Errata Sheet
for

The following Instruction Manuals and Quick Start Guides

Title	Form Number	Date	Page Number
FIELDVUE® DVC6000 Series Digital Valve Controller Instruction Manual	5647	May 2005	1−5
FIELDVUE® DVC6000 Series Digital Valve Controllers Quick Start Guide	5654	May 2005	4−1
FIELDVUE® DVC6000f Series Digital Valve Controller Instruction Manual	5774	March 01, 2005	1−5 and 1−6
FIELDVUE® DVC6000f Series Digital Valve Controllers Quick Start Guide	5778	April 2005	4−1 and 4−2

Please replace the Steady-State Air Consumption and the Maximum Ouput Capacity data found in the Specification table of each of the documents listed above with the following, updated data. Note that the footnotes currently associated with this data remain the same.

Steady-State Air Consumption

Standard Relay: *At 1.4 bar (20 psig) supply pressure:* Less than 0.38 normal m^3/hr (14 scfh)
At 5.5 bar (80 psig) supply pressure: Less than 1.3 normal m^3/hr (49 scfh)

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)

Maximum Output Capacity

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)

Note: 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

Note

Neither Emerson®, Emerson Process Management, Fisher®, 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.

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FIELDVUE® DVC6000 Series Digital Valve Controllers

This manual applies to:

DVC6000 Series			*Model 375 Field Communicator*	*Model 275 HART® Communicator*	
Device Revision	*Firmware Revision*	*Hardware Revision*	*Device Description Revision*	*Device Description Revision*	*Memory Module (Mb)*
1	*2, 3, 4, 5 & 6*	*1*	*4*	*4*	*4, 8 & 12*

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EMERSON Process Management

Model 375 Field Communicator Fast-Key Sequence (DVC6000 Series Instrument Level HC, AD and PD)

Function/Variable	Fast-Key Sequence	Coordinates[1]	Function/Variable	Fast-Key Sequence	Coordinates[1]
Actuator Style	1-2-5-3	4-E	Pressure, Output A	6-1	2-F
Alert Record	1-2-7-6	4-G	Pressure, Output A - Output B	6-3	2-F
Analog Input	2	1-E	Pressure, Output B	6-2	2-F
Analog Input Range High	1-2-4-2	4-D	Pressure, Supply	6-4	2-F
Analog Input Range Low	1-2-4-3	4-D	Pressure Units	1-2-4-4	4-D
Analog Input Units	1-2-4-1	4-D	Protection	Hot Key-3	1-B
Auto Setup	1-1-1	4-A	Raw Travel Input	1-3-1-6	5-H
Auxiliary Input	1-3-1-1	5-H	Relay Adjust	1-4-8	4-A
Auxiliary Input Alert Enable	1-2-7-5-2	6-G	Relay Type	1-2-5-1	4-E
Auxiliary Input Alert State	1-2-7-5-3	6-G	Restart	1-2-1-4	4-C
Auxiliary Terminal Mode	1-2-7-5-1	6-G	Restart Control Mode	1-2-1-3	4-C
Basic Setup	1-1	3-A	Self Test Shutdown	1-2-8	4-G
Burst	1-2-1-5	4-C	Set Point Filter Time	1-2-6-3	4-F
Calibrate	1-4	2-E	Setup Wizard	1-1-1-1	4-A
Calibrate, Analog Input	1-4-1	3-H	Stabilize/Optimize	Hot Key-4	1-B
Calibrate Travel (Auto)	1-4-2	3-H	Stroke Valve	1-5	3-I
Calibrate, Travel (Manual)	1-4-4	3-H	Supply Pressure Alert Point[2]	1-2-7-5-5	6-H
Calibrate, Pressure Sensors	1-4-5	3-H	Temperature, Internal	1-3-1-2	5-H
Calibration Location	1-4-7	3-H	Temperature Units	1-2-4-5	4-D
Calibration Restore	1-4-6	3-H	Travel	3	1-E
Control Mode	Hot Key-2	1-B	Travel Accumulator	1-2-7-3-4	6-F
Cycle Count	1-2-7-4-4	5-H	Travel Accumulator Alert Enable	1-2-7-3-1	6-F
Cycle Counter Alert Enable	1-2-7-4-1	6-G	Travel Accumulator Alert Point	1-2-7-3-2	6-F
Cycle Counter Alert Point	1-2-7-4-2	6-G	Travel Accumulator Deadband	1-2-7-3-3	6-F
Cycle Counter Deadband	1-2-7-4-3	6-G	Travel Alert Hi/Lo Enable	1-2-7-1-1	6-E
Date	1-2-3-4	4-C	Travel Alert High Point	1-2-7-1-3	6-E
Descriptor	1-2-3-3	4-C	Travel Alert Low Point	1-2-7-1-4	6-E
Device Description Revision, Field Communicator	1-3-3	3-H	Travel Alert HiHi/LoLo Enable	1-2-7-1-2	6-E
Device Information	1-3-2	5-I	Travel Alert High High Point	1-2-7-1-5	6-E
Drive Alert Enable	1-2-7-5-4	6-H	Travel Alert Low Low Point	1-2-7-1-6	6-E
Drive Signal	5	1-F	Travel Alert Deadband	1-2-7-1-7	6-E
Feedback Connection	1-2-5-4	4-E	Travel Cutoff High	1-2-6-4-3	6-D
HART Tag	1-2-3-1	4-C	Travel Cutoff Low	1-2-6-4-4	6-D
Input Characteristic	1-2-6-2	4-F	Travel Deviation Alert Enable	1-2-7-2-1	6-F
Instrument Level	1-3-2-5	5-I	Travel Deviation Alert Point	1-2-7-2-2	6-F
Instrument Mode	Hot Key-1	1-B	Travel Deviation Time	1-2-7-2-3	6-F
Instrument Serial Number	1-2-3-6	4-D	Travel Limit High	1-2-6-4-1	6-D
Instrument Status	7	1-F	Travel Limit Low	1-2-6-4-2	6-D
Integral Settings	1-2-6-6	6-D	Travel Sensor Adjust	1-4-9	3-I
Manual Setup	1-1-2	4-B	Travel Sensor Motion	1-2-5-5	4-E
Maximum Supply Pressure	1-2-5-2	4-E	Tuning Set	1-2-6-1	4-F
Message	1-2-3-2	4-C	Valve Serial Number	1-2-3-5	4-D
Minimum Closing Time	1-2-6-5-2	6-D	Valve Set Point	4	1-F
Minimum Opening Time	1-2-6-5-1	6-D	Valve Style	1-2-5-6	4-E
Performance Tuner[2]	1-1-1-5	4-A	Zero Control Signal	1-2-5-7	4-E
Polling Address	1-2-3-7	4-D			

1. Coordinates are to help locate the item on the menu structure on the following page.
2. Not available in the HC tier.

Model 375 Field Communicator Menu Structure for FIELDVUE® DVC6000 Instrument Level HC, AD & PD

Hot Key
1 Instrument Mode
2 Control Mode
3 Protection
4 Stabilize/Optimize

Online
1 Setup & Diag
2 Analog In
3 Travel
4 Valve SP
5 Drive Sgl
6 Pressures
7 Instrument Status

1 Setup & Diag
1 Basic Setup
2 Detailed Setup
3 Display
4 Calibrate
5 Stroke Valve

6 Pressures
1 Output A
2 Output B
3 A-B
4 Supply

7 Instrument Status
1 Done
2 Valve Alerts
3 Failure Alerts
4 Alert Record
5 Operational Status

Field Communicator
1 Offline
2 Online
3 Frequency Device
4 Utility

1-1 Basic Setup
1 Auto Setup
2 Manual Setup

1-1-1 Auto Setup
1 Setup Wizard
2 Relay Adjust
3 Auto Calib Travel
4 Stabilize/Optimize
5 Performance Tuner(2)

1-1-2 Manual Setup
1 Instrument Mode
2 Control Mode
3 Press & Actuator
4 Tuning & Calib

1-1-2-3 Press & Actuator
1 Pressure Units
2 Max Supply Press
3 Actuator Style
4 Feedbck Connection
5 Tvl Sensor Motion
6 Valve Style
7 Zero Ctrl Signal

1-1-2-4 Tuning & Calib
1 Tuning Set
2 Tvl Cutoff Low
3 Relay Adjust
4 Auto Calib Travel

1-2 Detailed Setup
1 Mode
2 Protection
3 General
4 Measured Var
5 Actuator & Valve
6 Response Control
7 Alerts
8 Self Test Shutdown

1-2-1 Mode
1 Instrument Mode
2 Control Mode
3 Restart Ctrl Mode
4 Restart
5 Burst

1-2-1-5 Burst
1 Burst Enable
2 Burst Command
3 Select Cmd 3 Press

1-2-3 General
1 HART Tag
2 Message
3 Descriptor
4 Date
5 Valve Serial Num
6 Inst Serial Num
7 Polling Address

1-2-4 Measured Var
1 Analg Input Units
2 Analog In Range Hi
3 Analog In Range Lo
4 Pressure Units
5 Temp Units

1-2-5 Actuator & Valve
1 Relay Type
2 Max Supply Press
3 Actuator Style
4 Feedbck Connection
5 Tvl Sensor Motion
6 Valve Style
7 Zero Ctrl Signal

1-2-6 Response Control
1 Tuning Set
2 Input Char
3 Set Pt Filter Time
4 Limits & Cutoffs
5 Min Open/Close
6 Integral Settings

1-2-6-2 Input Char
1 Select Input Char
2 Define Custom Char

1-2-6-4 Limits & Cutoffs
1 Tvl Limit High
2 Tvl Limit Low
3 Tvl Cutoff High
4 Tvl Cutoff Low

1-2-6-5 Min Open/Close
1 Min Opening Time
2 Min Closing Time

1-2-6-6 Integral Settings
1 Enab Int Settings
2 Integral Gain
3 Integral Dead Zone

1-2-7 Alerts
1 Travel Alerts
2 Travel Dev Alert
3 Travel Accum Alert
4 Cycle Count Alert
5 Other Alerts
6 Alert Record

1-2-7-1 Travel Alerts
1 Tvl Hi/Lo Enab
2 Tvl HH/LL Enab
3 Tvl Alert Hi Pt
4 Tvl Alert Lo Pt
5 Tvl Alert Hi Hi Pt
6 Tvl Alert Lo Lo Pt
7 Tvl Alrt DB

1-2-7-2 Travel Dev Alert
1 Tvl Dev Alrt Enab
2 Tvl Dev Alrt Pt
3 Tvl Dev Time

1-2-7-3 Travel Accum Alert
1 Tvl Acum Alrt Enab
2 Tvl Acum Alrt Pt
3 Tvl Acum DB
4 Tvl Acum

1-2-7-4 Cycle Count Alert
1 Cycl Cnt Alrt Enab
2 Cycl Count Alrt Pt
3 Cycl Count DB
4 Cycl Count

1-2-7-5 Other Alerts
1 Aux Terminal Mode
2 Aux In Alrt Enab
3 Aux In Alrt State
4 Drive Alrt Enab
5 Supply Press Alrt Pt(2)

1-2-7-6 Alert Record
1 Display Record
2 Clear Record
3 Inst Date & Time
4 Record Group Enab

1-2-8 Self Test Shutdown
1 Done
2 Flash ROM Fail
3 No Free Time
4 Ref Voltage Fail
5 Drive Current Fail
6 Critical NVM Fail
7 Temp Sensor Fail
8 Press Sensor Fail
9 Tvl Sensor Fail

1-3 Display
1 Variables
2 Device Information
3 375 DD Rev

1-3-1 Variables
1 Aux Input
2 Temp
3 Cycl Count
4 Tvl Acum
5 Free Time
6 Raw Tvl Input

1-3-2 Device Information
1 HART Univ Rev
2 Device Rev
3 Firmware Rev
4 Hardware Rev
5 Inst Level
6 Device ID

1-4 Calibrate
1 Analog In Calib
2 Auto Calib Travel
3 Man Calib Travel
4 Pressure Calib
5 Restore Calib
6 Calib Loc
7 Relay Adjust
8 Tvl Sensor Adjust
9 Performance Tuner(2)

1-4-3 Man Calib Travel
1 Analog Adjust
2 Digital Adjust

1-4-4 Pressure Calib
1 Output A Sensor
2 Output B Sensor
3 Supply Sensor(2)

1-5 Stroke Valve
1 Done
2 Ramp Open
3 Ramp Closed
4 Ramp to Target
5 Step to Target

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.
2. Not available in the HC tier.

