum (near 0) output pressure to port A when 0 VDC is applied. With the single-acting direct relay, there would be no output pressure from port B.

Other configurations of the relay are available (see table 3-2). An example of this flexibility is the use of a single-acting reverse relay that will supply full pressure output at 0 VDC input. This configuration can be useful to provide the benefits of Partial Valve Stroke Diagnostics but minimize the spurious trip rate (the power to the digital valve controller can be lost without tripping the valve), but would only be recommended when a solenoid is provided to take the valve to the safe position

Table 4-7. Guidelines for Manually Setting Pressure Set Point

Actuator Type	Relay Type	Zero Power Condition	Partial Stroke Start Point	Pressure Set Point
Single-Acting	A or C	Closed	Open	Psupply − 2 psig
			Closed	2 psig
		Open	Open	2 psig
			Closed	Psupply − 2 psig
	B	Closed	Open	2 psig
			Closed	Psupply − 2 psig
		Open	Open	Psupply − 2 psig
			Closed	2 psig
Double-Acting	A	Closed	Open	Psupply − 5 psig
			Closed	5 psig − Psupply
		Open	Open	5 psig − Psupply
			Closed	Psupply − 5 psig

End Pt Press Control (1-2-2-2-2)

- *End Pt Control Enab*— Yes or No. End Point Pressure Control allows the digital valve controller to pull back from saturation of the pneumatic output after reaching the travel extreme. Rather than having the instrument provide full supply pressure (saturation) continuously at the travel extreme, the digital valve controller switches to an End Point Pressure Control where the output pressure (pressure controller set point) to the actuator is controlled at a certain value. This value is configured through Pressure Set Point. Because the digital valve controller is constantly in control and not allowed to reach a dormant or saturated state, it is constantly testing its own pneumatic system. If there is an output pressure deviation, for example, the instrument will issue an alert. To assure there is an alert when an output pressure deviation occurs, set up the alert as described under Pressure Deviation Alert.

- *PST Start Pt*—Defines the travel stop the valve needs to be at before a partial stroke test can be initiated. Also defines the travel stop for end point pressure control. Setting this value to Not Configured will disable partial stroke tests and end point pressure control.

- *Press Set Point*— As part of End Point Pressure Control, Pressure Set Point is the target pressure the positioner controls to when the valve is at the travel stop defined by PST Start Point. Default values for Pressure Set Point are summarized in table 4-7. When controlling pressure in the open position, Pressure Set Point must be set at a value that ensures the valve will remain open. When controlling pressure in the closed position, Pressure Set Point must be set at a value that ensures the valve will remain closed and has enough force to maintain its rated shutoff classification. For double-acting spring return actuators, this is the differential pressure required to either maintain the fully open or fully closed position, depending on the valve and actuator configuration. For a double-acting actuator without springs with a fail-close valve, this is 95% of the supply pressure. If the valve is fail-open, the upper operating pressure for all actuator is set to the supply pressure.

Note

End Point Pressure Control will be set automatically during the Setup Wizard, or during the Auto Calibration Travel procedure.

Refer to table 4-7 for guidelines for manually setting Pressure Set Point.

- *Press Sat Time*—Pressure Saturation Time is the amount of time the digital valve controller stays in hard cutoff before switching to pressure control. Default is 45 seconds.

Input Char (1-2-2-3)

Input Characterization defines the relationship between the travel target and ranged set point. Ranged set point is the input to the characterization function. If the zero power condition equals closed, then a set point of 0% corresponds to a ranged input of 0%. If the zero power condition equals open, a set point of 0% corresponds to a ranged input of 100%. Travel target is the output from the characterization function.

To select an input characterization, select *Select Input Char* from the *Input Char* menu. You can select from the three fixed input characteristics shown in figure 4-1 or you can select a custom characteristic. Figure 4-1

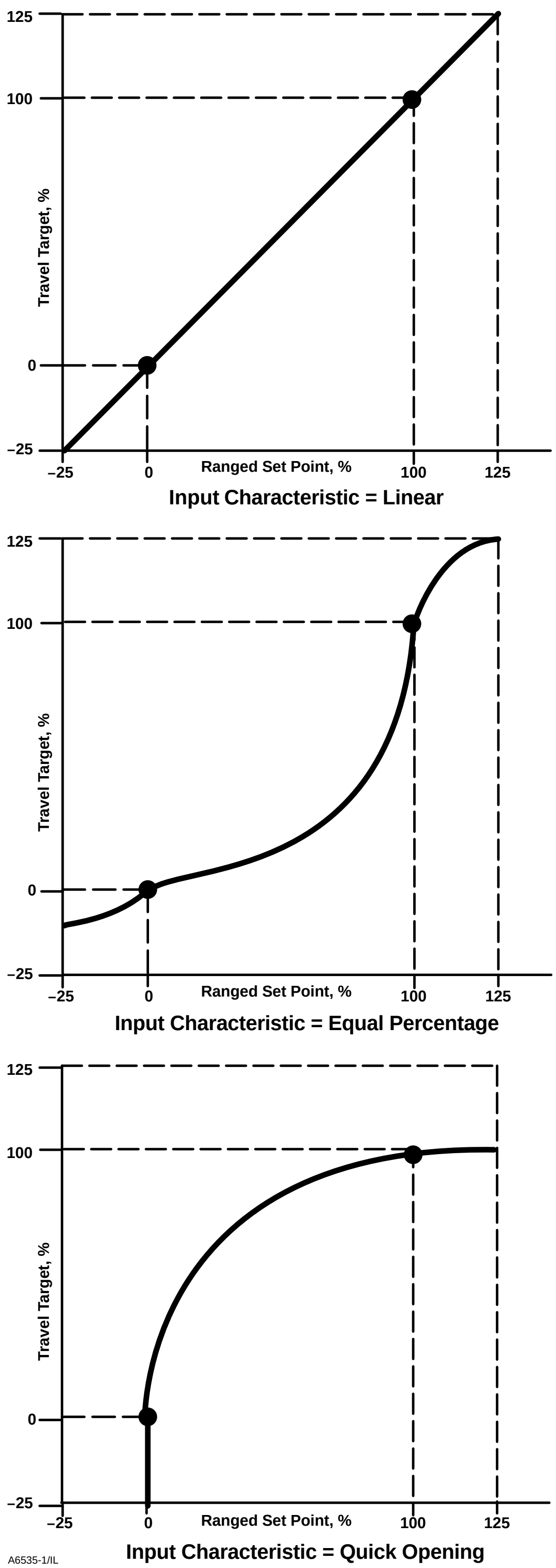


Figure 4-1. Travel Target Versus Ranged Set Point, for Various Input Characteristics (Zero Power Condition = Closed)

shows the relationship between the travel target and ranged set point for the fixed input characteristics, assuming the Zero Power Condition is configured as closed.

You can specify 21 points on a custom characteristic curve. Each point defines a travel target, in % of ranged travel, for a corresponding set point, in % of ranged set point. Set point values range from −6.25% to 106.25%. Before modification, the custom characteristic is linear.

Define Custom Char (1-2-2-4)

To define a custom input characteristic, from the *Input Char* menu select *Define Custom Char.* Select the point you wish to define (1 to 21), then enter the desired set point value. Press Enter then enter the desired travel target for the corresponding set point. When finished, select point 0 to return to the *Input Char* menu.

With input characterization you can modify the overall characteristic of the valve and instrument combination. Selecting an equal percentage, quick opening, or custom (other than the default of linear) input characteristic modifies the overall valve and instrument characteristic. However, if you select the linear input characteristic, the overall valve and instrument characteristic is the characteristic of the valve, which is determined by the valve trim (i.e., the plug or cage).

Dynamic Response (1-2-2-5)

- *SP Rate Open*—Maximum rate (% of valve travel per second) at which the digital valve controller will move to the open position regardless of the rate of input current change. A value of 0 will deactivate this feature and allow the valve to stroke open as fast as possible.

- *SP Rate Close*—Maximum rate (% of valve travel per second) at which the digital valve controller will move to the close position regardless of the rate of input current change. A value of 0 will deactivate this feature and allow the valve to stroke close as fast as possible.

- *Lag Time*—Slows the response of the digital valve controller. A value ranging from 0.2 to 10.0 can be used for noisy or fast processes to improve closed loop process control. Entering a value of 0.0 will deactivate the lag filter.

Alerts (1-2-3)

The following menus are available for configuring alerts and shutdowns. Items on the menus may be changed with the instrument In Service. Protection does not need to be removed (no need to set to

None). Alerts are not processed when a diagnostic is in progress. Select *Configure / Setup*, *Detailed Setup*, and *Alerts.* Follow the prompts on the Field Communicator display to configure the following Alerts: *Electronic Alerts, Sensor Alerts, Environment Alerts, Travel Alerts, Travel History Alerts, SIS Alerts,* and *Alert Record.*

Note

The Alerts section covers alerts and shutdowns. An alert, if enabled, can provide information on operational and performance issues. A shutdown, if enabled, will typically shut the instrument down if there is a failure associated with the enabled shutdown.

- **Electronics Alerts (1-2-3-1)**

- *Drive Current Shutdown*— Drive Current Shutdown describes the status of I/P current; should the current fail, the digital valve controller will drive the output to its safe condition. Drive Current Shutdown is part of “Self Test shutdown”. Default is not enabled.

Drive Signal Alert (1-2-3-1-2)

Drive Signal Alert checks the drive signal and calibrated travel. If one of the following conditions exists for more than 20 seconds, the Drive Signal Alert is set.

For the case where Zero Power Condition is defined as closed:

Drive Signal < 10% and Calibrated Travel > 3%

Drive Signal > 90% and Calibrated Travel < 97%

For the case where Zero Power Condition is defined as open:

Drive Signal < 10% and Calibrated Travel < 97%

Drive Signal > 90% and Calibrated Travel > 3%

- *Drive Signal Alert Enable*—Yes or No. Drive Signal Alert Enable activates checking of the relationship between the Drive Signal and the calibrated travel.

- *Drive Signal*—Shows the value of the instrument drive signal in % (percent) of maximum drive.

Processor Impaired Alerts (1-2-3-1-3)

- *Offline/Failed Alrt Enab*—If enabled, set when the device is in a failed state and not controlling the input.

- *Power Starvation Alrt Enab*—When enabled, an alert is generated whenever power starvation is detected. Default is not enabled.

- *Non-Critical NVM Alrt Enab*—When enabled, an alert is generated whenever there is a failure associated with non-critical NVM (non-volatile memory). Default is not enabled.

- *Critical NVM Shutdown*—When enabled, the instrument shuts down whenever there is a failure associated with critical NVM (non-volatile memory). Default is not enabled.

- *Flash ROM Shutdown*—When enabled, the instrument shuts down whenever there is a failure associated with flash ROM (read only memory). Default is not enabled.

- *No Free Time Shutdown*—When enabled, the instrument shuts down whenever there is a failure associated with No Free Time. Default is not enabled.

- *Reference Voltage Shutdown*—When enabled, the instrument shuts down whenever there is a failure associated with the internal voltage reference. Default is not enabled.

- **Sensor Alerts (1-2-3-2)**

- **Tvl Sensor Shutdown**

When enabled, the instrument shuts down whenever there is a failure associated with the travel sensor. Default is not enabled.

- **Temp Sensor Shutdown**

When enabled, the instrument shuts down whenever there is a failure associated with the temperature sensor. Default is not enabled.

- **Press Sensor Shutdown**

When enabled, the instrument shuts down whenever there is a failure associated with the pressure sensor. Default is not enabled.

- **Environment Alerts**

Aux Terminal Alrt (1-2-3-3-1)

- *Aux Terminal Alrt Enab*—Yes or No. When enabled, the aux terminal acts as an alert activation.

- *Aux Input*—The auxiliary input of the digital valve controller can be configured to be used in different ways. The default configuration allows a pre-configured partial stroke test to be initiated by shorting the aux terminals together, such as with the use of an appropriately connected local pushbutton switch. It can also be configured to enable an alert that will be generated when a switch connected to the Aux terminals is either “open” or “closed”. The third configuration option is for the Aux terminals to be used with the LCP100. In this configuration, the partial stroke test is initiated using the LCP100, and the Aux Input alert is not available.

- *Aux Term Mode*—Aux terminal mode can be Disabled, Alert on Open or Close Contact, SIS Local Control Panel or Push Button Partial Stroke Test. If the LCP100 is not selected, the default is Partial Stroke Test. If the LCP100 is selected during Setup Wizard or enabled in Detailed Setup as Aux Terminal Mode – SIS Local Control Panel, the following parameters will be automatically set under Travel Alerts:
  Hi Hi / Lo Lo Enable – YES
  Lo Lo Point (%) – 1
  Hi Hi Point (%) – 99
  DVC Power Up – Manual Reset

Supply Press Lo Alert (1-2-3-3-2)

- *Supply Press Lo Alrt Enab*—When enabled, the instrument shuts down whenever there is a failure associated with the supply pressure.

- *Supply Press*—Supply Pressure displays the instrument supply pressure in psi, bar, kPa, or kg/cm^2.

- *Supply Press Lo Alrt Pt*—Supply Pressure Lo Alert Point. When the supply pressure falls below the supply pressure alert point, the supply pressure alert is active. To disable the supply pressure alert, set Supply Press Alrt Pt to zero.

- **Travel Alerts (1-2-3-4)**

- *Travel*—Travel displays the actual position of the valve in percent (%) of calibrated travel.

- *Tvl Set Pt*—Travel Set Point is the input to the characterization function.

- *Tvl Alrt DB*—Travel Alert Deadband is the travel, in percent (%) of ranged travel, required to clear a travel alert, once it has been set. The deadband applies to both Travel Alert Hi/Lo and Travel Alert Hi Hi/Lo Lo. See figure 4-2.

Travel Deviation Alert (1-2-3-4-4)

If the difference between the travel target and the actual target exceeds the Travel Deviation Alert Point for more than the Travel Deviation Time, the Travel Deviation Alert is set. It remains set until the difference between the travel target and the actual travel is less than the Travel Deviation Alert Point minus the Travel Alert Deadband.

- *Tvl Dev Alrt Enab*—Travel Deviation Alert Enable, select Yes or No. When enabled, checks the difference between the travel target and the actual travel.

- *Tvl Dev Alrt Pt*—Travel Deviation Alert Point is the alert point for the difference, expressed in percent (%), between the travel target and the actual travel. When the difference exceeds the alert point for more than the Travel Deviation Time, the Travel Deviation Alert is set. Default value is 5%.

- *Tvl Dev Time*—Travel Deviation Time is the time, in seconds, that the travel deviation must exceed the Travel Deviation Alert Point before the alert is set. Default value is 10 seconds.

Travel Limit Alerts (1-2-3-4-5)

Travel Alert Hi Hi is set if the ranged travel rises above the alert high point. Once the alert is set, the ranged travel must fall below the alert high high point by the Travel Alert Deadband before the alert is cleared. See figure 4-2.

Travel Alert Lo Lo is set if the ranged travel falls below the alert low low point. Once the alert is set, the ranged travel must rise above the alert low low point by the Travel Alert Deadband before the alert is cleared.

- *Tvl Alrt Hi Hi Enab*—Yes or No. Travel Alert Hi Hi Enable activates checking of the ranged travel against the Travel Alert High-High points.

- *Tvl Alrt Lo Lo Enab*—Yes or No. Travel Alert Lo Lo Enable activates checking of the ranged travel against the Travel Alert Low-Low points.

- *Tvl Alrt Hi Hi Pt*—Travel Alert High-High Point is the value of the travel, in percent (%) of ranged

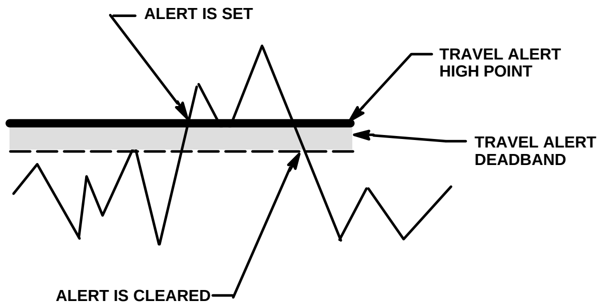


Figure 4-2. Travel Alert Deadband

travel, which, when exceeded, sets the Travel Alert Hi Hi alert. When used with the LCP100 local control panel this value is defaulted to 99% (< 99% travel, flashing light, > 99% travel, solid lights).

- *Tvl Alrt Lo Lo Pt*—Travel Alert Low-Low Point is the value of the travel, in percent (%) of ranged travel, which, when exceeded, sets the Travel Alert Lo Lo alert. When used with the LCP100 local control panel the value is set to 1%.

Travel Limit Hi/Lo Alerts (1-2-3-4-6)

Travel Alert Hi is set if the ranged travel rises above the alert high point. Once the alert is set, the ranged travel must fall below the alert high point by the Travel Alert Deadband before the alert is cleared. See figure 4-2.

Travel Alert Lo is set if the ranged travel falls below the alert low point. Once the alert is set, the ranged travel must rise above the alert low point by the Travel Alert Deadband before the alert is cleared.

- *Tvl Alrt Hi Enab*—Yes or No. Travel Alert Hi Enable activates checking of the ranged travel against the Travel Alert High Point.

- *Tvl Alrt Lo Enab*—Yes or No. Travel Alert Lo Enable activates checking of the ranged travel against the Travel Alert Lo Point.

- *Tvl Alrt Hi Point*—Travel Alert High Point is the value of the travel, in percent (%) of ranged travel, which, when exceeded, sets the Travel Alert High alert.

- *Tvl Alrt Lo Point*—Travel Alert Low Point is the value of the travel, in percent (%) of ranged travel, which, when exceeded, sets the Travel Alert Low alert.

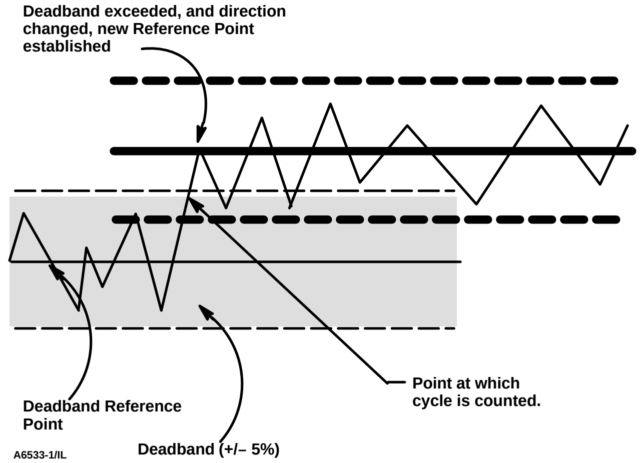


Figure 4-3. Cycle Counter Deadband (set at 10%)

Travel Limit / Cutoff Alerts (1-2-3-4-7)

- *Tvl Limit/Cutoff Hi Alrt Enab*—Yes or No. Travel Limit /Cutoff Hi Alert Enable activates the Travel Limit /Cutoff Hi alert.

- *Tvl Limit/Cutoff Lo Alrt Enab*—Yes or No. Travel Limit /Cutoff Lo Alert Enable activates the Travel Limit/Cutoff Lo alert.

- *Tvl/Press Cut Hi*—Travel Cutoff Hi defines the high cutoff point for the travel in percent (%) of pre-characterized set point.

Pressure Cutoff Hi defines the high cutoff point for the travel in percent (%) of pre-characterized set point.

- *Tvl/Press Cut Lo*—Travel Cutoff Lo defines the low cutoff point for the travel in percent (%)of pre-characterized set point.

Pressure Cutoff Lo defines the low cutoff point for the travel in percent (%) of pre-characterized set point.

- **Travel History Alerts**

Cycle Count (1-2-3-5-1)

- *Cycle Count Alrt Enab*—Yes or No. Cycle Counter Alert Enable activates checking of the difference between the Cycle Counter and the Cycle Counter Alert point. The Cycle Counter Alert is set when the value exceeds the Cycle Counter Alert point. It is cleared after you reset the Cycle Counter to a value less than the alert point.

- *Cycle Count*—Cycle Counter records the number of times the travel changes direction. The change in direction must occur after the deadband has been exceeded before it can be counted as a

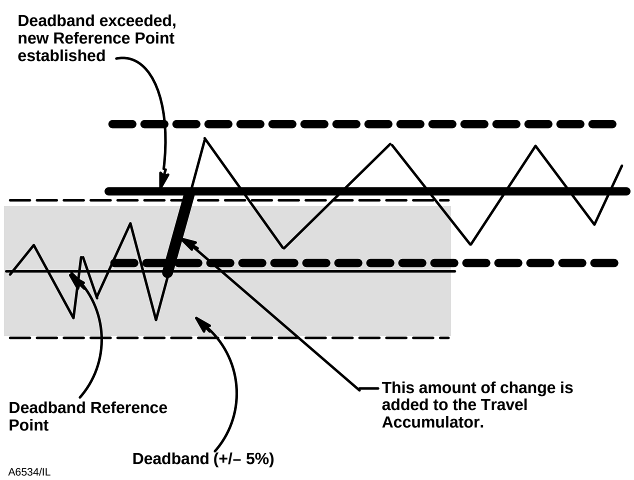


Figure 4-4. Travel Accumulator Deadband (set at 10%)

4

cycle. See figure 4-3. You can reset the Cycle Counter by configuring it as zero.

- *Cycle Count Alrt Pt*—Cycle Counter Alert Point is the value of the Cycle Counter, in cycles, which, when exceeded, sets the Cycle Counter Alert.

Cycle Count/Tvl Accum Deadband (1-2-3-5-2)

- *Deadband*

Cycle Counter Deadband is the area around the travel reference point, in percent (%) of ranged travel, that was established at the last increment of the Cycle Counter. This area must be exceeded before a change in travel direction can be counted as a cycle. See figure 4-3.

Travel Accumulator Deadband is the area around the travel reference point, in percent (%) of ranged travel, that was established at the last increment of the accumulator. This area must be exceeded before a change in travel can be accumulated. See figure 4-4.

Tvl Accum (1-2-3-5-3)

- *Tvl Accum Alrt Enab*—Yes or No. Travel Accumulation Alert Enable activates checking of the difference between the Travel Accumulator value and the Travel Accumulator Alert Point. The Travel Accumulation Alert is set when the Travel Accumulator value exceeds the Travel Accumulator Alert Point. It is cleared after you reset the Travel Accumulation to a value less than the alert point.

- *Tvl Accum*—Travel Accumulator records the total change in travel, in percent (%) of ranged travel, since the accumulator was last cleared. The value of the Travel Accumulator increments when the magnitude of the change exceeds the Travel Accumulator Deadband. See figure 4-4. You can reset the Travel Accumulator by configuring it to zero.

- *Tvl Accum Alrt Pt*—Travel Accumulator Alert Point is the value of the Travel Accumulator, in percent (%) of ranged travel, which, when exceeded, sets the Travel Accumulator Alert.

- **SIS Alerts (1-2-3-6)**

- *PST Press Limit*—Partial Stroke Pressure Limit defines the output pressure that will cause the partial stroke test to stop. For actuators that vent from the test starting point, the pressure limit will be a minimum value. For actuators that fill from the test starting point, the pressure will be a maximum value.

- *Press Dev Alrt Enab*—Pressure Deviation Alert Enable, select Yes or No. This alert notifies a monitoring system when a deviation in the actuator pressure has occurred. This is used when the instrument is controlling via pressure (Pressure Control Mode is enabled) to the actuator (rather than valve position) to prevent saturation of the pneumatic output. When enabled, this alert checks the difference between the target pressure and the actual pressure. If the difference exceeds the Pressure Deviation Alert Point for more than the pressure deviation time, the Pressure Deviation Alert is set. It remains set until the difference between the target pressure and the actual pressure is less than the Pressure Deviation Alert Point. The pressure deviation alert point and deviation alert time are configurable and can be disabled altogether.

- *Press Dev Alrt Pt*—Pressure Deviation Alert Point is the alert point for the difference between the pressure target and the actual pressure. When the difference exceeds the alert point for more than the Pressure Deviation Time, the Pressure Deviation Alert is set. After completion of the Setup Wizard or Auto Travel calibration a default value of 2 psi is set. This will generate an alert when the actuator pressure is not within ±2 psi of the target pressure.

- *Press Dev Time*—Pressure Deviation Time is the time, in seconds, that the pressure deviation must exceed the Pressure Deviation Alert Point before the alert is set. The Pressure Deviation Time is set to 30 seconds by default.

- **Alert Record (1-2-3-7)**

To be recorded, an alert must both be enabled for reporting, and the group in which it resides must be enabled for recording. Table 4-8 lists the alerts included in each of the groups. When any alert from an enabled group becomes active, active alerts in all enabled groups are stored.

- *Alrt Record Not Empty Enab*—Yes or No. When enabled indicates when an alert has been recorded.

- *Alrt Record Full Enab*—Yes or No. When enabled indicates when the Alert Event Record is full.

- *Display Record*—Displays all recorded alerts and the date and time the alerts were recorded.

- *Clear Record*—Clears the alert record. To clear the alert record, all alerts in enabled groups must be inactive.

Alert Groups (1-2-3-7-5)

- *Failure Group Enab*—Permits enabling the Failure Alert group. Table 4-8 lists the alerts included in each of the groups.

- *Valve Group Enab*—Permits enabling the Valve Alert group. Table 4-8 lists the alerts included in each of the groups.

- *Misc Group Enab*—Permits enabling the Miscellaneous Alert group. Table 4-8 lists the alerts included in each of the groups.

Status (1-2-4)

Select *Configure / Setup*, *Detailed Setup,* and *Status.* Follow the prompts on the Field Communicator display to configure the following parameters: *Instrument Time, Calibration and Diagnostics, Operational,* and *Integrator.*

- **Instrument Time (1-2-4-1)**

  - *Inst Time Invalid Enab*—Yes or No. When enabled indicates when the Instrument Time Invalid alert is active.

  - *Inst Date and Time*—Permits setting the instrument clock. When alerts are stored in the alert record, the date and time (obtained from the instrument clock) that they were stored is also stored in the record. The instrument clock uses a 24-hour format.

Table 4-8. Alerts Included in Alert Groups for Alert Record

Alert Group	Alerts Include in Group
Valve Alerts	Travel Lo Alert Travel Hi Alert Travel Lo Lo Alert Travel Hi Hi Alert Travel Deviation Alert Drive Signal Alert
Failure Alerts	Flash ROM Fail No Free Time Reference Voltage Fail Drive Current Fail Critical NVM Fail Temperature Sensor Fail Pressure Sensor Fail Travel Sensor Fail
Miscellaneous Alerts	Auxiliary input

- **Calibrations & Diagnostics (1-2-4-2)**

  - *Cal in Progress Enab*—Yes or No. When enabled indicates that calibration is in progress.

  - *AutoCal in Progress Enab*—Yes or No. When enabled indicates that auto calibration is in progress.

  - *Diag in Progress Enab*—Yes or No. When enabled indicates that a diagnostic test is in progress.

  - *Diag Data Avail Enab*—Yes or No. When enabled indicates when there is diagnostic data available.

- **Operational (1-2-4-3)**

  - *Press Ctrl Active Enab*—Yes or No. When enabled indicates when Pressure Control is active.

  - *Multi-Drop Enab*—Yes or No. When enabled indicates the digital valve controller is operating in a multi-drop loop.

- **Integrator (1-2-4-4)**

  - *Integrator Sat Hi Enab*—Yes or No. When enabled indicates when the Integrator Saturated High alert is active.

  - *Integrator Sat Lo Enab*—Yes or No. When enabled indicates when the Integrator Saturated Lo alert is active.

  - *Integ Limit*—The Integral Limit provides an upper limit to the integrator output. The high limit is configurable from 0 to 100% of the I/P drive signal.

  - *Integ DeadZ*—Integral Dead Zone is a window around the Primary Setpoint in which integral action is disabled. This feature is used to eliminate friction induced limit cycles around the Primary Setpoint when the integrator is active. The Dead Zone is configurable from 0% to 2%, corresponding to a symmetric window from 0% to +/−2% around the Primary Setpoint. Default value is 0.25%.

Instrument (1-2-5)

Select *Configure / Setup*, *Detailed Setup,* and *Instrument.* Follow the prompts on the Field Communicator display to configure the following Instrument parameters: *General, Units, Analog Input Range, Relay Type, Zero Pwr Condition* (Zero Power Condition), *Max Supply Press* (Maximum Supply Pressure), *Aux Term Mode* (Auxiliary Terminal Mode) *Inst Date and Time* (Instrument Date and Time), and *Calib Status and Loc* (Calibration Status and Location).

- **General (1-2-5-1)**

- *HART Tag*—Enter an up to 8 character HART tag for the instrument. The HART tag is the easiest way to distinguish between instruments in a multi-instrument environment. Use the HART tag to label instruments electronically according to the requirements of your application. The tag you assign is automatically displayed when the Field Communicator establishes contact with the digital valve controller at power-up.

- *Message*—Enter any message with up to 32 characters. Message provides the most specific user-defined means for identifying individual instruments in multi-instrument environments.

- *Descriptor*—Enter a descriptor for the application with up to 16 characters. The descriptor provides a longer user-defined electronic label to assist with more specific instrument identification than is available with the HART tag.

- *Date*—Enter a date with the format MM/DD/YY. Date is a user-defined variable that provides a place to save the date of the last revision of configuration or calibration information.

- *Valve Serial Num*—Enter the serial number for the valve in the application with up to 12 characters.

- *Inst Serial Num*—Enter the serial number on the instrument nameplate, up to 12 characters.

- *Polling Address*—If the digital valve controller is used in point-to-point operation, the Polling Address is 0. When several devices are connected

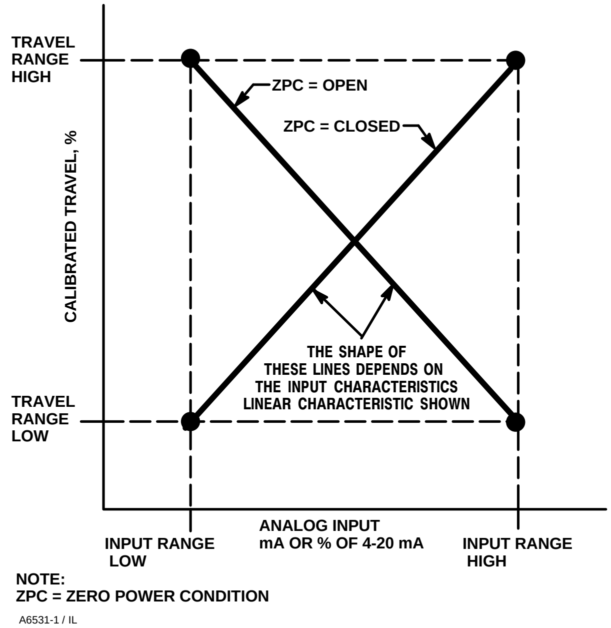


Figure 4-5. Calibrated Travel to Analog Input Relationship

in the same loop, such as for split ranging, each device must be assigned a unique polling address. The Polling Address is set to a value between 0 and 15. To change the polling address the instrument must be Out Of Service.

For the Field Communicator to be able to communicate with a device whose polling address is not 0, it must be configured to automatically search for all or specific connected devices. For information on configuring the Field Communicator for automatic polling, see the 375 Field Communicator Basics section.

- **Units (1-2-5-2)**

- *Pressure Units*—Defines the output and supply pressure units in either psi, bar, kPa, or kg/cm^2.

- *Temp Units*—Degrees Fahrenheit or Celsius. The temperature measured is from a sensor mounted on the digital valve controller's printed wiring board.

- *Analog In Units*—Permits defining the Analog Input Units in mA or percent of 4-20 mA range. Only for instruments in a 4-20 or 0-20 mA installation (point-to-point operation).

- **Analog Input Range (1-2-5-3)**

- *Input Range Hi*—Permits setting the Input Range High value. Input Range High should correspond to Travel Range High, if the Zero

RELAY TYPE	LOSS OF POWER	LOSS OF PNEUMATIC SUPPLY
Single-Acting Direct (Relay C)	Instrument goes to zero air output at port A.	Failure direction per actuator fail mode.
Double-Acting (Relay A)	Instrument goes to full supply air output at port B. A goes to zero air output.	Failure direction cannot be determined.
Single-Acting Reverse (Relay B)	Instrument goes to full supply air output at port B.	Failure direction per actuator fail mode.

Figure 4-6. Zero Power Condition

Power Condition is configured as closed. If the Zero Power Condition is configured as open, Input Range High corresponds to Travel Range Low. See figure 4-5.

- *Input Range Lo*—Permits setting the Input Range Low value. Input Range Low should correspond to Travel Range Low, if the Zero Power Condition is configured as closed. If the Zero Power Condition is configured as open, Input Range Low corresponds to Travel Range High. See figure 4-5.

- **Relay Type**

There are three basic categories of relays that result in various combinations from which to select.

Relay Type: The relay type is printed on the label affixed to the relay body.
A = double-acting or single-acting
B = single-acting, reverse
C= single-acting, direct

Special App: This is used only in single-acting applications where the “unused” output port is configured to read the pressure downstream of a solenoid valve. See page 2-18 for additional information.

Lo Bleed: The label affixed to the relay body indicates it is a low bleed version (default for SIS tier).

- **Zero Pwr Cond**

The position of the valve (open or closed) when the electrical power to the instrument is removed. Zero Power Condition (ZPC) is determined by relay and actuator action, as shown in figure 4-6.

- **Max Supply Press**

Enter the maximum supply pressure in psi, bar, kPa, or kg/cm^2, depending on what was selected for pressure units.

- **Aux Term Mode**

The auxiliary terminal mode selections are Disabled, Alert on Open or Close Contact, SIS Local Control Panel or Push Button Partial Stroke Test. If the LCP100 is not selected, the default is Partial Stroke Test. If the LCP100 is selected during Setup Wizard or enabled in Detailed Setup as Aux Terminal Mode – SIS Local Control Panel, the following parameters will be automatically set under Travel Alerts:
Hi Hi / Lo Lo Enable – YES
Lo Lo Point (%) – 1
Hi Hi Point (%) – 99
DVC Power Up – Manual Reset

- **Inst Date and Time**

Date is a user-defined variable that provides a place to save the date of the last revision of configuration or calibration information.