A B C D E F G H I

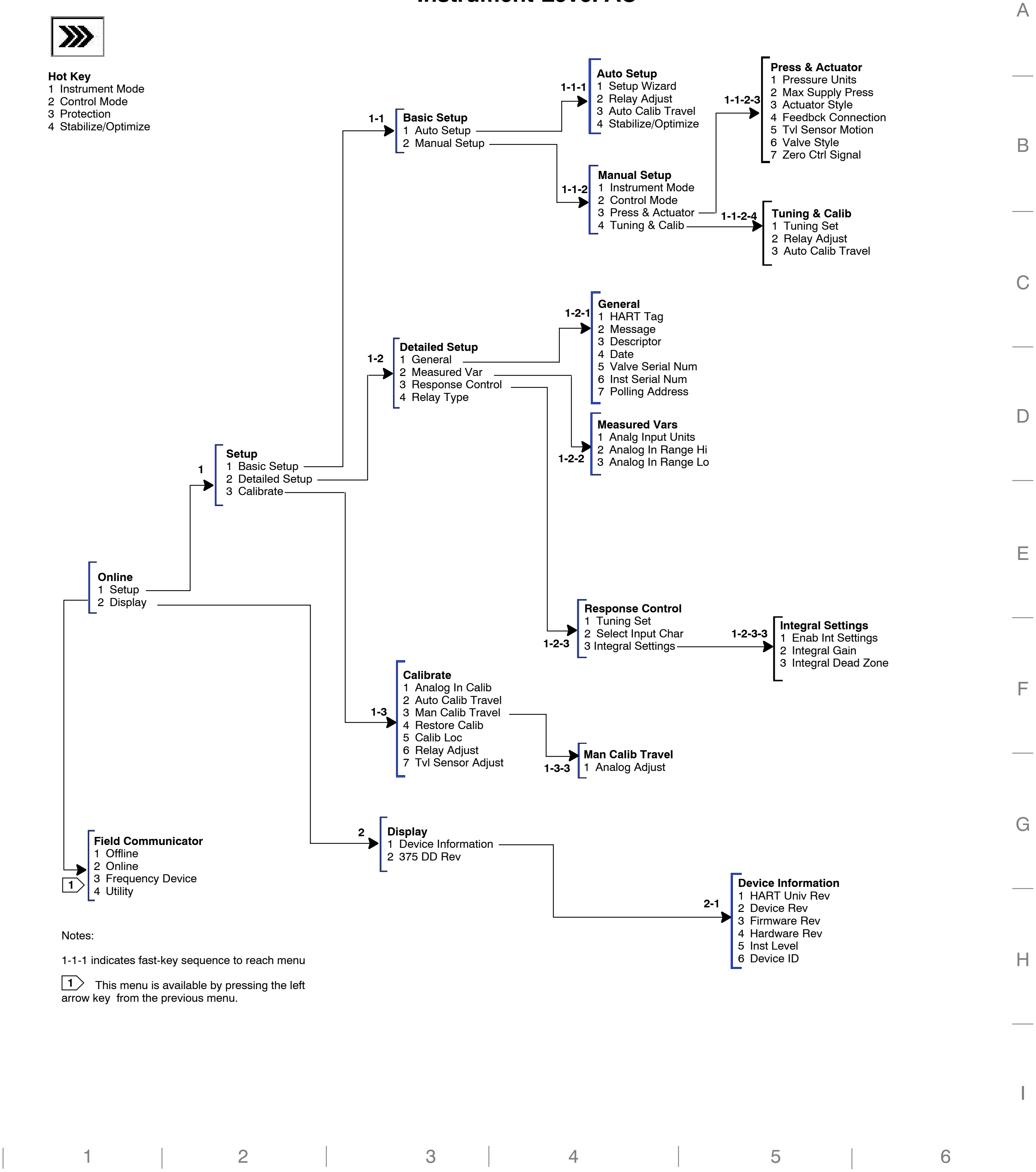
1 2 3 4 5 6

Model 375 Field Communicator Fast-Key Sequence (DVC6000 Series Instrument Level AC)

Function/Variable	Fast-Key Sequence	Coordi-nates(1)	Function/Variable	Fast-Key Sequence	Coordi-nates(1)
Analog Input Range High	1-2-2-2	4-D	Polling Address	1-2-1-7	4-D
Analog Input Range Low	1-2-2-3	4-D	Protection	Hot Key-3	1-B
Analog Input Units	1-2-2-1	4-D	Relay Adjust	1-3-6	4-B
Auto Setup	1-1-1	4-B	Relay Type	1-2-4	3-D
Basic Setup	1-1	3-B	Setup Wizard	1-1-1-1	4-B
Calibrate, Analog Input	1-3-1	3-F	Stabilize/Optimize	Hot Key-4	1-B
Calibrate Travel (Auto)	1-3-2	3-F	Travel Sensor Adjust	1-3-7	3-G
Calibrate, Travel (Manual)	1-3-3	3-F	Travel Sensor Motion	1-1-2-3-5	5-B
Calibration Location	1-3-5	3-F	Tuning Set	1-2-3-1	4-F
Calibration Restore	1-3-4	3-F	Valve Serial Number	1-2-1-5	4-D
Control Mode	Hot Key-2	1-B	Valve Style	1-1-2-3-6	5-B
Date	1-2-1-4	4-D	Zero Control Signal	1-1-2-3-7	5-B
Descriptor	1-2-1-3	4-D	Instrument Level	2-1-5	5-H
Device Description Revision, Field Communicator	2-2	5-G	Instrument Mode	Hot Key-1	1-B
Device Information	2-1	3-G	Instrument Serial Number	1-2-1-6	4-D
Feedback Connection	1-1-2-3-4	5-B	Integral Settings	1-2-3-3	5-F
HART Tag	1-2-1-1	4-C	Manual Setup	1-1-2	4-B
Input Characteristic	1-2-3-2	4-F	Message	1-2-1-2	4-C

1. Coordinates are to help locate the item on the menu structure on the following page.

Model 375 Field Communicator Menu Structure for FIELDVUE® DVC6000 Instrument Level AC



THE FIELDVUE® DVC6000 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 AMS VALVELINK® SOFTWARE, THE DVC6000 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 Series Digital Valve Controller

1

Section 1 Introduction

Table 1-1. DVC6000 Product Tier Capabilities

CAPABILITY	DIAGNOSTIC TIER LEVEL				
	AC	HC	AD	PD	SIS
Auto Calibration	X	X	X	X	X
Burst Communication		X	X	X	X
Custom Characterization	X	X	X	X	X
Alerts		X	X	X	X
Step Response, Drive Signal Test & Dynamic Error Band			X	X	X
Advanced Diagnostics (Valve Signature)			X	X	X
Performance Tuner			X	X	X
Performance Diagnostics				X	
SIS					X

Scope of Manual

This instruction manual includes specifications, installation, operating, and maintenance information for the FIELDVUE® DVC6000 Series digital valve controller with Firmware Revision 2, 3, 4, 5 and 6.

This instruction manual describes using the Model 375 Field Communicator with device description revision 4, used with Firmware Revision 2, 3, 4, 5 and 6 instruments, to setup and calibrate the instrument. You can also use AMS ValveLink® Software version 4.2 or higher to setup, calibrate, and diagnose the valve and instrument. For information on using the AMS ValveLink Software with the instrument, refer to the AMS ValveLink Software help or documentation.

No person may install, operate, or maintain a DVC6000 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 Fisher® sales office before proceeding.

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Figure 1-1. Sliding-Stem Control Valve with Type DVC6010 Digital Valve Controller

Note

Neither Emerson™, Emerson Process Management, Fisher, 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.

Conventions Used in this Manual

Procedures that require the use of the Model 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 *Auto Setup* menu, from the Online menu, press 1 (selects

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Figure 1-2. Rotary Control Valve with Type DVC6020 Digital Valve Controller

Setup & Diag) followed by a second 1 (selects *Basic Setup*) followed by a third 1 (selects *Auto Setup*). The key sequence in the procedure heading is shown as (1-1-1). 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 Model 375 Field Communicator menu structures are shown at the beginning of this manual.

Description

DVC6000 Series digital valve controllers (figures 1-1 and 1-2) are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the normal function of converting an input current signal to a pneumatic output pressure, the DVC6000 Series digital valve controller, using the HART® communications protocol, gives 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 a personal computer and AMS ValveLink Software, AMS Suite™: Intelligent Device Manager, or a Model 375 Field Communicator, you can perform several operations with the DVC6000 Series 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 each diagnostic tier.

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

The DVC6000 Series digital valve controller is designed to directly replace standard pneumatic and electro-pneumatic valve mounted positioners.

Specifications

Specifications for the DVC6000 Series 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.

WARNING

This product is intended for a specific range of application specifications. Incorrect configuration of a positioning instrument could result in the malfunction of the product, property damage or personal injury.

Related Documents

Other documents containing information related to the DVC6000 Series digital valve controllers include:

- FIELDVUE® DVC6000 Series Digital Valve Controller (Bulletin 62.1:DVC6000)

- FIELDVUE® DVC6000 Series Digital Valve Controllers for Safety Instrumented System (SIS) Solutions (Bulletin 62.1:DVC6000(SIS))

- FIELDVUE® Instrument Split Ranging (PS Sheet 62.1:FIELDVUE(C))

- FIELDVUE® Instrument Status Flags on Rosemount RS3 DCS (PS Sheet 62.1:FIELDVUE(D))

- Proportional Control Loop with FIELDVUE® Instruments (PS Sheet 62.1:FIELDVUE(E))

- Using Loop Tuners with FIELDVUE® Instruments (PS Sheet 62.1:FIELDVUE(F))

- Audio Monitor for HART® Communications (PS Sheet 62.1:FIELDVUE(G))

- Using the HART® Tri-Loop™ HART® -to-Analog Signal Converter with FIELDVUE® Instruments (PS Sheet 62.1:FIELDVUE(J))

- Using the FIELDVUE® Instruments with the Smart HART® Loop Interface and Monitor (HIM) (PS Sheet 62.1:FIELDVUE(L))

- FIELDVUE® HF300 Series HART® Filters Instruction Manual - Form 5715

- Type 2530H1 HART® Interchange Multiplexer Instruction Manual - Form 5407

- FIELDVUE® DVC6000 Series Digital Valve Controllers Quick Start Guide - Form 5654

- AMS ValveLink® Software Help or Documentation

Educational Services

For information on available courses for the DVC6000 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

Table 1-2. Specifications

Available Configurations

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

Remote-Mounted Instrument(1)

DVC6005: 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 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 to 20 mA dc, nominal
Minimum Voltage Available at instrument terminals must be 10.5 volts dc for analog control, 11 volts dc for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.5 mA
Maximum Voltage: 30 volts dc
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 to 30 volts dc at approximately 8 mA
Reverse Polarity Protection: No damage occurs from reversal of loop current.

Output Signal(2)

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

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 EC Directives.

Supply Pressure(2,5)

Recommended: 0.3 bar (5 psi) higher than maximum actuator requirements, up to maximum supply pressure
Maximum: 10 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Steady-State Air Consumption(3)

Standard Relay:
Supply Pressure: At 1.4 bar (20 psig) / Temperature: 70°F
Consumption: Less than 0.38 m^3/hr (14 cfh)

Supply Pressure: At 5.5 bar (80 psig) / Temperature: 70°F
Consumption: Less than 1.4 m^3/hr (49 cfh)

Low Bleed Relay(6):
Supply Pressure: At 1.4 bar (20 psig) / Temperature: 70°F
Consumption: Average value 0.056 m^3/hr (2.1 cfh)

Supply Pressure: At 5.5 bar (80 psig) / Temperature: 70°F
Consumption: Average value 0.184 m^3/hr (6.9 cfh)

Maximum Output Capacity(3)

Supply Pressure: At 1.4 bar (20 psig) / Temperature: 70°F
Capacity: 10.6 m^3/hr (375 cfh)

Supply Pressure: At 5.5 bar (80 psig) / Temperature: 70°F
Capacity: 31.1 m^3/hr (1100 cfh)

Independent Linearity(2,4)

±0.5% of output span

Electromagnetic Interference (EMI)

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

- continued -

Table 1-2. Specifications (continued)

Operating Ambient Temperature Limits(5)

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

See the Hazardous Area Classification bulletins for specific ambient temperature limits of units approved for operation in hazardous areas.

Humidity Limits

0 to 100% condensing relative humidity

Electrical Classification

Hazardous Area:

CSA: Explosion proof, Division 2, Dust-Ignition proof, Intrinsically Safe

FM APPROVED: Explosion proof, Non-incendive, Dust-Ignition proof, Intrinsically Safe

ATEX: Flameproof, Type n, Intrinsically Safe

IECEx: Flameproof, Type n, Intrinsically Safe

Refer to tables 1-4, 1-5, 1-6 and 1-7, and figures 12-1, 12-2 12-3, 12-4, 12-5, 12-6, 12-7, 12-8, 12-9 and 12-10 for specific approval information, and Hazardous Area Classification Bulletins 9.2:001 Series and 9.2:002 for additional 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

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-inch NPT female and integral pad for mounting 67CFR regulator
Output Pressure: 1/4-inch NPT female
Tubing: 3/8-inch metal, recommended
Vent: 3/8-inch NPT female
Electrical: 1/2-inch NPT female conduit connection,
optional—M20 female conduit connection, spring clamp terminal connection(7)

Stem Travel

DVC6010, DVC6015: 0 to 102 mm (4-inches) maximum travel span
0 to 9.5 mm (0.375 inches) minimum travel span

DVC6020, DVC6025: 0 to 606 mm (23.875 inches) maximum travel span

Shaft Rotation (DVC6020, DVC6025, DVC6030 and DVC6035)

0 to 50 degrees minimum
0 to 90 degrees maximum

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: 7.7 kg (17 lbs)

Remote-Mounted Instruments
DVC6005 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 (valve-mounted instruments only) ■ Low Bleed Relay

1. 3-conductor shielded cable, 22 AWG minimum wire size, is recommended 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. Defined in ISA Standard S51.1.
3. 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.
4. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also, not applicable to Type DVC6020 digital valve controllers in long-stroke applications.
5. The pressure/temperature limits in this manual and any applicable code or standard should not be exceeded.
6. The Low Bleed Relay is offered as standard relay for DVC6000 SIS tier, used for On/Off applications.
7. ATEX/IEC approvals only.