- **Calib Status and Loc (1-2-5-9)**

  - *Last Calib Status*—Indicates the status of the last instrument calibration.

  - *Calib Loc*—Indicates the location of the last instrument calibration.

Valve & Actuator (1-2-6)

Select *Configure / Setup, Detailed Setup,* and *Valve & Actuator.* Follow the prompts on the Field Communicator display to configure the following instrument parameters: *Manufacturer, Valve Serial Num* (Valve Serial Number), *Valve Style, Actuator Style, Feedback Conn* (Feedback Connection), and *Tvl Sensor Motion* (Travel Sensor Motion).

- **Manufacturer**

Enter the manufacturer of the actuator on which the instrument is mounted. If the actuator manufacturer is not listed, select Other.

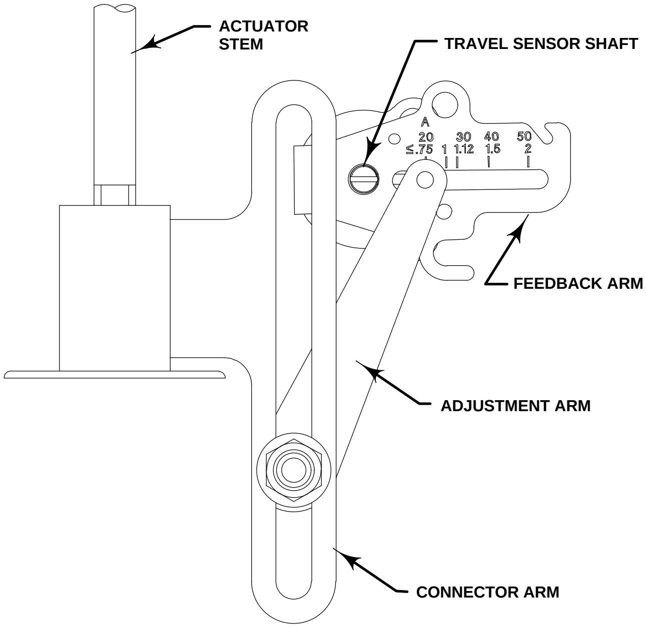


Figure 4-7. Feedback Connection for Typical Sliding-Stem Actuator (Up to 4 inch Travel)

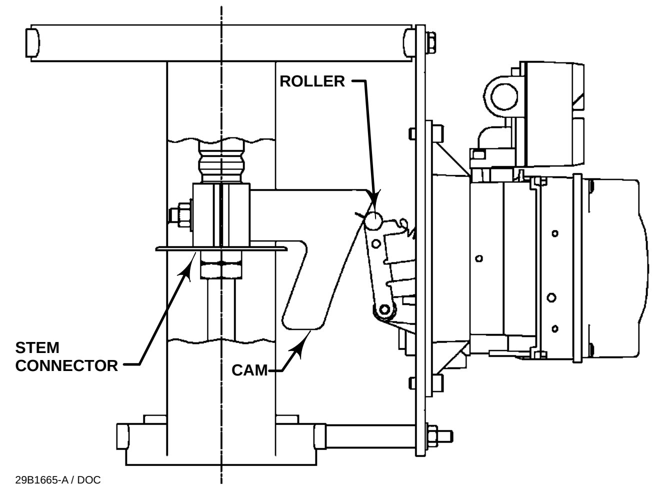


Figure 4-8. Feedback Connection for Typical Long-Stroke Sliding-Stem Actuator (4 to 24 Inches Travel)

- **Valve Serial Num**

Enter the serial number for the valve in the application with up to 12 characters.

- **Valve Style**

Enter the valve style, rotary or sliding-stem.

- **Actuator Style**

Enter the actuator style, spring and diaphragm, piston double-acting without spring, piston single-acting with spring, or piston double-acting with spring.

- **Feedback Conn**

Select Rotary All, SStem - Roller or SStem - Standard. For rotary valves, enter Rotary - All, SStem - Roller.

For sliding-stem valves, if the feedback linkage consists of a connector arm, adjustment arm, and feedback arm (similar to figure 4-7), enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam (similar to figure 4-8), enter Rotary All, SStem - Roller.

- **Tvl Sensor Motion**

Select Clockwise, or Counterclockwise. Travel Sensor Motion establishes the proper travel sensor rotation. Determine the rotation by viewing the end of the travel sensor shaft from the perspective of the actuator.

For instruments with Relay A and C: If increasing air pressure at output A causes the shaft to turn clockwise, enter Clockwise. If it causes the shaft to turn counterclockwise, enter Counterclockwise.

For instruments with Relay B: If increasing air pressure at output B causes the shaft to turn counterclockwise, enter Clockwise. If it causes the shaft to turn clockwise, enter Counterclockwise.

SIS/Partial Stroke (1-2-7)

- **PST Enable**

Yes or No. Enables or disables the Partial Stroke Test.

- **PST Vars View/Edit**

Follow the prompts on the Field Communicator display to enter or view information for following PST Variables: *Max Travel Movement* (Maximum Travel Movement), *Stroke Speed, Pause Time, PST Press Limit* (Partial Stroke Pressure Limit), *PST Mode Enable* (Partial Stroke Enable), *Pressure Set Point* (Pressure Set Point), and *End Pt Contrl Enab* (End Point Control Enable). For more information on the partial stroke test see Partial Stroke Test in Section 6.

Max Travel Movement—Defines the maximum displacement of partial stroke test signal from the travel stop. Default value is 10%. It may be set to a value between 1 and 30% in 0.1% increments.

Table 4-9. Estimates for Partial Stroke Pressure Limits

Actuator Style	Relay Type	Zero Power Condition	PST Starting Point	Partial Stroke Pressure Limit
Spring and Diaphragm	A or C	Closed	Open	Pmin – 0.25 * (Bench Set High – Bench Set Low)
			Closed	Pmax + 0.25 * (Bench Set High – Bench Set Low)
		Open	Open	Pmax + 0.25 * (Bench Set High – Bench Set Low)
			Closed	Pmin – 0.25 * (Bench Set High – Bench Set Low)
	B	Closed	Open	Pmax + 0.25 * (Bench Set High – Bench Set Low)
			Closed	Pmin – 0.25 * (Bench Set High – Bench Set Low)
		Open	Open	Pmin – 0.25 * (Bench Set High – Bench Set Low)
			Closed	Pmax + 0.25 * (Bench Set High – Bench Set Low)
Single-Acting Piston	A or C	Closed	Open	0.5 * Pmin
			Closed	Pmax + 0.5 * (Psupply – Pmax)
		Open	Open	Pmax + 0.5 * (Psupply – Pmax)
			Closed	0.5 * Pmin
	B	Closed	Open	Pmax + 0.5 * (Psupply – Pmax)
			Closed	0.5 * Pmin
		Open	Open	0.5 * Pmin
			Closed	Pmax + 0.5 * (Psupply – Pmax)
Double-Acting Piston	A	Closed	Open	Pmin – 0.5 * (Psupply + Pmin)
			Closed	Pmax + 0.5 * (Psupply – Pmax)
		Open	Open	Pmax + 0.5 * (Psupply – Pmax)
			Closed	Pmin – 0.5 * (Psupply + Pmin)

Note

The Max Travel Movement is the percentage of total span that the valve moves away from its operating state towards its fail state during a Partial Stroke Test.

Stroke Speed—The stroke speed can be set for 1%/second, 0.5%/second, 0.25%/second, 0.12%/second, or 0.06%/second. The default value for Partial Stroke Speed is 0.25%/second. For large size actuators set the stroke speed to 0.06%/second.

Pause Time—The Setup Wizard sets the Partial Stroke Pause Time to 5 seconds. This is the pause time between the up and down strokes of the test. It can be set for 5, 10, 15, 20 or 30 seconds.

PST Press Limit (single-acting actuators)—During the Setup Wizard or Auto Travel Calibration, the Partial Stroke Pressure Limit will be set to a positive value for single-acting actuators. For those actuators that vent from the test starting point, the pressure limit will be a minimum value. For those actuators that fill from the test starting point, the pressure limit will be a maximum value. The pressure signal used for this threshold depends on relay type and is summarized below.

Relay Type	Pressure Signal
A or C	Port A – Port B
B	Port B – Port A
B Special App.	Port B
C Special App.	Port A

PST Press Limit (double-acting actuators)— During the Setup Wizard or Auto Travel Calibration, the PST Press Limit will be set to a negative value for actuators where the Partial Stroke Start Point is opposite of the Zero Power Condition (e.g., Partial Stroke Start Point = Open and Zero Power Condition = Closed) and to a positive valve for actuators where the Partial Stroke Start Point is the same as the Zero Power Condition.

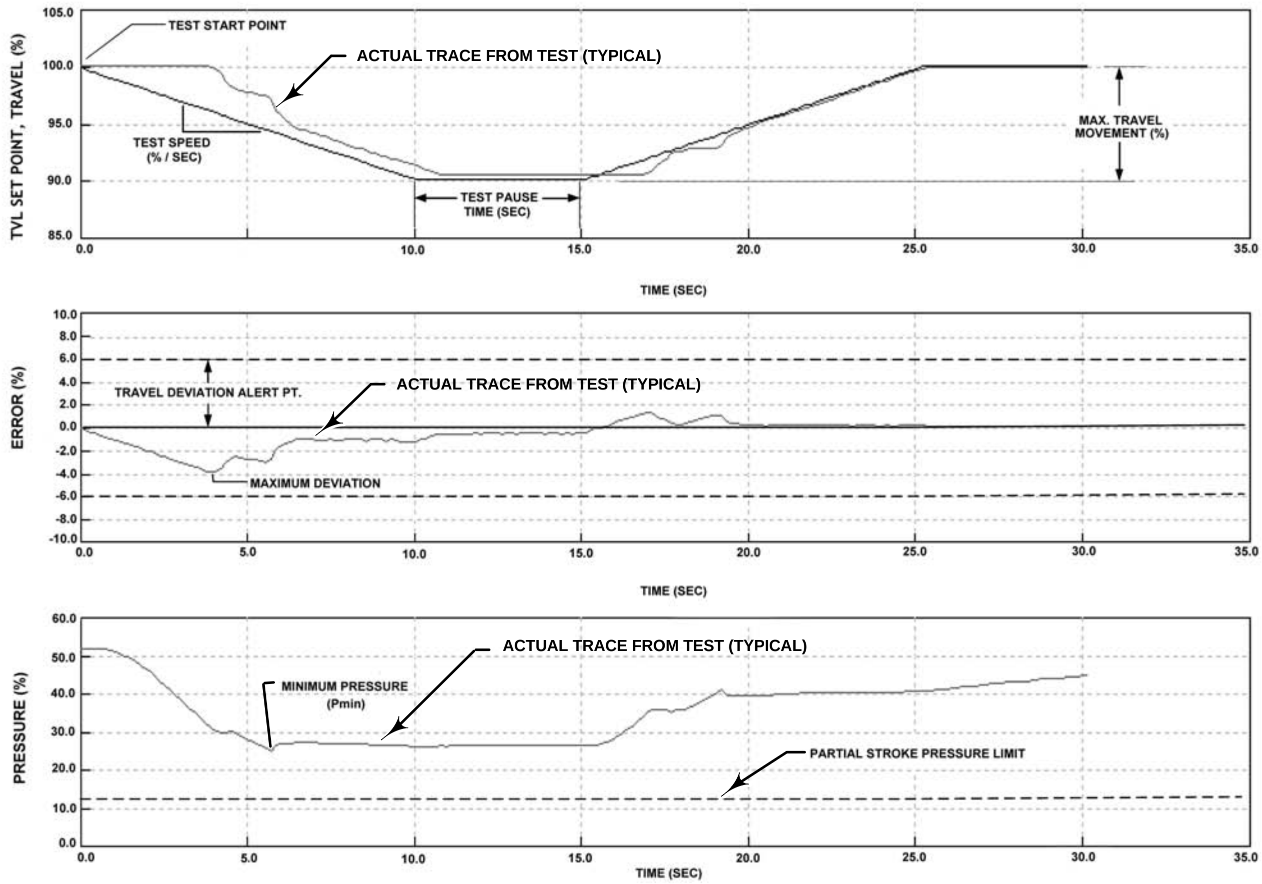


Figure 4-9. Time Series Plots of Travel Set Point, Travel, Error, and Actuator Pressure for a Typical Emergency Shutdown Valve

Manual SIS / Partial Stroke Parameter Configuration

Note

In order to manually set the partial stroke pressure limit with the correct value, you must be able to run a valve signature test using AMS ValveLink Software (see figure 4-9). It is then possible to set the partial stroke pressure limit with the Field Communicator, using the information generated by the valve signature test.

Thresholds for detecting a stuck valve are automatically configured when the Setup Wizard or Partial Stroke Calibration routines are run. However

Table 4-10. Values for Disabling Partial Stroke Pressure Limit

Actuator Type	Relay Type	Zero Power Condition	Partial Stroke Start Point	Partial Stroke Pressure Limit (Disabled)
Single-Acting	A or C	Closed	Open	0.0
			Closed	Psupply
		Open	Open	Psupply
			Closed	0.0
	B	Closed	Open	Psupply
			Closed	0.0
		Open	Open	0.0
			Closed	Psupply
Double-Acting	A	Closed	Open	−Psupply
			Closed	Psupply
		Open	Open	Psupply
			Closed	−Psupply

thresholds can also be configured manually. To manually configure thresholds, disable the travel deviation alert by setting Travel Dev Alert Pt to 125% (1-2-3-4-4-2). Also disable end point pressure control (1-2-2-2-2-1) and disable the partial stroke pressure limit (1-2-7-2) by setting the values shown in table 4-10.

Run the partial stroke test using the 375 Field Communicator. Once the test is completed, download the partial stroke test results using ValveLink Software.

On the partial stroke graph page, select the Tvl(%)/Time radio button to plot travel set point and travel time series traces. The Travel Deviation Alert Point should be set at least 1.5 times the maximum deviation obtained from the time series plot. Maximum Travel Movement should be set at least 5% above the Travel Deviation Alert Point.

On the partial stroke graph page, select the Press/Time radio button to plot the pressure trace. If the actuator pressure starts high and moves low, find the minimum actuator pressure. If the actuator pressure starts low and moves high, find the maximum actuator pressure. Use table 4-9 to estimate the partial stroke pressure limit.

In the example shown in the middle graph of figure 4-9, the maximum travel deviation between travel set point and travel is approximately 4%. Travel Deviation Alert Point should be set to 1.5 x 4% = 6%. Max Travel Movement should be set at 6% + 5% = 11%.

In the bottom graph of figure 4-9, with a single-acting piston actuator, fail closed, Relay A, and supply pressure at 52 psig (read from instrument gauge), Partial Stroke Pressure Limit is the minimum actuator pressure attained during the test, i.e., 24 psig. Set the Partial Stroke Pressure Limit to 0.5 * Pmin = 12 psig.

The default value is 0.

For double-acting valves, the differential pressure is used.

- **Auto Test Interval**

An interval of time (in days) between partial stroke tests that are automatically run by the digital valve controller, subject to the device being powered up. A value of 0 disables this feature.

- **DVC Power Up**

Defines the power up behavior of the DVC6000 SIS. Auto Reset allows the valve to track the command signal when power is applied to the device. Manual Reset will lock the device in its safety position until the digital valve controller is reset.

If Manual Reset is selected, its state can be determined from the status monitor by monitoring the Locked In Safety Position alert.

When Aux Terminal Mode is set to SIS Local Control Panel (LP100), DVC Power Up is set to Manual Reset and cannot be changed to Auto Reset.

The reset signal depends on how the aux terminals are configured. If configured for SIS Local Control Panel, the digital valve controller can be reset by pressing the button next to the green light on the LCP100. If configured as Push Button Partial Stroke, the digital valve controller can be reset by shorting the aux terminals for more than 3 seconds but less than 10 seconds. The device cannot be reset from the aux terminals if they are configured otherwise.

4

Valve Stuck Alert

CAUTION

If a valve stuck alert is active, there may be potential energy stored in the valve and actuator assembly. Sudden release of this energy may cause the valve to suddenly open or close, resulting in equipment damage.

While performing the partial stroke test, even if the valve sticks, the digital valve controller will not fully exhaust or fill the actuator pressure in its attempt to complete the partial stroke. Rather, the instrument will abort the test and issue an alert. It is recommended that the Travel Deviation alert be enabled and configured.

The Valve Stuck alert will be generated either by the Travel Deviation alert (the difference between expected and actual travel exceeds the level defined in the deviation alert), or if the actuator pressure reaches the Partial Stroke pressure limit. If the Travel Deviation alert is not configured, then the Partial Stroke pressure limit will abort the test and cause the Valve Stuck alert.

If the valve is stuck and only the Travel Deviation alert is enabled (without specifying partial stroke pressure limit) the Valve Stuck alert will still be generated and the test will be aborted.

Section 5 Calibration 

Calibration Overview

When a DVC6000 SIS Series digital valve controller is ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator and connects the necessary tubing, then sets up and calibrates the controller.

For digital valve controllers that are ordered separately, recalibration of the analog input or pressure sensors generally is unnecessary. However, after mounting on an actuator, perform the initial setup (either auto or manual), then calibrate travel by selecting *Calibrate, Travel Calibration,* and *Auto Tvl Calib* (Auto Travel Calibration) from the *Configure / Setup* menu. For more detailed calibration information, refer to the following calibration procedures, available from the *Calibrate* menu:

Travel Calibration

- **Auto Travel Calibrate** —This procedure automatically calibrates the travel. The calibration procedure uses the valve and actuator stops as the 0% and 100% calibration points.

- **Manual Travel Calibrate** —This procedure permits manual calibration of the travel. This calibration procedure allows you to determine the 0% and 100% calibration points and obtain the optimum linearity on a sliding-stem valve.

Sensor Calibration

- **Pressure Sensor Calibration**—This procedure permits calibrating the three pressure sensors. Normally the sensors are calibrated at the factory and should not need calibration.

- **Travel Sensor Adjust**—This procedure permits calibrating the travel sensor. Normally the travel sensor is calibrated at the factory. Calibrating the travel sensor should only be necessary if the travel sensor is replaced.

- **Analog In Calibration**—This procedure permits calibrating the analog input sensor. Normally the sensor is calibrated at the factory and should not need calibration.

Note

Analog Input is only available when the DVC6000 SIS is operating in Point-to-Point mode with 4-20 mA or 0-20 mA current.

Relay Adjustment—This procedure permits adjustment of the pneumatic relay.

Restore Factory Settings—This procedure permits you to restore the calibration settings back to the factory settings.

PST Calibration—This procedure permits you to run the PST calibration procedure.

To display the calibrate menu, from the *Online* menu, select *Configure / Setup* and *Calibrate*.

Note

The Instrument Mode must be Out Of Service and the Protection set to None before the instrument can be calibrated.

If you are operating in burst mode, we recommend that you disable burst before continuing calibration. Once calibration is complete, burst mode may then be turned back on.

Note

In the event of a power failure the DVC6000 SIS automatically restores the device to In Service upon restoration of power. This is to provide greater availability of the safety function.

If power is inadvertently interrupted while performing set up or maintenance, you may need to return the DVC6000 SIS to out of service if the interrupted task requires that mode of operation.

WARNING

During calibration, the valve may move. To avoid personal injury and property damage caused by the release of pressure or process fluid, provide some temporary means of control for the process.

Travel Calibration

There are two procedures available for calibrating travel:

- Automatically (Auto Tvl Calib)
- Manually (Man Tvl Calib)

Auto Travel Calibrate (1-3-1-1)

User interaction is only required with Auto Calibrate Travel when the feedback connection is SStem - Standard (Sliding Stem - Standard). A feedback connection of Rotary - All, SStem - Roller (Sliding Stem - Roller) requires no user interaction and you can start with step 6.

For a SStem - Standard feedback connection, interaction provides a more accurate crossover adjustment. Setting crossover establishes the zero degree point for the geometric correction used to translate the rotary motion observed by the travel sensor into the linear motion of the sliding-stem valve.

When a double-acting actuator is used, you will be prompted to run the Relay Adjustment when Auto Travel Calibration is selected. Select Yes to adjust the relay. Select No to proceed with Auto Travel Calibration. For additional information, refer to Relay Adjustment in this section.

Select *Auto Tvl Calib* from the *Calibrate* menu, then follow the prompts on the Field Communicator display to automatically calibrate travel.

1. Select the method of crossover adjustment: manual, last value, or default. Manual is the recommended choice. If you select Manual, the Field Communicator will prompt you to adjust the crossover in step 3.

If you select Last Value, the crossover setting currently stored in the instrument is used and there are no further user interactions with the auto-calibration routine (go to step 6). Use this selection if you cannot use manual, such as when you cannot see the valve.

If you select Default, an approximate value for the crossover is written to the instrument and there are no further user interactions with the auto-calibration routine (go to step 6). Use this selection only as a last resort. Default assumes a midrange position on the travel sensor as the crossover point, however, this may not be an appropriate value to use for crossover because of variations in mounting and travel sensor calibration.

2. The instrument seeks the high and low drive points and the minor loop feedback (MLFB) and output bias.

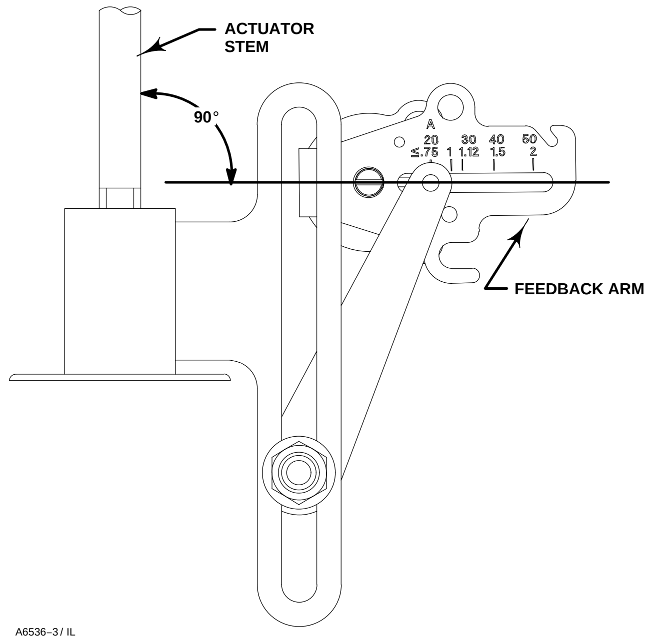


Figure 5-1. Crossover Point

No user interaction is required in this step. For a description of these actions see step 6.

3. If you select Manual in step 1, you are asked to select an adjustment source, either analog or digital. If you use a current source to adjust the crossover, select Analog and go to step 4. If you wish to adjust the current source digitally, select Digital and go to step 5.

Note

The analog option is not available when the DVC6000 SIS is operated by 0-24 VDC in multi-drop mode.

4. If you selected Analog as the crossover adjustment source, the Field Communicator prompts you to adjust the current source until the feedback arm is 90° to the actuator stem, as shown in figure 5-1. After you have made the adjustment, press OK and go to step 6.

5. If you selected Digital as the crossover adjustment source, the Field Communicator displays a menu to allow you to adjust the crossover.

Select the direction and size of change required to set the feedback arm so it is 90° to the actuator stem, as shown in figure 5-1. Selecting large, medium, and small adjustments to the crossover causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the rotation of the feedback arm.

If another adjustment is required, repeat step 5. Otherwise, select Done and go to step 6.

6. The remainder of the auto calibration procedure is automatic.

During calibration, the instrument seeks the high and low end points and the minor loop feedback (MLFB) and output bias. By searching for the end points, the instrument establishes the limits of physical travel, i.e., the actual travel 0 and 100% positions. This also determines how far the relay beam swings to calibrate the sensitivity of the beam position sensor.

Adjusting the minor loop feedback bias is done around mid travel. The valve position is briefly moved back and forth to determine the relay beam position at quiescence. Essentially, it establishes the zero point for the Minor Loop Feedback circuit. The back and forth motion is performed to account for hysteresis.

Adjusting the output bias aligns the travel set point with the actual travel by computing the drive signal required to produce 0% error. This is done while the valve is at 50% travel, making very small adjustments. Calibration is complete when the “Auto Calibration has completed” message appears.

7. Place the instrument In Service and verify that the travel properly tracks the current source.

If the unit does not calibrate, refer to table 5-1 for error messages and possible remedies.

Table 5-1. Auto Calibrate Travel Error Messages

Error Message	Possible Problem and Remedy
Input current must exceed 3.8 mA for calibration.	The analog input signal to the instrument must be greater than 3.8 mA. Adjust the current output from the control system or the current source to provide at least 4.0 mA.
Place Out Of Service and ensure Calibrate Protection is disabled before calib.	The Instrument Mode must be *Out of Service* and the Protection must be *None* before the instrument can be calibrated. For information on changing instrument protection and mode, see the beginning of this section.
Calibration Aborted. An end point was not reached.	The problem may be one or the other of the following: 1. The tuning set selected is too low and the valve does not reach an end point in the allotted time. Press the Hot Key, select *Stabilize/Optimize* then *Increase Response* (selects next higher tuning set). 2. The tuning set selected is too high, valve operation is unstable and does not stay at an end point for the allotted time. Press the Hot Key, select *Stabilize/Optimize* then *Decrease Response* (selects next lower tuning set).
Invalid travel value. Check travel sensor and feedback arm adjustments, and inst supply press. Then, repeat Auto Calib.	Prior to receiving this message, did the instrument output go from zero to full supply? If not, verify instrument supply pressure by referring to the specifications in the appropriate actuator instruction manual. If supply pressure is correct, check instrument pneumatic components (I/P converter and relay). If the instrument output did go from zero to full supply prior to receiving this message, then verify proper mounting by referring to the appropriate mounting procedure in the Installation section. Verify travel sensor adjustment by performing the appropriate Travel Sensor Adjust procedure in the Calibration section. Making the crossover adjustment with the valve positioned at either end of its travel will also cause this message to appear.

Manual Travel Calibrate (1-3-1-2)

It is recommended that you adjust the relay before manually calibrating travel. For additional information refer to Relay Adjustment in this section.

Note

Relay Adjustment is only available for the double-acting relay (Relay A).

Two procedures are available to manually calibrate travel:

- Analog Adjust
- Digital Adjust

Analog Calibration Adjust

Note

Analog Calibration Adjust is only available in 4-20 mA or 0-20 mA systems (point-to-point operation).

From the *Calibrate* menu, select *Man Tvl Calib* and *Analog Adjust.* Connect a variable current source to the instrument LOOP + and LOOP − terminals. The current source should be capable of generating 4-20 mA. Follow the prompts on the Field Communicator display to calibrate the instrument’s travel in percent.

Note

0% Travel = Valve Closed
100% Travel = Valve Open

1. Adjust the input current until the valve is near mid-travel. Press OK.

2. If the feedback connection is Rotary - All, SStem - Roller, go to step 6. If the feedback connection is SStem - Standard, you are prompted to set the crossover point. Adjust the current source until the feedback arm is 90° to the actuator stem, as shown in figure 5-1. Then press OK.

Note

In steps 3 through 7, the accuracy of the current source adjustment affects the position accuracy.

3. Adjust the current source until the valve is at 0% travel, then press OK.

4. Adjust the current source until the valve is at 100% travel, then press OK.

5. Adjust the current source until the valve is at 50% travel, then press OK.

6. Adjust the current source until the valve is at 0% travel, then press OK.

7. Adjust the current source until the valve is at 100% travel, then press OK.

8. Adjust the current source until the valve is near 5% travel, then press OK.

9. Adjust the current source until the valve is near 95% travel, then press OK.

10. Place the instrument In Service and verify that the travel properly tracks the current source.

Digital Calibration Adjust

From the *Calibrate* menu, select *Man Tvl Calib* and *Digital Adjust.* Connect a variable current source to the instrument LOOP + and LOOP – terminals. The current source should be set between 4 and 20 mA. Follow the prompts on the Field Communicator display to calibrate the instrument's travel in percent.

Note

0% Travel = Valve Closed
100% Travel = Valve Open

1. From the adjustment menu, select the direction and size of change required to adjust the output until the valve is near mid-travel. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation.

If another adjustment is required, repeat step 1. Otherwise, select Done and go to step 2.

2. If the feedback connection is Rotary - All, SStem - Roller, go to step 7. If the feedback connection is SStem - Standard, adjust the feedback arm to the crossover point by using the adjustment menu.

3. From the adjustment menu, select the direction and size of change required to set the feedback arm so it is 90° to the actuator stem, as shown in figure 5-1. Selecting large, medium, and small adjustments to the crossover causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation.

If another adjustment is required, repeat step 3. Otherwise, select Done and go to step 4.

4. From the adjustment menu, select the direction and size of change required to set the travel at 0%. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation.

If another adjustment is required, repeat step 4. Otherwise, select Done and go to step 5.

5. From the adjustment menu, select the direction and size of change required to set the travel to 100%. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation.

If another adjustment is required, repeat step 5. Otherwise, select Done and go to step 6.

6. From the adjustment menu, select the direction and size of change required to set the travel to 50%. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation.

If another adjustment is required, repeat step 6. Otherwise, select Done and go to step 7.

7. From the adjustment menu, select the direction and size of change required to set the travel to 0%.

Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation for a sliding-stem valve or to the travel for a rotary valve.

If another adjustment is required, repeat step 7. Otherwise, select Done and go to step 8.

8. From the adjustment menu, select the direction and size of change required to set the travel to 100%. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation for a sliding-stem valve or to the travel for a rotary valve.

If another adjustment is required, repeat step 8. Otherwise, select Done and go to step 9.

9. From the adjustment menu, select the direction and size of change required to set the travel to near 5%. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation for a sliding-stem valve or to the travel for a rotary valve.

If another adjustment is required, repeat step 9. Otherwise, select Done and go to step 10.

10. From the adjustment menu, select the direction and size of change required to set the travel to near 95%. Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation for a sliding-stem valve or to the travel for a rotary valve.

If another adjustment is required, repeat step 10. Otherwise, select Done and go to step 11.

11. Place the instrument In Service and verify that the travel properly tracks the current source.

12. After manual calibration is completed manually set the SIS parameters as described in Section 4. See page 4-13 for End Point Pressure Control; page 4-16 Travel Deviation Alert Point and Travel Deviation Time; and page 4-23 for Partial Stroke Pressure Limit.

Sensor Calibration

Pressure Sensors (1-3-2-1)

There are three pressure sensors: output A, output B and supply. Select the appropriate menu depending upon which pressure sensor you are calibrating.

Note

The pressure sensors are calibrated at the factory and should not require calibration.

Output Pressure Sensor Calibration

To calibrate the output pressure sensors, connect an external reference gauge to the output being calibrated. The gauge should be capable of measuring maximum instrument supply pressure. From the *Calibrate* menu, select *Sensor Calibration* and *Press Sensors* (Pressure Sensors). Depending upon the sensor you wish to calibrate, select either *Output A Sensor* or *Output B Sensor.* Follow the prompts on the Field Communicator display to calibrate the instrument's output pressure sensor.

1. Adjust the supply pressure regulator to the desired supply pressure. Press OK.

2. Select a) Zero only, or b) Zero and Span (gauge required) sensor calibration.

a. If Zero only calibration is selected, wait until output x pressure has completely exhausted, then continue. Once calibration is completed, go to step 6. The output x pressure corresponds to A or B, depending on which output you are calibrating.

b. If Zero and Span calibration is selected, wait until output x pressure has completely exhausted, then continue. You will then be asked to wait until output x pressure has reached full supply, then continue. The output x pressure corresponds to A or B, depending on which output you are calibrating. Proceed with step 3.

3. The instrument sets the output pressure to full supply. The following message appears:

Use the Increase and Decrease selections until the displayed pressure matches the output x pressure.

The output x pressure corresponds to A or B, depending on which output you are calibrating. Press OK when you have read the message.

4. The value of the output pressure appears on the display.

5. From the adjustment menu, select the direction and size of adjustment to the displayed value. Selecting

large, medium, and small adjustments causes changes of approximately 3.0 psi/0.207 bar/20.7 kPa, 0.30 psi/0.0207 bar/2.07 kPa, and 0.03 psi/0.00207 bar/0.207 kPa, respectively. Adjust the displayed value until it matches the output pressure, select Done and go to step 6.

6. Place the instrument In Service and verify that the displayed pressure matches the measured output pressure.

Supply Pressure Sensor Calibration

To calibrate the supply pressure sensor, connect an external reference gauge to the output side of the supply regulator. The gauge should be capable of measuring maximum instrument supply pressure. From the *Calibrate* menu, select *Sensor Calibration, Press Sensors* (Pressure Sensors), and *Supply Sensor.* Follow the prompts on the Field Communicator display to calibrate the instrument's supply pressure sensor.

1. Select a) Zero Only, or b) Zero and Span (gauge required).

a. If Zero Only calibration is selected, adjust the supply pressure regulator to remove supply pressure from the instrument. Press OK. Once calibration is complete, go to step 5.

b. If Zero and Span calibration is selected, adjust the supply pressure regulator to remove supply pressure from the instrument. Press OK. Adjust the supply regulator to the maximum instrument supply pressure. Press OK. Proceed with step 2.

2. The following message appears:

Use the Increase and Decrease selections until the displayed pressure matches the instrument supply pressure.

Press OK when you have read this message.

3. The value of the pressure appears on the display.

4. From the adjustment menu, select the direction and size of adjustment to the displayed value. Selecting large, medium, and small adjustments causes changes of approximately 3.0 psi/0.207 bar/20.7 kPa, 0.30 psi/0.0207 bar/2.07 kPa, and 0.03 psi/0.00207 bar/0.207 kPa, respectively. Adjust the displayed value until it matches the supply pressure, select Done and go to step 5.