Table 1-3. Immunity Performance

Port	Phenomenon	Basic Standard	Performance Criteria[1]	
			Point-to-Point Mode	Multi-drop Mode
Enclosure	Electrostatic discharge (ESD)	IEC 61000-4-2	A[2]	A
	Radiated EM field	IEC 61000-4-3	A	A
	Rated power frequency magnetic field	IEC 61000-4-8	A	A
I/O signal/control	Burst	IEC 61000-4-4	A[2]	A
	Surge	IEC 61000-4-5	A[2]	A
	Conducted RF	IEC 61000-4-6	A	A

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. Type DVC6000 Series, Hazardous Area Classifications for North America—Canada

CERTIFICATION BODY	Type / Model	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

Table 1-5. Type DVC6000 Series, Hazardous Area Classifications for North America—United States

CERTIFICATION BODY	Type / Model	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($T_{amb} \leq$ 80°C)	4X
		(Explosion Proof) Class/Division •Class I, Division 1 GP B,C,D	- - -		T6($T_{amb} \leq$ 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($T_{amb} \leq$ 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($T_{amb} \leq$ 60°C)	4X
		(Explosion Proof) Class/Division •Class I, Division 1 GP C,D	- - -		T6($T_{amb} \leq$ 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($T_{amb} \leq$ 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($T_{amb} \leq$ 125°C) T5($T_{amb} \leq$ 95°C) T6($T_{amb} \leq$ 80°C)	4X
		(Explosion Proof) Class/Division •Class I, Division 1 GP A,B,C,D	- - -		T4($T_{amb} \leq$ 125°C) T5($T_{amb} \leq$ 95°C) T6(Tamb ≤ 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($T_{amb} \leq$ 125°C) T5($T_{amb} \leq$ 95°C) T6($T_{amb} \leq$ 80°C)	4X

Table 1-6. Type DVC6000 Series, Hazardous Area Classifications—Europe

CERTIFICATE (AGENCY)	Type / Model	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING
ATEX (LCIE)	DVC60x0 DVC60x0S (x = 1,2,3)	(Intrinsic Safety) ⟨Ex⟩ II 1 G D Gas •EEx ia IIC T5/T6 Dust •T85°C (Tamb ≤ 80°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
		(Flameproof) ⟨Ex⟩II 2 G D Gas •EEx d IIB+H2 T5/T6 Dust •T90°C (Tamb ≤ 85°C)	- - -		T5(T_{amb} ≤ 85°C) T6 (T_{amb} ≤ 75°C)	IP66
		(Type n) ⟨Ex⟩ II 3 G D Gas •EEx nCL IIC T5/T6 Dust •T85°C (Tamb ≤ 80°C)	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC6005	(Intrinsic Safety) ⟨Ex⟩ II 1 G D Gas •EEx ia IIC T5/T6 Dust •T85°C (Tamb ≤ 80°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
		(Flameproof) ⟨Ex⟩II 2 G D Gas •EEx d IIB T5/T6 Dust •T90°C (Tamb ≤ 80°C)	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 70°C)	IP66
		(Type n) ⟨Ex⟩ II 3 G D Gas •EEx nL IIC T5/T6 Dust •T85°C (Tamb ≤ 80°C)	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) ⟨Ex⟩II 1 G D Gas •EEx ia IIC T4/T5/T6 Dust •T130°C (Tamb ≤ 125°C)	U_i = 10 Vdc I_i = 4 mA C_i = 0 nF L_i = 0 mH P_i = 5 mW		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		(Flameproof) ⟨Ex⟩ II 2 G D Gas •EEx d IIC T4/T5/T6 Dust •T130°C (Tamb ≤ 125°C)	- - -		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		(Type n) ⟨Ex⟩II 3 G D Gas •EEx nA IIC T4/T5/T6 Dust •T130°C (Tamb ≤ 125°C)	- - -		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66

Table 1-7. Type DVC6000 Series, Hazardous Area Classifications—International

CERTIFICATE (AGENCY)	Type / Model	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING
IECEx (CSA)	DVC60x0 DVC60x0S (x = 1,2,3)	(Intrinsic Safety) Gas •Ex ia IIC T5/T6	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
		(Flameproof) Gas •Ex d IIB+H2 T5/T6	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		(Type n) Gas •Ex nC IIC T5/T6	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC6005	(Intrinsic Safety) Gas •Ex ia IIC T5/T6	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
		(Flameproof) Gas •Ex d IIB T5/T6	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		(Type n) Gas •Ex nC IIC T5/T6	- - -		T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Gas •Ex ia IIC T4/T5/T6	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
		(Flameproof) Gas •Ex d IIC T4/T5/T6	- - -		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66
		(Type n) Gas •Ex nA IIC T4/T5/T6	- - -		T4(T_{amb} ≤ 125°C) T5(T_{amb} ≤ 95°C) T6(T_{amb} ≤ 80°C)	IP66

Section 2 Installation

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 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. Drain the process media 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.**

Mounting

WARNING

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

Type DVC6010 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 Type DVC6010 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 Type DVC6020 digital valve controller.

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 11-2.

1. Isolate the control valve from the process line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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.

2

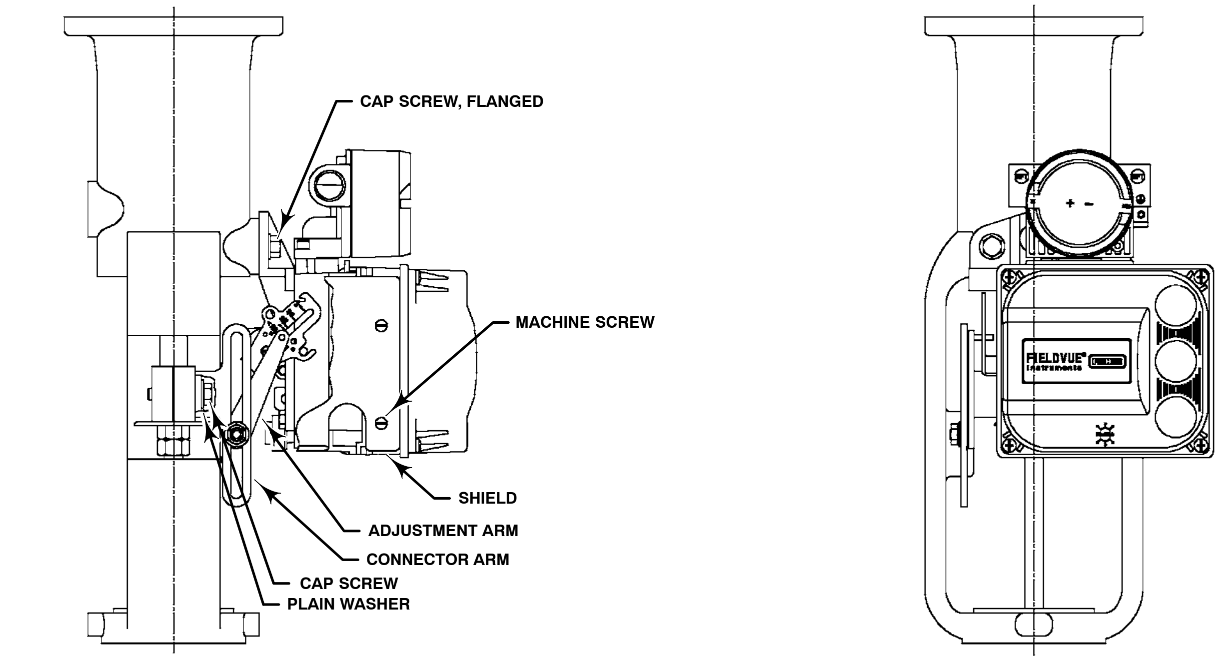


Figure 2-1. Type DVC6010 Digital Valve Controller Mounted on Sliding-Stem Actuators with up to 2 Inches Travel

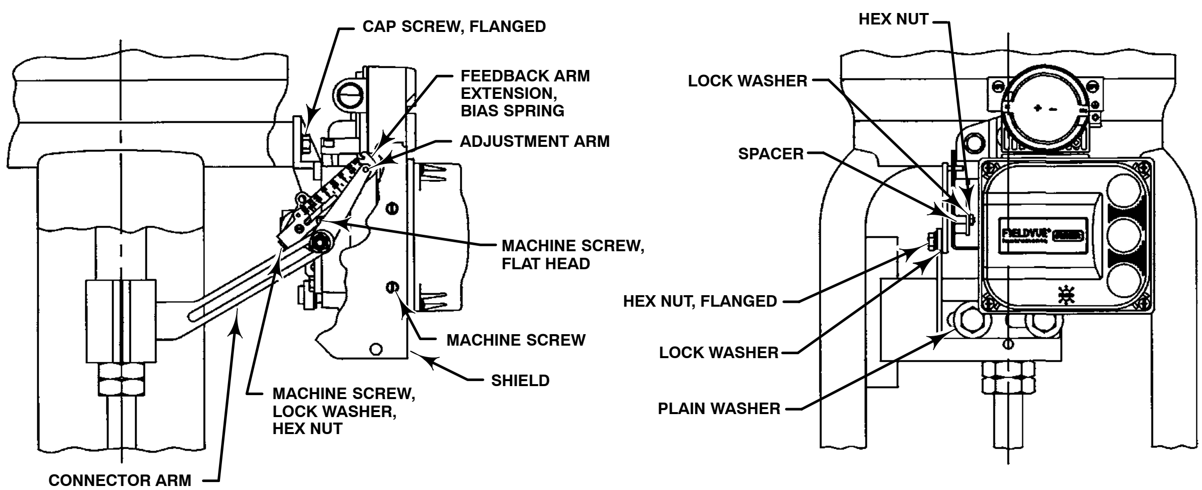


Figure 2-2. Type DVC6010 Digital Valve Controller Mounted on Sliding-Stem Actuators with 2 to 4 Inches Travel

7. Apply lubricant to the pin of the adjustment arm. As shown in figure 2-4, 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.

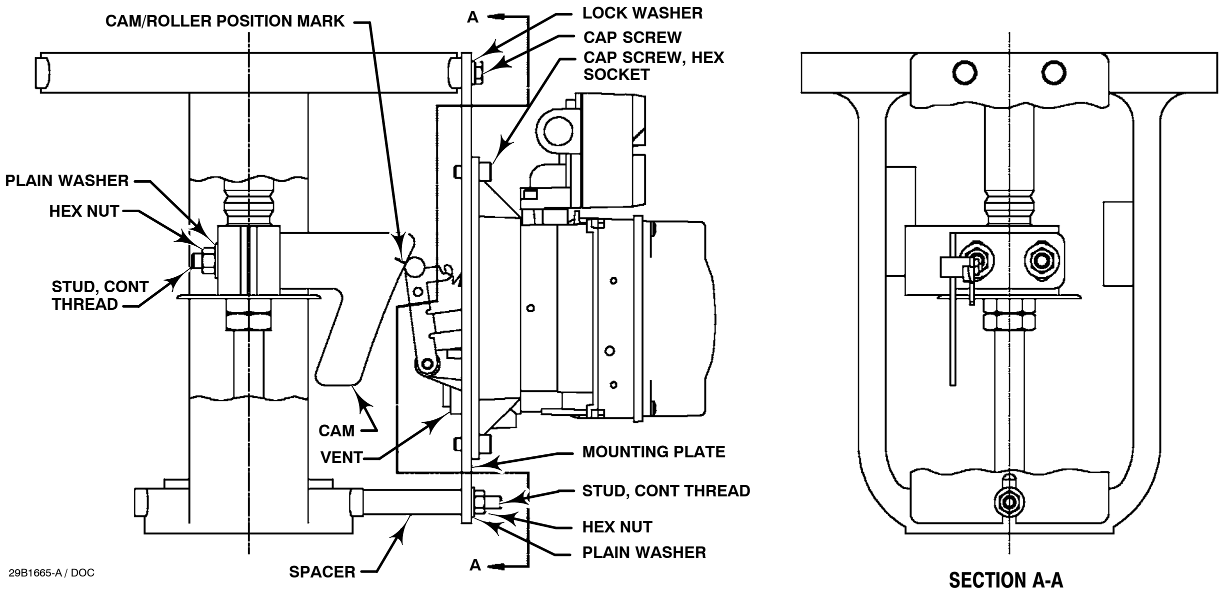


Figure 2-3. Type DVC6020 Digital Valve Controller Mounted on Long-Stroke Sliding-Stem Actuator.