5. Place the instrument In Service and verify that the displayed pressure matches the measured supply pressure.

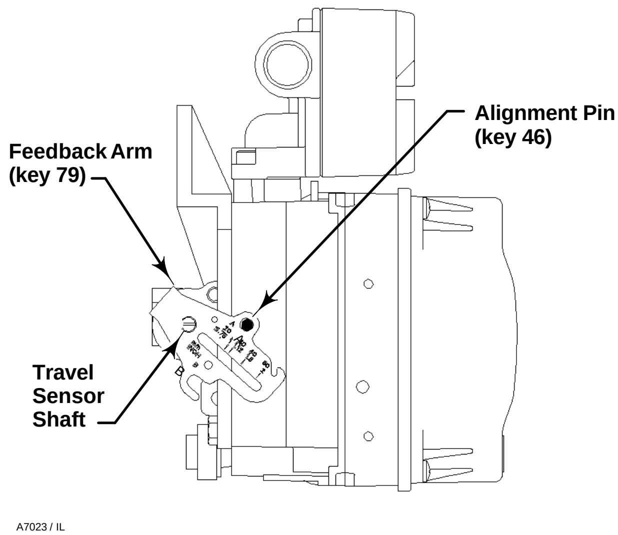


Figure 5-2. FIELDVUE DVC6010 SIS Digital Valve Controller Showing Feedback Arm in Position for Travel Sensor Adjustment

Travel Sensor Adjust (1-3-2-2)

The travel sensor is normally adjusted at the factory and should not require adjustment. However, if the travel sensor has been replaced, adjust the travel sensor by performing the appropriate procedure. See the Maintenance section for travel sensor replacement procedures.

DVC6010 SIS, DVC6015, DVC6030 SIS, and DVC6035

WARNING

Failure to remove air pressure may cause personal injury or property damage from bursting parts.

1. Remove supply air and remove the instrument from the actuator.

2. As shown in figure 5-2, align the feedback arm (key 79) with the housing by inserting the alignment pin (key 46) through the hole marked "A" on the feedback arm. Fully engage the alignment pin into the tapped hole in the housing.

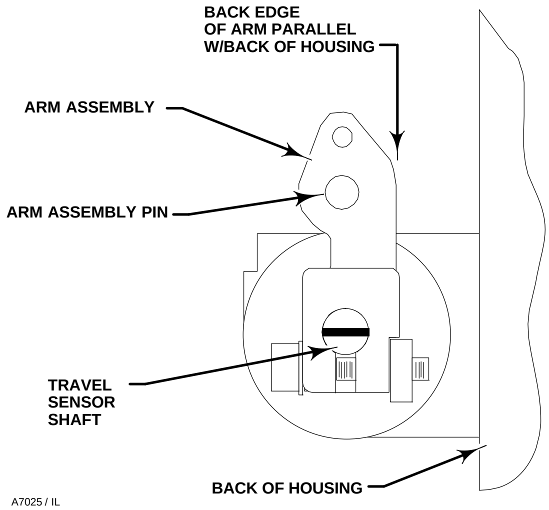


Figure 5-3. FIELDVUE DVC6020 SIS Travel Sensor Arm/Housing Back Plane Alignment

Table 5-2. Travel Sensor Counts

Digital Valve Controller	Travel Sensor Counts
DVC6010 SIS / DVC6015	700 ±200
DVC6020 SIS / DVC6025	2100 ±200
DVC6030 SIS / DVC6035	600 ±200

Note

The alignment pin (key 46) is stored inside the digital valve controller housing.

3. Loosen the screw that secures the feedback arm to the travel sensor shaft. Position the feedback arm so that the surface of the feedback arm is flush with the end of the travel sensor shaft.

4. Connect a current source to the instrument LOOP − and LOOP + terminals. Set the current source to any value between 4 and 20 mA. Connect the Field Communicator to the TALK terminals.

5. Before beginning the travel sensor adjustment, set the instrument mode to Out Of Service and the protection to None.

6. From the *Calibrate* menu select *Sensor Calibration,*and *Tvl Sensor Adjust* (Travel Sensor Adjust). Follow the prompts on the Field Communicator display to adjust the travel sensor counts to the value listed in table 5-2.

Note

In the next step, be sure the feedback arm surface remains flush with the end of the travel sensor shaft.

7. While observing the travel sensor counts, tighten the screw that secures the feedback arm to the travel sensor shaft. Be sure the travel sensor counts remain within the tolerances listed in table 5-2. Paint the screw to discourage tampering with the connection.

8. Disconnect the Field Communicator and current source from the instrument.

9. Remove the alignment pin and store it in the instrument housing.

10. Install the digital valve controller on the actuator.

DVC6020 SIS and DVC6025

WARNING

Failure to remove air pressure may cause personal injury or property damage from bursting parts.

1. Remove supply air and remove the instrument from the actuator.

2. See figure 5-4 for parts identification. Disconnect the bias spring (key 82) from the feedback arm assembly (key 84) and the arm assembly (key 91). Remove the mounting bracket (key 74) from the back of the digital controller. Hold the arm assembly (key 91) so that the arm assembly points toward the terminal box and the arm is parallel to the back of the housing, as shown in figure 5-3.

3. Loosen the screw that secures the arm assembly to the travel sensor shaft. Position the arm assembly so that the outer surface is flush with the end of the travel sensor shaft.

4. Connect a current source to the instrument LOOP − and LOOP + terminals. Set the current source to any value between 4 and 20 mA. Connect the Field Communicator to the TALK terminals.

5. Before beginning the travel sensor adjustment, set the instrument mode to Out Of Service and the protection to None.

6. From the *Calibrate* menu, select *Sensor Calibration* and *Tvl Sensor Adjust* (Travel Sensor Adjust). Follow the prompts on the Field Communicator display to adjust the travel sensor counts to the value listed in table 5-2.

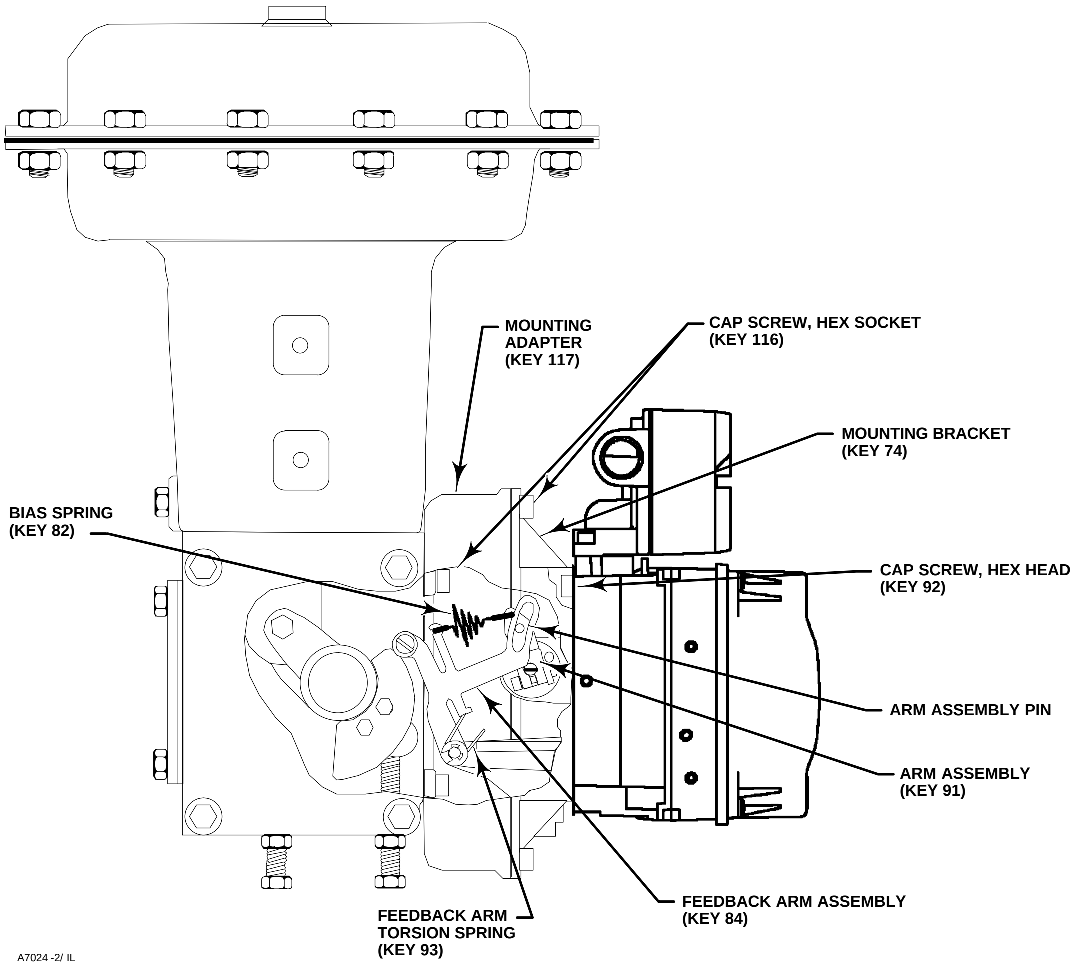


Figure 5-4. FIELDVUE DVC6020 SIS Digital Valve Controller Mounted on a Fisher 1052 Size 33 Actuator

Note

In the next step, be sure the arm assembly outer surface remains flush with the end of the travel sensor shaft.

7. While observing the travel sensor counts, tighten the screw that secures the arm assembly to the travel sensor shaft. Be sure the travel sensor counts remain within the tolerances listed in table 5-2. Paint the screw to discourage tampering with the connection.

8. Disconnect the Field Communicator and current source from the instrument.

9. Apply lubricant (key 63) to the pin portion of the arm assembly (key 91).

10. Replace the mounting bracket on the back of the instrument and reconnect the bias spring between the feedback arm assembly and the arm assembly on the travel sensor shaft.

11. Install the digital valve controller on the actuator.

Analog Input Calibration (1-3-2-3)

Note

Analog Input Calibration is only available in 4-wire systems (point-to-point operation).

To calibrate the analog input sensor, connect a variable current source to the instrument LOOP+ and LOOP− terminals. The current source should be capable of generating an output of 4 to 20 mA. From the *Configure / Setup* menu select *Calibrate, Sensor Calibration,* and *Analog In Calib* (Analog Input Calibration). Follow the prompts on the Field Communicator display to calibrate the analog input sensor.

1. Set the current source to the target value shown on the display. The target value is the Input Range Low value. Press OK.

2. The following message appears:

Use Increase and Decrease selections until the displayed current matches the current source.

Press OK when you have read this message.

3. The value of the Analog Input appears on the display.

4. From the adjustment menu, select the direction and size of adjustment to the displayed value. Selecting large, medium, and small adjustments causes changes of approximately 0.4 mA, 0.04 mA, and 0.004 mA, respectively. Adjust the displayed value until it matches the current source, select Done and go to step 5.

5. Set the current source to the target value shown on the display. The target value is the Input Range High value. Press OK.

6. The following message appears:

Use Increase and Decrease selections until the displayed current matches the current source.

Press OK when you have read this message.

7. The value of the Analog Input appears on the display.

8. From the adjustment menu, select the direction and size of adjustment to the displayed value. Selecting large, medium, and small adjustments causes changes of approximately 0.4 mA, 0.04 mA, and 0.004 mA, respectively. Adjust the displayed value until it matches the current source, select Done and go to step 9.

9. Place the instrument In Service and verify that the analog input displayed matches the current source.

Relay Adjustment (1-3-3)

Before beginning travel calibration, check the relay adjustment. To check relay adjustment, select *Relay Adjust* from the *Calibrate* menu, then follow the prompts on the Field Communicator display. Replace the digital valve controller cover when finished.

Note

Relay B and C are not user-adjustable.

Double-Acting Relay

The double-acting relay is designated by “Relay A” on a label affixed to the relay itself. For double-acting actuators, the valve must be near mid-travel to properly adjust the relay. The Field Communicator will automatically position the valve when *Relay Adjust* is selected.

Rotate the adjustment disc, shown in figure 5-5, until the output pressure displayed on the Field Communicator 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).

Relay A may also be adjusted for use in single-acting direct applications. Rotate the adjustment disc as shown in figure 5-5 for single-acting direct operation.

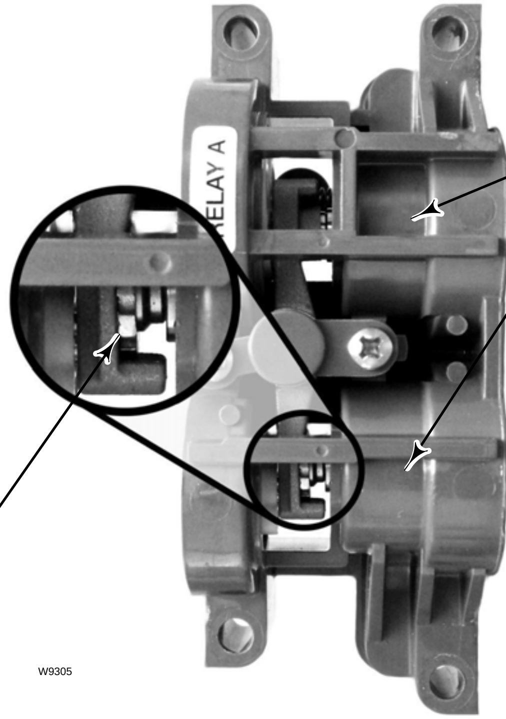


Figure 5-5. Location of Relay Adjustment (Shroud Removed for Clarity)

Single-Acting Relays

WARNING

If the unused port is monitoring pressure, ensure that the pressure source conforms to ISA Standard 7.0.01, and does not exceed the pressure supplied to the instrument.

Failure to do so could result in personal injury or property damage caused by loss of process control.

Single-Acting Direct Relay

The single-acting direct relay is designated by “Relay C” on a label affixed to the relay itself. Relay C requires no adjustment.

Single-Acting Reverse Relay

The single-acting reverse relay is designated by “Relay B” on a label affixed to the relay itself. Relay B is calibrated at the factory and requires no further adjustment.

Restoring Factory Settings (1-3-4)

From the *Online* menu, select *Configure / Setup*, then select *Calibrate,* and *Restore Factory Settings.* Follow the prompts on the Field Communicator display to restore calibration to the factory settings. You should only restore the calibration if it is not possible to calibrate an individual sensor. Restoring calibration returns the calibration of all of the sensors and the tuning set to their factory settings. Following restoration of the factory calibration, the individual sensors should be recalibrated.

PST Calibration (1-3-5)

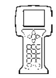
Access PST Calibration by selecting *PST Calibration* from the *Calibrate* menu*.* Follow the prompts on the Field Communicator display to complete the PST calibration.

This procedure permits you to run the Partial Stroke Calibration, which enables the Partial Stroke Test. It establishes values for Partial Stroke Pressure Limit, Pressure Set Point and Pressure Saturation Time for End Point Pressure Control, Travel Deviation Alert Point and Travel Deviation Time. The Partial Stroke Calibration also sets default values for max travel movement, test speed, and test pause time.

Note

You must take the instrument out of service before running Partial Stroke Calibration.

Ensure that the instrument is put back in service after the completing the calibration procedure.

Section 6 Viewing Device Variables and Diagnostics 

Device Diagnostics

Alert Conditions (2-1)

Instrument Alert Conditions, when enabled, detect many operational and performance issues that may be of interest. To view these alerts, from the *Online* menu select *Device Diagnostics,* and *Alert Conditions*. The alert conditions for each group of alerts are listed below. If there are no alerts active for a particular group the group will not be displayed on the Field Communicator.

- **Electronics**— If an electronics alert is active it will appear under ELECT ALERTS.

Drive Current

Drive Current Alert—This alert is indicated when the drive current does not read as expected. If this alert occurs, check the connection between the I/P converter and the printed wiring board assembly. Try removing the I/P converter and re-installing it. If the failure does not clear, replace the I/P converter or the printed wiring board assembly.

Drive Signal

Drive Signal Alert—This alert is indicated when the Drive Signal is greater or less than the expected maximum or minimum.

Processor Impaired

Offline/Failed Alert—This alert is indicated if a failure, enabled from the Self Test Shutdown menu, caused an instrument shutdown. Press Enter to see which of the specific failures caused the Offline/Failed indication.

Power Starvation Alert—This alert is indicated if the instrument does not have enough power to function properly.

Non-Critical NVM Alert—This alert is indicated if the checksum for data, which are not critical for instrument operation, has failed.

Critical NVM Alert—This alert is indicated when the Non-Volatile Memory integrity test fails. Configuration data is stored in NVM. If this failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the PWB Assembly.

Flash ROM Alert—This alert indicates that the Read Only Memory integrity test failed. If this alert is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

No Free Time Alert—This alert is indicated if the instrument is unable to complete all of the configured tasks. This will not occur with a properly functioning instrument.

Reference Voltage Alert—This failure is indicated whenever there is a failure associated with the internal voltage reference. If this alert is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

Internal Sensor Out of Limits—This alert is indicated if there is a possible problem with either the pressure sensor or the printed wiring board assembly submodule.

Variable Out of Range—This alert is indicated if there is a possible problem with one or more of the following: the Analog Input Signal, the I/P converter submodule, the pneumatic relay submodule, or the printed wiring board.

Field device malfunction—The alert is indicated if the pressure, position, or temperature sensors are providing invalid readings.

- **Sensor**— If a sensor alert is active it will appear under *SENSOR ALERTS*.

Travel Sensor

Travel Sensor Alert—This alert is indicated if the sensed travel is outside the range of −25.0 to 125.0% of calibrated travel. If this alert is indicated, check the instrument mounting and the travel sensor adjustment. Also, check that the electrical connection from the travel sensor is properly plugged into the printed wiring board assembly. After restarting the instrument, if the alert does not clear, troubleshoot the printed wiring board assembly or travel sensor.

Pressure Sensors

Pressure Sensor Alert—This alert is indicated if the actuator pressure is outside the range of −24.0 to 125.0% of the calibrated pressure for more than 60 seconds. If this alert is indicated, check the instrument supply pressure. If the failure persists, ensure the printed wiring board assembly is properly mounted onto the Module Base Assembly, and the pressure sensor O-rings are properly installed. If the alert does not clear after restarting the instrument, replace the printed wiring board assembly.

Note

The pressure sensor alert is used for output A, output B, and the supply pressure sensor. Check the pressure values to see which sensor is causing the alert.

Temperature Sensor

Temperature Sensor Alert—This alert is indicated when the instrument temperature sensor fails, or the sensor reading is outside of the range of −40 to 85°C (−40 to 185°F). The temperature reading is used internally for temperature compensation of inputs. If this alert is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

- **Environment**— If an environment alert is active it will appear under ENVIRO ALERTS.

Supply Pressure
Supply Pressure Lo Alert—This alert is indicated when supply pressure is lower than the configured limit.

Aux Terminal Alert
Aux Terminal Alert—This alert is set when the auxiliary input terminals are either open or closed, depending upon the selection for the Aux In Alrt State.

- **Travel**— If a travel alert is active it will appear under TRAVEL ALERTS.

Travel Deviation
Travel Deviation Alert—The difference between Setpoint and Travel is greater than the configured limits.

Travel Limit
Travel Alert Hi Hi—This alert is indicated if the Travel is greater than the configured limit.

Travel Alert Lo Lo—This alert is indicated if the Travel is lower than the configured limit.

Travel Limit Hi/Lo
Travel Alert Hi—This alert is indicated if the Travel is greater than the configured limit.

Travel Alert Lo—This alert is indicated if the Travel is lower than the configured limit.

Travel Limit / Cutoff
Travel Limit/Cutoff Hi—This alert is indicated if the Travel is limited high or the high cutoff is in effect.

Travel Limit/Cutoff Lo—This alert is indicated if the Travel is limited low or the low cutoff is in effect.

- **Travel History**— If a travel history alert is active it will appear under TVL HIST ALERTS.

Cycle Count
Cycle Count Alert—This alert is indicated if the Cycle Counter exceeds the Cycle Count Alert Point.

Travel Accumulator
Travel Accumulator Alert—This alert is indicated if the Travel Accum exceeds the Travel Accumulator Alert Point.

Table 6-1. Alerts Included in Alert Groups for Alert Record

Alert Group	Alerts Include in Group
Valve Alerts	Travel Alert Lo Travel Alert Hi Travel Alert Lo Lo Travel Alert Hi Hi Travel deviation Drive signal
Failure Alerts	No free time Flash ROM fail Drive current fail Ref Voltage fail NVM fail Temperature sensor fail Pressure sensor fail Travel sensor fail
Miscellaneous Alerts	Auxiliary input

- **SIS**— If an SIS alert is active it will appear under SIS ALERTS.

Partial Stroke Test (PST)
Valve Stuck or Pressure/Travel Path Obstructed—This alert is indicated if the valve is stuck or the pressure/travel path is obstructed.

End Point Pressure Deviation
Pressure Deviation Alert—The alert is indicated if the difference between the target pressure and the actual pressure exceeds the Pressure Deviation Alert Point for a period of time greater than the Pressure Deviation Time.

Locked in Safety Alert—This alert is indicated if the unit is locked in the safety position.

SIS Panel Comm Error—This alert is indicated if the SIS panel is not communicating.

- **Alert Record**

Alert Record not Empty—This alert indicates that an alert has been saved to the alert record.

Alrt Record Full—This alert indicates that the alert record is full.

Viewing Instrument Status (2-2)

To view the instrument status, from the *Device Diagnostics* menu select *Status*. This menu item indicates the status of the Operational items listed below. The status of more than one operational item may be indicated.

Instrument Time

Inst Time Invalid

Calibration and Diagnostics

Cal in Progress

Autocal in Progress

Diag in Progress

Diag Data Avail

Operational

Press Ctrl Active

Multi-Drop

Integrator

Integrator Sat Hi

Integrator Sat Lo

Device Record (2-3)

From the *Online* menu, select *Device Diagnostics* and *Device Record*. Follow the prompts on the Field Communicator display to view the following Device Record parameters: *Temp Max* (Maximum Temperature), *Temp Min* (Minimum Temperature), *Run Time,* and *Num of Power Ups* (Number of Power Ups).

- *Temp Max*—Maximum Recorded Temperature shows the maximum temperature the instrument has experienced since installation.

- *Temp Min*—Minimum Recorded Temperature shows the minimum temperature the instrument has experienced since installation.

- *Run Time*—Indicates in hours or days the total elapsed time the instrument has been powered up.

- *Num of Power Ups*—Number of Power Ups indicates how many times the instrument has cycled power.

Stroking the Digital Valve Controller Output (2-4)

From the *Online* menu, select *Device Diagnostics* and *Stroke Valve*. Follow the prompts on the Field Communicator display to select from the following: *Done, Ramp Open, Ramp Closed, Ramp to Target, Step to Target,* and *Stop*.

- *Done*—Select this if you are done. All ramping is stopped when DONE is selected.

- *Ramp Open*—ramps the travel toward open at the rate of 1.0% per second of the ranged travel.

- *Ramp Closed*—ramps the travel toward closed at the rate of 1.0% per second of the ranged travel.

- *Ramp to Target*—ramps the travel to the specified target at the rate of 1.0% per second of the ranged travel.

- *Step to Target*—steps the travel to the specified target.

Partial Stroke Test (2-5)

WARNING

During the partial stroke test the valve will move. To avoid personal injury and property damage caused by the release of pressure or process fluid, when used in an application where the valve is normally closed, provide some temporary means of control for the process.

The Partial Stroke Test allows the DVC6000 SIS Series digital valve controllers to perform a Valve Signature type of test while the instrument is in service and operational. In SIS applications, it is important to be able to exercise and test the valve to verify that it will operate when commanded. This feature allows the user to partially stroke the valve while continually monitoring the input signal. If a demand arises, the test is aborted and the valve moves to its commanded position. The partial stroke valve travel is configurable between 1 and 30% maximum travel, in 0.1% increments. Data from the last partial stroke test is stored in the instrument memory for retrieval by AMS ValveLink Software.

The Partial Stroke Test allows you to perform a partial, 10%, stroke test (standard) or a custom stroke test. With the custom stroke test, the stroke may be extended up to 30%. Be sure to check plant guidelines before performing a custom stroke test. The purpose of this test is to ensure that the valve assembly moves upon demand.

A partial stroke test can be initiated when the valve is operating at either 4 mA or 20 mA (point-to-point mode). In applications where a spurious trip is to be minimized, 4 mA is the normal operating position.

When enabled, a partial stroke test may be initiated by the device (as a scheduled, auto partial stroke test), a remote push button located in the field or at the valve, the optional LCP100 local control panel, the 375 Field Communicator, or ValveLink Software.

Device (Digital Valve Controller)

The Auto Partial Stroke Test allows the partial stroke test to be scheduled by the DVC6000 SIS. The test is scheduled in number of hours between tests. Any power cycle will reset the test interval timer.

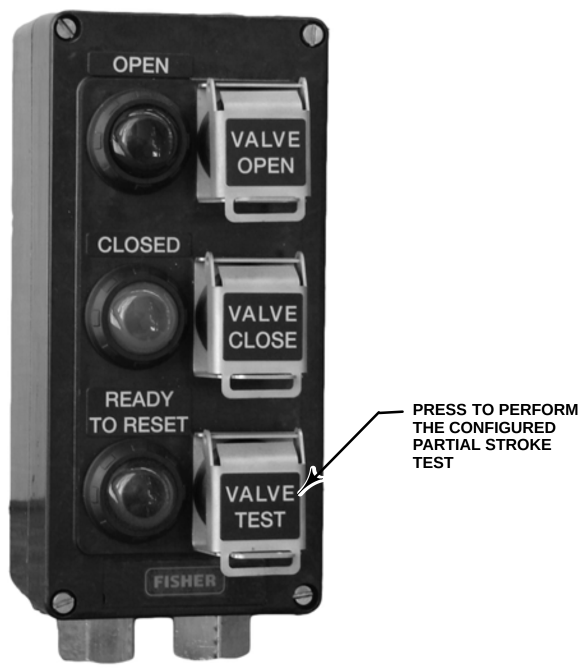


Figure 6-1. Local Control Panel

Auxiliary Terminal

The auxiliary terminal can be used for different applications. The default configuration is for a partial stroke test initiated by shorting the contacts wired to the auxiliary +/– terminals of the DVC6000 SIS. Refer to Auxiliary Terminal Wiring Length Guidelines below.

- **Local Push Button**

A partial stroke test command may be sent to the DVC6000 SIS Series digital valve controller using a set of contacts wired to the auxiliary +/– terminals. To perform a test, the contacts must be closed for 3 to 5 seconds and then opened. To abort the test, close the contacts for 1 second. The last set of diagnostic data is stored in the instrument memory for later retrieval via ValveLink Software.

- **Local Control Panel**

The LCP100 local control panel is wired directly to the DVC6000 SIS digital valve controller.

The black “Valve Test” push button (see figure 6-1) allows the valve to perform the configured partial stroke test.

- Press and hold for 3 to 10 seconds

The test can be overridden by the “Valve Close” button, “Valve Open” button, or if an emergency demand occurs.

- **Local DI**

When configured by the user interface, the Auxiliary Terminal can be used as a discrete input from a pressure switch, temperature switch, etc., to provide an alert.

Auxiliary Terminal Wiring Length Guidelines

The Auxiliary Input Terminals of a DVC6000 SIS can be used with a locally-mounted switch for initiating a partial stroke test. Some applications require that the partial stroke test be initiated from a remote location.

The length for wiring connected to the Auxiliary Input Terminals is limited by capacitance. For proper operation of the Auxiliary Input Terminals capacitance should not exceed 18000 pF. As with all control signal wiring, good wiring practices should be observed to minimize adverse effect of electrical noise on the Aux Switch function.

Example Calculation: Capacitance per foot or per meter is required to calculate the length of wire that may be connected to the Aux switch input. The wire should not exceed the capacitance limit of 18000 pF. Typically the wire manufacturer supplies a data sheet which provides all of the electrical properties of the wire. The pertinent parameter is the highest possible capacitance. If shielded wire is used, the appropriate number is the “Conductor to Other Conductor & Shield” value.

Example — 18AWG Unshielded Audio, Control and Instrumentation Cable

Manufacturer’s specifications include:

Nom. Capacitance Conductor to Conductor @ 1 KHz: 26 pF/ft

Nom. Conductor DC Resistance @ 20 Deg. C: 5.96 Ohms/1000 ft

Max. Operating Voltage – UL 200 V RMS (PLTC, CMG),150 V RMS (ITC)

Allowable Length with this cable = 18000pF /(26pF/ft) = 692 ft

Example — 18AWG Shielded Audio, Control and Instrumentation Cable

Manufacturer’s specifications include:

Nom. Characteristic Impedance: 29 Ohms

Nom. Inductance: .15 µH/ft

Nom. Capacitance Conductor to Conductor @ 1 KHz: 51 pF/ft

Nom. Cap. Cond. to other Cond. & Shield @ 1 KHz 97 pF/ft

Allowable Length with this cable = 18000pF /(97pF/ft) = 185 ft

The AUX switch input passes less than 1 mA through the switch contacts, and uses less than 5V, therefore, neither the resistance nor the voltage rating of the cable are critical. Ensure that switch contact corrosion is prevented. It is generally advisable that the switch have gold-plated or sealed contacts.

375 Field Communicator

1. Connect the 375 Field Communicator to the LOOP terminals on the digital valve controller.

2. Turn on the Field Communicator.

3. From the *Online* menu, select *Device Diagnostics* and *Partial Stroke Test*.

4. Select either *Standard (10%)* or *Custom*. With the Custom Stroke Test, the stroke may be entered up to 30% with configurable stroking speed and pause time.

5. The currently configured Stroke, Stroking Speed, and Pause Time is displayed. Choose “Yes” to run the test using these values. Choose “No” to modify the values. The default value for Stroke Speed is 0.25%/second.

6. The valve begins to move and the actual travel reported by the digital valve controller is displayed on the Field Communicator.

7. Observe the valve as it runs the Partial Stroke Test to verify that it moves to the desired setpoint and then returns to the original position.

For information on configuring the Partial Stroke Test, see Partial Stroke Variables in the Detailed Setup section.

Additional SIS Diagnostics

Manual Reset

The DVC6000 SIS Series digital valve controller can be configured to hold the trip state until a local reset button is pressed. It is configurable by the 375 Field Communicator or ValveLink Software. Manual Reset can be initiated by shorting the AUX terminals with a user-supplied push button for at least 3 seconds, but less than 5 seconds or by pressing the button next to the green light on the optional LCP100 local control panel when the current is at it’s normal state. The digital valve controller will drive the valve to its normal operating position.

Demand Mode Tests

The following steps assume the use of single acting spring and diaphragm actuators or double-acting spring assist piston actuators.

Perform the following steps to confirm valve operation:

a. Point-to-Point Mode (DVC6000 SIS powered with 4−20 mA current source)

If the DVC6000 SIS is in series with a solenoid valve,

1. Disconnect the power from the solenoid valve, but maintain the 20 mA current to the digital valve controller. The valve should move to its “fail safe” position.

2. Maintain power to the solenoid valve and adjust the current to the digital valve controller from 20 mA to 4mA. The valve should move to its “fail safe” position.

3. Remove power from the solenoid valve and adjust the current to the digital valve controller from 20mA to 4mA. The valve should go to its “fail safe” position.

If a solenoid is not used with a DVC6000 SIS,

1. Adjust the current to the digital valve controller from 20 mA to 4 mA. The valve should move to its “fail safe” position.

Note

The above tests are applicable for single-acting direct relay A and C. If single-acting reverse relay B is used adjust the current from 4 mA (normal state) to 20 mA (trip state).

b. Multi-drop Mode (DVC6000 SIS is powered by a 24 VDC power source)

If the DVC6000 SIS is pneumatically in series with a solenoid valve, and shares a single power source,

Disconnect power to both devices. The valve should go to its “fail safe” position.

If the DVC6000 SIS is pneumatically in series with a solenoid valve, with independent power sources,

Connect a 24 VDC power supply to the solenoid valve and a second 24 VDC power supply to the DVC6000 SIS. Disconnect the solenoid valve power supply, but maintain the power supply to the DVC6000 SIS. The valve should go to its “fail safe” position quickly. Then, maintain the power supply to the solenoid valve and disconnect the DVC6000 SIS power supply. The valve should go to its “fail safe” position, although not as quickly as it does in the previous scenario.

If DVC6000 SIS is alone, without a solenoid valve,

Disconnect power to the digital valve controller. The valve should go to its “fail safe” position.

Note

The above tests are not applicable for single-acting reverse relay B when no solenoid valve is present.

If the LCP100 is used, conduct the following tests:

Successful Partial Stroke Test

1. Press the “Valve Test” (black) push button for more than 3 seconds (but less than 10 seconds).

2. Observe that the green light starts flashing when the valve starts moving.

3. Observe that the valve moves no more than the configured PST travel limit.

4. Observe that the valve returns to the normal operating position and the green light comes on solid.

Manually Aborted Partial Stroke Test

1. Press the “Valve Test” (black) push button for more than 3 seconds (but less than 10 seconds).

2. Observe that the green light starts flashing when the valve starts moving.

3. Before the valve reaches the travel limit of the configured partial stroke test, press the “Valve Test” push button, or the push button next to the green light.

4. Observe that the valve immediately returns to the normal operating position and the green light comes on solid.

Emergency Demand through the Logic Solver

1. Reduce the current to the DVC6000 to 4 mA for de-energize to trip operation.

Note

You may remove the power completely; however, the lights in step 3 will be off. Without power to the DVC6000 SIS, the LCP100 cannot function.

2. Observe that the valve moves to its fail safe state.

3. Observe that the red light comes on solid and the amber light stays off (valve is not ready to open).

4. Press the push button next to the green light and observe that the valve does not move.

5. Increase the current to the DVC6000 to 20 mA and observe that the valve remains in its fail safe state.

6. Observe that the red light stays on solid and the amber light comes on solid (ready to reset).

7. Press the push button next to the green light.

8. Observe that the green light starts flashing, then becomes solid and the red light is off.

Emergency Demand through Local Control Panel

1. Press the push button next to the red light.

2. Observe that the valve moves to it fail safe position.

3. Observe that the red light starts flashing, then becomes solid and the amber light comes on solid (ready to reset).

4. Press the push button next to the green light.

5. Observe that the red light goes off, the valve moves to its normal operating position, and the green light comes on solid.

Solenoid Valve Health Monitoring

The following steps assume the use of a single-acting actuator with a solenoid valve installed. The DVC6000 SIS digital valve controller, with single-acting, direct relay C, must be powered separately from the solenoid. The unused output of the DVC6000 SIS must be connected between the solenoid and the actuator as described in the Installation section. The relay configuration selection must be “special application” and ValveLink Software must have the triggered profile enabled.

1. When allowed by the Logic Solver, momentarily remove and then restore power to the solenoid

(typically 100 to 200 milliseconds). This process should occur quickly enough that the valve assembly does not move when the solenoid is de-energized.

2. With ValveLink Software, upload the diagnostic data from the triggered profile menu.

3. Examine the graph and observe that there was a change in the pressure reading downstream of the solenoid.

Device Variables

The following menus are available to define and/or view information about the instrument. From the Online menu select *Device Variables*.

Analog In (3-1)

Analog Input shows the value of the instrument analog input in mA (milliamperes) or % (percent) of ranged input.

Tvl Set Pt (3-2)

Travel Set Point shows the requested valve position in % of ranged travel.

Travel (3-3)

Travel shows the value of the DVC6000 SIS Series digital valve controller travel in % (percent) of ranged travel. Travel always represents how far the valve is open.

Drive Signal (3-4)

Drive Signal shows the value of the instrument drive signal in % (percent) of maximum drive.

Pressures (3-5)

Shows the value of the instrument supply and output pressures in psi, bar, kPa, or kg/cm^2. Also shows the output pressure differential. To display pressures may require selecting the variable; a detail display of that variable with its values will appear.

- *Pressure A*— Pressure A shows the value of Output Pressure A in psi, bar, kPa, or kg/cm^2.

- *Pressure B*— Pressure B shows the value of Output Pressure A in psi, bar, kPa, or kg/cm^2.

- *Pressure Diff*—Pressure Differential shows the value of the output pressure differential in psi, bar, kPa, or kg/cm^2.

- *Supply Pressure*—Supply Pressure displays the instrument supply pressure in psi ,bar, kPa, or kg/cm^2.

Variables (3-6)

The *Variables* menu is available to view additional variables, including; *Aux Input* (Auxiliary Input), *Temperature, Temp Max* (Maximum Temperature), *Temp Min* (Minimum Temperature), *Cycle Count, Tvl Accum* (Travel Accumulator), *Raw Tvl Input* (Raw Travel Input), *Run Time,* and *Num of Power Ups* (Number of Power Ups).

To view one of these variables, from the *Online* menu select *Device Variables* and *Variables.* If a value for a variable does not appear on the display, select the variable and a detailed display of that variable with its value will appear. A variable's value does not appear on the menu if the value becomes too large to fit in the allocated space on the display, or if the variable requires special processing, such as Aux Input.

- *Aux Input*—The Auxiliary Input is a discrete input that can be used with an independent limit or pressure switch. Its value is either open or closed.

- *Temperature*—The internal temperature of the instrument is displayed in either degrees Fahrenheit or Celsius.

- *Temp Max*—Maximum Recorded Temperature shows the maximum temperature the instrument has experienced since installation.

- *Temp Min*—Minimum Recorded Temperature shows the minimum temperature the instrument has experienced since installation.

- *Cycle Count*—Cycle Counter displays the number of times the valve travel has cycled. Only changes in direction of the travel after the travel has exceeded the deadband are counted as a cycle. Once a new cycle has occurred, a new deadband around the last travel is set. The value of the Cycle Counter can be reset from the *Cycle Count Alert* menu. See page 4-18 of the Detailed Setup section for additional information.

- *Tvl Accum*—Travel Accumulator contains the total change in travel, in percent of ranged travel. The accumulator only increments when travel exceeds the deadband. Then the greatest amount of change in one direction from the original reference point (after the deadband has been exceeded) will be added to the Travel Accumulator. The value of the Travel Accumulator can be reset from the *Travel Accum* menu. See page 4-18 of the Detailed Setup section for additional information.

Note

Do not use the following raw travel input indication for calibrating the travel sensor. The following should only be used for a relative indication to be sure the travel sensor is working and that it is moving in the correct direction. Perform the Travel Sensor Adjust procedure in the Calibration section to calibrate the travel sensor.

- *Raw Tvl Input*—Raw travel input indicates the travel sensor position in analog-to-digital converter counts. When the travel sensor is operating correctly, this number changes as the valve strokes.

- *Run Time*—Indicates in hours or days the total elapsed time the instrument has been powered up.

- *Num of Power Ups*—Number of Power Ups Indicates how many times the instrument has cycled power.

Device Information (3-7)

The *Device Information* menu is available to view information about the instrument. From the *Online* menu, select *Device Variables* and *Device Information.* Follow the prompts on the Field Communicator display to view information in the following fields: *HART Tag, Device ID*, *Manufacturer*, *Model, Device Rev* (Device Revision)*, Firmware Rev* (Firmware Revision)*, Hardware Rev* (Hardware Revision)*, Inst Level* (Instrument Level), and *HART Univ Rev* (HART Universal Revision).

- *Hart Tag*—A HART tag is a unique name (up to eight characters) that identifies the physical instrument.

- *Device ID*—Each instrument has a unique Device Identifier. The device ID provides additional security to prevent this instrument from accepting commands meant for other instruments.

Table 6-2. Functions Available for Instrument Level

Functions Available
Communicates with 375 Field Communicator and ValveLink Software. Provides: travel cutoffs and limits, minimum opening and closing times, input characterization (linear, equal percentage, quick opening, and custom), trending with ValveLink Solo, and the following alerts: travel deviation; travel alert high, low, high high, and low low; drive signal; auxiliary terminal; cycle counter; and travel accumulation. With ValveLink Software, all offline diagnostic tests (dynamic error band, drive signal, step response, and valve signature) plus online trending and partial stroke test

- *Manufacturer*—Identifies the manufacturer of the instrument.

- *Model*—Identifies the instrument model.

- *Device Rev*—Device Revision is the revision number of the software for communication between the Field Communicator and the instrument.

- *Firmware Rev*—Firmware Revision is the revision number of the firmware in the instrument.

- *Hardware Rev*—Hardware Revision is the revision number of the electrical circuitry within the instrument printed wiring board.

- *Inst Level*—Indicates the instrument level – SIS

Table 6-2 lists the functions available instrument level SIS.

- *HART Univ Rev*—HART Universal Revision is the revision number of the HART Universal Commands which are used as the communications protocol for the instrument.

- **DD Information (3-8)**

DD Information contains the device description in the Field Communicator. To access DD Information from the Online menu, select *Device Variables* and *DD Information*.

Section 7 Maintenance and Troubleshooting

The DVC6000 SIS digital valve controller enclosure is rated NEMA 4X and IP66, therefore periodic cleaning of internal components is not required. If the DVC6000 SIS is installed in an area where the exterior surfaces tend to get heavily coated or layered with industrial or atmospheric contaminants, however, it is recommended that the vent (key 52) be periodically inspected to ensure it is fully open. If the vent appears to be clogged, the vent can be removed, cleaned and replaced. Lightly brush the exterior of the vent to remove contaminant and run a mild water/detergent solution through the vent to ensure it is fully open.

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.

WARNING

To avoid static discharge from the plastic cover, do not rub or clean the cover with solvents. To do so could result in an explosion. Clean with a mild detergent and water only.

WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance procedures on the DVC6000 SIS Series digital valve controller:

- **Always wear protective clothing, gloves, and eyewear to prevent personal injury.**
- **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.**
- **Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression.**
- **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.**

CAUTION

When replacing components, use only components specified by the factory. Always use proper component replacement techniques, as presented in this manual. Improper techniques or component selection may invalidate the approvals and the product specifications, as indicated in table 1-2. It may also impair operations and the intended function of the device.

Note

If the feedback arm (key 79) or feedback arm assembly (key 84) is removed from the digital valve controller, the travel sensor (key 77) must be recalibrated.

Note

In the event of a power failure the DVC6000 SIS automatically restores the device to In Service upon restoration of power. This is to provide greater availability of the safety function.

If power is inadvertently interrupted while performing set up or maintenance, you may need to return the DVC6000 SIS to out of service if the interrupted task requires that mode of operation.

Table 7-1. Tools Required

Tool	Size	Component
Phillips Screwdriver		Relay, printed wiring board assembly, and cover screws
Hex key	5 mm	Terminal box screw
Hex key	1.5 mm	Terminal box cover screw
Hex key	2.5 mm	I/P converter screws
Hex key	5 mm	Travel sensor screws
Hex key	6 mm	Module base screws
Open-end wrench	1/2-inch	Connector Arm screw (DVC6010)
Hex key	9/64-inch	Feedback arm screw
Open-end wrench	7/16-inch	DVC6010 mounting bolts
Hex key	3/16-inch	DVC6020 mounting bolts

Because of the diagnostic capability of the DVC6000 SIS Series digital valve controllers, predictive maintenance is available through the use of Fisher AMS ValveLink Software. Using the digital valve controller, valve and instrument maintenance can be enhanced, thus avoiding unnecessary maintenance. For information on using the ValveLink Software, refer to the AMS ValveLink Software online help.

Tools Required

Table 7-1 lists the tools required for maintaining the DVC6000 SIS Series digital valve controller.

Module Base Maintenance

For DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, and DVC6005 SIS

CAUTION

To avoid affecting performance of the instrument, take care not to damage the module base seal or guide surface. Do not bump or damage the bare connector pins on the PWB assembly. Damaging either the module base or guide surface may result in material damage, which could compromise the instruments ability to maintain a pressure seal.

The digital valve controller contains a module base consisting of the I/P converter, printed wiring board assembly, and pneumatic relay. The module base may be easily replaced in the field without disconnecting field wiring or tubing.

Removing the Module Base

To remove the module base perform the following steps. Refer to figures 8-1, 8-2, 8-3, and 8-4 for key number locations.

WARNING

To avoid personal injury or equipment damage from bursting of parts, turn off the supply pressure to the digital valve controller and bleed off any excess supply pressure before attempting to remove the module base assembly from the housing.

1. For sliding-stem applications only, a protective shield for the feedback linkage is attached to the side of the module base assembly (see figures 2-1 and 2-2). Remove this shield and keep for reuse on the replacement module. The replacement module will not have this protective shield.

2. Unscrew the four captive screws in the cover (key 43) and remove the cover from the module base (key 2).

3. Using a 6 mm hex socket wrench, loosen the three-socket head screws (key 38). These screws

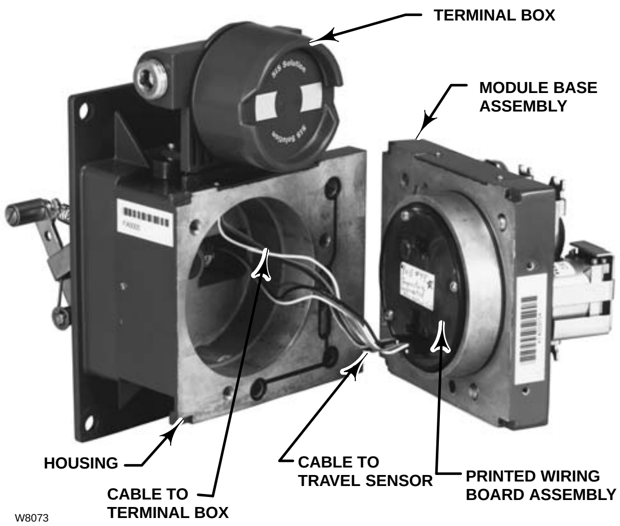


Figure 7-1. Printed Wiring Board Cable Connections

are captive in the module base by retaining rings (key 154).

Note

The module base is linked to the housing by two cable assemblies. Disconnect these cable assemblies after you pull the module base out of the housing.

4. Pull the module base straight out of the housing (key 1). Once clear of the housing, swing the module base to the side of the housing to gain access to the cable assemblies.

5. The digital valve controller has two cable assemblies, shown in figure 7-1, which connect the module base, via the printed wiring board assembly, to the travel sensor and the terminal box. Disconnect these cable assemblies from the printed wiring board assembly on the back of the module base.

Replacing the Module Base

To replace the module base perform the following steps. Refer to figures 8-1, 8-2, 8-3, and 8-4 for key number locations.

Note

Inspect the guide surface on the module and the corresponding seating area in the housing before installing the module base assembly. To avoid affecting performance of the instrument these surfaces must be free of dust, dirt, scratches, and contamination.

Ensure the module base seal is in good condition. Do not reuse a damaged or worn seal.

1. Ensure the module base seal (key 237) is properly installed in the housing (key 1). Ensure the O-ring (key 12) is in place on the module base assembly.

2. Connect the terminal box connector to the PWB assembly (key 50). Orientation of the connector is required.

3. Connect the travel sensor connector to the PWB assembly (key 50). Orientation of the connector is required.

4. Insert the module base (key 2) into the housing (key 1).

5. Install three socket head screws (key 38) in the module base into the housing. If not already installed, press three retaining rings (key 154) into the module base. Evenly tighten the screws in a crisscross pattern to a final torque of 16 N•m (138 lbf•in).

6. Attach the cover (key 43) to the module base assembly.

7. For sliding-stem applications only, install the protective shield onto the side of the replacement module base assembly (see figures 2-1 and 2-2).

Submodule Maintenance

For DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, and DVC6005 SIS

CAUTION

Exercise care when performing maintenance on the module base. Reinstall the cover to protect the I/P converter and gauges when servicing other submodules.

In order to maintain accuracy specifications, do not strike or drop the I/P converter during submodule maintenance.

The digital valve controller's module base contains the following submodules: I/P converter, PWB assembly, and pneumatic relay. If problems occur, these submodules may be removed from the module base and replaced with new submodules. After replacing a submodule, the module base may be put back into service.

I/P Converter

Refer to figures 8-1 through 8-4 for key number locations. The I/P converter (key 41) is located on the front of the module base.

Note

After I/P converter submodule replacement, calibrate the digital valve controller to maintain accuracy specifications.

Replacing the I/P Filter

A screen in the supply port beneath the I/P converter serves as a secondary filter for the supply medium. To replace this filter, perform the following procedure:

1. Remove the I/P converter (key 41) and shroud (key 169) as described in the Removing the I/P Converter procedure.

2. Remove the screen (key 231) from the supply port.

3. Install a new screen in the supply port as shown in figure 7-2.

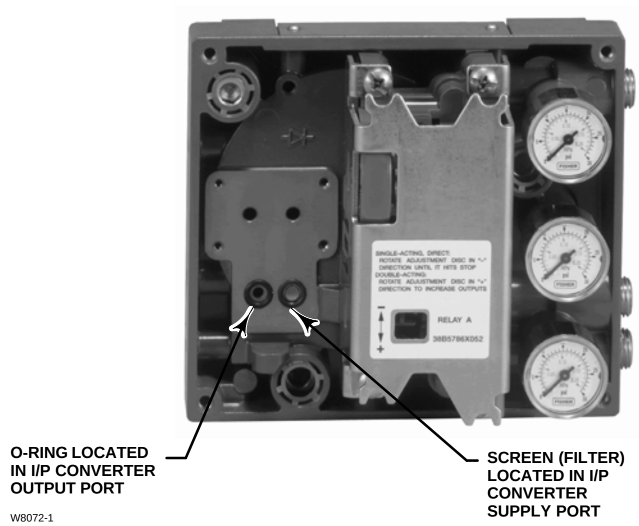


Figure 7-2. I/P Filter Location

4. Inspect the O-ring (key 39) in the I/P output port. if necessary, replace it.

5. Reinstall the I/P converter (key 41) and shroud (key 169) as described in the Replacing the I/P Converter procedure.

Removing the I/P Converter

1. Remove the front cover (key 43), if not already removed.

2. Refer to figure 7-3. Using a 2.5 mm hex socket wrench, remove the four socket-head screws (key 23) that attach the shroud (key 169) and I/P converter (key 41) to the module base (key 2).

3. Remove the shroud (key 169); then pull the I/P converter (key 41) straight out of the module base (key 2). Be careful not to damage the two electrical leads that come out of the base of the I/P converter.

4. Ensure that the O-ring (key 39) and screen (key 231) stay in the module base and do not come out with the I/P converter (key 41).

Replacing the I/P Converter

1. Refer to figure 7-2. Inspect the condition of the O-ring (key 39) and screen (key 231) in the module base (key 2). Replace them, if necessary. Apply silicone lubricant to the O-rings.

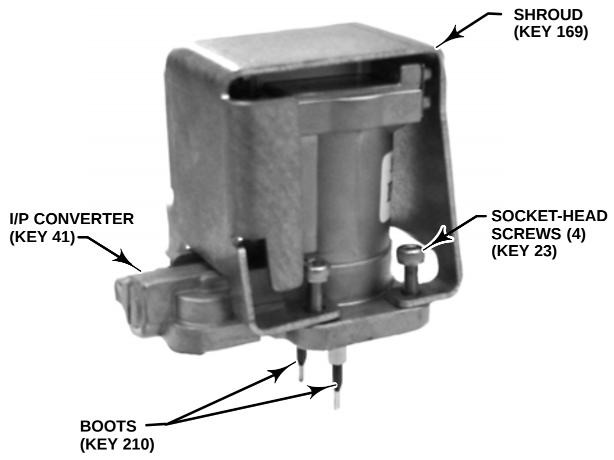


Figure 7-3. I/P Converter

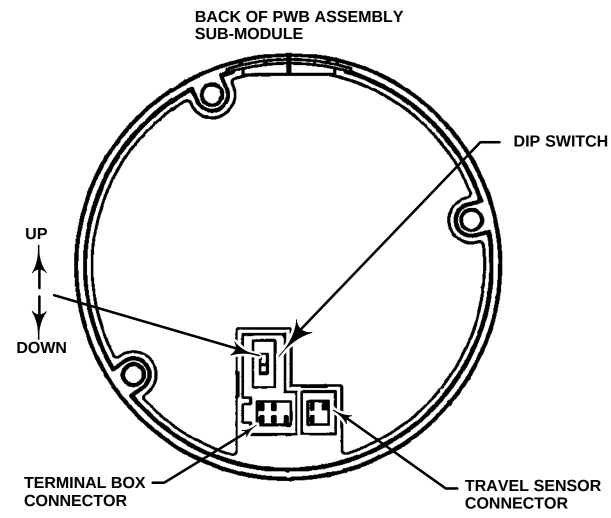


Figure 7-4. DIP Switch Location

Table 7-2. DIP Switch Configuration(1)

Operational Mode	Switch Position
Multi-drop Loop	UP ↑
Point-to-Point Loop	DOWN ↓

1. Refer to figure 7-4 for switch location.

7

Note

If the PWB assembly submodule is replaced, calibrate and configure the digital valve controller to maintain accuracy specifications.

2. Ensure the two boots (key 210) shown in figure 7-3 are properly installed on the electrical leads.

3. Install the I/P converter (key 41) straight into the module base (key 2), taking care that the two electrical leads feed into the guides in the module base. These guides route the leads to the printed wiring board assembly submodule.

4. Install the shroud (key 169) over the I/P converter (key 41).

5. Install the four socket-head screws (key 23) and evenly tighten them in a crisscross pattern to a final torque of 1.6 N•m (14 lbf•in).

6. After replacing the I/P converter, calibrate travel or perform touch-up calibration to maintain accuracy specifications.

PWB (Printed Wiring Board) Assembly

Refer to figures 8-1 through 8-4 for key number locations. The PWB assembly (key 50) is located on the back of the module base assembly (key 2).

Removing the Printed Wiring Board Assembly

1. Separate the module base from the housing by performing the Removing the Module Base procedure.

2. Remove three screws (key 33).

3. Lift the PWB assembly (key 50) straight out of the module base (key 2).

4. Ensure that the O-rings (key 40) remain in the pressure sensor bosses on the module base assembly (key 2) after the PWB assembly (key 50) has been removed.

Replacing the PWB Assembly and Setting the DIP Switch

1. Apply silicone lubricant to the pressure sensor O-rings (key 40) and install them on the pressure sensor bosses in the module base assembly.

2. Properly orient the PWB assembly (key 50) as you install it into the module base. The two electrical leads from the I/P converter (key 41) must guide into their receptacles in the PWB assembly and the pressure

sensor bosses on the module base must fit into their receptacles in the PWB assembly.

3. Push the PWB assembly (key 50) into its cavity in the module base.

4. Install and tighten three screws (key 33) to a torque of 1 N•m (10.1 lbf•in).

5. Set the DIP switch on the PWB assembly according to table 7-2.

Note

For the digital valve controller to operate with a 4-20 mA control signal, the DIP switch must be in the point-to-point loop position, as shown in table 7-2.

For the digital valve controller to operate with a 24 VDC voltage control signal, the DIP switch must be in the multi-drop loop position, as shown in table 7-2.

6. Reassemble the module base to the housing by performing the Replacing the Module Base procedure.

7. Setup and calibrate the digital valve controller.

Pneumatic Relay

Refer to figures 8-1 through 8-4 for key number locations. The pneumatic relay (key 24) is located on the front of the module base.

Note

After relay submodule replacement, calibrate the digital valve controller to maintain accuracy specifications.

Removing the Pneumatic Relay

1. Loosen the four screws that attach the relay (key 24) to the module base. These screws are captive in the relay.

2. Remove the relay.

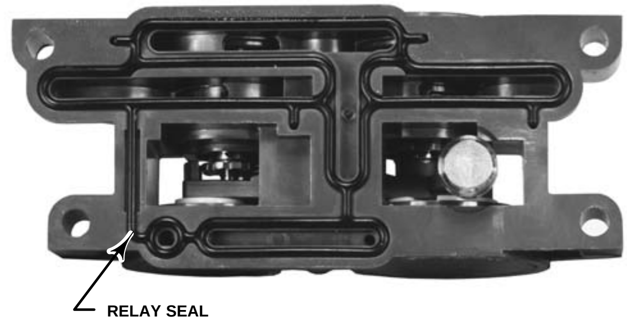


Figure 7-5. Pneumatic Relay Assembly

Replacing the Pneumatic Relay

1. Visually inspect the holes in the module base to ensure they are clean and free of obstructions. If cleaning is necessary, do not enlarge the holes.

2. Apply silicone lubricant to the relay seal and position it in the grooves on the bottom of the relay as shown in figure 7-5. Press small seal retaining tabs into retaining slots to hold relay seal in place.

3. Position the relay (with shroud) on the module base. Tighten the four screws, in a crisscross pattern, to a final torque of 2 N•m (20.7 lbf•in).

4. Using the Field Communicator, verify that the value for Relay Type parameter matches the relay type installed.

5. After replacing the relay and verifying the relay type, calibrate travel to maintain accuracy specifications

Gauges, Pipe Plugs, or Tire Valves

Depending on the options ordered, the DVC6000 Series digital valve controller will be equipped with either gauges (key 47), pipe plugs (key 66), or tire valves (key 67). Single-acting direct instruments will also have a screen (key 236, figure 8-5). These are located on the top of the module base next to the relay.

Perform the following procedure to replace the gauges, tire valves, or pipe plugs. Refer to figures 8-1 through 8-5 for key number locations.

1. Remove the front cover (key 43).

2. Remove the gauge, pipe plug, or tire valve as follows:

For gauges (key 47), the flats are on the gauge case. Use a wrench on the flats of the gauge to remove the gauge from the module base. For double-acting instruments, to remove the supply gauge remove one of the output gauges.

For pipe plugs (key 66) and tire valves (key 67), use a wrench to remove these from the module base.

3. Apply anti-seize (key 64) to the threads of the replacement gauges, pipe plugs, or tire valves.

4. Using a wrench, screw the gauges, pipe plugs, or tire valves into the module base.

Terminal Box

For DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, and DVC6005 SIS

Refer to figures 8-1 through 8-4 for key number locations.

The terminal box is located on the housing and contains the terminal strip assembly for field wiring connections.

Note

This procedure also applies to the DVC6005 SIS remote terminal box.

Removing the Terminal Box

WARNING

To avoid personal injury or property damage caused by fire or explosion, remove power to the instrument before removing the terminal box cover in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

1. Loosen the set screw (key 58) in the cap (key 4) so that the cap can be unscrewed from the terminal box.

2. After removing the cap (key 4), note the location of field wiring connections and disconnect the field wiring from the terminal box.

3. Separate the module base from the housing by performing the Removing the Module Base procedure.

4. Remove the screw (key 72). Pull the terminal box assembly straight out of the housing.

5. Remove two wire retainers (key 44), internal and external to the terminal box.

Replacing the Terminal Box

Note

Inspect all O-rings for wear and replace as necessary.

1. Install two wire retainers (key 44), internal and external to the terminal box.

2. Apply silicone lubricant to the O-ring (key 35) and install the O-ring over the stem of the terminal box.

3. Insert the terminal box assembly stem into the housing until it bottoms out. Position the terminal box assembly so that the hole for the screw (key 72) in the terminal box aligns with the threaded hole in the housing. Install the screw (key 72).

4. Connect the terminal box connector to the PWB assembly (key 50). Orientation of the connector is required.

5. Reassemble the module base to the housing by performing the Replacing the Module Base procedure.

6. Reconnect the field wiring as noted in step 2 in the Removing the Terminal Box procedure.

7. Apply silicone lubricant to the O-ring (key 36) and install the O-ring over the 2-5/8 inch threads of the terminal box. Use of a tool is recommended to prevent cutting the O-ring while installing it over the threads.

8. Apply lubricant (key 63) to the 2-5/8 inch threads on the terminal box to prevent seizing or galling when the cap is installed.

9. Screw the cap (key 4) onto the terminal box.

10. Install a set screw (key 58) into the cap (key 4). Loosen the cap (not more than 1 turn) to align the set screw over one of the recesses in the terminal box. Tighten the set screw (key 58).

11. Apply anti-seize (key 64) to the conduit entrance plug (key 62) and install it into the unused conduit entry of the terminal box.

Travel Sensor

For DVC6010 SIS, DVC6015, DVC6020 SIS DVC6025, DVC6030 SIS, and DVC6035

Replacing the travel sensor requires removing the digital valve controller from the actuator.

WARNING

To avoid personal injury or property damage caused by fire or explosion, remove power to the instrument before removing the potentiometer in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

Disassembly

Note

If the feedback arm (key 79) or feedback arm assembly (key 84) is removed from the digital valve controller, the travel sensor (key 77) must be recalibrated.

DVC6010 SIS Digital Valve Controller and DVC6015 Remote Feedback Unit

Refer to figure 8-1 for DVC6010 SIS and 8-6 for DVC6015 key number locations.

1. Remove piping and fittings from the instrument.

2. Disconnect the adjustment arm from the connector arm and the feedback arm (see figures 2-1 and 2-2).

3. Remove the instrument from the actuator.

4. Loosen the screw (key 80) that secures the feedback arm (key 79) to the travel sensor shaft.

5. Remove the feedback arm (key 79) from the travel sensor shaft.

If disassembling a DVC6010 SIS digital valve controller, use step 6a. If disassembling a DVC6015 remote feedback unit, use step 6b.

6. a. Separate the module base from the housing by performing the Removing the Module Base procedure.

b. Disconnect the three potentiometer assembly wires from the terminal.

7. Remove the screw (key 72) that fastens the travel sensor assembly to the housing.

8. Pull the travel sensor assembly (key 223) straight out of the housing.

DVC6020 SIS Digital Valve Controller and DVC6025 Remote Feedback Unit

Refer to figure 8-2 for DVC6020 SIS and 8-7 for DVC6025 key number locations.

1. Remove piping and fittings from the instrument.

2. Remove the digital valve controller from the actuator.

3. Disconnect the bias spring (key 82) from the feedback arm assembly (key 84) and the arm assembly (key 91). Remove the mounting bracket (key 74) from the back of the digital controller.

4. Loosen the screw (key 80) that secures the arm assembly to the travel sensor shaft.

5. Remove the arm assembly (key 91) from the travel sensor assembly (key 77) shaft.

If disassembling a DVC6020 SIS digital valve controller, use step 6a. If disassembling a DVC6025 remote feedback unit, use step 6b.

6. a. Separate the module base from the housing by performing the Removing the Module Base procedure.

b. Disconnect the three potentiometer assembly wires from the terminal.

7. Remove the screw (key 72) that fastens the travel sensor assembly to the housing.

8. Pull the travel sensor assembly (key 223) straight out of the housing.

DVC6030 SIS Digital Valve Controller and DVC6035 Remote Feedback Unit

Refer to figure 8-3 for DVC6030 SIS and 8-8 for DVC6035 key number locations.

1. Remove piping and fittings from the instrument.

2. Remove the digital valve controller from the actuator.

3. Loosen the screw (key 80) that secures the feedback arm (key 79) to the travel sensor shaft and remove the feedback arm from the travel sensor shaft.

If disassembling a DVC6030 SIS digital valve controller, use step 4a. If disassembling a DVC6035 remote feedback unit, use step 4b.

4. a. Separate the module base from the housing by performing the Removing the Module Base procedure.

b. Disconnect the three potentiometer assembly wires from the terminal.

5. From within the housing, unscrew the travel sensor assembly (key 223) from the housing.

Assembly

Note

If the feedback arm (key 79) or feedback arm assembly (key 84) is removed from the digital valve controller, the travel sensor (key 77) must be recalibrated.

DVC6010 SIS Digital Valve Controller and DVC6015 Remote Feedback Unit

Refer to figure 8-1 for DVC6010 SIS and 8-6 for DVC6015 key number locations.

1. Insert the travel sensor assembly (key 223) into the housing (key 1). Secure the travel sensor assembly with screw (key 72).

If assembling a DVC6010 digital valve controller, use step 2a. If assembling a DVC6015 remote feedback unit, use step 2b.

2. a. Connect the travel sensor connector to the PWB as described in the Replacing the Module Base procedure.

b. Connect the three travel sensor wires to the terminals.

Note

For the DVC6015 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3

3. Loosely assemble the bias spring (key 78), screw (key 80), plain washer (key 163), and nut (key 81) to the feedback arm (key 79), if not already installed.

4. Attach the feedback arm (key 79) to the travel sensor shaft.

Two methods are available for adjusting the travel sensor. You can use a multimeter to measure the potentiometer resistance, or if you have a Field Communicator, you can use the procedure in the Calibration section. To use the multimeter, perform steps 5 through 13. To use the Field Communicator, skip to step 14.

Travel Sensor Adjustment with a Multimeter

5. Align the feedback arm (key 79) to the housing (key 1) by inserting the alignment pin (key 46) through the hole marked "A" on the feedback arm. Fully engage the alignment pin into the tapped hole in the side of the housing. Position the feedback arm so that the surface is flush with the end of the travel sensor shaft.

6. Connect a multimeter set to a resistance range of 50,000 ohms. Measure the resistance between pins 1 and 3 of the travel sensor connector. Refer to figure 7-6 for pin location. The resistance should be between 40,000 and 50,000 ohms.

7. Multiply the result in step 6 by 0.046 to get a calculated resistance. The calculated resistance should be in the range of 1840 to 2300 ohms.

8. Re-range the multimeter to a resistance of 3000 ohms between pins 2 and 3 of the travel sensor connector. Refer to figure 7-6 for pin location.

9. Adjust the travel sensor shaft to obtain the calculated resistance determined in step 7, ±100 ohms.

Note

In the next step, be sure the feedback arm surface remains flush with the end of the travel sensor shaft.

10. While observing the resistance, tighten the screw (key 80) to secure the feedback arm to the travel sensor shaft. Be sure the resistance reading remains within the range listed in step 7, ±100 ohms. Paint the screw to discourage tampering with the connection.

11. Disconnect the multimeter from the travel sensor connector.

12. For the DVC6010 SIS only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

13. Travel sensor replacement is complete. Install the digital valve controller on the actuator.

Travel Sensor Adjustment with the Field Communicator

The next two steps do not apply if you used a multimeter to adjust the travel sensor. Perform these steps only if you elected to adjust the travel sensor using the Field Communicator.

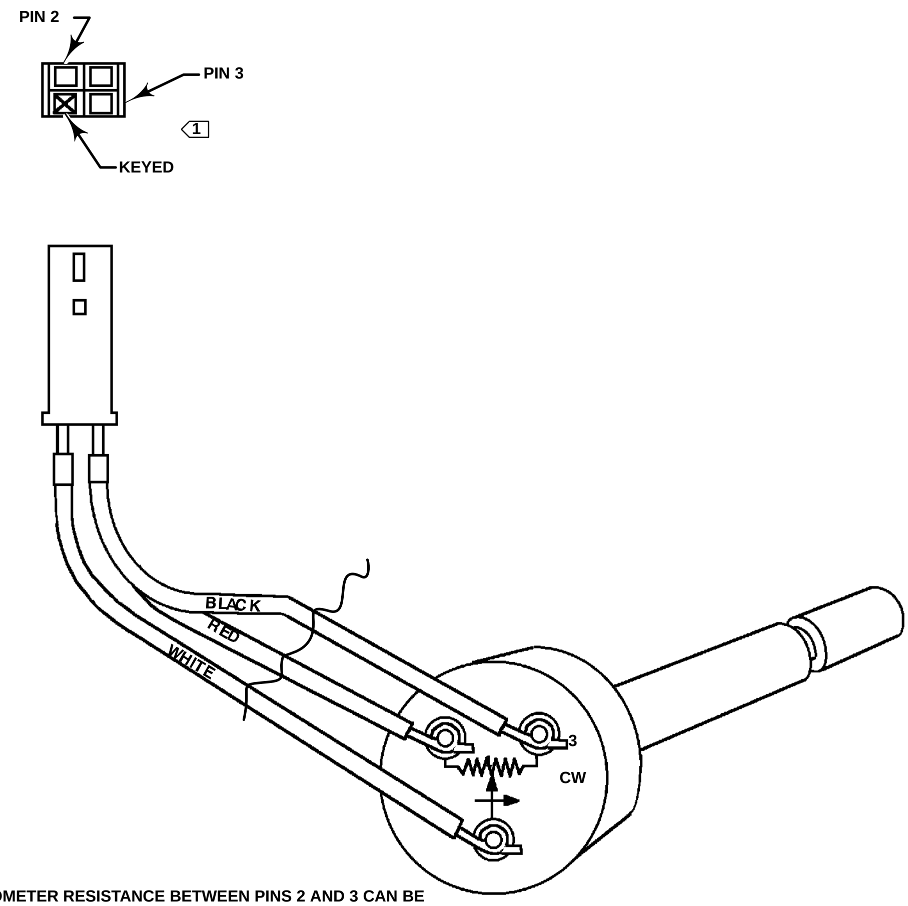


Figure 7-6. Potentiometer Resistance Measurement

14. For the DVC6010 SIS, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

15. For both DVC6010 SIS and DVC6015, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

DVC6020 SIS Digital Valve Controller and DVC6025 Remote Feedback Unit

Refer to figure 8-2 for DVC6020 SIS and 8-7 for DVC6025 key number locations.