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

WARNING

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

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

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

Type DVC6020 digital valve controllers use a cam (designed for linear response) and roller as the

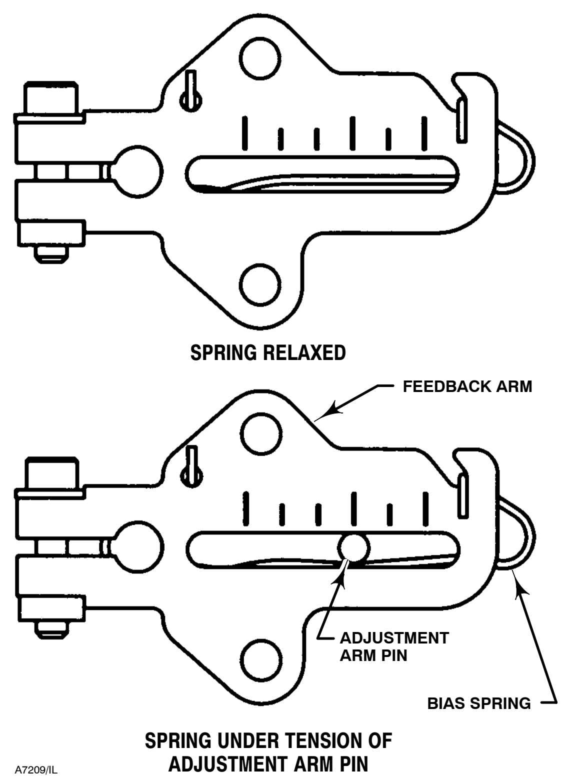
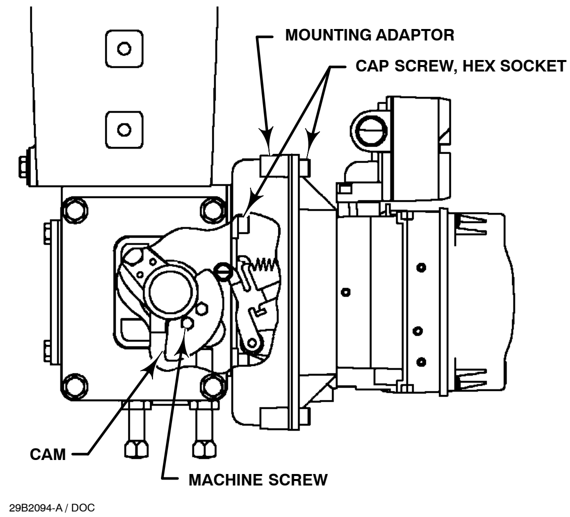
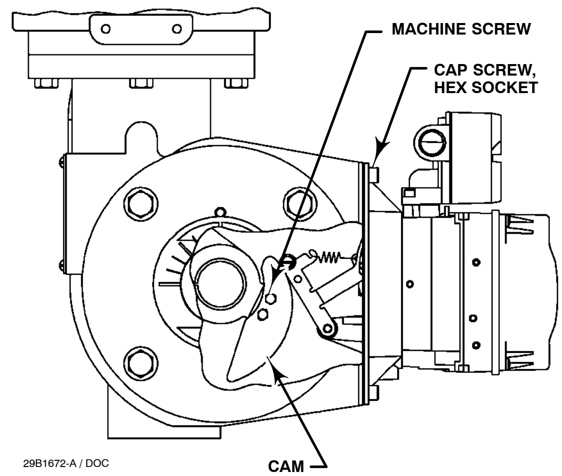


Figure 2-4. Locating Adjustment Arm Pin in Feedback Arm



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



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

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

feedback mechanism. Figure 2-3 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 2-7 show the Type DVC6020 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 (2.45 inches) from roller to pivot point]. Installations on Fisher Type 1051 size 33 and Type 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 2-3, 2-5, and 2-7 for parts locations. Also, where a key number is referenced, refer to figure 11-4. 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, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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 2-7. 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. Mount the Type DVC6020 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

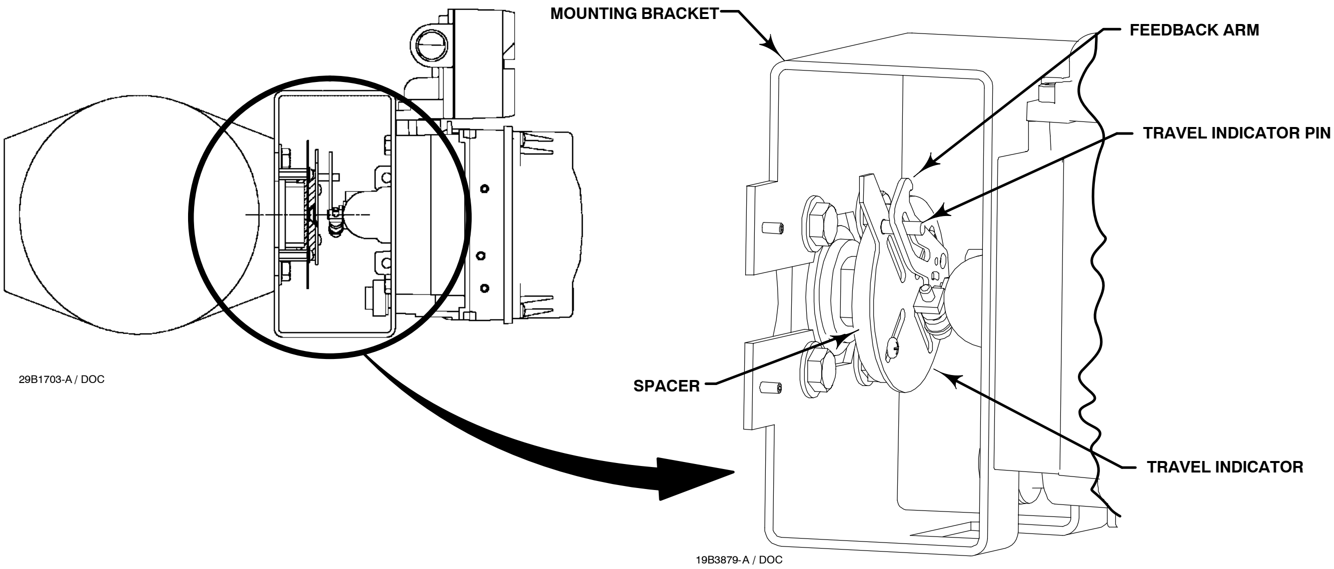


Figure 2-6. Mounting a Type DVC6030 Digital Valve Controller on a Rotary Actuator (Type 1032 Size 425A Shown)

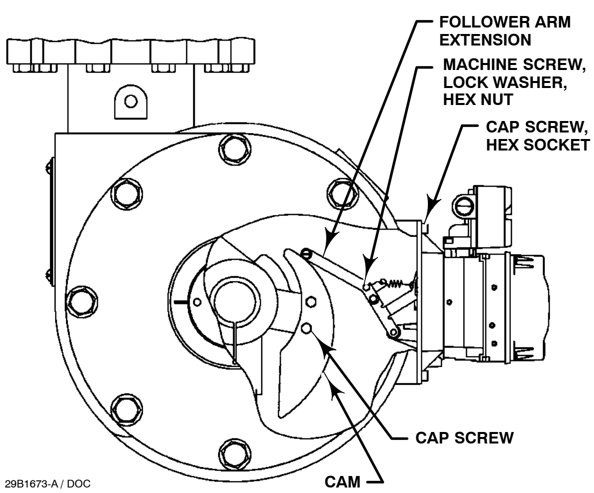


Figure 2-7. Type DVC6020 Digital Valve Controller with Long Feedback Arm and Follower Arm Extension Mounted on a Rotary Actuator

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.

7. 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 2-3). If necessary, reposition the cam to attain alignment.

Type DVC6030 on Quarter-Turn Actuators

WARNING

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

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 2-6 shows the Type DVC6030 digital valve controller mounted on a quarter-turn actuator. Refer to figure 2-6 for parts locations. Refer to the following guidelines when mounting on quarter-turn actuators:

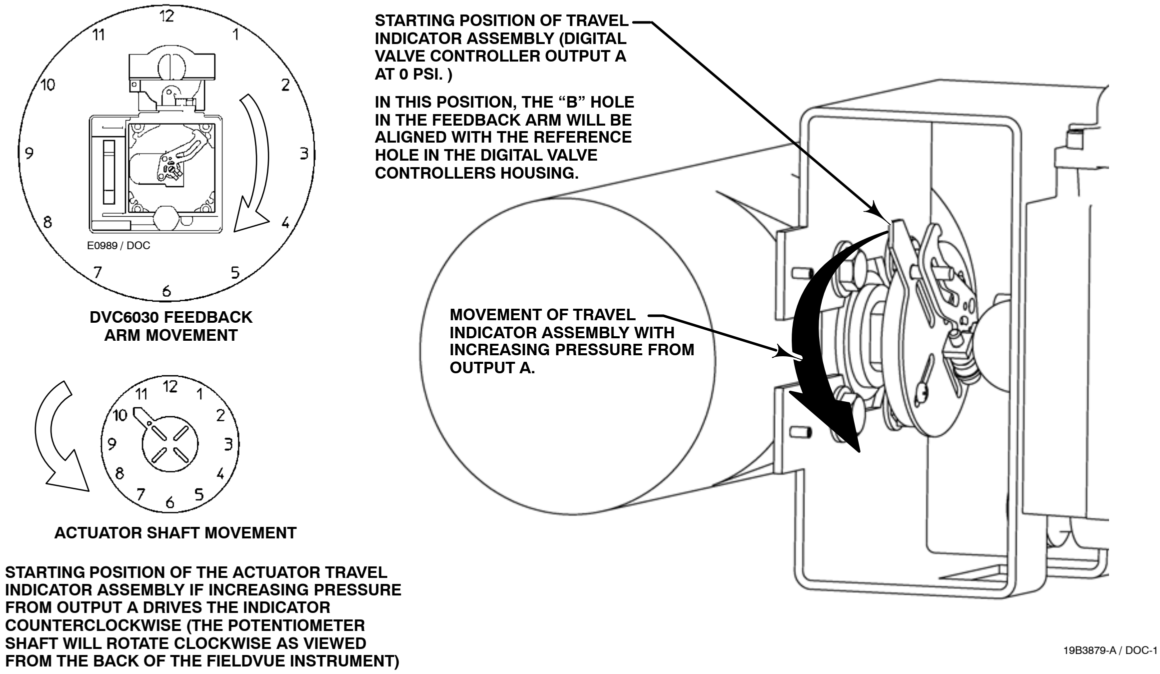


*Figure 2-8. Explanation of Travel Indicator Starting Position and Movement, if **Clockwise** Orientation is Selected for “Travel Sensor Motion” in AMS ValveLink® Software or the 375 Field Communicator*

Note

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

1. Isolate the control valve from the process line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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 2-8 and 2-9. 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 2-8.

- **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 2-9.

Note

AMS ValveLink Software and the 375 Field Communicator use the convention of clockwise (figure 2-8) and counterclockwise (figure 2-9) 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.

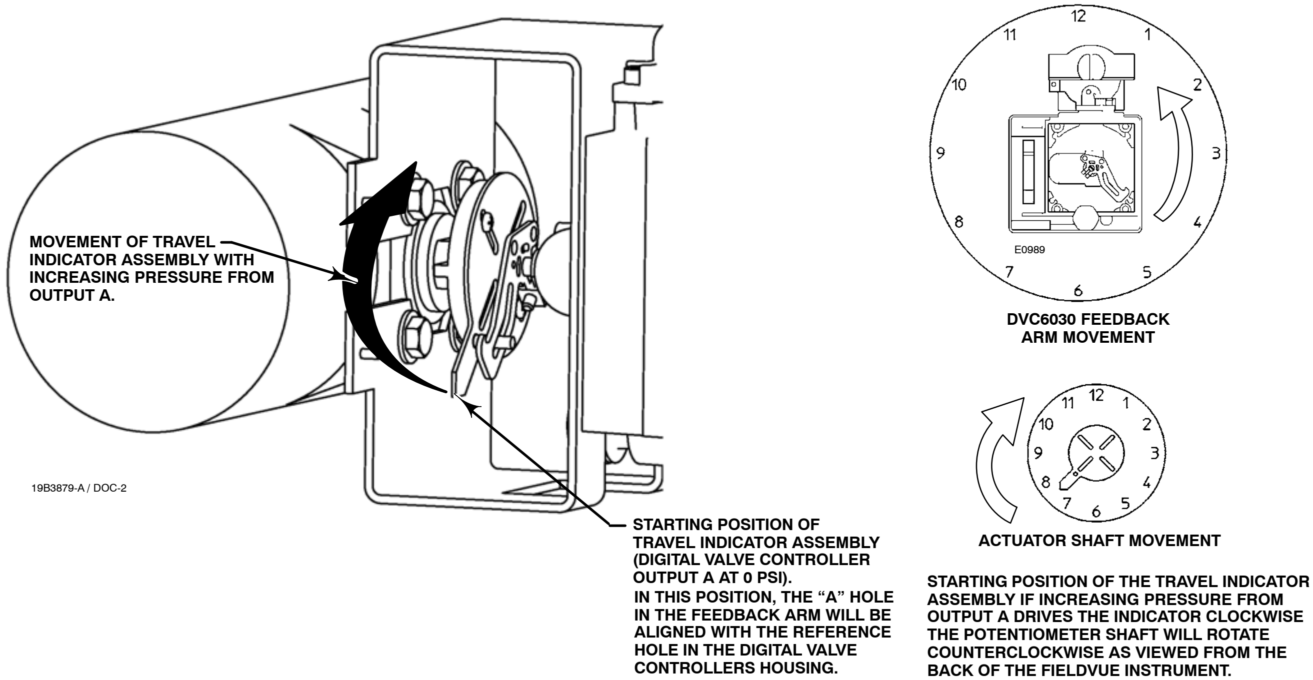


*Figure 2-9. Explanation of Travel Indicator Starting Position and Movement if **Counterclockwise** Orientation is Selected for “Travel Sensor Motion” in AMS ValveLink® Software or the 375 Field Communicator*

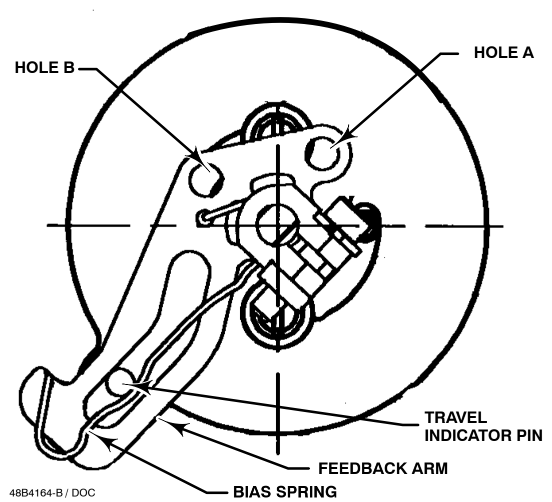


Figure 2-10. Positioning Travel Indicator Pin in the Feedback Arm (Viewed as if Looking from the Type DVC6030 toward the Actuator)

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 that the bias spring loads the pin as shown in figure 2-10. 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.

Guidelines for Mounting the Type DVC6005 Base Unit

For remote-mounted digital valve controllers, the Type DVC6005 base unit ships separately from the control valve and does not include tubing, fittings or wiring. 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 Type DVC6005 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 2-11 and 2-12. Drill two holes in the wall using the dimensions shown in figure 2-11. 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 2-12. Position a standoff on the back of the base unit. Using two 101.6 mm (4-inch) 1/4-20 hex

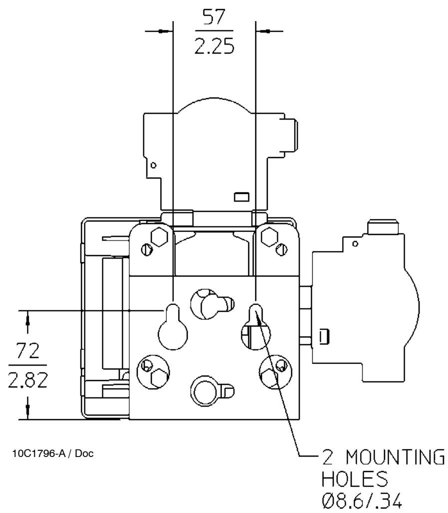


Figure 2-11. Type DVC6005 Base Unit with Mounting Bracket (Rear View)

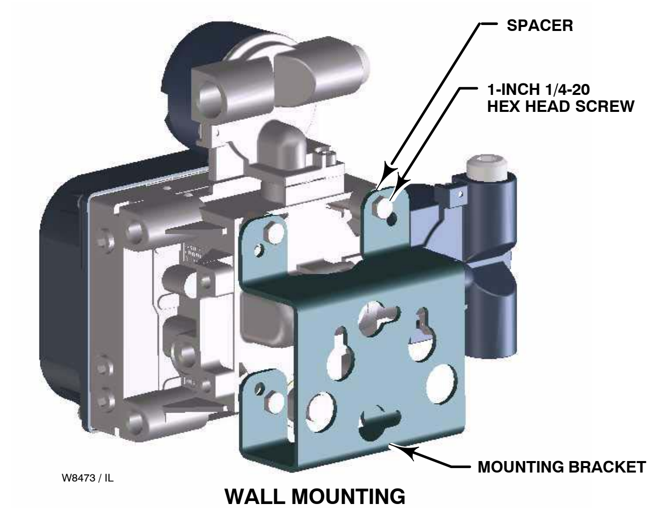
head screws loosely attach the base unit to the pipestand with the mounting bracket. Position the second standoff, then using the remaining 101.6 mm (4-inch) hex head screws, securely fasten the base unit to the pipe stand.

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

⚠ WARNING

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

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.



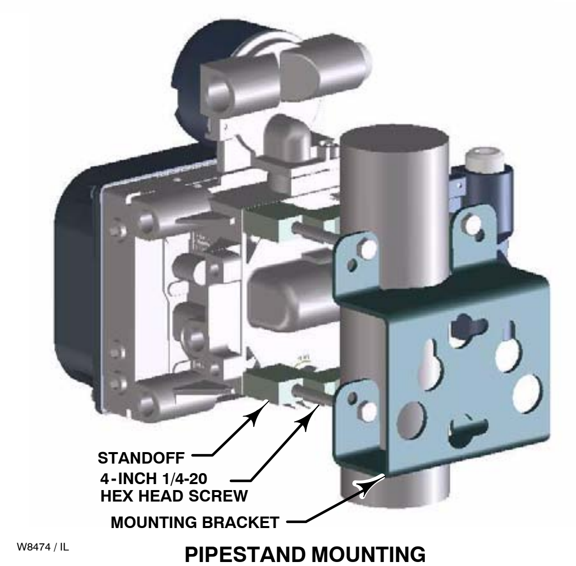


Figure 2-12. Type DVC6005 Base Unit Mounting

Note

Refer to Type DVC6005 Base Unit Mounting on page 2-9 when installing a Type DVC6015 remote feedback unit.

The Type 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 Type DVC6025 remote feedback unit.

Note

While the housing differs on the DVC6015 and the DVC6010, 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 11-3.

1. Isolate the control valve from the process line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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.

7. Apply lubricant to the pin of the adjustment arm. As shown in figure 2-4, 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.

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

WARNING

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

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 Type DVC6005 Base Unit Mounting on page 2-9 when installing a Type DVC6025 remote feedback unit.

Type DVC6025 remote feedback units use a cam and roller as the feedback mechanism. Figure 2-3 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 2-7 show examples of mounting on rotary actuators.

Note

While the housing differs on the DVC6025 and the DVC6020, 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 Fisher Type 1051 size 33 and Type 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 2-3, 2-5, and 2-7 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, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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 2-7. 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. Mount the Type 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.

7. 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 2-3). If necessary, reposition the cam to attain alignment.

Type DVC6035 on Quarter-Turn Actuators

WARNING

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

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 Type DVC6005 Base Unit Mounting on page 2-9 when installing a Type DVC6035 remote feedback unit.

Figure 2-6 shows an example of mounting on a quarter-turn actuator. Refer to figure 2-6 for parts locations. Refer to the following guidelines when mounting on quarter-turn actuators:

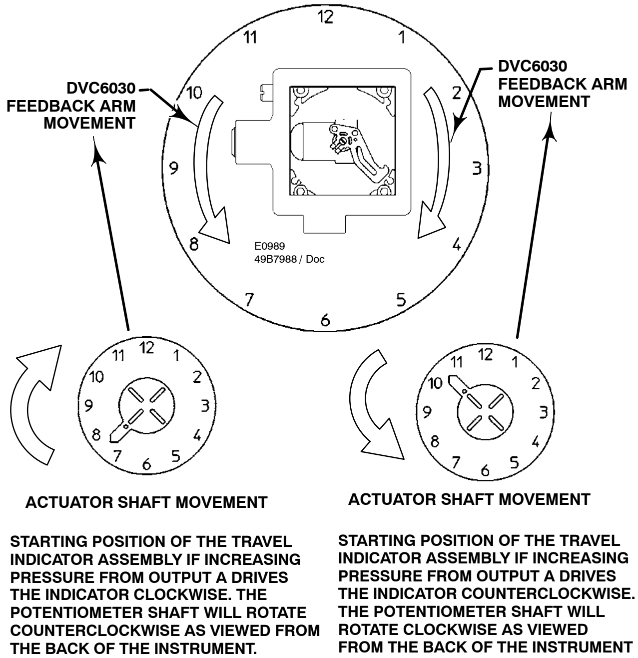


Figure 2-13. Type DVC6035 Travel Indicator Installation

Note

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

1. Isolate the control valve from the process line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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 2-13. 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 2-9 and 2-13.

- **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 2-8 and 2-13.

2

Note

AMS ValveLink Software and the 375 Field Communicator use the convention of clockwise (figure 2-8) and counterclockwise (figure 2-9) 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 that the bias spring loads the pin as shown in figure 2-10. 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 Type 67CFR Filter Regulator

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

Integral-Mounted Regulator

Refer to figure 2-14. Lubricate an O-ring and insert it in the recess around the SUPPLY connection on the digital valve controller. Attach the Type 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.

Yoke-Mounted Regulator

Mount the filter regulator with 2 cap screws to the pre-drilled and tapped holes in the actuator yoke.

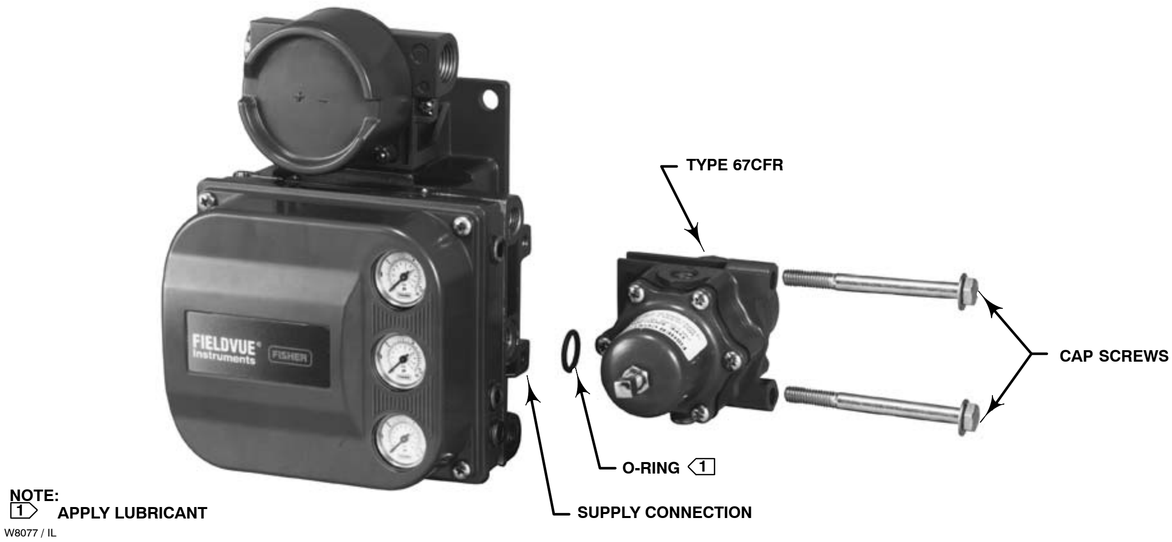


Figure 2-14. Mounting the Type 67CFR Regulator on a DVC6000 Series Digital Valve Controller

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 Type 67CFR filter regulator casing mounting bracket provided with the filter regulator. Attach the mounting bracket to the Type 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

WARNING

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

Note

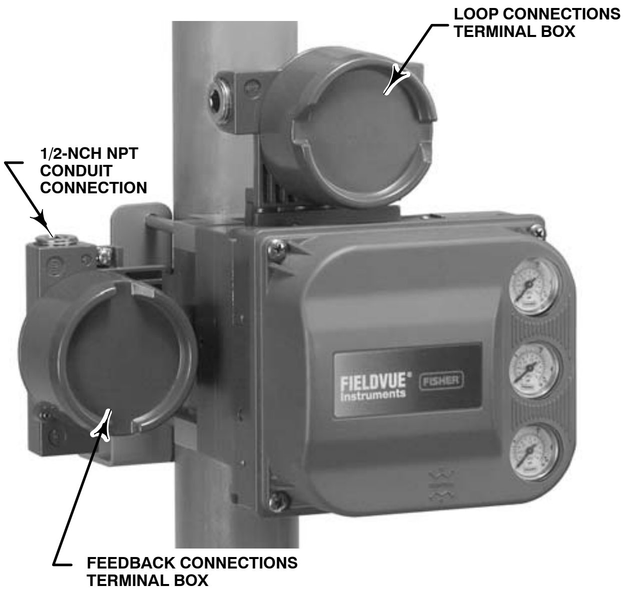
Make pressure connections to the digital valve controller using tubing with at least 3/8-inch diameter.

Pressure connections are shown in figure 2-15. All pressure connections on the digital valve controller are 1/4-inch NPT female connections. Use 10 mm (3/8-inch) tubing for all pneumatic connections. If remote venting is required, refer to the vent subsection.

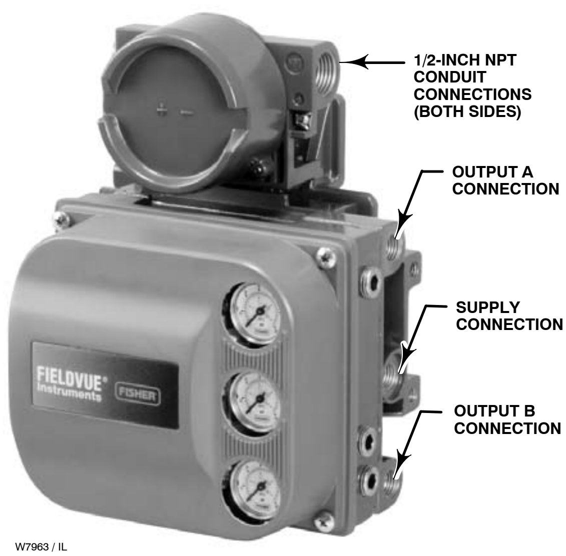
Supply Connections

WARNING

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



TYPE DVC6005 BASE UNIT



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

Figure 2-15. DVC6000 Series Digital Valve Controller Connections

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 a Fisher 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.