1. Insert the travel sensor assembly (key 223) into the housing. Secure the travel sensor assembly with screw (key 72).

If assembling a DVC6020 SIS digital valve controller, use step 2a. If assembling a DVC6025 remote feedback unit, use step 2b.

2. a. Connect the travel sensor connector to the PWB as described in Replacing the Module Base.

b. Connect the three travel sensor wires to the terminals.

Note

For the DVC6025 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3

3. Loosely assemble the screw (key 80), plain washer (key 163), and nut (key 81) to the arm assembly (key 91), if not already installed.

4. Attach the arm assembly (key 91) to the travel sensor assembly (key 223) shaft.

Two methods are available for adjusting the travel sensor. You can use a multimeter to measure the potentiometer resistance, or if you have a Field Communicator, you can use the procedure in the Calibration section. To use the multimeter, perform steps 5 through 17. To use the Field Communicator, skip to step 18.

Travel Sensor Adjustment with a Multimeter

5. Connect a multimeter set to a resistance range of 50,000 ohms. Measure the resistance between pins 1 and 3 of the travel sensor connector. Refer to figure 7-6 for pin location. The resistance should be between 40,000 and 50,000 ohms.

6. Multiply the result in step 5 by 0.142 to get a calculated resistance. The calculated resistance should be in the range of 5680 to 7100 ohms.

7. Re-range the multimeter to a resistance of 7000 ohms between pins 2 and 3 of the travel sensor connector. Refer to figure 7-6 for pin location.

8. Hold the arm assembly (key 91) in a fixed position so that the arm is parallel to the housing back plane and pointing toward the terminal box. Position the arm assembly so that the outer surface is flush with the end of the travel sensor shaft.

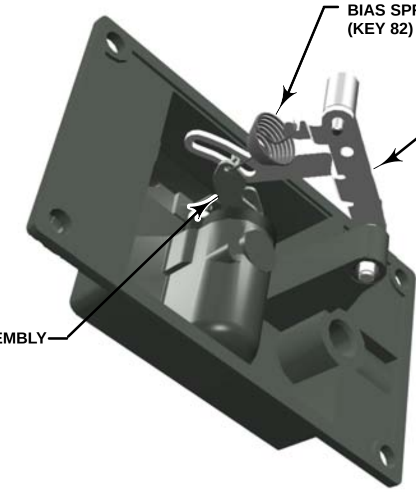
9. Adjust the travel sensor shaft to obtain the calculated resistance determined in step 6, ±100 ohms.

Note

In the next step, be sure the arm assembly outer surface remains flush with the end of the travel sensor shaft.

10. While observing the resistance, tighten the screw (key 80) to secure the feedback arm to the travel sensor shaft. Be sure the resistance reading remains within the range listed in step 6, ±100 ohms. Paint the screw to discourage tampering with the connection.

11. Disconnect the multimeter from the travel sensor connector.



NOTE:
INSTALL BIAS SPRING WITH SMALLER DIAMETER HOOK CONNECTED TO ARM ASSEMBLY (KEY 91) AND WITH BOTH HOOK OPENINGS TOWARD CENTER OF BRACKET.

Figure 7-7. FIELDVUE DVC6020 SIS Bias Spring (key 82) Installation

12. Apply anti-seize (key 64) to the pin portion of the arm assembly (key 91).

13. Position the mounting bracket over the back of the digital valve controller. Push the feedback arm assembly (key 84) toward the housing and engage the pin of the arm assembly into the slot in the feedback arm.

14. Install the mounting bracket (key 74).

15. Install the bias spring (key 82) as shown in figure 7-7.

16. For the DVC6020 SIS only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

17. Travel sensor replacement is complete. Install the digital valve controller on the actuator.

Travel Sensor Adjustment with the Field Communicator

The next two steps do not apply if you used a multimeter to adjust the travel sensor. Perform these steps only if you elected to adjust the travel sensor using the Field Communicator.

18. For the DVC6020 SIS only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

19. For both the DVC6020 SIS and the DVC6025, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

DVC6030 SIS Digital Valve Controller and DVC6035 Remote Feedback Unit

Refer to figure 8-3 for DVC6030 SIS and 8-8 for DVC6035 key number locations.

1. Apply lubricant (key 63) to the travel sensor assembly threads.

2. Screw the travel sensor assembly (key 223) into the housing until it is tight.

If assembling a DVC6030 SIS digital valve controller, use step 3a. If assembling a DVC6035 remote feedback unit, use step 3b.

3. a. Connect the travel sensor connector to the PWB as described in the Replacing the Module Base procedure.

b. Connect the three travel sensor wires to the terminals.

Note

For the DVC6035 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3

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4. Loosely assemble the bias spring (key 78), screw (key 80), plain washer (key 163), and nut (key 81) to the feedback arm (key 79), if not already installed.

5. Attach the feedback arm (key 79) to the travel sensor shaft.

Two methods are available for adjusting the travel sensor. You can use a multimeter to measure the potentiometer resistance, or if you have a Field Communicator, you can use the procedure in the Calibration section. To use the multimeter, perform steps 6 through 14. To use the Field Communicator, skip to step 15.

Travel Sensor Adjustment with a Multimeter

6. Align the feedback arm (key 79) to the housing (key 1) by inserting the alignment pin (key 46) through the hole marked “A” on the feedback arm. Fully engage the alignment pin into the tapped hole in the housing. Position the feedback arm so that the outer surface is flush with the end of the travel sensor shaft.

7. Connect a multimeter set to a resistance range of 50,000 ohms. Measure the resistance between pins 1 and 3 of the travel sensor connector. Refer to figure 7-6 for pin location. The resistance should be between 40,000 and 50,000 ohms.

8. Multiply the result in step 7 by 0.042 to get a calculated resistance. The calculated resistance should be in the range of 1680 to 2100 ohms.

9. Re-range the multimeter to a resistance of 3000 ohms between pins 2 and 3 of the travel sensor connector. Refer to figure 7-6 for pin location.

10. Adjust the travel sensor shaft to obtain the calculated resistance determined in step 8, ±100 ohms.

Note

In the next step, be sure the feedback arm outer surface remains flush with the end of the travel sensor shaft.

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11. While observing the resistance, tighten the screw (key 80) to secure the feedback arm to the travel sensor shaft. Be sure the resistance reading remains within the range listed in step 8, ±100 ohms. Paint the screw to discourage tampering with the connection.

12. Disconnect the multimeter from the travel sensor connector.

13. For the DVC6030 SIS only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

14. Travel sensor replacement is complete. Install the digital valve controller on the actuator as described in the Installation section.

Travel Sensor Adjustment with the Field Communicator

The next two steps do not apply if you used a multimeter to adjust the travel sensor. Perform these steps only if you elected to adjust the travel sensor using the Field Communicator.

15. For the DVC6030 SIS only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

16. For both the DVC6030 SIS and the DVC6035, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Instrument Troubleshooting

If communication or output difficulties are experienced with the instrument, refer to the troubleshooting chart in table 7-3. Also see the DVC6000 SIS Troubleshooting Checklist on page 7-17.

Checking Voltage Available

WARNING

Personal injury or property damage caused by fire or explosion may occur if this test is attempted in an area which contains a potentially explosive atmosphere or has been classified as hazardous.

To check the Voltage Available at the instrument, perform the following:

1. Connect the equipment in figure 2-24 to the field wiring in place of the FIELDVUE instrument.

2. Set the control system to provide maximum output current.

3. Set the resistance of the 1 kilohm potentiometer shown in figure 2-24 to zero.

4. Record the current shown on the milliammeter.

5. Adjust the resistance of the 1 kilohm potentiometer until the voltage read on the voltmeter is 11.0 volts.

6. Record the current shown on the milliammeter.

7. If the current recorded in step 6 is the same as that recorded in step 4 (± 0.08 mA), the voltage available is adequate.

8. If the voltage available is inadequate, refer to Wiring Practices in the Installation section.

Table 7-3. Instrument Troubleshooting

Symptom	Possible Cause	Action
1. Analog input reading at instrument does not match actual current provided.	1a. Control mode not Analog.	1a. Check the control mode using the Field Communicator. If in the Digital or Test mode, the instrument receives its set point as a digital signal. Control is not based on input current. Change Control Mode to Analog.
	1b. Low control system compliance voltage.	1b. Check system compliance voltage (see Wiring Practices in the Installation section.
	1c. Instrument shutdown due to self test failure.	1c. Check instrument status using the Field Communicator (see Viewing Instrument Status in the Viewing Device Information section).
	1d. Analog input sensor not calibrated.	1d. Calibrate the analog input sensor (see Analog Input Calibration in the Calibration section).
	1e. Current leakage.	1e. Excessive moisture in the terminal box can cause current leakage. Typically the current will vary randomly if this is the case. Allow the inside of the terminal box to dry, then retest.
2. Instrument will not communicate.	2a. Insufficient Voltage Available.	2a. Calculate Voltage Available (see Wiring Practices in the Installation section). Voltage Available should be greater than or equal to 11 VDC.
	2b. Controller output Impedance too low.	2b. Install a HART filter after reviewing Control System Compliance Voltage requirements (see Wiring Practices in the Installation section).
	2c. Cable capacitance too high.	2c. Review maximum cable capacitance limits (see Wiring Practices in the Installation section).
	2d. HART filter improperly adjusted.	2d. Check filter adjustment (see the appropriate HART filter instruction manual).
	2e. Improper field wiring.	2e. Check polarity of wiring and integrity of connections. Make sure cable shield is grounded only at the control system.
	2f. Controller output providing less than 4 mA to loop.	2f. Check control system minimum output setting, which should not be less than 3.8 mA.
	2g. Disconnected loop wiring cable at PWB.	2g. Verify connectors are plugged in correctly.
	2h. PWB DIP switch not set properly.	2h. Check for incorrect setting or broken DIP switch on the back of the PWB. Reset switch or replace PWB, if switch is broken. See table 7-2 for switch setting information
	2j. PWB failure.	2j. Use a 4−20 mA current source to apply power to the instrument. Terminal voltage across the LOOP+ and LOOP− terminals should be 9 to 10.5 VDC. If the terminal voltage is not 9 to 10.5 VDC, replace the PWB.
	2k. Polling address incorrect.	2k. Use the Field Communicator to set the polling address (refer to the Detailed Setup section). From the *Utilities* menu, select *Configure Communicator* and *Polling*. Select *Always Poll*. Set the instrument polling address to 0.
	2l. Defective terminal box.	2l. Check continuity from each screw terminal to the corresponding PWB connector pin. If necessary, replace the terminal box assembly.
	2m. Defective Field Communicator or ValveLink modem cable.	2m. If necessary, repair or replace cable.
	2n. ValveLink modem defective or not compatible with PC.	2n. Replace ValveLink modem.
	2p. ValveLink hardlock defective or not programmed.	2p. Replace if defective or return to factory for programming.
3. Instrument will not calibrate, has sluggish performance or oscillates.	3a. Travel sensor seized, will not turn.	3a. Rotate feedback arm to ensure it moves freely. If not, replace the pot/bushing assy.
	3b. Broken travel sensor wire(s).	3b. Inspect wires for broken solder joint at pot or broken wire. Replace pot/bushing assy.
	3c. Travel sensor misadjusted.	3c. Perform Travel Sensor Adjust procedure in the Calibration section.
	3d. Open travel sensor.	3d. Check for continuity in electrical travel range. If necessary, replace pot/bushing assy.
	3e. Cables not plugged into PWB correctly.	3e. Inspect connections and correct.
	3f. Feedback arm loose on pot.	3f. Perform Travel Sensor Adjust procedure in the Calibration section.
	3g. Feedback arm bent/damaged or bias spring missing/damaged.	3g. Replace feedback arm and bias spring.

−continued−

7

Table 7-3. Instrument Troubleshooting (Continued)

Symptom	Possible Cause	Action
	3h. Configuration errors.	3h. Verify configuration: If necessary, set protection to None. If Out of Service, place In Service. Check: Travel Sensor Motion Tuning set Zero power condition Feedback Connection Control mode (should be Analog) Restart control mode (should be Analog)
	3j. Restricted pneumatic passages in I/P converter.	3j. Check screen in I/P converter supply port of the module base. Replace if necessary. If passages in I/P converter restricted, replace I/P converter.
	3k. O-ring(s) between I/P converter ass'y missing or hard and flattened losing seal.	3k. Replace O-ring(s).
	3l. I/P converter ass'y damaged/corroded/clogged.	3l. Check for bent flapper, open coil (continuity), contamination, staining, or dirty air supply. Coil resistance should be between 1680 - 1860 ohms. Replace I/P assy if damaged, corroded, clogged, or open coil.
	3m. I/P converter ass'y out of spec.	3m. I/P converter ass'y nozzle may have been adjusted. Verify drive signal (55 to 80% for double-acting; 60 to 85% for single-acting) with the valve off the stops. Replace I/P converter ass'y if drive signal is continuously high or low.
	3n. Defective module base seal.	3n. Check module base seal for condition and position. If necessary, replace seal.
	3p. Defective relay.	3p. Depress relay beam at adjustment location in shroud, look for increase in output pressure. Remove relay, inspect relay seal. Replace relay seal or relay if I/P converter ass'y good and air passages not blocked. Check relay adjustment.
	3q. Defective 67CFR regulator, supply pressure gauge jumps around.	3q. Replace 67CFR regulator.
4. ValveLink diagnostic tests provide erroneous results.	4a. Bent or defective pressure sensor.	4a. Replace PWB.
	4b. Pressure sensor O-ring missing.	4b. Replace O-ring.
5. Field Communicator does not turn on.	5a. Battery pack not charged.	5a. Charge battery pack. Note: Battery pack can be charged while attached to the Field communicator or separately. The 375 Field Communicator is fully operable while the battery pack is charging. Do not attempt to charge the battery pack in a hazardous area.

DVC6000 SIS Troubleshooting Checklist

1. Instrument serial number as read from nameplate ____
2. Is the digital valve controller responding to the control signal?   Yes _________   No _________

   If not, describe

3. Measure the voltage across the "Loop –" and Loop +" terminal box screws when the commanded current is 4.0 mA and 20.0 mA: V @ 4.0 mA   V @ 20.0 mA.
(These values should be around 9.6 V @ 4.0 mA and 10.3 V @ 20 mA.
4. Is it possible to communicate via HART to the digital valve controller?   Yes _________   No _________
5. What is the Diagnostic Tier of the digital valve controller?   SIS
6. What is the firmware version of the digital valve controller?
7. What is the hardware version of the digital valve controller?
8. Is the digital valve controller's Instrument Mode "In Service"?   Yes _________   No _________
9. Is the digital valve controller's Control Mode set to "Analog"?   Yes _________   No _________
10. Is it on Travel or Pressure control?
11. What are the following parameter readings?

    Input Signal _________   Drive Signal _________%

    Supply Pressure _________   Pressure A _________   Pressure B _________

    Travel Target _________%   Travel _________%
12. What are the following alert readings?

    Fail alerts ____

    Valve alerts ____

    Operational status ____

    Alert event record entries ____
13. Export ValveLink data (if available) for the device (Status Monitor, Detailed Setup, etc.).

Mounting

1. Which DVC6000 SIS do you have?   DVC6010 ____ DVC6020 ____   DVC6030 ____   Remote Mount? ____
2. What Make, Brand, Style, Size, etc. actuator is the DVC6000 SIS mounted on? ________________________
3. What is the full travel of the valve? ____
4. What is the Mounting Kit part number? ____
5. If mounting kits are made by LBP/Customer, please provide pictures of installation.
6. Is the Mounting kit installed per the instructions?   Yes _________   No _________
7. What is the safe position of the valve?   Fail closed _________   Fail open _________
8. For a DVC6010 SIS or DVC6030 SIS: During full travel of the actuator, does the DVC6000 feedback arm move below the "A" or above the "B" alignment positions? (It should not)   Yes _________   No _________

Section 8 Parts

Parts Ordering

Whenever corresponding with your Emerson Process Management sales office about this equipment, always mention the controller serial number. When ordering replacement parts, refer to the 11-character part number of each required part as found in the following parts list. Parts which do not show part numbers are not orderable.

WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson Process Management may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

Note

All part numbers are for both aluminum and stainless steel constructions, unless otherwise indicated.

Note

The stainless steel option, extreme temperature, and remote mount options are available for the DVC6000 SIS digital valve controller with exida approval.

Parts Kits

Conversion kit 3 listed below provides the parts required to convert a DVC6010 SIS to a DVC6020 SIS or a DVC6015 to a DVC6025. Conversion kit 4 provides the parts required to convert a DVC6020 SIS to a DVC6010 SIS or a DVC6025 to a DVC6015.

Kit	Description	Part Number
1*	Elastomer Spare Parts Kit (kit contains parts to service one digital valve controller)	
	Standard	19B5402X012
	Extreme Temperature option (fluorosilicone elastomers)	19B5402X022
2*	Small Hardware Spare Parts Kit (kit contains parts to service one digital valve controller)	19B5403X012
3	Conversion Kit (DVC6010 SIS to DVC6020 SIS or DVC6015 to DVC6025) Also see note below	19B5405X012

Note

When converting a DVC6010 SIS to a DVC6020 SIS for pipe-away construction, also order pipe-away bracket kit, item 6.

Kit	Description	Part Number
4	Conversion Kit (DVC6020 SIS to DVC6010 SIS or DVC6025 to DVC6015)	14B5072X112
5	Alignment Pin Kit [kit contains 15 alignment pins (key 46)]	14B5072X092
6	Pipe-Away Bracket Kit (DVC6020 SIS) [kit contains mounting bracket (key 74) and O-ring (key 75)]	
	Standard	19B5404X012
	Extreme Temperature option (fluorosilicone elastomers)	19B5404X022

*Recommended spare parts

Kit	Description	Part Number
7*	Seal Screen Kit [kit contains 25 seal screens (key 231) and 25 O-rings (key 39)]	
	Standard and Extreme Temperature option (fluorosilicone elastomers)	14B5072X182
8	Terminal Box Kit, aluminum	
	Standard	19B5401X012
	Extreme Temperature option (fluorosilicone elastomers)	19B5401X022
9*	I/P Converter Kit	38B6041X092
10	Adjustment Arm Kit (includes washer, nut and adjustment arm)	14B5072X132
11*	PTFE Sleeve Kit [For pot bushing assembly (kit includes 10 sleeves and Lubricant)]	
	DVC6010 SIS and DVC6020 SIS	GE08726X012
	DVC6030 SIS	GE08727X012
12*	Spare Module Base Assembly Kit, aluminum [kit contains module base (key 2); drive screws, qty. 2, (key 11); shield/label (key 19); hex socket cap screw, qty. 3, (key 38); self tapping screw, qty. 2 (key 49); pipe plug, qty. 3 (key 61); retaining ring, qty. 3 (key 154); screen (key 236); and flame arrestors, qty. 3 (key 243)]	GE18654X012
13*	Spare Housing Assembly Kit, aluminum [kit contains housing (key 1); drive screw, qty. 2 (key 11); shield (key 20); and screen (key 271)]	
	DVC6010 SIS/DVC6020 SIS	GE18652X012
	DVC6030 SIS	GE18653X012
14	DVC6020 SIS Cam Adjustment Tool	GE12742X012
15*	Spare Shroud Kit	GE29183X012

Remote Mount Kits

Kit	Description	Part Number
16	Remote Terminal Box Kit	
	Standard	GE00418X012
17	Feedback Unit	
	DVC6015	49B7986X012
	DVC6025 long arm	49B7987X012
	DVC6025 Short Arm	49B7987X022
	DVC6035	49B7988X012
18*	Remote Mount Retrofit Kit	

Note

This kit converts an existing DVC6000 to the remote mounted version. Note that the DVC6030 cannot be converted to the DVC6035.

Kit	Description	Part Number
	DVC6010 SIS to DVC6005 SIS/DVC6015	DVC6015RMTR
	DVC6010 SIS to DVC6005 SIS/DVC6035	DVC6035RMTR
	DVC6020 SIS to DVC6005 SIS/ DVC6025 (short arm)	DVC6025RMSA
	DVC6020 SIS to DVC6005 SIS/ DVC6025 (long arm)	DVC6025RMLA
19	Feedback Unit Termination Strip Kit	GE00419X012
20	Pipestand/Wall Mounting Kit	GE00420X012

Severe Service Linkage Kits

Note

All metallic parts (except coil springs) in the corrosion kit and parts that experience rubbing or wear in the wear kit are coated with a proprietary tungsten carbon coating.

Kit	Description	Part Number
21	Corrosion Kit	
	DVC6010 SIS 0.25−2 Inch travel	GE22667X012
	DVC6010 SIS 2−4 Inch travel	GE22668X012
	DVC6020 SIS short arm	GE22670X012
	DVC6020 long arm	GE22671X012
	DVC6030 SIS rotary	GE22672X012
	DVC6030 SIS linear	GE22673X012
	Wear Kit	
	DVC6010 SIS 0.25−2 Inch travel	GE22674X012
	DVC6010 SIS 2−4 Inch travel	GE22675X012
	DVC6020 SIS short arm	GE22676X012
	DVC6020 SIS long arm	GE22677X012
	DVC6030 SIS rotary	GE22678X012
	DVC6030 SIS linear	GE22679X012
22	Kit, Spring	
	DVC6010 SIS 0.25−2 inch travel [kit contains 10 bias springs w/tungsten carbon coating]	GE37413X012
	DVC6010 SIS 2−4 inch travel, [kit contains 10 bias springs w/tungsten carbon coating]	GE37414X012

Safety Instrumented System Kits

Kit	Description	Part Number
23*	SIS Preventative Maintenance Kits	
	DVC6010 SIS and DVC6020 SIS	19B4032X012
	DVC6030 SIS	19B4031X012

8

*Recommended spare parts

Parts List

Parts which do not show part numbers are not orderable as individual parts. In most cases, they are available in one of the parts kits listed under Parts Kits.

Note

Parts with footnote numbers shown are available in parts kits. Also see footnote information at the bottom of the page.

Key	Description	Part Number

Housing

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, and 8-4)

Key	Description	Part Number
1	Housing(13)	
11	Drive Screw (2 req'd)(13)	
20	Shield(13)	
52	Vent, plastic DVC6010 SIS and DVC6030 SIS only(2)	
74	Mounting Bracket DVC6020 SIS Std(3) or pipe-away(6)	
75*	O-Ring, DVC6020 SIS only(6)	
245	Pipe Plug, pl stl(6), DVC6020 SIS Vent-away only	
248	Screw, hex head (4 req'd), (DVC6005 SIS only)(20)	
249	Screw, hex head (4 req'd), (DVC6005 SIS only)(20)	
250	Spacer (4 req'd), (DVC6005 SIS only)(20)	
267	Standoff (2 req'd), (DVC6005 SIS only)(20)	
271	Screen(13)	

Common Parts

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, and 8-4)

Key	Description	Part Number
16*	O-ring (3 req'd)(1,23)	
23	Cap Screw, hex socket, SST (4 req'd)(2,15)	
29	Warning label, for use only with LCIE hazardous area classifications	
33	Mach Screw, pan hd, SST (3 req'd)(2)	
38	Cap Screw, hex socket, SST (3 req'd)(2,12)	
43*	Cover Assembly (includes cover screws)	38B9580X022
48	Nameplate	
49	Screw, self tapping (2 req'd)(12)	
63	Lithium grease (not furnished with the instrument)	
64	Anti-seize compound (not furnished with the instrument)	
65	Lubricant, silicone sealant (not furnished with the instrument)	
154	Retaining Ring (3 req'd)(2)	
237	Module Base Seal(1,23)	

Module Base

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, 8-4 and 8-5)

Key	Description	Part Number
2	Module Base(12)	
11	Drive Screw (2 req'd)(12)	
12	O-ring(1,23)	
19	Label, Shield Assembly(12)	
61	Pipe Plug, hex socket (3 req'd)(12)	
236	Screen, for single-acting direct units only(12)	
243	Flame Arrestor Assy (3 req'd)(12)	

I/P Converter Assembly

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, and 8-4)

Key	Description	Part Number
39*	O-ring (1,7,9,23)	
41	I/P Converter(9,23)	
169	Shroud(9,15,23)	
210*	Boot, nitrile (2 req'd)(1,9,23) (see figure 7-3)	
231*	Seal Screen(1,7,9,23)	

Relay

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, and 8-4)

Key	Description	Part Number
24*	Relay Assembly, (includes shroud, relay seal, mounting screws)(23)	
	Low Bleed, nitrile	
	Relay A, double-acting	38B5786X072

Note

Relay B and C are not TÜV approved.

Key	Description	Part Number
	Relay B, single-acting reverse	38B5786X112
	Relay C, single-acting direct	38B5786X152

*Recommended spare parts
1. Available in the Elastomer Spare Parts Kit
2. Available in the Small Hardware Spare Parts Kit
3. Available in the DVC6010 SIS to DVC6020 SIS Conversion Kit
6. Available in the Pipe-Away Bracket Kit
7. Available in the Seal Screen Kit
9. Available in the I/P Converter Kit
12. Available in the Spare Module Base Assembly Kit
13. Available in the Spare Housing Assembly Kit
15. Available in the Spare Shroud Kit
20. Available in the Pipestand/Wall Mounting Kit
23. Available in the SIS Preventative Maintenance Kit

Terminal Box

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, and 8-4)

Key	Description	Part Number
4	Terminal Box Cap	
34*	O-ring[1,8,23]	
36*	O-ring[1,8,23]	
44	Wire Retainer, pl stl (6 req'd) (not shown)[2]	
58	Set Screw, hex socket, SST[2]	
72	Cap Screw, hex socket, SST[2]	
164	Terminal Box Assembly[8]	
246	SIS Label	
247	TÜV or exida Approval Label	

Remote Terminal Box

DVC6005 SIS (see figure 8-4)

Key	Description	Part Number
4	Terminal Box Cap[16]	
34*	O-ring[1,8,16]	
36*	O-ring[1,8,16]	
44	Wire Retainer, pl stl (5 req'd) (not shown)[2,17]	
58	Set Screw, hex socket, SST[2,16]	
62	Pipe Plug, hex hd, SST[16]	
72	Cap Screw, hex socket, SST (3 req'd)[2,16]	
262	Adapter[16]	
263*	O-ring[16]	
	Standard	1F463606992
	Extreme temperature option, (fluorosilicone)	1F4636X0092
264	Terminal Box Assembly, remote[16]	

PWB Assembly

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6005 SIS (see figures 8-1, 8-2, 8-3, and 8-4)

Note

Contact your Emerson Process Management sales office for PWB Assembly FS numbers.

Key	Description	Part Number
50*	PWB Assembly	

Pressure Gauges, Pipe Plugs, or Tire Valve Assemblies (see figure 8-5)

Key	Description	Part Number
47*	Pressure Gauge, nickel-plated brass case, brass connection	
	Double-acting (3 req'd); Single-acting (2 req'd)	
	PSI/MPA Gauge Scale	
	To 60 PSI, 0.4 MPa	18B7713X042
	To 160 PSI, 1.1 MPa	18B7713X022
	PSI/bar Gauge Scale	
	To 60 PSI, 4 bar	18B7713X032
	To 160 PSI, 11 bar	18B7713X012
66	Pipe Plug, hex hd	
	For double-acting and single acting direct w/gauges (none req'd)	
	For single-acting reverse w/gauges (1 req'd)	
	For all units w/o gauges (3 req'd)	
67	Tire Valve Assembly (3 req'd)	

Feedback / Remote Travel Sensor Parts

Common Feedback Parts

DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6015, DVC6025, and DVC6035 (see figures 8-1, 8-2, 8-3, 8-6, 8-7, and 8-8)

Key	Description	Part Number
46	Alignment Pin[5]	
	for DVC6010 SIS, DVC6030 SIS, DVC6015, and DVC6035	
64	Anti-seize compound (not furnished with the instrument)	
65	Lubricant, silicone sealant (not furnished with the instrument)	
72	Cap Screw, hex socket (2 req'd)[2]	
	for DVC6010 SIS, DVC6030 SIS, DVC6015, and DVC6035	
78	Bias Spring, SST[2]	
	for DVC6010 SIS, DVC6030 SIS, DVC6015, and DVC6035	
79	Feedback Arm	
	for DVC6010 SIS, DVC6030 SIS, DVC6015, and DVC6035	
80	Cap Screw, hex socket, SST[2]	
81	Square Nut, SST[2]	
104	Cap Screw, hex hd (4 req'd)	
	Aluminum Construction	
	DVC6010 SIS and DVC6015	
	Not for mounting on 1250 and 1250R actuators.	
	Mounting parts for 1250 and 1250R actuators are included in the mounting kit for these actuators.	
	Stainless Steel Construction	
	DVC6010 SIS (oversized) (4 req'd)	
	Not for mounting on 1250 and 1250R actuators.	
107	Mounting Bracket[4]	
	DVC6010 SIS and DVC6015 only	
	Not for mounting on 1250 and 1250R actuators.	
	Mounting parts for 1250 and 1250R actuators are included in the mounting kit for these actuators.	
- - -	Feedback Linkage Shield, see figures 2-1 and 2-2	
	Up to 50.4 mm (2-inch) travel	
	All sliding-stem actuators except 585C size 60	
	50.4 mm (2-inch) to 104mm (4-inch) travel	
	All sliding-stem actuators except 585C size 60	
	585C size 60, 19 mm (0.75 inch) to 104mm (4-inch) travel	
163	Plain Washer, SST[2]	
223*	Potentiometer/Bushing Assy[18,23]	
	Standard Elastomers	
	DVC6010 SIS, DVC6020 SIS	GE31447X012
	DVC6030 SIS	GE31448X012
	Extreme Temperature option (fluorosilicone elastomers)	
	DVC6010 SIS and DVC6020 SIS	GE31450X012
	DVC6030 SIS	GE31451X012
	DVC6015 and DVC6025[17]	GE31453X012
	DVC6035[17]	GE31454X012

*Recommended spare parts
1. Available in the Elastomer Spare Parts Kit
2. Available in the Small Hardware Spare Parts Kit
4. Available in the DVC6020 SIS to DVC6010 SIS Conversion Kit
5. Available in the Alignment Pin Kit
8. Available in the Terminal Box Kit
16. Available in the Remote Terminal Box Kit
17. Available in Feedback Unit Kit
18. Available in the Remote Mount Retrofit Kit
23. Available in the SIS Preventative Maintenance Kit

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Key	Description	Part Number

DVC6020 SIS and DVC6025 (see figure 8-2 and 8-7)

Key	Description	Part Number
74	Mounting Bracket	
82	Bias Spring, SST(3)	
83	Bearing Flange, PTFE-based (2 req'd)(3)	
84	Feedback Arm Assy, SST(3)	
85	E-ring, pl stl (2 req'd)(3)	
86	Plain Washer, pl stl (2 req'd)(3)	
87	Follower Post, SST(3)	
88	Roller, SST/PTFE(3)	
89	Spring Lock Washer, pl stl(3)	
90	Hex Nut, pl stl(3)	
91	Arm Assy, SST	
92	Cap Screw, hex socket (4 req'd)(3)	
93	Torsion Spring, Feedback Arm(3)	

DVC6015, DVC6025, and DVC6035 (see figures 8-6, 8-7, and 8-8)

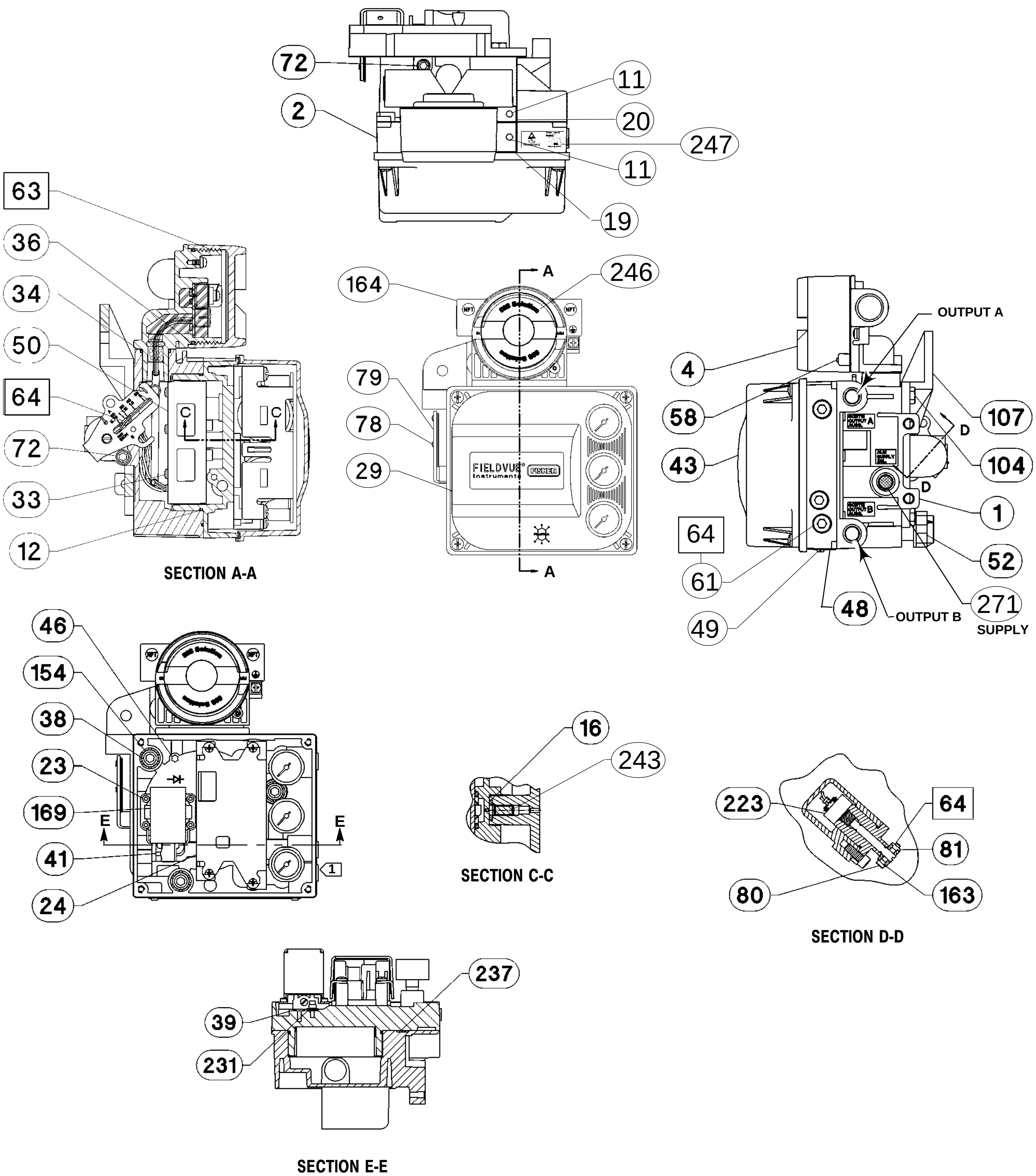
Key	Description	Part Number
23	Cap Screw, hex socket (2 req'd)(17,19)	
44	Wire Retainer, pl stl (9 req'd)(17,19)	
49	Screw, self tapping (2 req'd)	
58	Set Screw, hex socket(17)	
62	Pipe Plug, hex hd, SST(17)	
131	Retainer Wire	
251	Feedback housing(17)	
252	Assembly Plate Shield (DVC6015 only)(17)	
253	Terminal bracket(17,19)	
254	Terminal Strip(17,19)	
255	Terminal Cap(17)	
256	O-ring, fluorosilicone(17)	
257	Machine Screw, pan head (2 req'd) (DVC6015 only)(17)	
258	Label, cover(17)	
260	Hex Nut, SST (2 req'd)	
261	Nameplate	
265	Plug (DVC6015 and DVC6035 only)(17)	