A Fisher Type 67CFR filter regulator, 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-inch NPT IN connection on the filter regulator (if furnished) or to the 1/4-Inch NPT SUPPLY connection on the digital valve controller housing (if Type 67CFR filter regulator is not attached).

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, or installing the remote-mounted Type DVC6005 base unit, connect the 1/4-inch NPT digital valve controller output connections to the pneumatic actuator input connections.

Single-Acting Actuators

When connecting a single-acting direct digital valve controller (relay type A) to a single-acting actuator, the OUTPUT B connection must be plugged. Connect OUTPUT A to the actuator diaphragm casing. The gauge for OUTPUT B is not used. It should be removed and replaced with a screened vent.

When connecting a single-acting reverse digital valve controller (relay type B) to a single-acting actuator, the OUTPUT A connection must be plugged. Connect OUTPUT B to the actuator diaphragm casing. The

2

Figure 2-16. Type DVC6010 Digital Valve Controller Mounted on Type 585C Piston Actuator

gauge for OUTPUT A is not used and should be replaced with a pipe plug.

Double-Acting Actuators

DVC6000 Series digital valve controllers on double-acting actuators always use relay type A. With no input current, OUTPUT A is at 0 pressure and OUTPUT B is at full supply pressure when the relay is properly adjusted.

To have the actuator stem extend from the cylinder with increasing input signal, connect OUTPUT A to the upper actuator cylinder connection. Connect OUTPUT B to the lower cylinder connection. Figure 2-16 shows the digital valve controller connected to a double-acting piston actuator.

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

Vent

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 Type DVC6010 and DVC6030 digital valve controllers and Type DVC6015 and DVC6035 remote feedback units—sliding-stem remove the plastic vent (key 52, figures 11-1 and 11-2). The vent connection is 3/8-inch NPT female. Typically, 12.7 mm (1/2-inch) tubing is used to provide a remote vent.

To connect a remote vent to Type DVC6020 digital valve controllers and DVC6025—rotary Replace the standard mounting bracket (key 74, figures 11-1 and 11-4) 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-inch NPT female. Typically, 12.7 mm (1/2-inch) tubing is used to provide a remote vent.

Electrical Connections

WARNING

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

WARNING

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

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 to 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 11-2 through 11-6 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 2-17. 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.

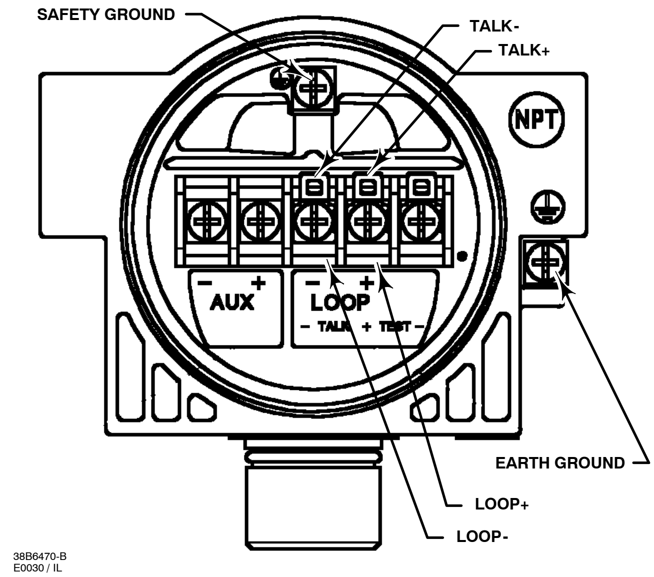


Figure 2-17. DVC6000 Series Digital Valve Controller Terminal Box

WARNING

Personal injury or property damage, caused by fire or explosion, can result from the discharge of static electricity. Connect a 14 AWG (2.08 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 2-17, 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.

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

Remote Travel Sensor Connections

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

- Fisher 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).

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 2-15).

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 2-18).

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. Do not connect the shield or drain wire to any terminal on the feedback unit.

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) 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 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.

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 2-15).

3. If necessary, install conduit between the potentiometer and the base unit following applicable

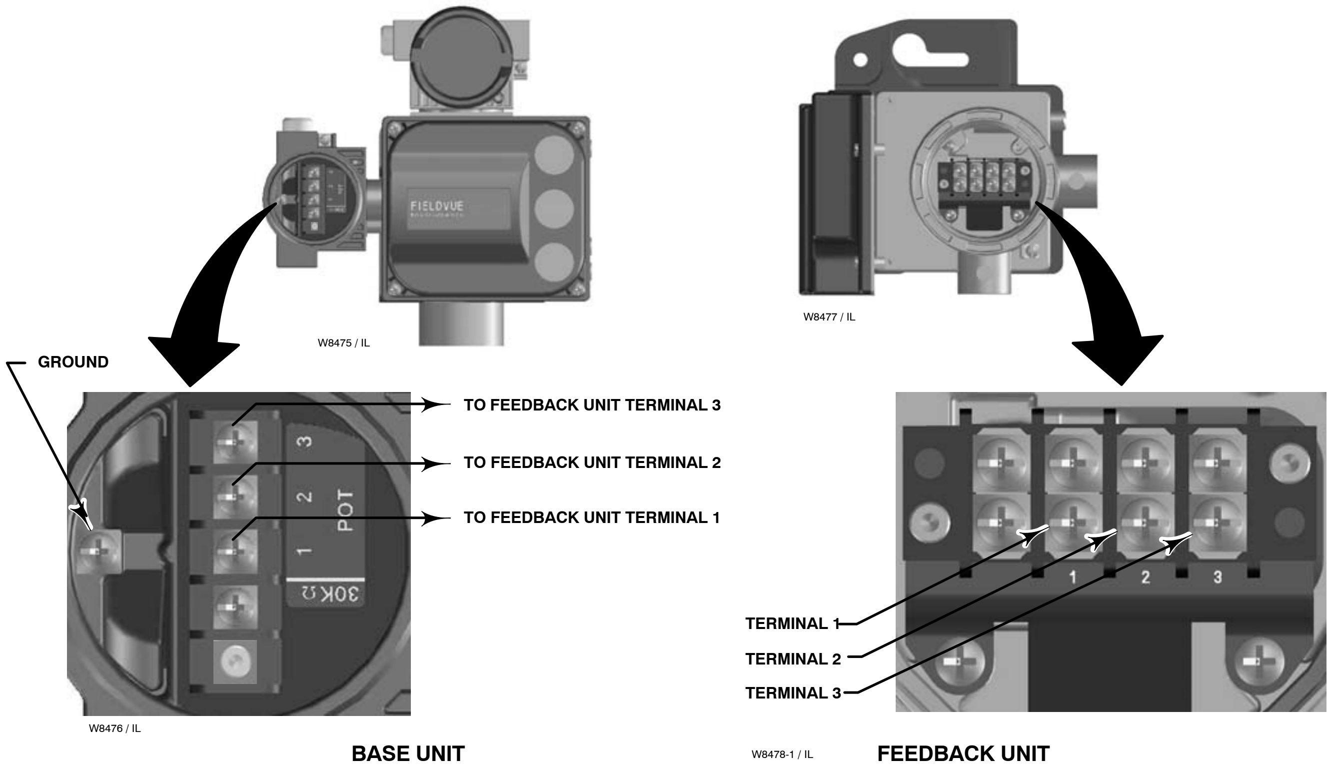


Figure 2-18. Terminal Details for Connecting Base Unit and Feedback Units of Remote-Mounted Digital Valve Controllers

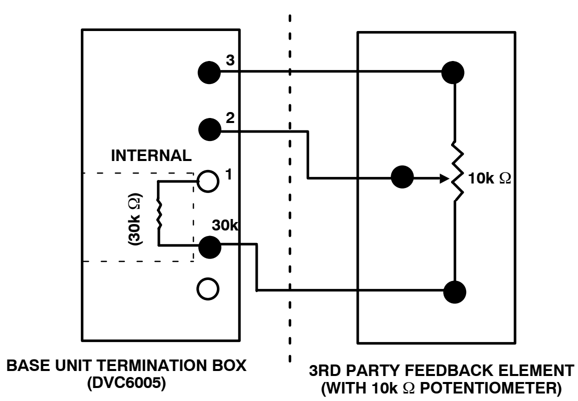


Figure 2-19. Terminal Details for Connecting a DVC60005 Base Unit and a 10k Ohm External Potentiometer

local and national electrical codes. Route the 3-conductor shielded cable between the two units (refer to figure 2-19).

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 10kOhm 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.

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 2-15).

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 2-20).

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.

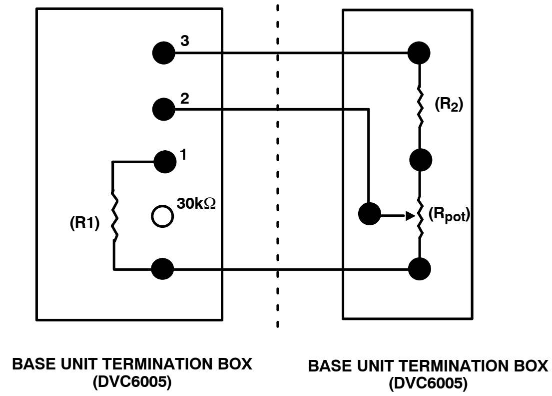


Figure 2-20. Terminal Details for Connecting a DVC60005 Base Unit and a Three-Resistor Series

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 (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

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) $\times$ 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 Model 375 Field Communicator or a personal computer running

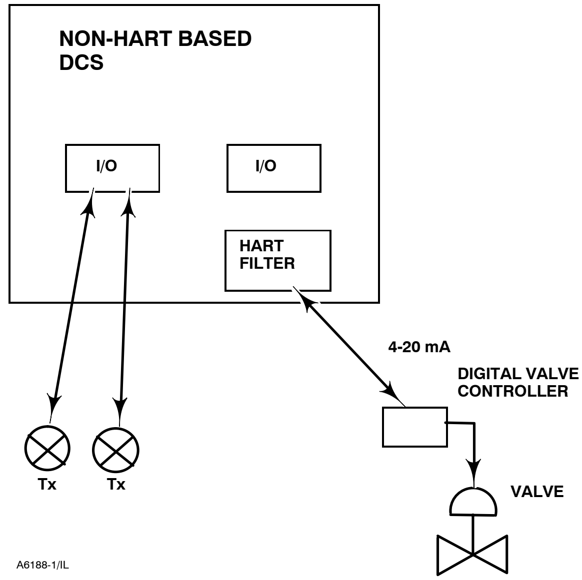


Figure 2-21. HART® Filter Application

AMS ValveLink Software communicating through a HART modem, interfaces with the DVC6000 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.

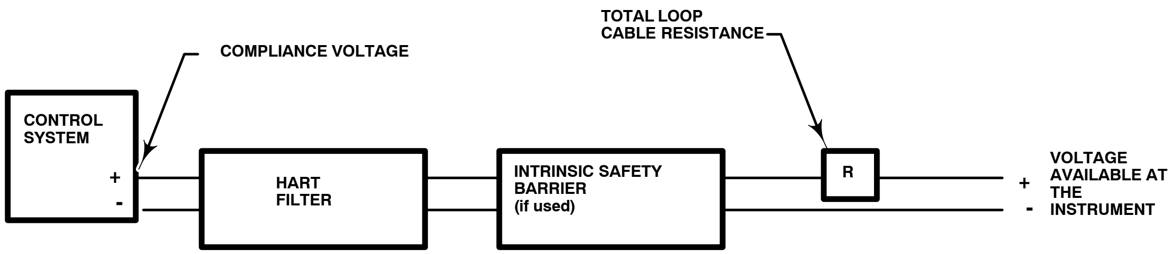
Wiring Practices

Control System Requirements

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

HART® Filter

Depending on the control system you are using, a HART filter may be needed to allow HART communication. The HART filter is an active device that is inserted in field wiring from the HART loop. The filter is normally installed near the field wiring terminals of the control system I/O (see figure 2-21). Its purpose is to effectively isolate the control system output from modulated HART communication signals and raise the impedance of the control system to allow HART communication. For more information on the description and use of the HART filter, refer to the appropriate separate HART filter instruction manual.



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 HF200 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**

NOTES:

1. **Obtain filter voltage drop from table 2-1. 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 2-22. Determining Voltage Available at the Instrument

To determine if your system requires a filter, refer to table 2-1. Table 2-1 lists control systems that have been tested with FIELDVUE instruments. If your control system is not listed, you can either:

- always install a filter, or
- contact your Fisher sales office for their recommendation.

Voltage Available

The voltage available at the DVC6000 Series digital valve controller must be at least 11 volts dc. 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 2-22, 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 volts dc.

Table 2-1 lists the compliance voltage of tested control systems and other control system parameters. Table 2-2 lists the resistance of some typical cables.