Line Conditioner

Key	Description	Part Number
	LC340 Line conditioner	39B5416X012

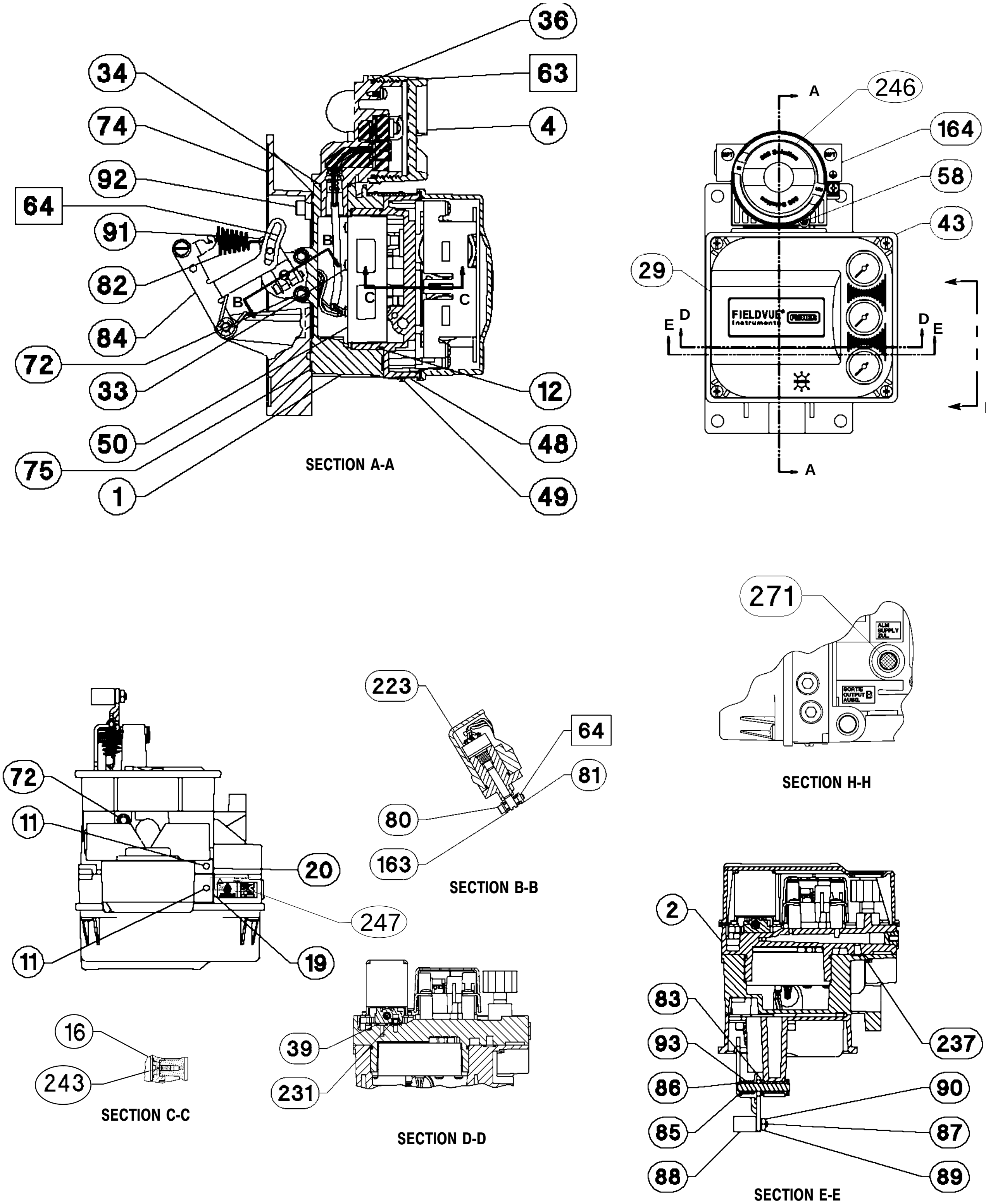
8

*Recommended spare parts
3. Available in the DVC6010 SIS to DVC6020 SIS Conversion Kit
17. Available in Feedback Unit Kit
19. Available in Feedback Unit Termination Strip Kit



☐ APPLY LUB, SEALANT
NOTES:
1 SEE FIGURE 8-5 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED
48B7710 K SHT 1 & 2 / DOC

Figure 8-1. FIELDVUE DVC6010 SIS Digital Valve Controller Assembly

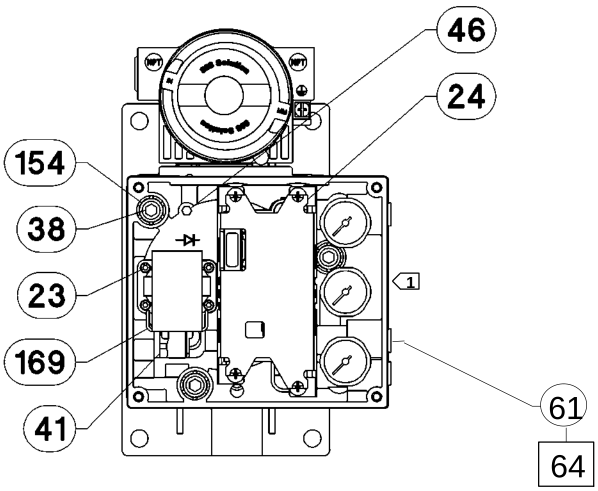


☐ APPLY LUB, SEALANT

1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

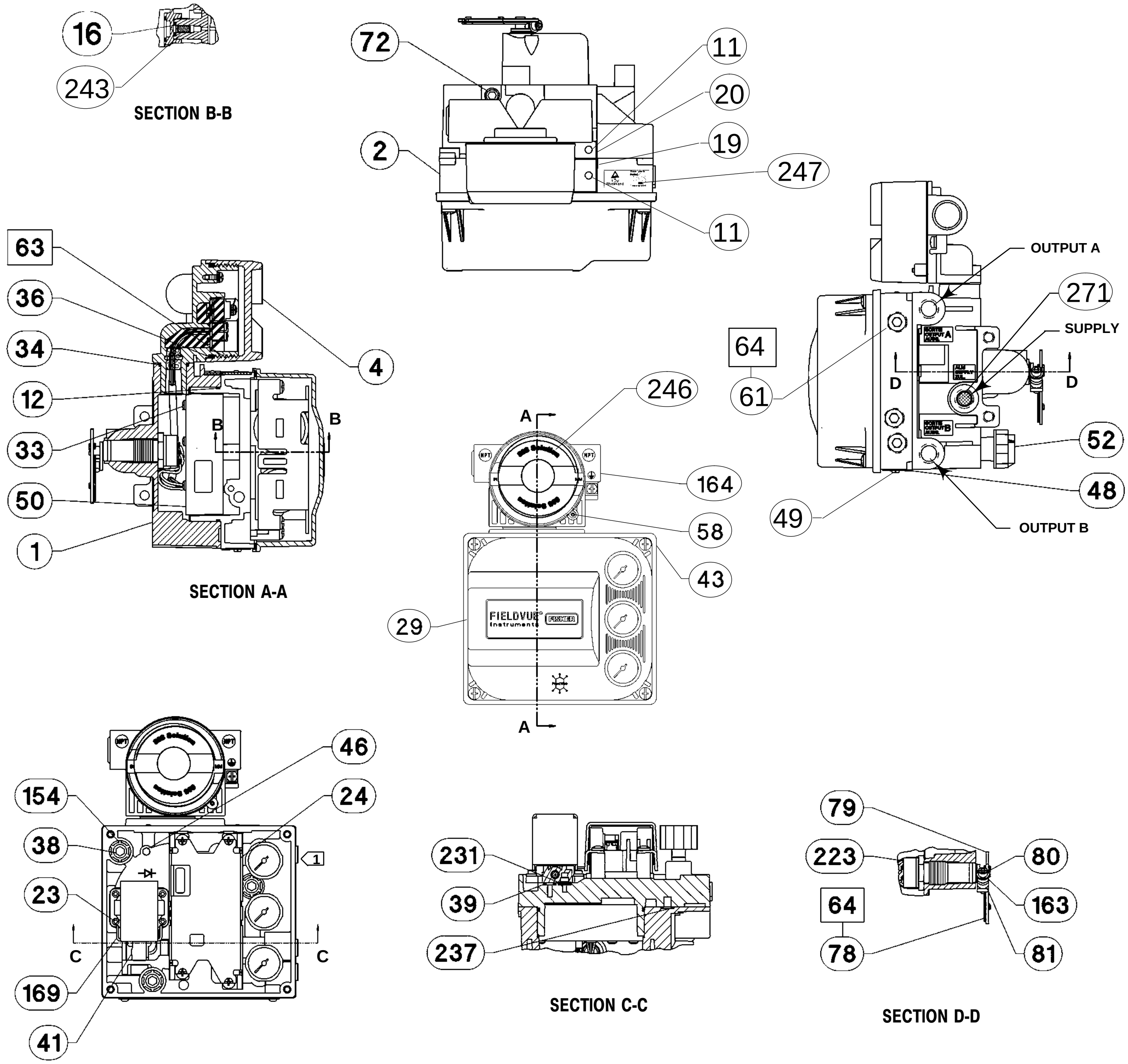
48B9596-K/IL SHT 1 & 2 / DOC

Figure 8-2. FIELDVUE DVC6020 SIS Digital Valve Controller Assembly



☐ APPLY LUB, SEALANT
NOTES:
1 SEE FIGURE 8-5 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED
48B9596-K SHT 3 / DOC

Figure 8-2. FIELDVUE DVC6020 SIS Digital Valve Controller Assembly (continued)



☐ APPLY LUB, SEALANT, THREAD LOCK

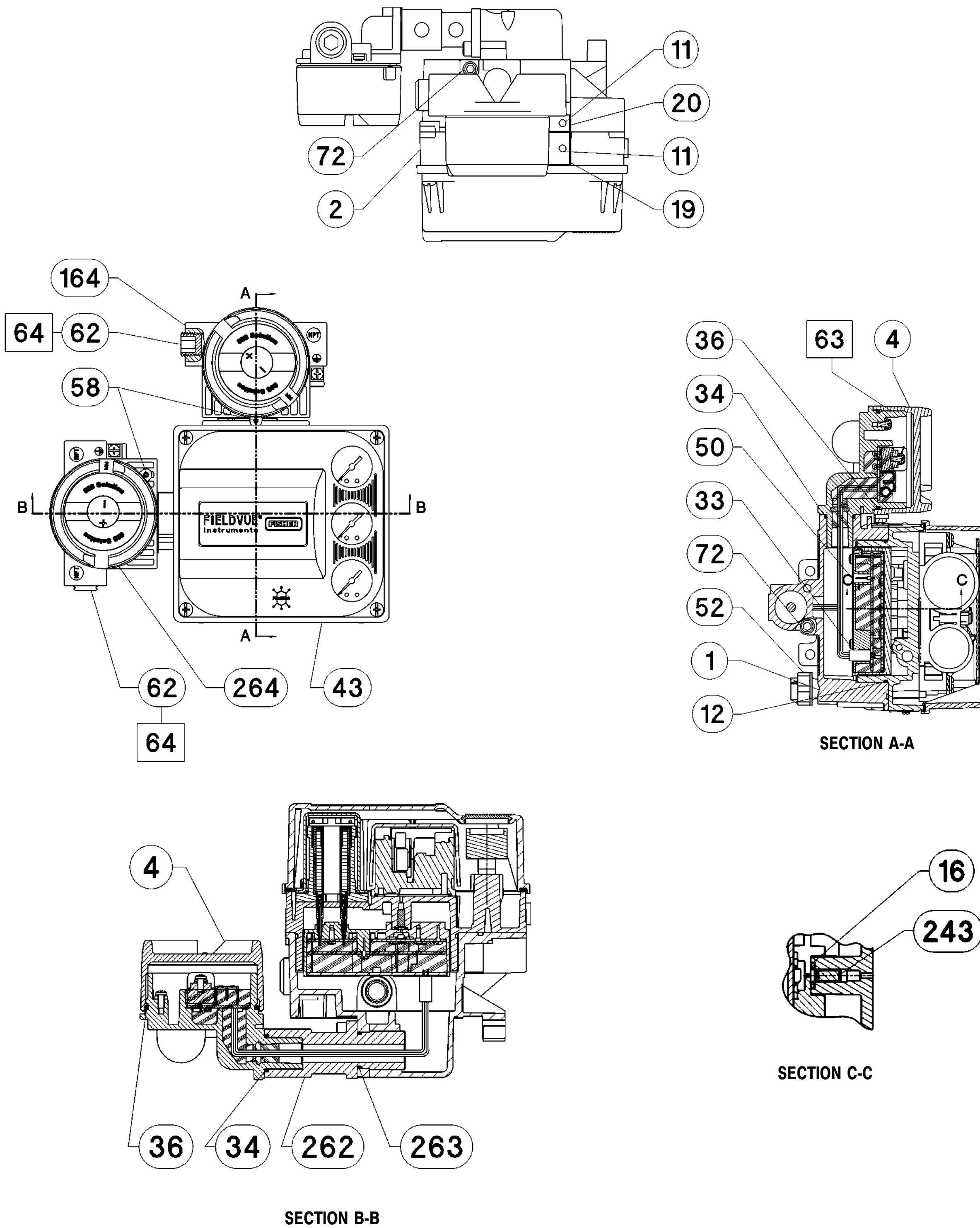
NOTES:

1 SEE FIGURE 8-5 FOR GAUGE CONFIGURATIONS

2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B9597-K SHT 1 & 2 / DOC

Figure 8-3. FIELDVUE DVC6030 SIS Digital Valve Controller Assembly



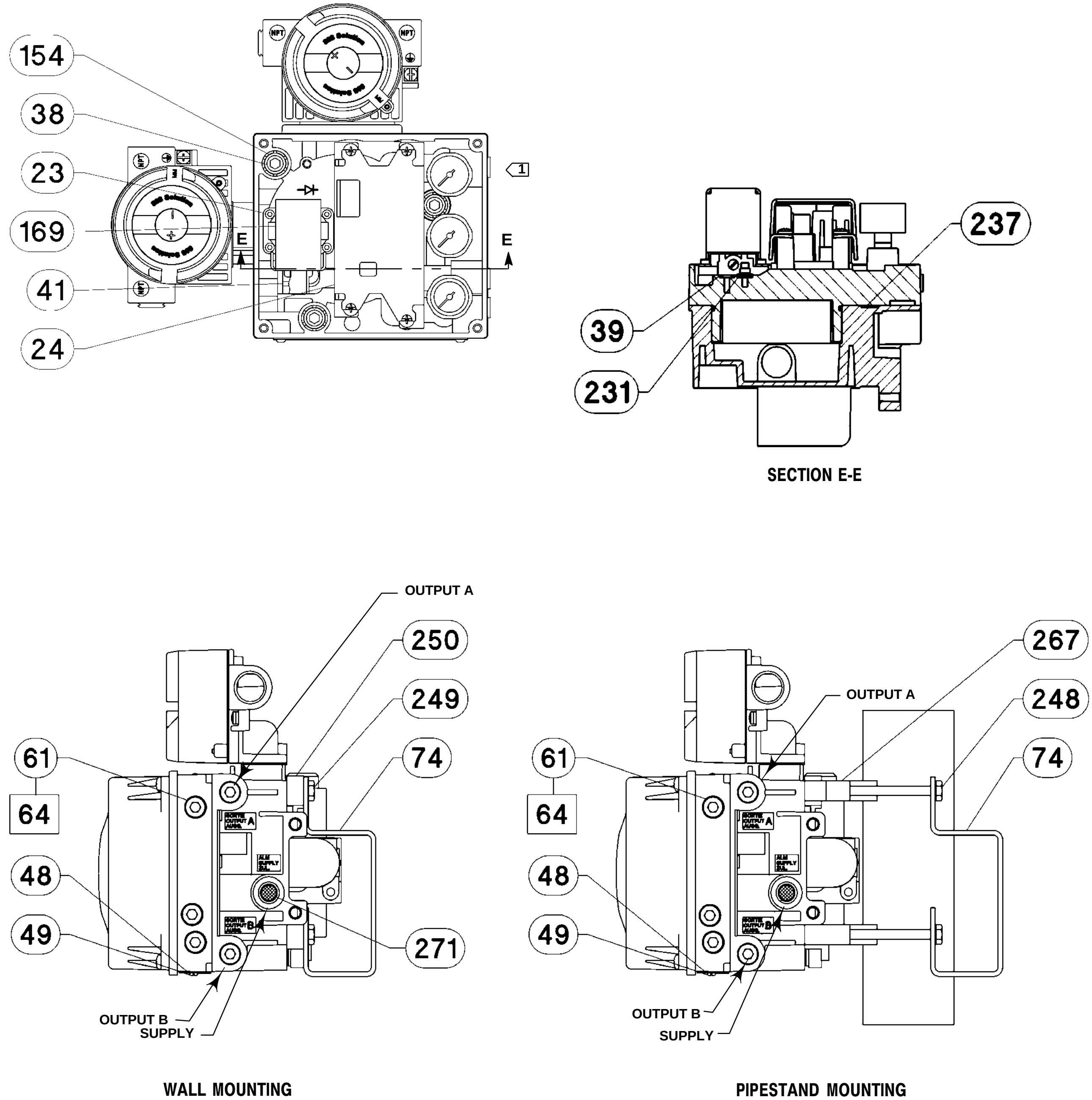
☐ APPLY LUB, SEALANT

NOTES:

1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B3261-C SHT 1 & 2

Figure 8-4. FIELDVUE DVC6005 SIS Base Unit



☐ APPLY LUB, SEALANT

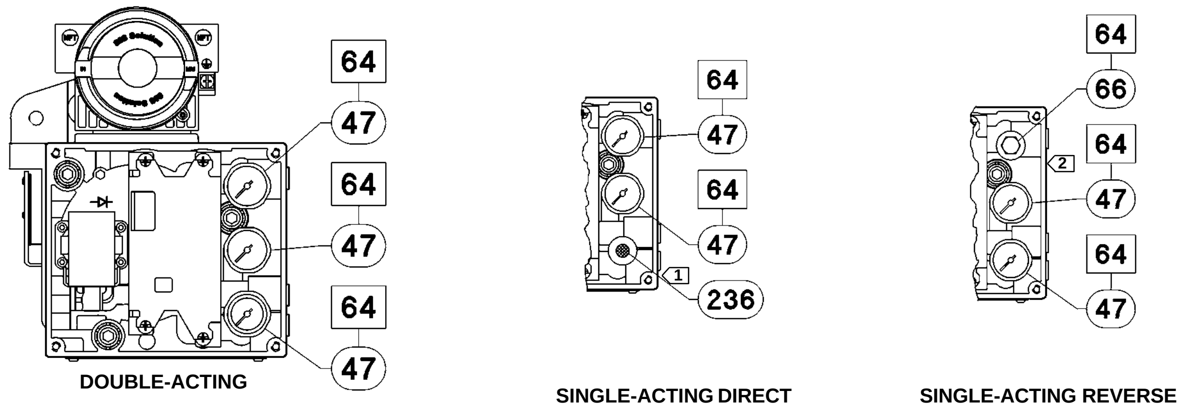
NOTES:

1 SEE FIGURE 8-5 FOR GAUGE CONFIGURATIONS

2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B3261-C SHT 2 & 3 / DOC

Figure 8-4. FIELDVUE DVC6005 SIS Base Unit (continued)



☐ APPLY LUB, SEALANT

NOTE:

DRAWING IS REPRESENTATIVE OF A DVC6000 SERIES DIGITAL VALVE CONTROLLER.

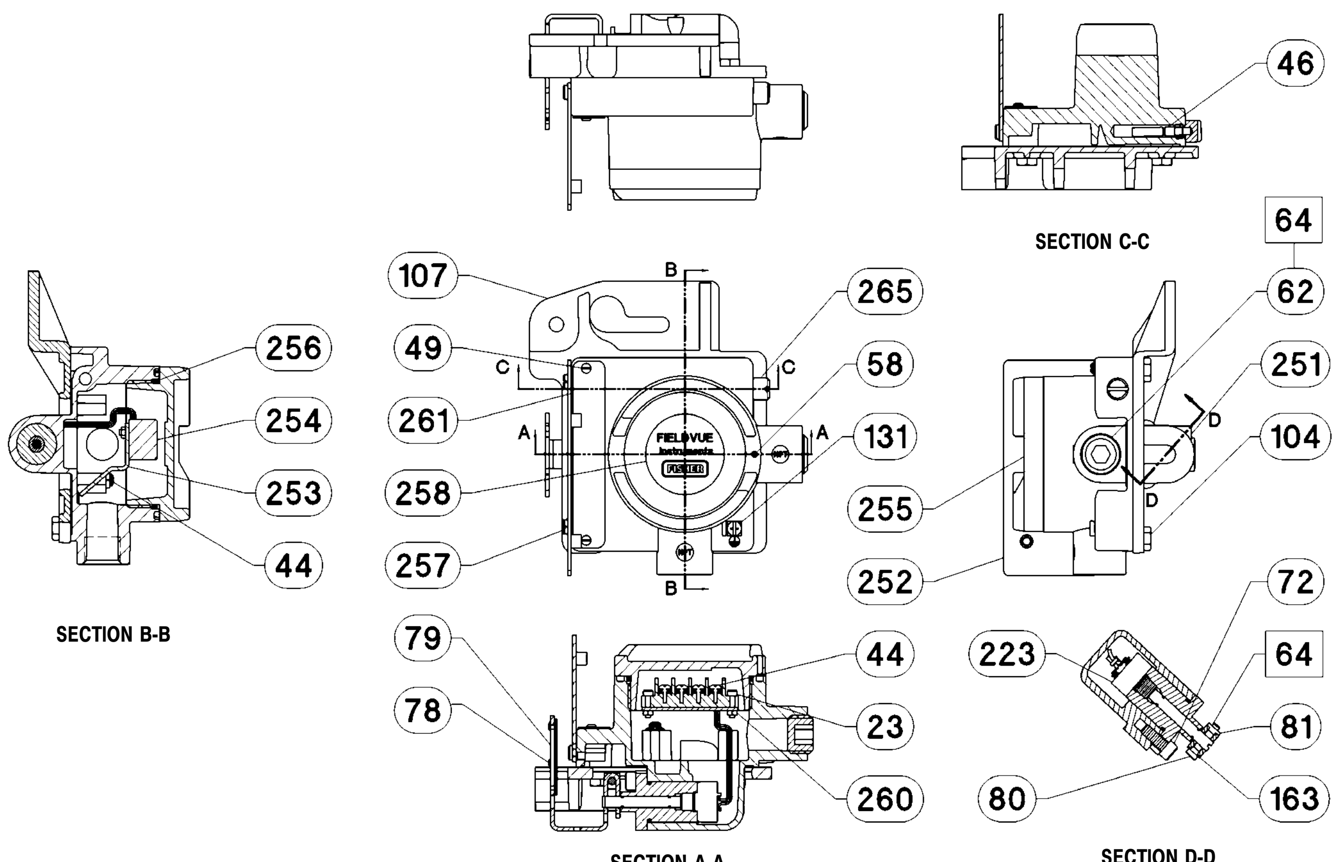
GAUGE CONFIGURATION IS REPRESENTATIVE OF BOTH DVC6000 SERIES AND DVC6005.

1 FOR SINGLE-ACTING DIRECT, OUTPUT B IS PLUGGED.

2 FOR SINGLE-ACTING REVERSE, OUTPUT A IS PLUGGED.

48B7710-K SHT 2 / DOC

Figure 8-5. Typical FIELDVUE DVC6000 SIS Series / DVC6005 SIS Base Unit Gauge Configuration



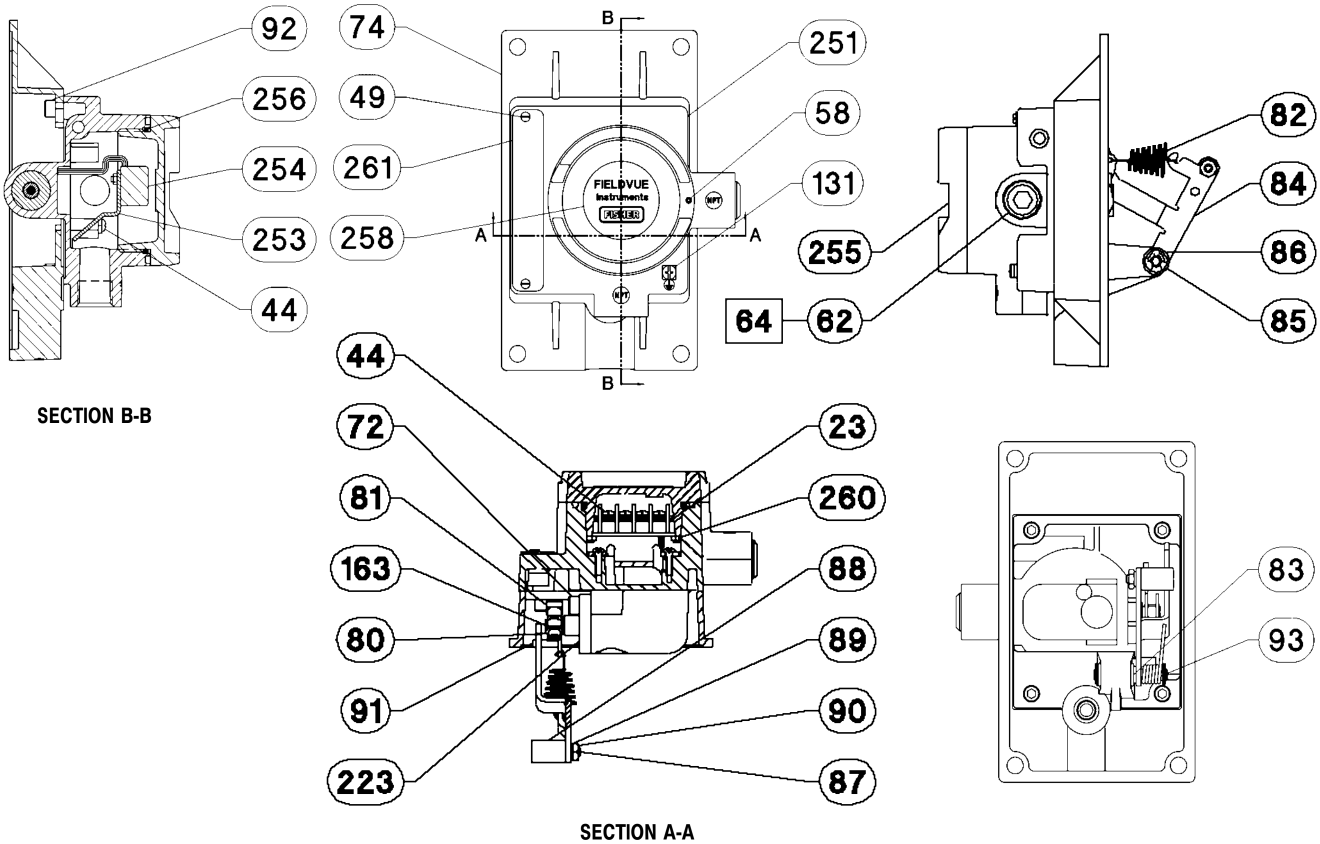
☐ APPLY LUB, SEALANT

NOTE:

1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B7986-A

Figure 8-6. FIELDVUE DVC6015 Feedback Unit Assembly



☐ APPLY LUB, SEALANT, THREAD LOCK
NOTE:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B7987-A/IL

Figure 8-7. FIELDVUE DVC6025 Feedback Unit Assembly

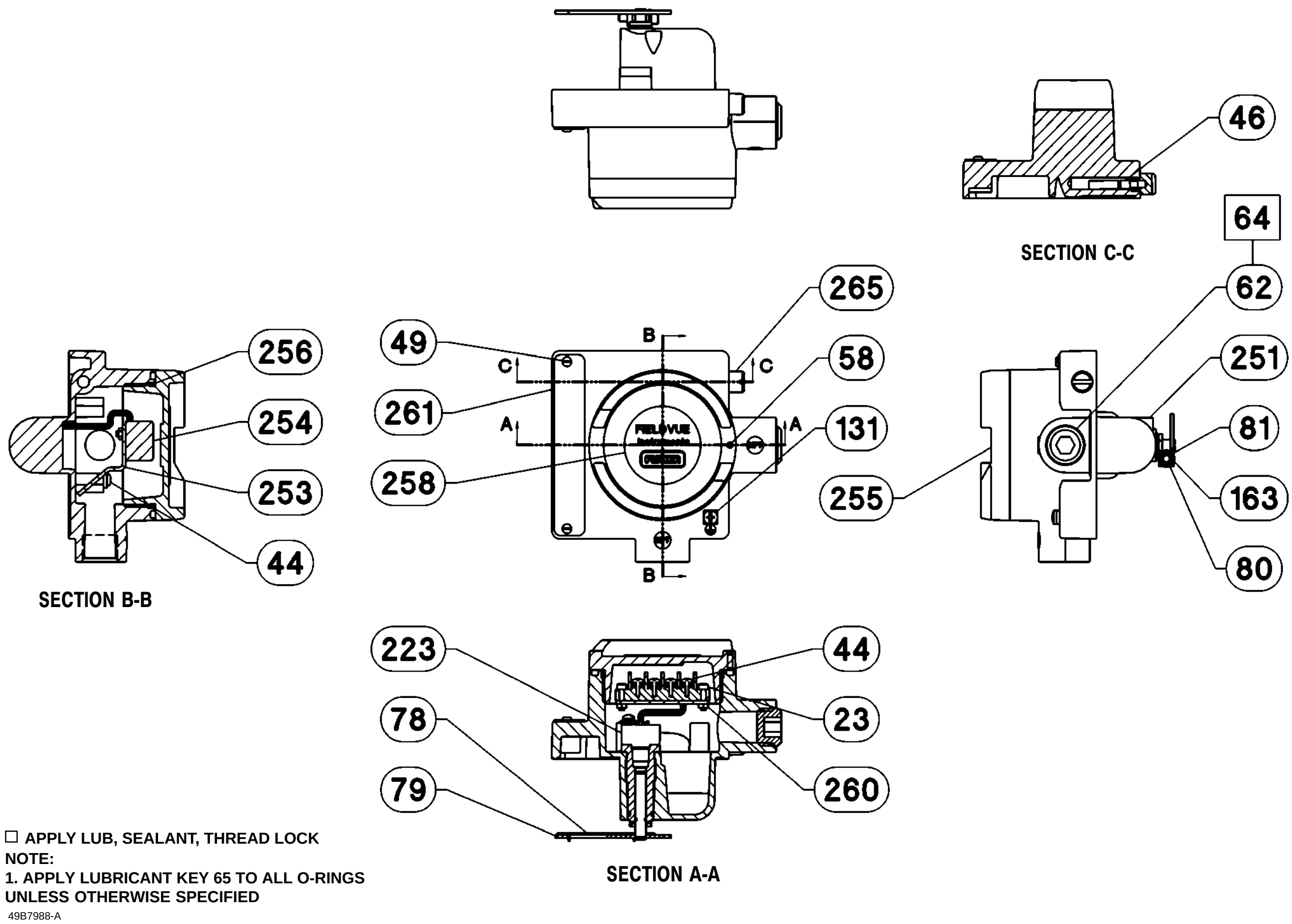


Figure 8-8. FIELDVUE DVC6035 Feedback Unit Assembly

Appendix A Principle of Operation

A

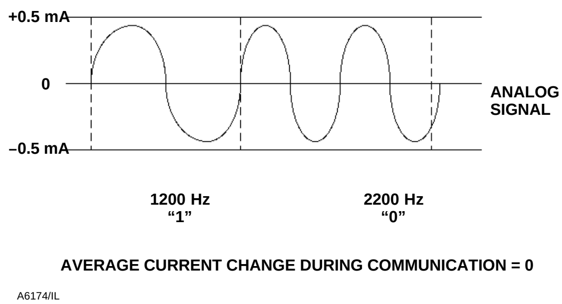


Figure A-1. HART Frequency Shift Keying Technique

HART Communication

The HART (Highway Addressable Remote Transducer) protocol gives field devices the capability of communicating instrument and process data digitally. This digital communication occurs over the same two-wire loop that provides the 4-20 mA process control signal, without disrupting the process signal. In this way, the analog process signal, with its faster update rate, can be used for control. At the same time, the HART protocol allows access to digital diagnostic, maintenance, and additional process data. The protocol provides total system integration via a host device.

The HART protocol uses frequency shift keying (FSK). Two individual frequencies of 1200 and 2200 Hz are superimposed over the 4-20 mA current signal. These frequencies represent the digits 1 and 0 (see figure A-1). By superimposing a frequency signal over the 4-20 mA current, digital communication is attained. The average value of the HART signal is zero, therefore no DC value is added to the 4-20 mA signal. Thus, true simultaneous communication is achieved without interrupting the process signal.

The HART protocol allows the capability of multi-dropping, i.e., networking several devices to a single communications line. This process is well suited for monitoring remote applications such as pipelines, custody transfer sites, and tank farms. See table 7-2 for instructions on changing the printed wiring board DIP switch configuration to multi-drop.

Digital Valve Controller Operation

The DVC6000 Series digital valve controller housing contains the travel sensor, terminal box, pneumatic input and output connections and a module base that may be easily replaced in the field without disconnecting field wiring or tubing. This master module contains the following submodules: I/P converter, printed wiring board (pwb) assembly, and pneumatic relay. The module base can be rebuilt by replacing the submodules. See figures A-3 and A-4.

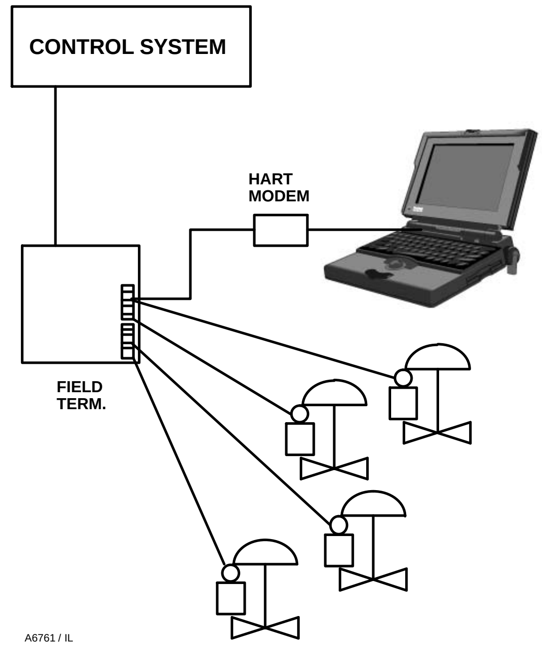


Figure A-2. Typical FIELDVUE Instrument to Personal Computer Connections for ValveLink Software

Process Applications

DVC6000 Series digital valve controllers are loop-powered instruments that provide a control valve position proportional to an input signal from the control room. The following describes a double-acting DVC6010 digital valve controller mounted on a piston actuator.

The input signal is routed into the terminal box through a single twisted pair of wires and then to the printed wiring board assembly submodule where it is read by the microprocessor, processed by a digital algorithm, and converted into an analog I/P drive signal.

As the input signal increases, the drive signal to the I/P converter increases, increasing the I/P output pressure. The I/P output pressure is routed to the pneumatic relay submodule. The relay is also connected to supply pressure and amplifies the small pneumatic signal from the I/P converter. The relay accepts the amplified pneumatic signal and provides two output pressures. With increasing input (4 to 20 mA signal), the output A pressure always increases and the output B pressure decreases. The output A pressure is used for double-acting and single-acting direct applications. The output B pressure is used for

A

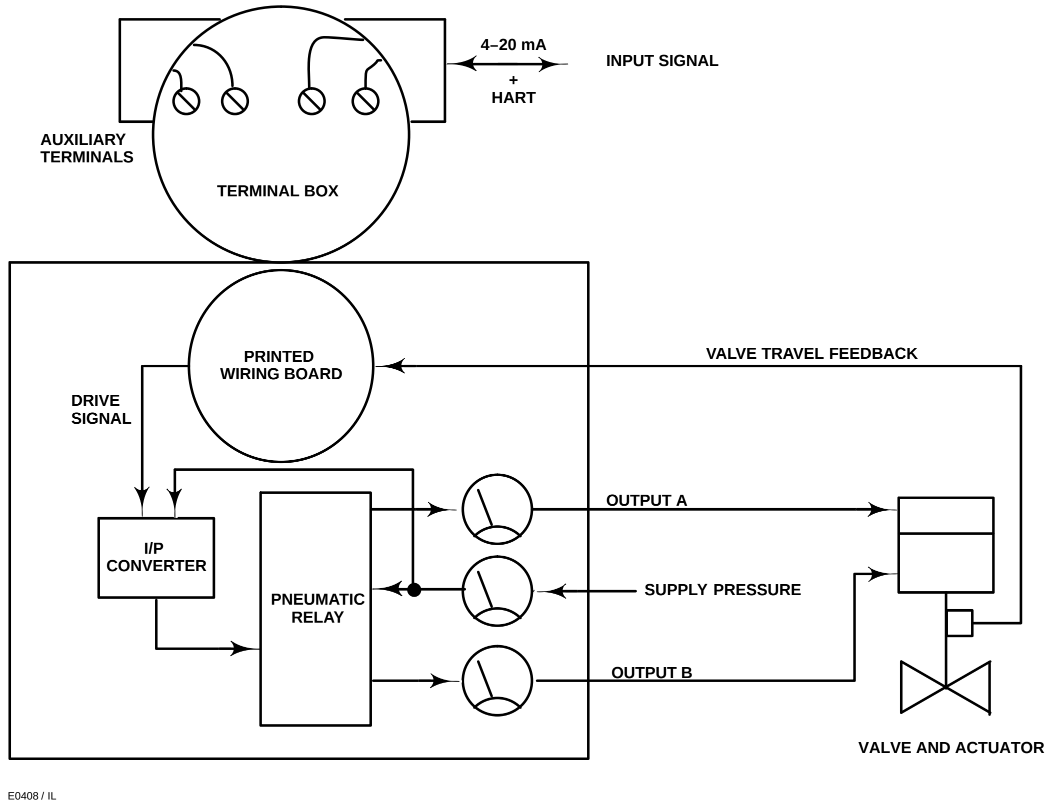


Figure A-3. FIELDVUE DVC6000 SIS Series Digital Valve Controller Block Diagram

A

double-acting and single-acting reverse applications. For single-acting actuators, unused ports can also be used to monitor the actuator pressure if any accessories are used in the output of the digital valve controller. As shown in figure A-3 the increased output A pressure causes the actuator stem to move downward. Stem position is sensed through the feedback linkage by the travel sensor which is electrically connected to the printed wiring board assembly submodule. The stem continues to move downward until the correct stem position is attained. At this point the printed wiring board assembly stabilizes the I/P drive signal. This positions the flapper to prevent any further increase in nozzle pressure.

As the input signal decreases, the drive signal to the I/P converter submodule decreases, decreasing the I/P output pressure. The pneumatic relay decreases the output A pressure and increases the output B pressure. The stem moves upward until the correct position is attained. At this point the printed wiring board assembly stabilizes the I/P drive signal. This positions the flapper to prevent any further decrease in nozzle pressure.

Safety Instrumented System Applications

The principle of operation of the DVC6000 SIS is the same for safety instrumented system applications as for process applications. However, when used in a safety instrumented system application the DVC6000 SIS can be configured for two output positions. Depending on relay action (direct or reverse) the DVC6000 SIS can be configured for full pneumatic output during normal operation and minimum output during trip condition, or vice versa.

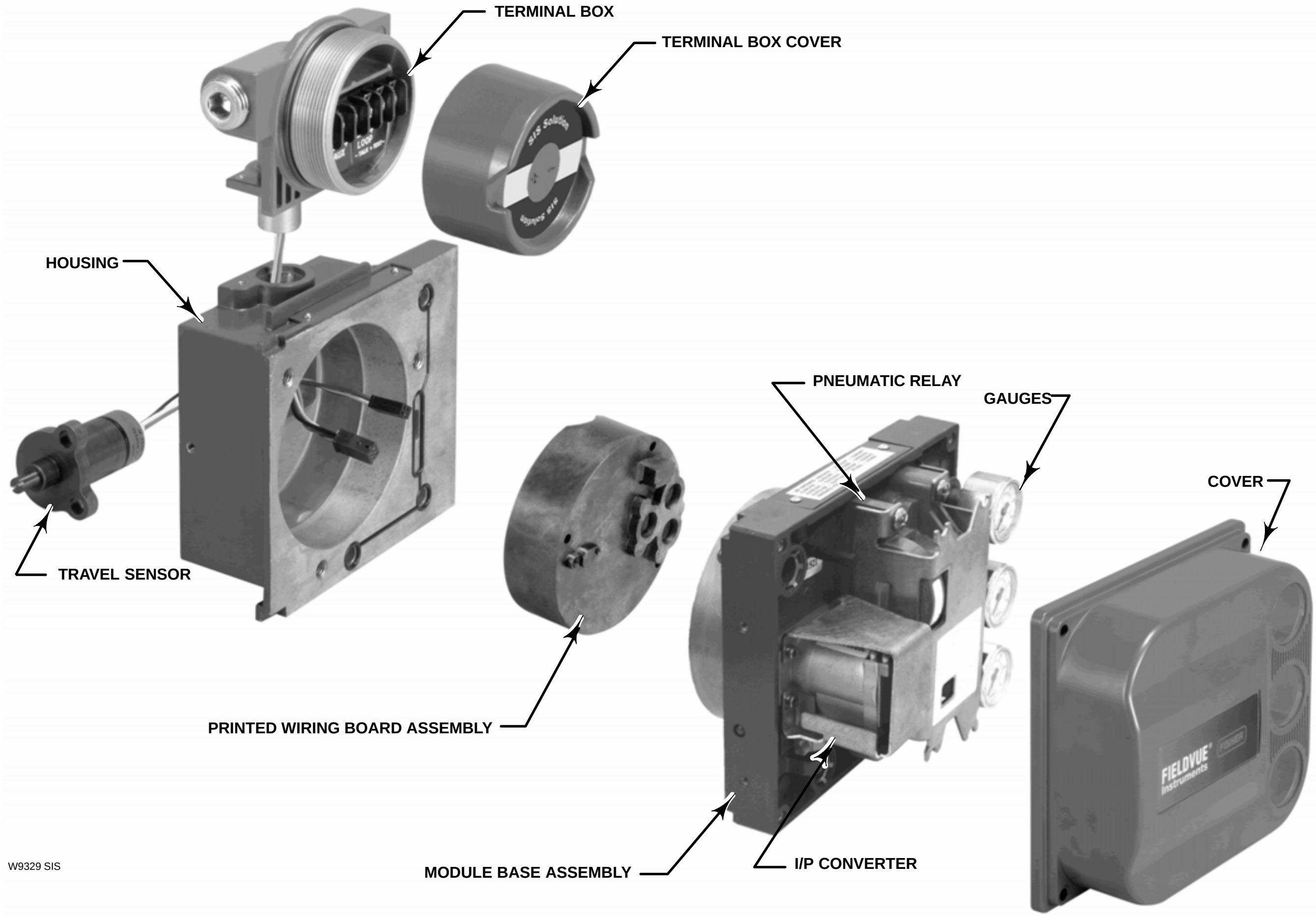


Figure A-4. FIELDVUE DVC6000 SIS Series Digital Valve Controller Assembly

Appendix B 375 Field Communicator Basics

B

Figure B-1. 375 Field Communicator

Note

The 375 Field Communicator device description revision (DD) determines how the Field Communicator interfaces with the instrument. For information on displaying the device description revision, see page B-5.

This section discusses the display, keypad, and menu structure for the Field Communicator, shown in figure B-1. It includes information for displaying the Field Communicator device description revision number. For information on connecting the Field Communicator to the instrument, see the Installation section. For more information on the Field Communicator, such as specifications and servicing, see the User's Manual for the Field Communicator 00375-0047-0001, included with the Field Communicator. This manual also is available from Rosemount Inc., Measurement Division.

Display

The Field Communicator communicates information to you through a 1/4 VGA (240 by 320 pixels) monochrome touch screen. It has a viewing area of approximately 9 cm by 12 cm.

Using the Keypad

On/Off Key

The on/off key is used to turn the Field Communicator on and off.

From the Main Menu, select HART Application to run the HART application. On startup, the HART Application automatically polls for devices.

If a HART-compatible device is found, the Field Communicator displays the Online menu. For more information on Online and Offline operation, see Menu Structure in this section.

The on/off key is disabled while any applications are open, making it necessary for you to exit the 375 Main Menu before using the on/off key. This feature helps to avoid situations where the Field Communicator could be unintentionally turned off while a device's output is fixed or when configuration data has not been sent to a device.

Navigation Keys

Four arrow navigation keys allow you to move through the menu structure of the application. Press the right arrow ( ) navigation key to navigate further into the menu.

Enter Key

The enter key allows you perform the highlighted item, or to complete an editing action. For example, if you highlight the Cancel button, and then push the enter key, you will cancel out of that particular window. The enter key does not navigate you through the menu structure.

Tab Key

The tab key allows you to move between selectable controls.

Alphanumeric Keys

Figure B-2 shows the alphanumeric keypad. Data entry, and other options, using letters, number and

Figure B-2. 375 Field Communicator Alphanumeric and Shift Keys

other characters can be performed using this keypad. The 375 Field Communicator will automatically determine the mode depending upon the input necessary for the particular field.

To enter text when in alphanumeric mode, press the desired keypad button in quick repetition to scroll through the options to attain the appropriate letter or number.

For example, to enter the letter “Z”, press the 9 key quickly four times.

The alphameric keys are also used for the Fast Key sequence. The Fast Key sequence is a sequence of numerical button presses, corresponding to the menu options that lead you to a given task. See the 375 Field Communicator Menu Structures at the beginning of this manual.

Backlight Adjustment Key 

The backlight adjustment key has four settings allowing you to adjust the intensity of the display. Higher intensities will shorten the battery life.

Function Key 

The function key allows you to enable the alternate functionality of select keys. The grey characters on the keys indicate the alternate functionality. When enabled, the orange multifunction LED light will appear and an indication button can be found on the soft input panel (SIP). Press the key again to disable the function key.

Multifunction LED

The multifunction LED indicates when the 375 Field Communicator is in various states. Green signifies that the Field Communicator is on, while flashing green indicates that it is in power saving mode. Green and orange indicate that the function key is enabled, and a green and orange flash indicates that the on/off button has been pressed long enough for the Field Communicator to power up.

Using the Touch Screen

The touch screen display allows you to select and enter text by touching the window.

Tap the window once to select a menu item or to activate a control. Double-tap to access the various options associated with the menu item.

CAUTION

The touch screen should be contacted by blunt items only. The preferred item is the stylus that is included with the 375 Field Communicator. The use of a sharp instrument can cause damage to the touch screen interface.

Use the back arrow button() to return to the previous menu. Use the terminate key () in the upper right corner of the touch screen to end the application.

B

Using the Soft Input Panel (SIP) Keyboard

As you move between menus, different dynamic buttons appear on the display. For example, in menus providing access to online help, the HELP button may appear on the display. In menus providing access to the Home menu, the HOME button may appear on the display. In many cases the SEND label appears indicating that you must select the button on the display to send the information you have entered on the keypad to the Fisher FIELDVUE instrument’s memory. Online menu options include:

- **Hot Key** »

Tap the Hot Key from any Online window to display the Hot Key menu. This menu allows you to quickly:

- Change the instrument mode
- Change the control mode
- Change the instrument protection
- Change tuning to improve response

The Hot Key can also be accessed by enabling the function key, and pressing the 3 key on the alphanumeric key pad.

For details on instrument mode, control mode, protection, tuning sets, and other configuration parameters, see the Detailed Setup section of this manual.

- **SCRATCHPAD** is a text editor that allows you to create, open, edit and save simple text (.txt) documents.

- **HELP**—gives you information regarding the display selection.

- **SEND**—sends the information you have entered to the instrument.

- **HOME**—takes you back to the Online menu.

- **EXIT**—takes you back to the menu from which you had requested the value of a variable that can only be read.

- **ABORT**—cancels your entry and takes you back to the menu from which you had selected the current variable or routine. Values are not changed.

- **OK**—takes you to the next menu or instruction screen.

- **ENTER**—sends the information you have selected to the instrument or flags the value that is to be sent to the instrument. If it is flagged to be sent, the SEND dynamic label appears as a function key selection.

- **ESC**—cancels your entry and takes you back to the menu from which you had selected the current variable or routine. Values are not changed.

- **SAVE**—saves information to the internal flash or the configuration expansion module.

Menu Structure

The Field Communicator is generally used in two environments: offline (when not connected to an instrument) and online (connected to an instrument).

Offline Operation

Selecting HART Application when not connected to a FIELDVUE instrument causes the Field Communicator to display the message “No device found at address 0. Poll?” Selecting “Yes” or “No” will bring you to the HART Application menu. Three choices are available from this screen: *Offline, Online* and *Utility.* The Offline menu allows you to create offline configurations, as well as view and change device configurations stored on the 375 Field Communicator. The Utility menu allows you to set the polling option, change the number of ignored status messages, view the available Device Descriptions, perform a simulation, and view HART diagnostics.

Saving Setup and Calibration Data

You can upload setup and calibration data from the DVC6000 Series digital valve controller and save it in the Field Communicator Internal Flash or a Configuration Expansion Module. From the *Offline* menu you can then download this data to multiple devices so that they all contain the same setup and calibration data. You can also edit the saved data.

You upload setup and calibration data from the *Online* menu. This requires that the Field Communicator be connected to a digital valve controller powered by a 4 to 20 mA source. To save data from any *Online* menu select the SAVE key. Follow the prompts on the Field Communicator to save the data to the Internal Flash or the Configuration EM and name the saved data. Once the data is saved, the SAVE key disappears until you change the data in the instrument.

Downloading the saved data requires that you first mark the configurable variables you wish to download (the default is all variables unmarked). To do this, from the *Offline* menu select *Saved Configuration*. Depending on the location of the saved data, select either *Internal Flash Contents* or *Configuration EM Contents*. Select the name for the saved data. From the *Saved Configuration* menu select *Edit*.

From the *Edit* menu you can mark all configurable variables for download, unmark all configurable variables so none are downloaded, edit each variable individually, or save your configuration to the internal flash or the optional configuration expansion module. The following briefly describes each item on the menu. For more information, see the User’s Manual for the 375 Field Communicator – 00375-0047-0001.

- *Mark All*—flags all configurable variables to be sent to a HART-compatible device. Configurable variables are those that appear when you edit variables in the configuration using the *Edit Individually* option.

- *Unmark All*—removes flags from all configurable variables in the configuration. Unmarked configurable variables are not sent to a connected HART-compatible device.

- *Edit Individually*—opens the Edit Individually menu to permit editing configurable variables in the saved data. For information on editing configurable variables, refer to the Field Communicator product manual.

- *Save As...*—saves your new configuration to the Internal Flash, or the Configuration EM. For more information on the Save As option, see the Field Communicator product manual.

Once the configurable variables are marked for download, return to the Saved Configuration menu and select *Save.* Follow the prompts on the Field Communicator to download the saved data to the instrument.

Polling

When several devices are connected in the same loop, such as for split ranging, each device must be assigned a unique polling address. Use the Polling options to configure the Field Communicator to automatically search for all or specific connected devices.

To enter a polling option, select *Utility* from the HART Application menu. Select *Configure HART Application*, and then select *Polling.* Tap ENTER to select the highlighted option.

The Polling options are:

1. **Never Poll**—connects to a device at address 0, and if not found will not poll for devices at addresses 1 through 15.

2. **Ask Before Polling**—connects to a device at address 0, and if not found asks if you want to poll for devices at addresses 1 through 15.

3. **Always Poll**—connects to a device at address 0, and if not found will automatically poll for devices at addresses 1 through 15.

4. **Digital Poll**—automatically polls for devices at address 0 through 15 and lists devices found by tag.

5. **Poll Using Tag**—asks for a device HART tag and then polls for that device.

6. **Poll Using Long Tag**—allows you to enter the long tag of the device. (Only supported in HART Universal revision 6 devices.)

To find individual device addresses, use the Digital Poll option to find each connected device in the loop and list them by tag.

For more information on setting the polling address, see the Detailed Setup section.

System Information

To access the Field Communicator system information, select *Settings* from the 375 Main Menu.

About 375 includes software information about your 375 Field Communicator.

Licensing can be viewed when you turn on the 375 Field Communicator and in the License settings menu. The license setting allows you to view the license on the System Card.

Memory settings consists of System Card, Internal Flash size, and Ram size, as well as the Expansion Module if installed. It allows you to view the total memory storage and available free space.

Reviewing Instrument Device Descriptions

The Field Communicator memory module contains device descriptions for specific HART-compatible devices. These descriptions make up the application software that the communicator needs to recognize particular devices.

To review the device descriptions programmed into your Field Communicator, select *Utility* from the HART Application menu, then select *Available Device Descriptions*. The manufacturers with device descriptions installed on the Field Communicator are listed.

Select the desired manufacturer to see the list of the currently installed device models, or types, provided by the selected manufacturer.

Select the desired instrument model or type to see the available device revisions that support that instrument.

Simulation

The Field Communicator provides a simulation mode that allows you to simulate an online connection to a HART-compatible device. The simulation mode is a training tool that enables you to become familiar with the various menus associated with a device without having the Field Communicator connected to the device.

To simulate an online connection, select *Utility* from the main menu. Select *Simulation* then select *Fisher Controls.* Select *DVC6000* to see the menu structure for the DVC6000 Series digital valve controller. Refer to the appropriate sections of this manual for information on the various menus.

Online Operation

The Online menu is the first to be displayed when connecting to a HART compatible device. It contains important information about the connected device.

The figures in the beginning of this manual show the DVC6000 SIS Series digital valve controller menu structures.

Displaying the Field Communicator Device Description Revision

Device Description (DD) Revision is the revision number of the Device Description that resides in the Field Communicator. It defines how the Field Communicator is to interact with the user and instrument.

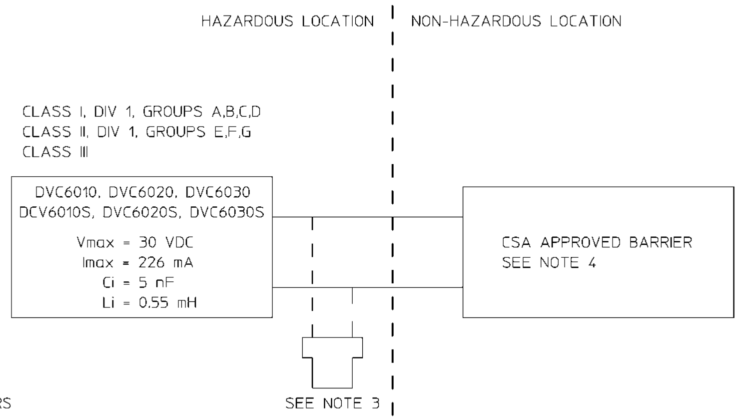
Field Communicators with device description revision 1 are used with DVC6000 SIS Series instruments with firmware revision 7. You can display the device description revision when the Field Communicator is Offline or Online:

Offline—To see the Field Communicator device description revision number, from the main menu, select *Utility, Simulation, Fisher Controls,* and *DVC6000*.

Online—To see the Field Communicator device description revision number, connect the Field Communicator to an instrument connected to a source supplying a 4-20 mA signal. From the *Online* menu, select *Device Variables, DD Information.*

Appendix C Loop Schematics/Nameplates

This section includes loop schematics required for wiring of intrinsically safe installations. It also contains the approvals nameplates. If you have any questions, contact your Emerson Process Management sales office.



NOTES:

1. BARRIERS MUST BE CSA APPROVED WITH ENTITY PARAMETERS AND ARE TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S I.S. INSTALLATION INSTRUCTIONS.
2. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC) PART 1.
3. IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE CSA APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING.
4. FOR ENTITY INSTALLATION: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La

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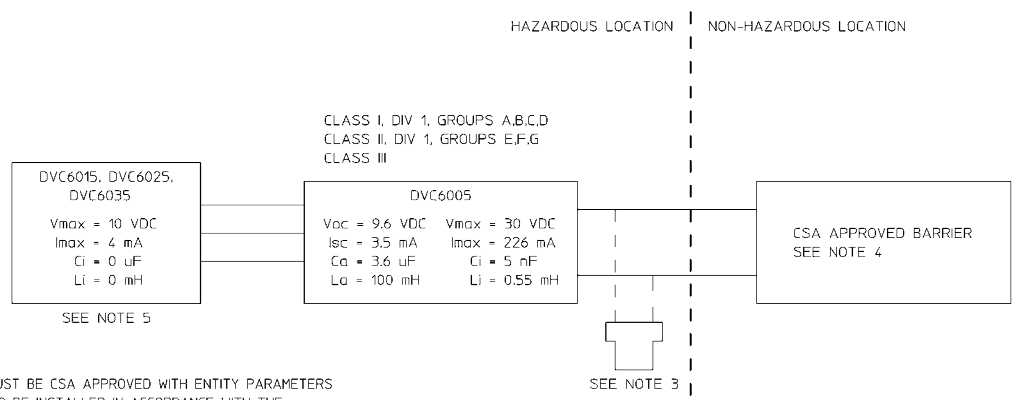
Figure C-1. CSA Schematic for FIELDVUE DVC6000 and DVC6000S SIS Digital Valve Controllers



NOTES:

1. BARRIERS MUST BE CSA APPROVED WITH ENTITY PARAMETERS AND ARE TO BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S I.S. INSTALLATION INSTRUCTIONS.
2. EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC) PART 1.
3. IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE CSA APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING.
4. FOR ENTITY INSTALLATION: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La
5. DVC6015, DVC6025, DVC6035 MAY BE CONNECTED TO DVC6005 OR OTHER CSA APPROVED EQUIPMENT WHEN THE FOLLOWING CONDITIONS ARE MET: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La

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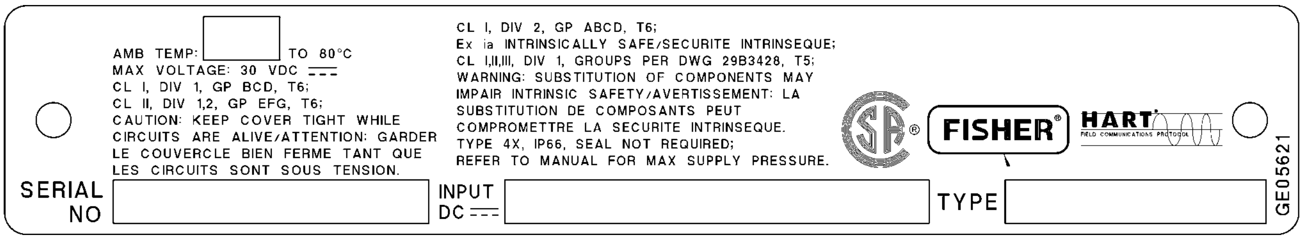
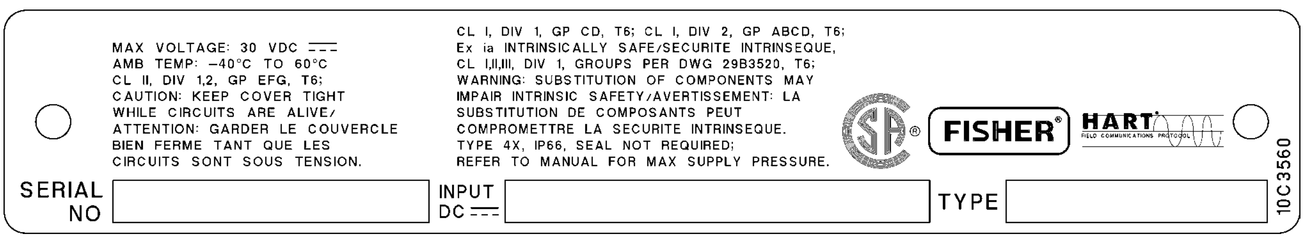
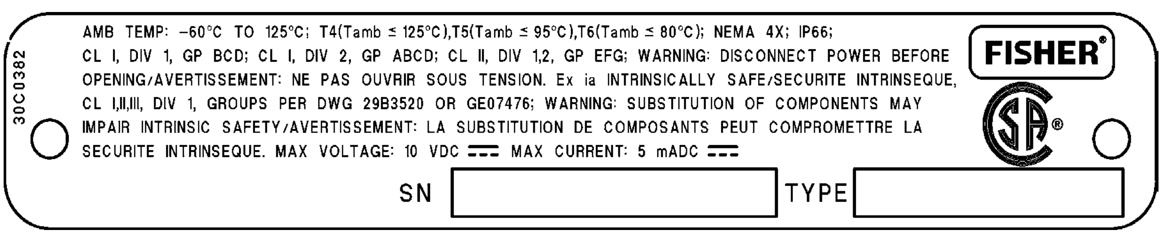
Figure C-2. CSA Schematic for FIELDVUE DVC6005 SIS Digital Valve Controllers



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6010S SIS, DVC6020S SIS, DVC6030S SIS



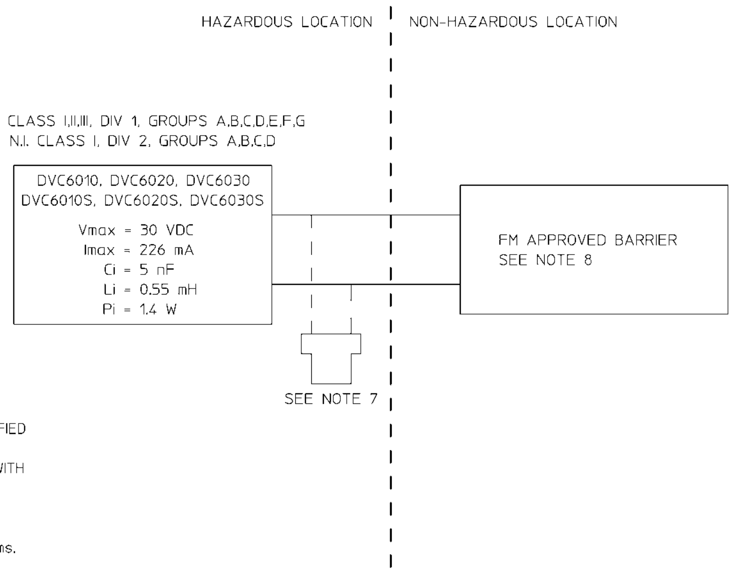
DVC6005 SIS



DVC6015, DVC6025, DVC6035

Figure C-3. CSA Nameplates

C

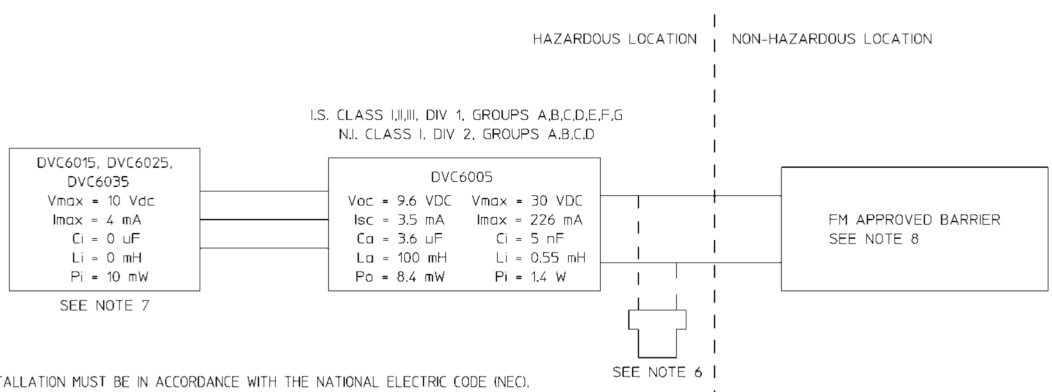


NOTES:

1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC), NFPA 70, ARTICLE 504 AND ANSI/ISA RP12.6.
2. CLASS 1, DIV 2 APPLICATIONS MUST BE INSTALLED AS SPECIFIED IN NEC ARTICLE 501-4(B). EQUIPMENT AND FIELD WIRING IS NON-INCENDIVE WHEN CONNECTED TO APPROVED BARRIERS WITH ENTITY PARAMETERS.
3. LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.
4. MAXIMUM SAFE AREA VOLTAGE SHOULD NOT EXCEED 250 Vrms.
5. RESISTANCE BETWEEN BARRIER GROUND AND EARTH GROUND MUST BE LESS THAN ONE OHM.
6. NORMAL OPERATING CONDITIONS 30 VDC 20 mADC.
7. IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE FM APPROVED AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING
8. FOR ENTITY INSTALLATION (I.S. AND N.I.):
   Vmax > Voc, or Vt   Ci + Ccable < Ca
   Imax > Isc, or It   Li + Lcable < La
   Pi > Po, or Pt

29B3427-B / DOC

Figure C-4. FM Schematic for FIELDVUE DVC6000 and DVC6000S SIS Digital Valve Controllers



NOTES:

1. THE INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC), NFPA 70, ARTICLE 504 AND ANSI/ISA RP12.6.
2. CLASS I, DIV 2 APPLICATIONS MUST BE INSTALLED AS SPECIFIED IN NEC ARTICLE 501-4(B). EQUIPMENT AND FIELD WIRING IS NON-INCENDIVE WHEN CONNECTED TO APPROVED BARRIERS WITH ENTITY PARAMETERS.
3. LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.
4. MAXIMUM SAFE AREA VOLTAGE SHOULD NOT EXCEED 250 Vrms.
5. RESISTANCE BETWEEN BARRIER GROUND AND EARTH GROUND MUST BE LESS THAN ONE OHM.
6. IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE FM APPROVED AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING
7. DVC6015, DVC6025, DVC6035 MAY BE CONNECTED TO DVC6005 OR OTHER FM APPROVED EQUIPMENT WHEN THE FOLLOWING CONDITIONS ARE MET: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La
8. FOR ENTITY INSTALLATION (I.S. AND N.I.):
   Vmax > Voc, or Vt   Ci + Ccable < Ca
   Imax > Isc, or It   Li + Lcable < La
   Pi > Po, or Pt