The following example shows how to calculate the voltage available for a Honeywell™ TDC2000 control

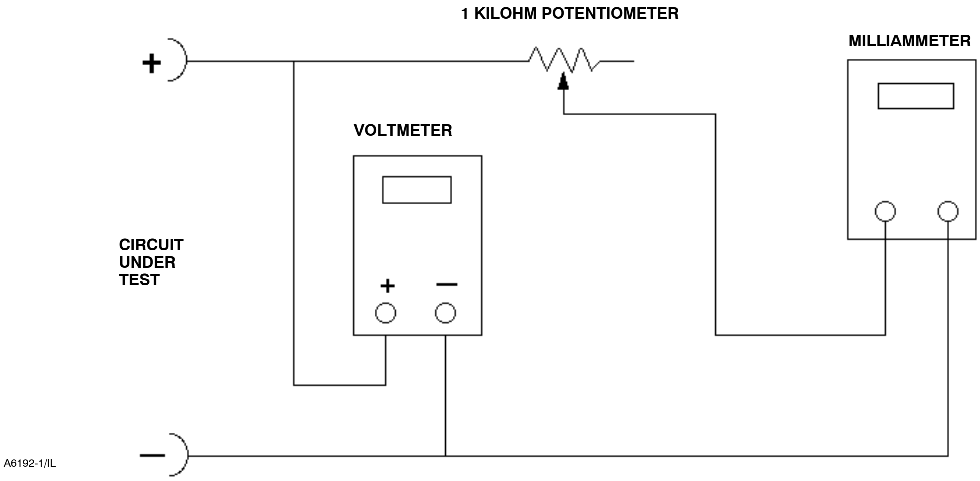


Figure 2-23. Voltage Test Schematic

system with a Type HF230 HART filter, and 1000 feet of Belden® 9501 cable:

Voltage available = [18.5 volts (at 21.05 mA)] - [2.3 volts] - [48 ohms $\times$ 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 2-23 to the control system terminals.

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

3. Increase the resistance of the 1 kilohm potentiometer, shown in figure 2-23, 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 Fisher 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)] $\div$ [C_{cable}(pF/ft)]

Length(m) = [160,000 - C_{master}(pF)] $\div$ [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 (see table 2-1)

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

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] $\div$ [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 Fisher sales office for specific information relating to your control system.

2

Table 2-1. Control System Parameters

Control System(1)		Compliance Voltage(2)	Installation Requirement
Bailey Infi 90®		15.5 V @ 20.8 mA 15.8 V @ 4.0 mA	Filter required Watch compliance voltage
Fischer-Porter DCI 40PC2000C		18.2 V @ 20.75 mA 21.7 v @ 3.89 mA	Filter required
Honeywell TDC 2000		18.5 V @ 21.05 mA 20.7 V @ 3.84 mA	Filter required
Honeywell TDC 3000	Multi-function controller	18.5 V @ 21.05 mA 20.7 V @ 3.84 mA	Filter required
	High-density Process Manager (HPM) controller	18.4 V @ 20.0 mA 20.7 V @ 4.0 mA	No filter required
FOXBORO I/A (1988)		18.2 V @ 20.0 mA 22.2 V @ 3.99 mA	No filter required Assume 50,000 pF C_{master}
Moore 352		No data available	No filter required
Valumet (output configured for straight through, not for 250 ohms		No data available	No filter required
Rosemount RS-3 Multiport with HART I/O		22.8 V @ 20.05 mA 24.2 V @ 4.0 mA	No filter required
Fisher-Rosemount PROVOX® Configurable, Computing, and Interactive (IAC) Controllers		20.7 V @ 22.09 mA 21.6 V @ 3.83 mA	Filter required
Fisher-Rosemount PROVOX MUX (parallel) I/O		17.51 V @ 20.39 mA 18.08 V @ 3.82 mA	No filter required Assume 100,000 pF C_{master}
Fisher-Rosemount PROVOX Control (serial) I/O	for AO	19.5 V @ 22.25 mA 20.3 V @ 3.85 mA	Filter required
	for HART I/O	No data available	No filter required
Fisher-Rosemount TL108 with 24 volt dc power		17.2 V @ 20.0 mA 21.67 v @ 4.0 mA	No filter required Assume 12,000 pF C_{master}
Fisher-Rosemount TL108 with 45 volt dc power		27.0 V @ 20.0 mA	No filter required Assume 12,000 pF C_{master}
Fisher-Rosemount DPR900		20.67 V @ 19.94 ma 24.82 V @ 3.80 mA	Filter required
Fisher-Rosemount ROC 364		17.32 V @ 20.40 mA 22.63 V @ 3.66 mA	No filter required Assume 0 pF C_{master}
Transmation® Model 1028 mA Calibrator		No data available	Filter required

1. For control systems not listed, a filter is recommended, if the voltage available at the instrument is adequate (see Voltage Available in this section). Filtering ensures proper communication and simplifies connecting a Field communicator or HART interchange.
2. Some control systems have a compliance voltage that is power supply dependent. If the power supply voltage is below nominal, for example, due to a switch to battery backup, the compliance voltages will drop as much as the power supply drops.

Table 2-2. 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.

Installation in Conjunction with a Rosemount® Model 333 HART® Tri-Loop™ HART-to-Analog Signal Converter

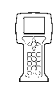
Use the DVC6000 Series digital valve controller in operation with a Rosemount® Model 333 HART Tri-Loop™ HART-to-Analog Signal Converter to acquire an independent 4-20 mA analog output signal for the analog input, valve set point, pressure, or travel. The HART Tri-Loop accepts any three of these digital signals and converts them into three separate 4-20 mA analog channels.

Refer to figure 2-24 for basic installation information. Refer to the Model 333 HART Tri-Loop HART-to-Analog Signal Converter Product Manual for complete installation information.

Commissioning the Digital Valve Controller for use with the HART® Tri-Loop™

To prepare the digital valve controller for use with a Model 333 HART Tri-Loop, you must configure the digital valve controller to burst mode, and select Burst Command 3. In burst mode, the digital valve controller provides digital information to the HART Tri-Loop HART-to-Analog Signal Converter. The HART Tri-Loop converts the digital information to a 4 to 20 mA analog signal. Each burst message contains the latest value of the primary (analog input), secondary (valve set point), tertiary (configured output pressure), and quaternary (travel) variables.

To commission a DVC6000 Series digital valve controller for use with a HART Tri-Loop, perform the following procedures.

Set the Burst Operation  *(1-2-1-5)*

1. From the Online menu, select, *Setup & Diag, Detailed Setup*, *Mode*, and *Burst*.

2. Select the *Burst Enable.* Select *Enable* then press ENTER (F4) and SEND (F2).

3. Select *Burst Command.* Select the desired command (HART Univ Command 3).

4. Select *Cmd 3 Press*. Select the pressure you desire the HART Tri-Loop to use as the tertiary variable.

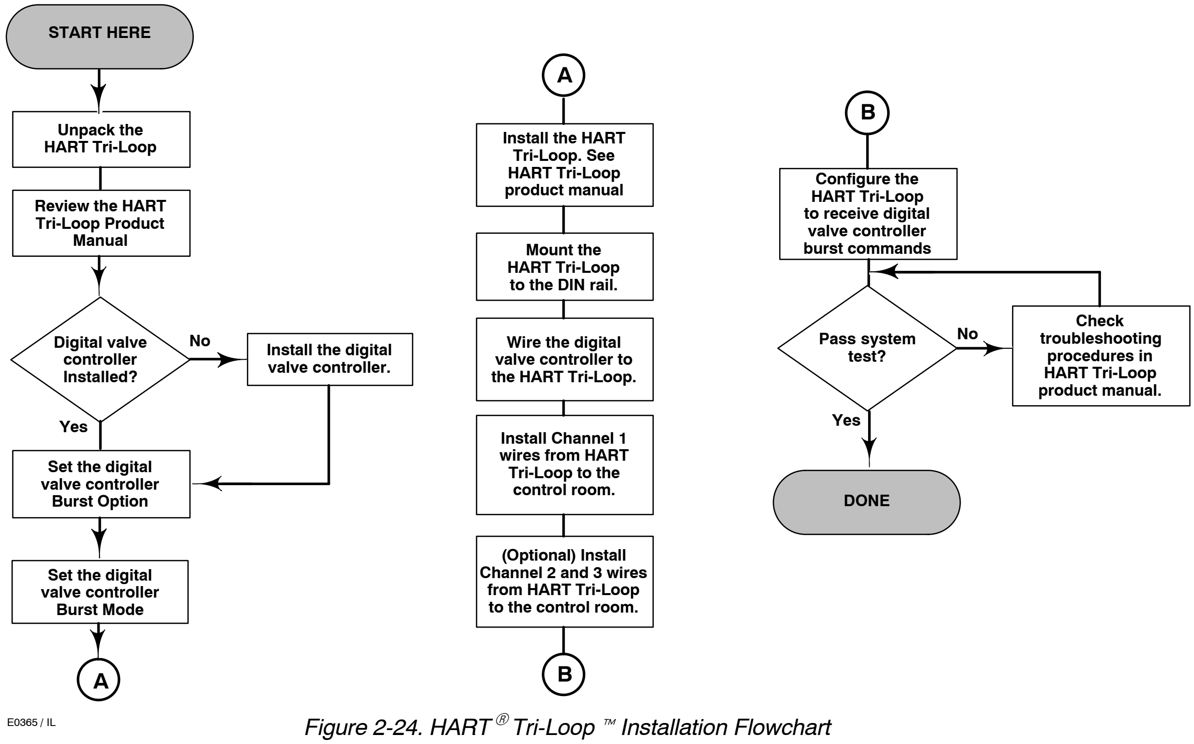


Figure 2-24. HART® Tri-Loop ™ Installation Flowchart

Section 3 Model 375 Field Communicator Basics

Figure 3-1. Model 375 Field Communicator

Note

The Model 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 3-5.

This section discusses the display, keypad, and menu structure for the Field Communicator, shown in figure 3-1. 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 3-2 shows the alphanumeric keypad. Data entry, and other options, using letters, number and

Figure 3-2. Model 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 Model 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 (X) in the upper right corner of the touch screen to end the application.

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 on-line 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 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 Series digital valve controller menu structures.

3

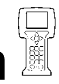
Displaying the Field Communicator Device Description Revision

Device Description (DD) Revision is the revision number of the Fisher 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 4 are used with DVC6000 Series instruments with firmware revision 2, 3, 4 and 5. 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 to 20 mA signal. From the *Online* menu, select *Setup & Diag, Display, 375 DD Rev.*

Section 4 Basic Setup and Calibration 

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.

To remove protection:

1. Connect a 4 to 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.*

Note

If the Aux Terminal Mode is configured for Auto Travel Calibration, be sure the jumper remains across the auxiliary terminals until the Field Communicator prompts you to remove it. Removing the jumper too soon will cause the instrument to begin auto travel calibration.

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 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.

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 variables, which may result in personal injury or property damage.

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.

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

When the DVC6000 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.

There are two basic setup procedures:

- **Auto Setup**—(Recommended) This procedure automatically selects the appropriate setup parameters depending upon the actuator type and size specified.

- **Manual Setup**—this procedure permits you to enter values for the following setup parameters:

  - Instrument Mode
  - Control Mode
  - Pressure & Actuator
  - Tuning & Calib

To enter pressure and actuator parameters, select *Press & Actuator* then enter values for the following setup parameters:

WARNING

Changes to the following parameters may result in changes to output pressure and valve travel. Depending on the application, these changes may upset process variables, which may result in personal injury or property damage.

- Pressure Units
- Max Supply Pressure
- Actuator Style
- Feedback Connection
- Tvl Sensor Motion
- Valve Style
- Zero Control Signal

To adjust the tuning, travel cutoff low, relay, or to automatically calibrate travel, select Tuning & Calib then select the desired procedure:

- Tuning Set
- Tvl Cutoff Low
- Relay Adjust
- Auto Calib Travel

Table 4-1. DVC6000 Series Factory Default Settings

Setup Parameter	Default Setting
Analog Input Units	mA
Analog In Range High	20.0 mA
Analog In Range Low	4.0 mA
Control Mode	Analog
Restart Control Mode	Resume Last
Self-Test Shutdown	All Failures Disabled
Setpoint Filter Time	0 secs
Input Characteristic	Linear
Travel Limit High	125%
Travel Limit Low	-25%
Travel Cutoff High	99.5%
Travel Cutoff Low	0.5%
Minimum Opening Time	0 secs
Minimum Closing Time	0 secs
Polling Address	0
Aux Terminal Mode	Aux Input Alert
Command 3 Pressure	For double-acting actuators—differential output pressure For single-acting actuators—actuator pressure

Auto Setup (1-1-1)

Setup Wizard (1-1-1-1)

To have the Field Communicator automatically setup the instrument using specified actuator information, from the *Online* Menu select *Setup & Diag, Basic Setup, Auto Setup, and Setup Wizard*. Follow the prompts on the Field Communicator display to setup the instrument. Table 4-2 provides the actuator information required to setup and calibrate the instrument.

1. Enter the pressure units: psi, bar, or kPa.
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 manufacturer of the actuator on which the instrument is mounted. If the actuator manufacturer is not listed, select Other.
4. Enter the actuator model or type. If the actuator model is not listed, select Other.
5. Enter the actuator size.