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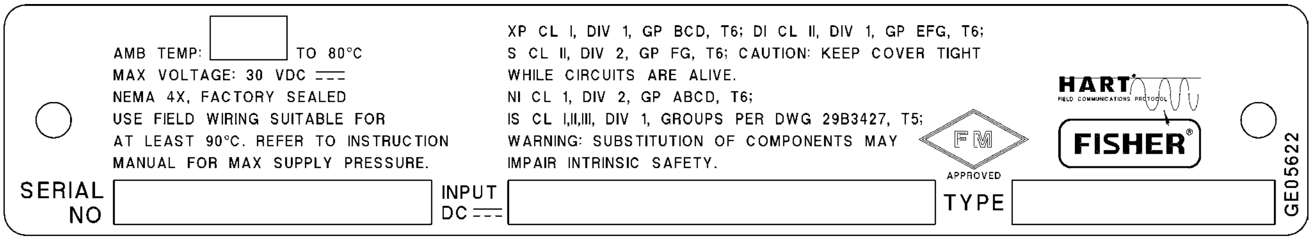
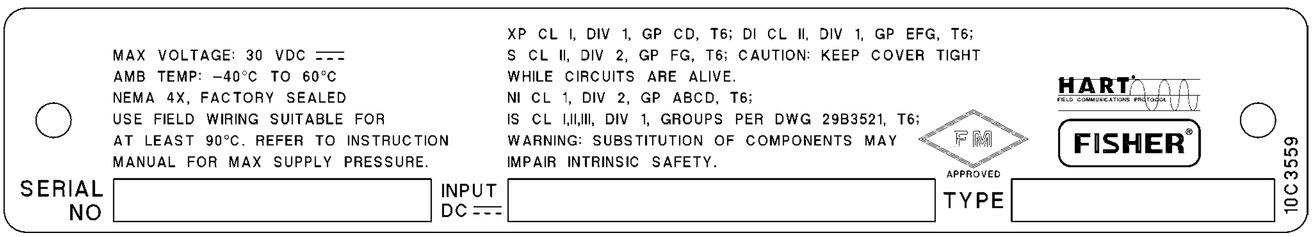
Figure C-5. FM Schematic for FIELDVUE DVC6005 SIS Digital Valve Controllers

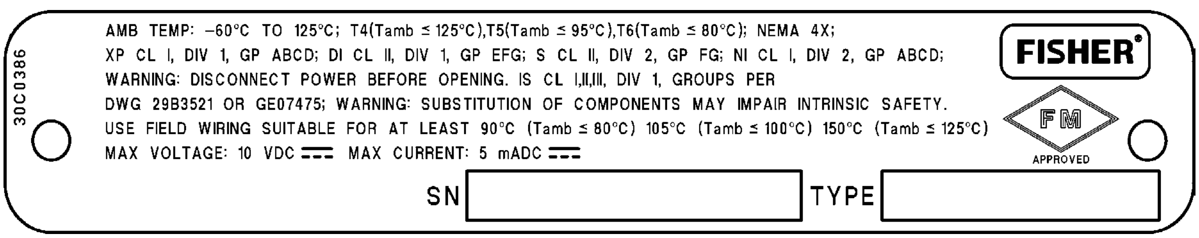
C



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6010S SIS, DVC6020S SIS, DVC6030S SIS



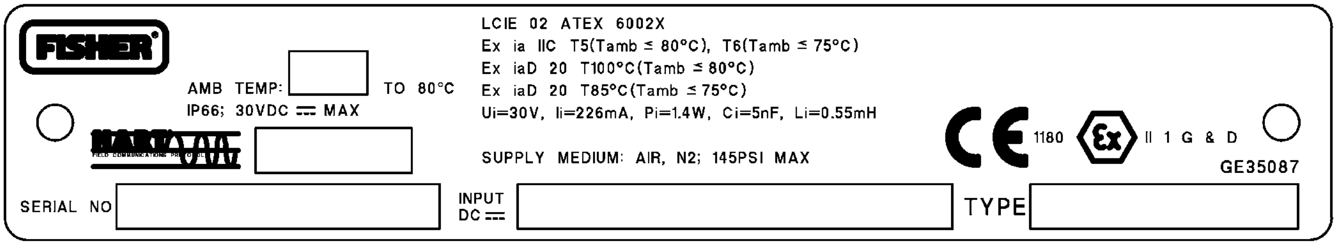
DVC6005 SIS



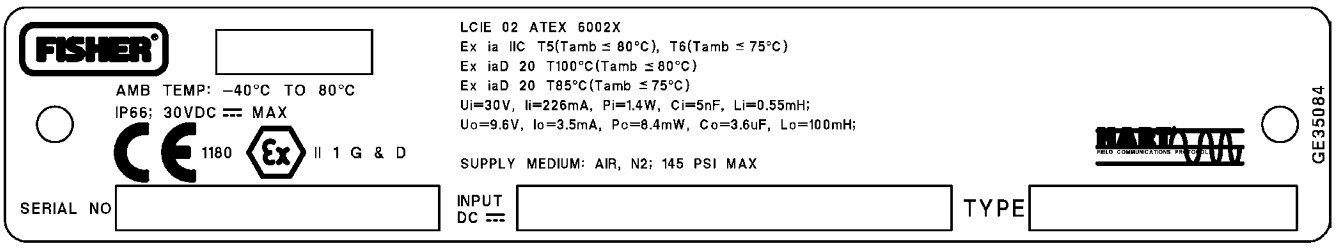
DVC6015, DVC6025, DVC6035

Figure C-6. FM Nameplates

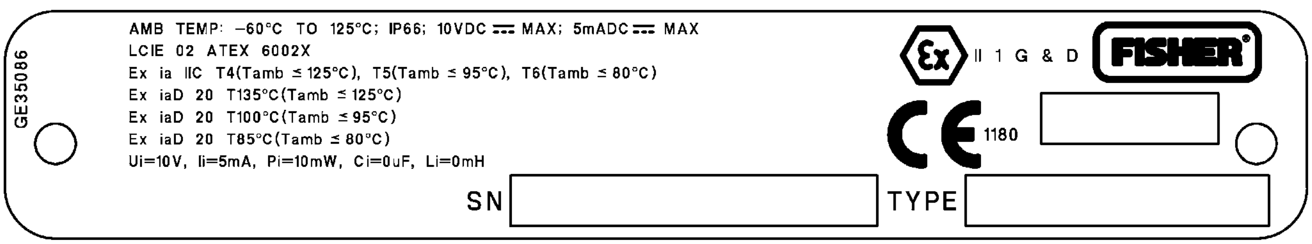
C



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6010S SIS, DVC6020S SIS, DVC6030S SIS



DVC6005 SIS



DVC6015, DVC6025, DVC6035

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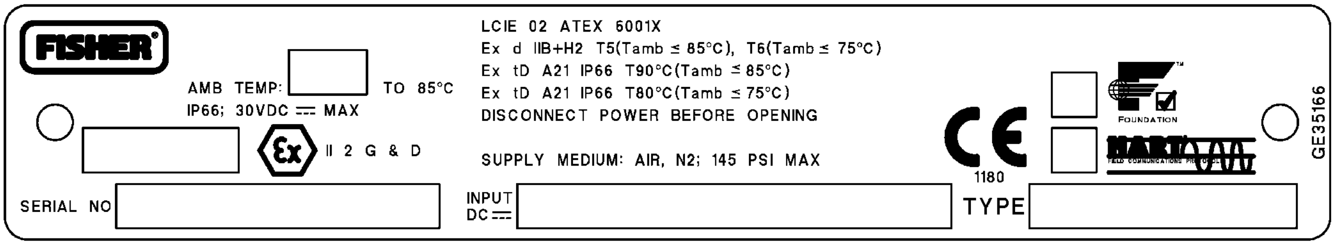
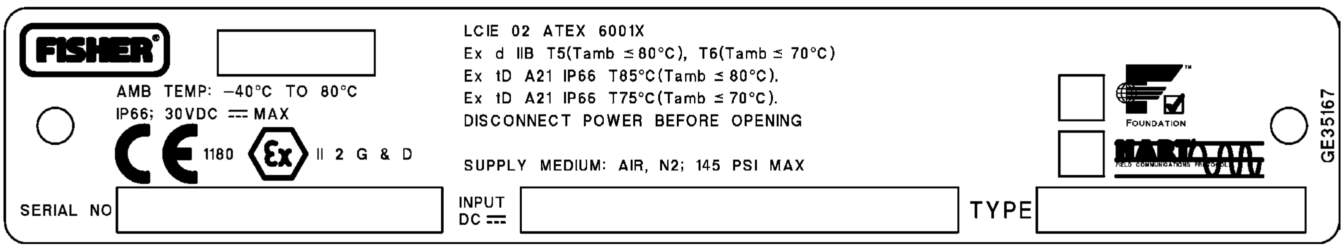
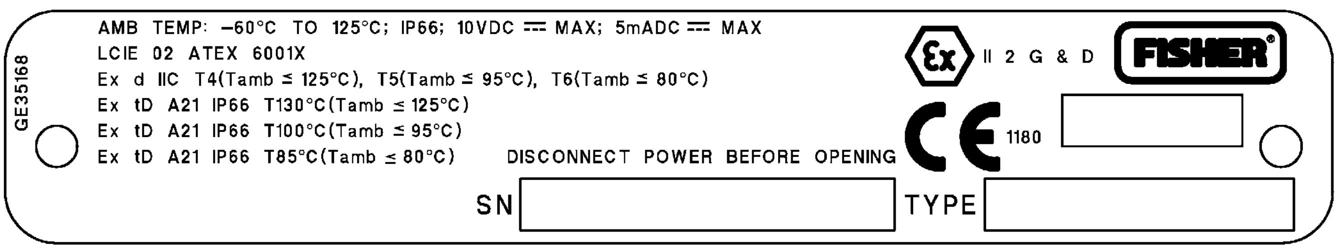
Figure C-7. ATEX Nameplates; Intrinsic Safety, Dust-Tight



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6010S SIS, DVC6020S SIS, DVC6030S SIS



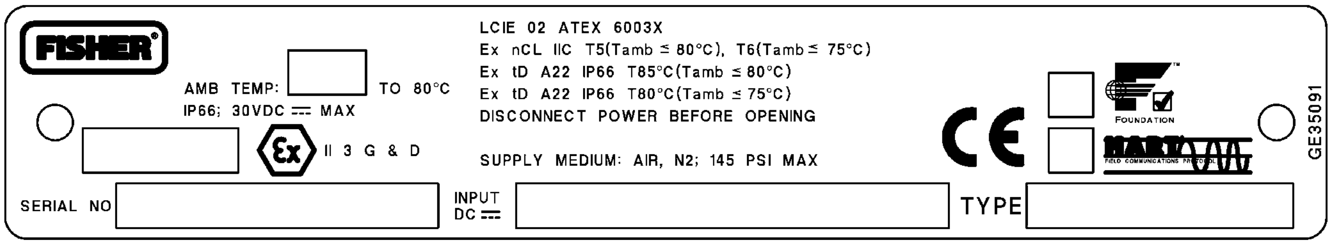
DVC6005 SIS



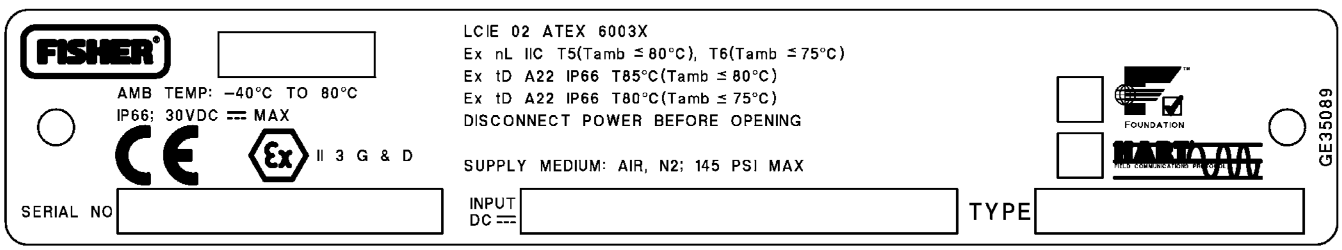
DVC6015, DVC6025, DVC6035

C

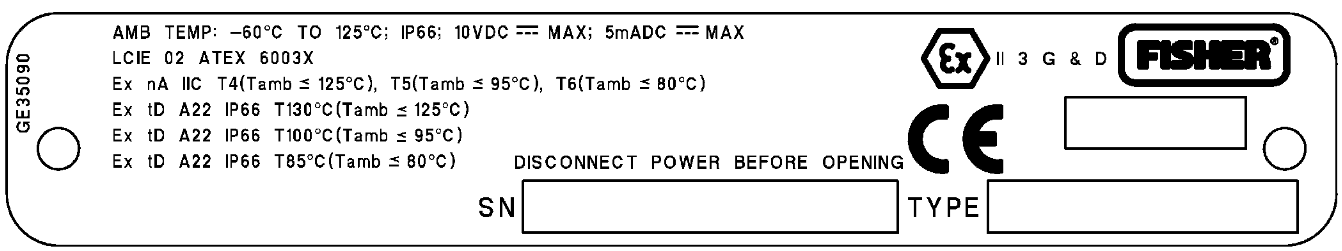
Figure C-8. ATEX Nameplates; Flameproof, Dust-Tight



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6010S SIS, DVC6020S SIS, DVC6030S SIS



DVC6005 SIS



DVC6015, DVC6025, DVC6035

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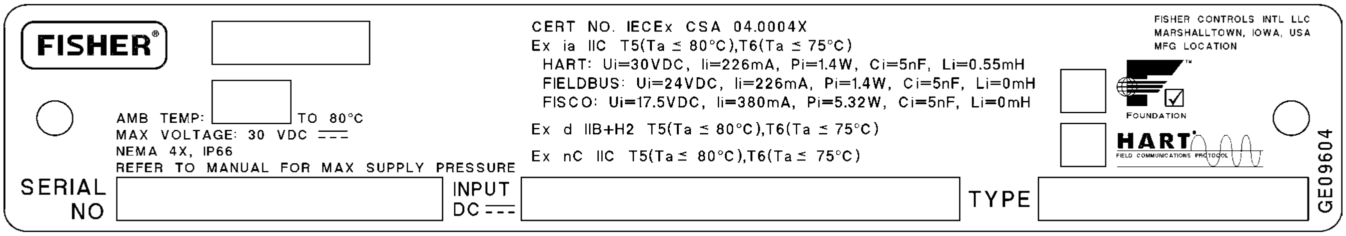
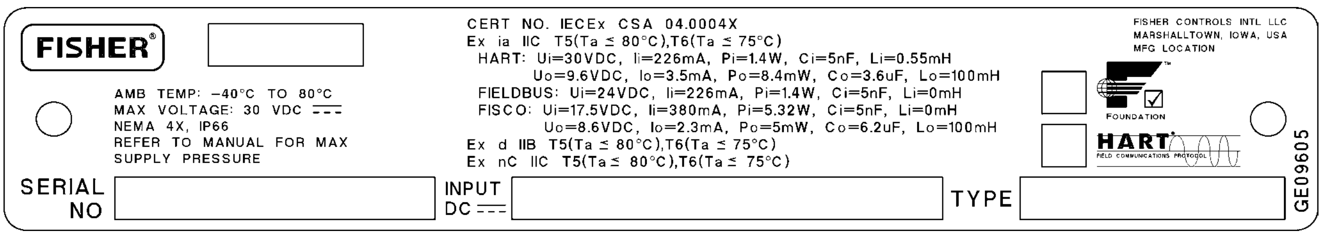
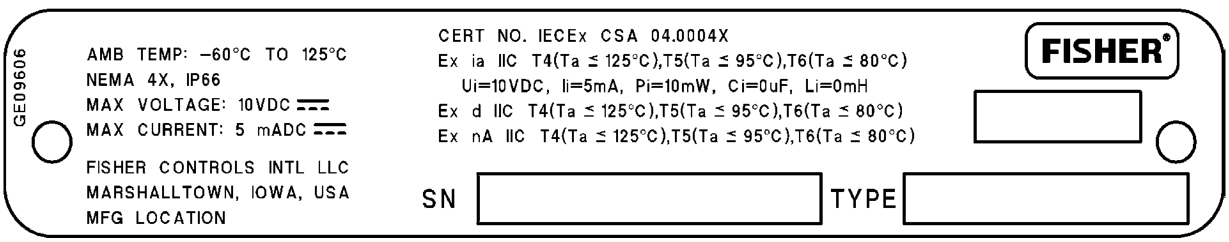
Figure C-9. ATEX Nameplates; Type n, Dust-Tight



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS, DVC6010S SIS, DVC6020S SIS, DVC6030S SIS

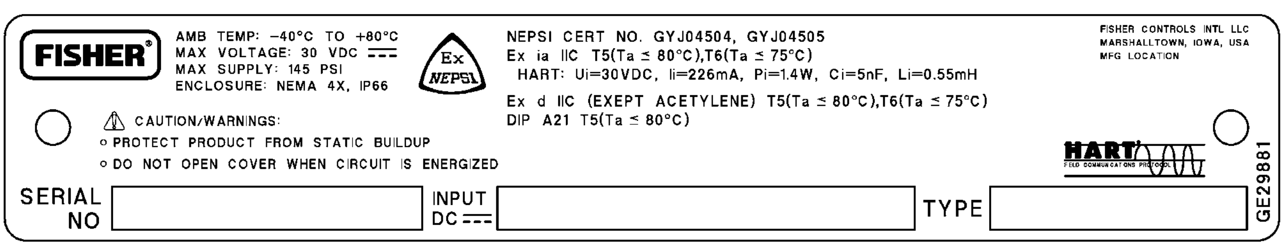


DVC6005 SIS



DVC6015, DVC6025, DVC6035

Figure C-10. IECEx Nameplates; Intrinsic Safety, Type n, Flameproof



DVC6010 SIS, DVC6020 SIS, DVC6030 SIS

Figure C-11. NEPSI Nameplate; Intrinsic Safety, Dust; Flameproof, Dust

C

C

Glossary

Alert Point
An adjustable value that, when exceeded, activates an alert.

Algorithm
A set of logical steps to solve a problem or accomplish a task. A computer program contains one or more algorithms.

Alphanumeric
Consisting of letters and numbers.

Analog Input Units
Units in which the analog input is displayed and maintained in the instrument.

ANSI (acronym)
The acronym ANSI stands for the American National Standards Institute

ANSI Class
Valve pressure/temperature rating.

Auto Test
The digital valve controller can be configured to automatically run the partial stroke test.

Auxiliary Input Alert
Checks the status of the auxiliary input; a discrete input. When enabled, the Auxiliary Input Alert is active when the auxiliary input terminals are open or closed (shorted), depending upon the selection for Auxiliary Input Alert State.

Auxiliary Terminal (Indicator)
Indicates whether auxiliary wiring terminals are open or closed (such as by an external switch contact).

Bench Set
Pressure, supplied to an actuator, required to drive the actuator through rated valve travel. Expressed in pounds per square inch.

Byte
A unit of binary digits (bits). A byte consists of eight bits.

Calibration Location
Where the instrument was last calibrated; either in the factory or in the field.

Configuration
Stored instructions and operating parameters for a FIELDVUE instrument.

Control Loop
An arrangement of physical and electronic components for process control. The electronic components of the loop continuously measure one or more aspects of the process, then alter those aspects as necessary to achieve a desired process condition. A simple control loop measures only one variable. More sophisticated control loops measure many variables and maintain specified relationships among those variables.

Control Mode
Defines where the instrument reads its set point. The following control modes are available for a FIELDVUE instrument:
Analog The instrument receives its travel set point over the 4-20 mA loop.
Digital The instrument receives its set point digitally, via the HART communications link.
Test This is not a user-selectable mode. The Field Communicator or AMS ValveLink Software places the instrument in this mode whenever it needs to move the valve, such as for calibration or diagnostic tests.

Control Mode, Restart
Determines the instrument control mode after a restart. See Control Mode for the available restart control modes.

Controller
A device that operates automatically to regulate a controlled variable.

Crossover Point
The point at which the feedback pin is closest to the axis of rotation of the travel sensor. A visual indication of the crossover point is found when the slot in the instrument feedback arm forms a 90-degree angle with the valve stem.

Current-to-Pressure (I/P) Converter
An electronic component or device that converts a milliamp signal to a proportional pneumatic pressure output signal.

Cycle Counter
The capability of a FIELDVUE instrument to record the number of times the travel changes direction. The change in direction must occur after the deadband has been exceeded before it can be counted as a cycle.

Cycle Counter Alert
Checks the difference between the Cycle Counter and the Cycle Counter Alert Point. Cycle Counter Alert is active when the cycle counter value exceeds the Cycle Counter Alert Point. It clears after you reset the Cycle Counter to a value less than the alert point.

Cycle Counter Alert Point
An adjustable value which, when exceeded, activates the Cycle Counter Alert. Valid entries are 0 to 4 billion cycles.

Cycle Counter Deadband
Region around the travel reference point, in percent of ranged travel, established at the last increment of the Cycle Counter. The deadband must be exceeded before a change in travel can be counted as a cycle. Valid entries are 0% to 100%. Typical value is between 2% and 5%.

Deviation
Usually, the difference between set point and process variable. More generally, any departure from a desired or expected value or pattern.

Device ID
Unique identifier embedded in the instrument at the factory.

Device Revision
Revision number of the interface software that permits communication between the Field Communicator and the instrument.

Drive Signal
The signal to the I/P converter from the printed wiring board. It is the percentage of the total microprocessor effort needed to drive the valve fully open.

Drive Signal Alert
Checks the drive signal and calibrated travel. If one of the following conditions exists for more than 20 seconds, the Drive Signal Alert is active. If none of the conditions exist, the alert is cleared.

If Zero Power Condition = Closed

The alert is active when:

drive signal <10% and calibrated travel >3%

drive signal >90% and calibrated travel <97%

If Zero Power Condition = Open

The alert is active when:

drive signal <10% and calibrated travel <97%

drive signal >90% and calibrated travel >3%

DVC Power Up
Defines the power up behavior of the DVC6000. Auto Reset allows the valve to track the command signal when power is applied to the device. Manual Reset will lock the device in its safety position until the digital valve controller is reset.

Equal Percentage
A valve flow characteristic where equal increments of valve stem travel produce equal percentage changes in existing flow. One of the input characteristics available for a FIELDVUE digital valve controller. See also, Linear and Quick Opening.

Feedback Arm
The mechanical connection between the valve stem linkage and the FIELDVUE digital valve controller travel sensor.

Feedback Connection
Identifies the type of feedback linkage: rotary, sliding-stem roller or sliding-stem standard.

Feedback Signal
Indicates to the instrument the actual position of the valve. The travel sensor provides the feedback signal to the instrument printed wiring board assembly. A mechanical linkage connects the travel sensor to the valve stem or shaft.

Firmware Revision
The revision number of the instrument firmware. Firmware is a program that is entered into the instrument at time of manufacture and cannot be changed by the user.

Free Time
Percent of time that the microprocessor is idle. A typical value is 25%. The actual value depends on the number of functions in the instrument that are enabled and on the amount of communication currently in progress.

Full Ranged Travel
Current, in mA, that corresponds with the point where ranged travel is maximum, i.e., limited by the mechanical travel stops.

Gain
The ratio of output change to input change.

Hardware Revision
Revision number of the instrument hardware. The physical components of the instrument are defined as the hardware.

HART (acronym)
The acronym HART stands for Highway Addressable Remote Transducer.

HART Tag
An eight-character name that identifies the physical instrument.

HART Universal Revision
Revision number of the HART Universal Commands which are the communications protocol for the instrument.

Input Characteristic
The relationship between the ranged travel and ranged input. Possible values include: linear, equal percentage, and quick opening.

Input Current
The current signal from the control system that serves as the analog input to the instrument. See also Input Signal.

Input Range
The analog input signal range that corresponds to the travel range.

Input Signal
The current signal from the control system. The input signal can be displayed in milliamperes or in percent of ranged input.

Instrument Level
Determines the functions available for the instrument.

Instrument Mode
Determines if the instrument responds to its analog input signal. There are two instrument modes:
In Service: For a fully functioning instrument, the instrument output changes in response to analog input changes. Typically changes to setup or calibration cannot be made when the instrument mode is In Service.
Out of Service: The instrument output does not change in response to analog input changes when the instrument mode is Out of Service. Some setup parameters can be changed only when the instrument mode is Out of Service.

Instrument Protection
Determines if commands from a HART device can calibrate and/or configure certain parameters in the instrument. There are two types of instrument protection:
Configuration and Calibration: Prohibits changing protected setup parameters; prohibits calibration.
None: Permits both configuration and calibration. The instrument is “unprotected.”

Instrument Serial Number
The serial number assigned to the printed wiring board by the factory but can be changed during setup. The instrument serial number should match the serial number on the instrument nameplate.

Leak Class
Defines the allowable leakage by a valve when it is closed. Leak class numbers are listed in two standards: ANSI/FCI 70-2 and IEC 534-4.

Linear
A valve flow characteristic where changes in flow rate are directly proportional to changes in valve stem travel. One of the input characteristics available for a FIELDVUE digital valve controller. See also, Equal Percentage and Quick Opening.

Linearity, dynamic
Linearity (independent) is the maximum deviation from a straight line best fit to the opening and closing curves and a line representing the average value of those curves.

Local Control Panel
The LCP100 local control panel is used with the FIELDVUE DVC6000 SIS digital valve controller. This panel is used to monitor and manually open and close a safety shutdown valve. The LCP100 also provides a manual reset feature and a button for initiating a partial stroke test.

Manual Reset
The DVC6000 Series digital valve controller in SIS applications can be configured to hold the trip state until a local reset button is pressed.

Memory
A type of semiconductor used for storing programs or data. FIELDVUE instruments use three types of memory: Random Access Memory (RAM), Read Only Memory (ROM), and Non-Volatile Memory (NVM). See also these listings in this glossary.

Menu
A list of programs, commands, or other activities that you select by using the arrow keys to highlight the item then pressing ENTER, or by entering the numeric value of the menu item.

Minimum Closing Time
Minimum time, in seconds, for the travel to decrease through the entire ranged travel. This rate is applied to any travel decrease. Valid entries are 0 to 400 seconds. Deactivate by entering a value of 0 seconds.

Minimum Opening Time
Minimum time, in seconds, for the travel to increase through the entire ranged travel. This rate is applied to any travel increase. Because of friction, actual valve travel may not respond in exactly the same time frame. Valid entries are 0 to 400 seconds. Deactivate by entering a value of 0 seconds.

Non-Volatile Memory (NVM)
A type of semiconductor memory that retains its contents even though power is disconnected. NVM contents can be changed during configuration unlike ROM which can be changed only at time of instrument manufacture. NVM stores configuration restart data.

Parallel
Simultaneous: said of data transmission on two or more channels at the same time.

Polling Address
Address of the instrument. If the digital valve controller is used in a point-to-point configuration, set the polling address to 0. If it is used in a multidrop configuration, or split range application, set the polling address to a value from 0 to 15.

Pressure Sensor
A FIELDVUE instrument internal device that senses pneumatic pressure. DVC6000 Series digital valve controllers have three pressure sensors: one to sense supply pressure and two to sense the output pressures.

Primary Master
Masters are communicating devices. A primary master is a communicating device permanently wired to a field instrument. Typically, a HART-compatible control system or a computer running AMS ValveLink Software is the primary master.

In contrast, a secondary master is not often permanently wired to a field instrument. The Model 375 Field Communicator or a computer running ValveLink software communicating through a HART modem could be considered a secondary master.

Note: If one type of master takes an instrument Out Of Service, the same type must put it In Service. For example, if a device set up as a primary master takes an instrument Out Of Service, a device set up as a primary master must be used to place the instrument In Service.

Quick Opening
A valve flow characteristic where most of the change in flow rate takes place for small amounts of stem travel from the closed position. The flow characteristic curve is basically linear through the first 40 percent of stem travel. One of the input characteristics available for a FIELDVUE digital valve controller. See also, Equal Percentage and Linear.

Random Access Memory (RAM)
A type of semiconductor memory that is normally used by the microprocessor during normal operation that permits rapid retrieval and storage of programs and data. See also Read Only Memory (ROM) and Non-Volatile Memory (NVM).

Rate
Amount of change in output proportional to the rate of change in input.

Read-Only Memory (ROM)
A memory in which information is stored at the time of instrument manufacture. You can examine but not change ROM contents.

Seat Load
Force exerted on the valve seat, typically expressed in pounds force per lineal inch of port circumference. Seat load is determined by shutoff requirements.

Set Point Filter Time
The time constant, in seconds, for the first-order input filter.

Software
Microprocessor or computer programs and routines that reside in alterable memory (usually RAM), as opposed to firmware, which consists of programs and routines that are programmed into memory (usually ROM) when the instrument is manufactured. Software can be manipulated during normal operation, firmware cannot.

Stroking Time
The time, in seconds, required to move the valve from its fully open position to fully closed, or vice versa.

Temperature Sensor
A device within the FIELDVUE instrument that measures the instrument's internal temperature.

Travel
Movement of the valve stem or shaft which changes the amount the valve is open or closed.

Travel Accumulator
The capability of a FIELDVUE instrument to record total change in travel. The value of the Travel Accumulator increments when the magnitude of the change exceeds the Travel Accumulator Deadband. To reset the Travel Accumulator, set it to zero.

Travel Accumulator Alert
Checks the difference between the Travel Accumulator value and the Travel Accumulator Alert Point. The Travel Accumulator Alert is active when the Travel Accumulator value exceeds the Travel Accumulator Alert Point. It clears after you reset the Travel Accumulator to a value less than the alert point.

Travel Accumulator Alert Point
An adjustable value which, when exceeded, activates the Travel Accumulator Alert. Valid entries are 0% to 4 billion %.

Travel Accumulator Deadband
Region around the travel reference point established at the last increment of the accumulator. This region must be exceeded before a change in travel can be accumulated. Valid entries are 0% to 100%.

Travel Alert
Checks the ranged travel against the travel high and low alert points. The travel alert is active if either the high or low point is exceeded. Once a high or low point is exceeded, the ranged travel must clear that point by the Travel Alert Deadband before the alert clears. Four travel alerts are available: Travel Alert Hi, Travel Alert Lo, Travel Alert Hi Hi, and Travel Alert Lo Lo.

Travel Alert Deadband
Travel, in percent of ranged travel, required to clear a travel alert, once it is active. Valid entries are −25% to 125%.

Travel Alert High Point
Value of the travel, in percent of ranged travel, which, when exceeded, sets the Travel Alert Hi alert. Valid entries are −25% to 125%.

Travel Alert High High Point
Value of the travel, in percent of ranged travel, which, when exceeded, sets the Travel Alert Hi Hi alert. Valid entries are −25% to 125%.

Travel Alert Low Point
Value of the travel, in percent of ranged travel, which, when exceeded, sets the Travel Alert Lo alert. Valid entries are −25% to 125%.

Travel Alert Low Low Point
Value of the travel, in percent of ranged travel, which, when exceeded, sets the Travel Alert Lo Lo alert. Valid entries are −25% to 125%.

Travel Cutoff
Defines the cutoff point for the travel, in percent of ranged travel. There are two travel cutoffs: high and low. Once travel exceeds the cutoff, the drive signal is set to either maximum or minimum, depending on the aero power condition and if the cutoff is high or low. Minimum opening time or minimum closing time are not in effect while the travel is beyond the cutoff. Use the travel cutoff to obtain the desired seat load or to be sure the valve is fully open.

Travel Deviation
The difference between the analog input signal (in percent of ranged input), the “target” travel, and the actual “ranged” travel.

Travel Deviation Alert
Checks the difference between the target and the ranged travel. If the difference exceeds the Travel Deviation Alert Point for more than the Travel Deviation Time, the Travel Deviation Alert is active. It remains active until the difference is less than the Travel Deviation Alert Point.

Travel Deviation Alert Point
An adjustable value for the target travel and the ranged travel difference, expressed in percent, When this value is exceeded by the travel deviation for more than the Travel Deviation Time, the Travel Deviation Alert is active. Valid entries are 0% to 100%. Typically this is set to 5%.

Travel Deviation Time
The time, in seconds. that the travel deviation must exceed the Travel Deviation Alert Point before the alert is active. Valid entries are 1 to 60 seconds.

Travel Limit
A setup parameter that defines the maximum allowable travel (in percent of ranged travel) for the valve. During operation, the travel target will not exceed this limit. There are two travel limits: high and low. Typically the travel limit low will be used to keep the valve from going completely closed.

Travel Range
Travel, in percent of calibrated travel, that corresponds to the input range.

Travel Sensor
A device within the FIELDVUE instrument that senses valve stem or shaft movement. The travel sensor is mechanically connected to the valve stem or shaft.

Travel Sensor Motion
Establishes motion of the travel sensor. While viewing the end of the travel sensor shaft, if increasing air pressure to the actuator causes the shaft to rotate clockwise, travel sensor motion is CW. If increasing air pressure causes the shaft to rotate counterclockwise, travel sensor motion is CCW.

Tuning
The adjustment of control terms or parameter values to produce a desired control effect.

Tuning Set
Preset values that identify gain settings for a FIELDVUE instrument. The tuning set and supply pressure together determine an instrument’s response to input signal changes.

Watch Dog Timer

A timer that the microprocessor must rearm periodically. If the microprocessor is unable to rearm the timer, the instrument goes through reset.

Zero Power Condition

The position of the valve when the power to the positioner is turned off. It is used to reference 0% travel. For Relay A and C, Port A will be at atmosphere pressure, and if double-acting, Port B will be at supply pressure. For Relay B, Port B will be at supply pressure.

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