Table 4-2. Actuator Information for Basic Setup

Actuator Manufacturer	Actuator Model	Actuator Size	Actuator Style	Starting Tuning Set	Feedback Connection	Travel Sensor Motion	
						Relay A	**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 4-3	
Baumann	Air to Extend	16 32 570	Spring & Diaphragm	C E K	SStem-Standard	Clockwise	Counterclockwise
	Air to Retract					Counterclockwise	Clockwise
	Rotary	10 25 54		E H J	Rotary	Specify	
Gulde	3024	GA 1.21 GA 1.31 GA 1.41	Spring & Diaphragm	E H K	SStem-Standard	For P_O operating mode (air opens), Counterclockwise For P_S operating mode (air closes), Clockwise	For P_O operating mode (air opens), Clockwise For P_S operating mode (air closes), Counterclockwise
	3025	P460, P462, P900		M	Rotary	Specify	

Table 4-3. Travel Sensor Motion Selections for Type DVC6030 on Type 1066SR Actuators

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

6. 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 4-1. 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 (spring & diaphragm, piston double-acting without spring, piston single-acting with spring, piston double-acting with spring), Valve style (rotary or sliding stem),

On Loss of Instrument Signal (valve opens or closes), see Zero Control Signal under Manual Setup,

Feedback connection (rotary-all, sstem-roller, or sstem-standard), see Feedback Connection under Manual Setup.

WARNING

In the next step, 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.

Travel Sensor motion (increasing air pressure causes the travel sensor shaft to rotate clockwise or counterclockwise). The Field Communicator 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: clockwise or counterclockwise. (see Travel Sensor Motion under Manual Setup).

Tuning set (see Tuning Set under Manual Setup).

When the Setup Wizard is complete, you are asked if you wish to run Relay Adjustment Calibration now. Select yes to adjust the relay. For additional information, refer to Relay Adjustment in this section.

After completing the relay adjustment, you are asked if you wish to run Auto Travel Calibration now. Select yes to automatically calibrate instrument travel at this time. 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 this section.

If after completing auto setup and auto calibration the valve seems slightly unstable or unresponsive, you can improve operation by selecting either *Performance Tuner* or *Stabilize/Optimize* from the *Auto Setup* menu. For additional information on using the performance tuner, refer to Using the Performance Tuner in this section. For additional information on stabilizing or optimizing valve response, refer to Stabilize/Optimize at the end of this section.

Manual Setup (1-1-2)

WARNING

Changes to the following parameters may result in changes to output pressure and valve travel. Depending on the application, these changes may upset process variables, which may result in personal injury or property damage.

If you want to enter the individual parameters for the instrument basic setup, from the *Online* Menu select *Setup & Diag, Basic Setup, and Manual Setup*. The following describe the parameters that appear during manual setup.

- *Instrument Mode*—Instrument Mode allows you to either take the instrument *Out Of Service* or place it *In Service*. The instrument must be *Out Of Service* to change configuration variables that affect control provided the calibration/configuration protection is set to *None*.

- *Control Mode*—Control Mode lets you define where the instrument reads its set point. Choose one of the following control modes: Analog or Digital.

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

Choose Digital if the instrument is to receive its set point digitally, 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, for example during calibration or stroke valve. 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.

To see the following parameters, select *Press & Actuator* from the *Manual Setup* menu.

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

- *Max Supply Pressure*—Enter the maximum instrument supply pressure in the units specified under *Pressure Units*.

- *Actuator Style*—Select spring & diaphragm, piston double-acting without spring, piston

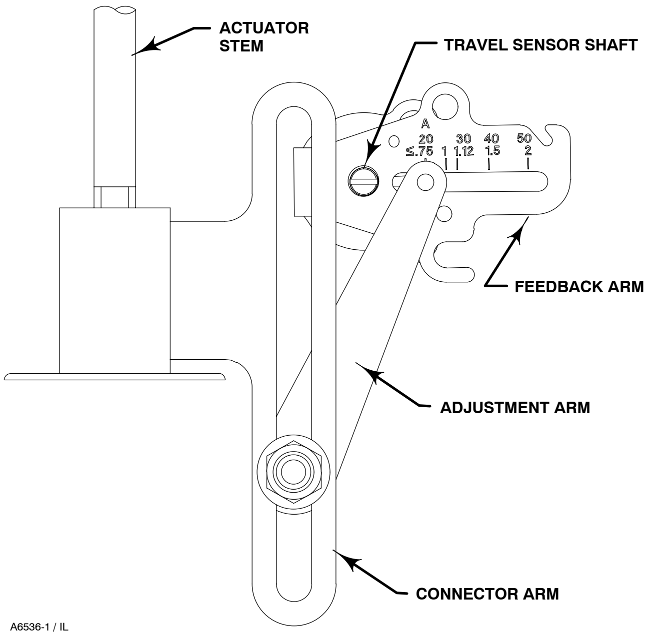


Figure 4-1. Feedback Connection for Typical Sliding-Stem Actuator (Up to 4-inch Travel)

single-acting with spring, piston double-acting with spring.

• *Feedback Connection*—Select Rot-All, SS-roller, or SStem-Standard. For rotary valves, enter Rot - All, SS-Roller. For sliding-stem valves, if the feedback linkage consists of a connector arm, adjustment arm, and feedback arm, similar to the linkage shown in figure 4-1, enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam, similar to the linkage shown in figure 4-2, enter Rotary All, SS-Roller.

Table 4-4. Gain Values for Preselected Tuning Sets

TUNING SET	Proportional Gain	Velocity Gain	Minor Loop Feedback Gain
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

• *Travel Sensor Motion*—Select Clockwise or Counterclockwise. Travel Sensor Motion establishes the proper valve travel sensor (feedback) rotation. Determine the rotation by viewing the end of the travel sensor shaft.

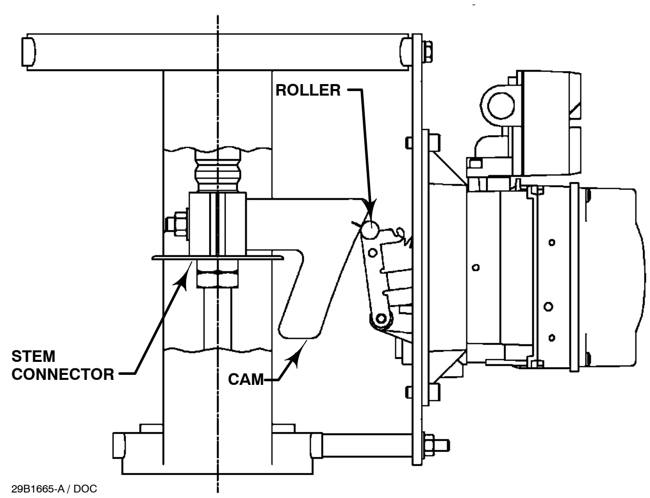


Figure 4-2. Feedback Connection for Typical Long-Stroke Sliding-Stem Actuator (4 to 24-Inches Travel)

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

Table 4-2 lists the required Travel Sensor Motion selections for Fisher, Baumann, and Gulde actuators.

• *Valve Style*—Select the valve style, rotary or sliding stem.

• *Zero Ctrl Signal*—Identifies whether the valve is fully open or fully closed when the input is 0%. If you are unsure how to set this parameter, disconnect the current source to the instrument. The resulting valve travel is the Zero Control Signal. (With direct acting digital valve controllers, disconnecting the current source is the same as setting the output pressure to zero.)

To see the following parameters, select *Tuning & Calib* from the *Manual Setup* menu.

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. 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.

• *Tuning Set*—There are eleven tuning sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings. Tuning set C provides the slowest response and M provides the fastest response. Table 4-4 lists the 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 can specify the proportional gain. An algorithm in the Field Communicator calculates the other gains. With Expert you can specify not only the proportional gain but the velocity and minor loop feedback gain as well.

Table 4-2 provides tuning set selection guidelines for Fisher, Baumann, and Gulde actuators. These tuning sets are only recommended starting points. After you finish setting up and calibrating the instrument, use the performance tuner to adjust the tuning set to get the desired response.

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

- *Tvl Cutoff Low*—Travel Cutoff Low defines the low cutoff point for the travel. Travel Cutoff Low can be used to ensure proper seat load is applied to the valve. When travel is below the travel cutoff low, the instrument sets the output to zero or to full supply pressure, depending upon the zero control signal. A Travel Cutoff Low of 0.5% is recommended to help ensure maximum shutoff seat loading.

When a Travel Cutoff Low is set, the Travel Limit Low is deactivated, since only one of these parameters can be active. Travel Cutoff Low is deactivated by setting it to -25.0%.

- *Relay Adjust*—Permits adjusting the pneumatic relay. For additional information, refer to Relay Adjustment in this section.

- *Auto Calib Travel*—Follow the prompts on the Field Communicator display to automatically calibrate the instrument travel. 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 this section.

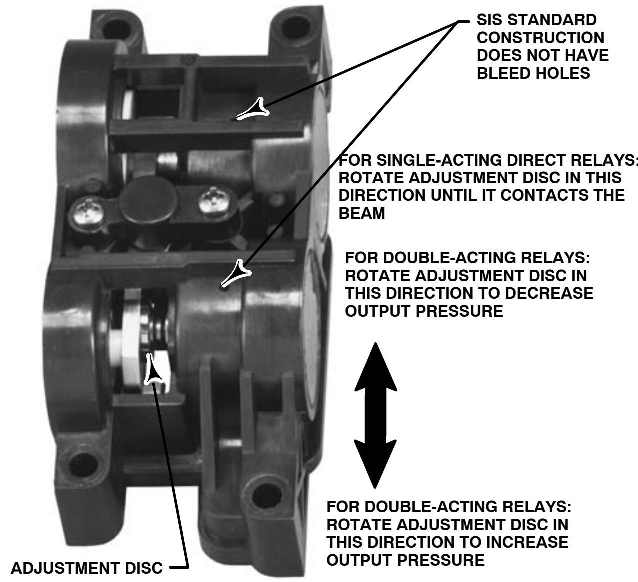


Figure 4-3. Location of Relay Adjustment (Shroud Removed for Clarity)

Relay Adjustment  (1-1-1-2)

Before beginning calibration, check the relay adjustment. To check relay adjustment, select *Relay Adjust* then follow the prompts on the Field Communicator display. Replace the digital valve controller cover when finished.

Single-Acting Actuators

For single-acting direct digital valve controllers, make sure the adjustment disc is against the beam, as shown in figure 4-3. For single-acting reverse digital valve controllers, the relay is adjusted at the factory, no further adjustment is necessary.

Double-Acting Actuators

Note

Converting a Type A relay from single-acting to double-acting requires several full turns of the adjustment disc in the + direction (increasing output pressure). The first few turns will not produce any change in output, however as you approach the correct position, both Output A and Output B will begin to change rapidly with very little additional disc rotation. Watch the output gauges to detect nearing the correct position and avoid rotating the adjustment disc too far. If using the Field Communicator and no gauges are available, listen for an audible change in relay bleed to detect nearing the correct adjustment disc position.

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 4-3, 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).

The Low Bleed Relay option [standard for SIS tier], has plugged bleed holes to reduce static air consumption rate. Depending upon the size of the actuator, stabilization may take longer (approximately two minutes) than the Standard Relay.

Reverse Acting Relay

Note

Do not install a reverse-acting relay (Relay Type B) in instruments used for SIS applications.

The reverse acting relay is designated by “Relay B” on a label affixed to the relay itself. In single acting mode, pneumatic reverse action can only be achieved with “Relay B” and cannot be achieved through adjustment of the standard direct acting “Relay A”. Normally “Relay B” is calibrated at the factory and requires no further adjustment. However, if you feel that the relay needs adjustment, perform the following steps.

1. Verify Configuration

A reverse acting DVC6000 Series digital valve controller requires different configuration settings for proper operation. First verify that these settings are correct:

a. Relay Type - “B”

b. Travel Sensor Motion – “Clockwise or Counterclockwise”

What direction does the potentiometer shaft rotate on increasing Input Signal (and therefore decreasing Output Pressure B)?

c. Zero Control Signal – “Open or Closed”

When the input signal is 4 mA (Output Pressure B at full supply), what is the valve position?

2. Rough Relay Adjustment Check

Visually examine the location of the Adjustment Disc in relation to the end of the Travel Stop on the Beam Assembly. You can view the adjustment disc through the opening in the metal shroud. It should be located approximately as shown in Figure 4-4. If it is not in the position shown, rotate the Adjustment Disc until the correct position is attained.

Figure 4-5. Relay Beam, Upper View

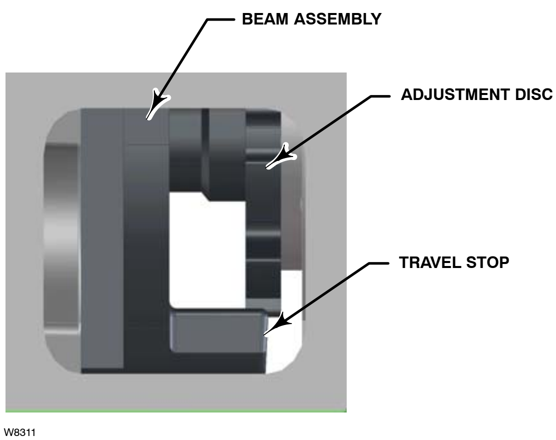


Figure 4-4. Shroud Opening Showing Rough Alignment of Adjustment Disc

Note

This is just a rough adjustment to position the Adjustment Disc in the correct range. Unless the disc has substantially deviated from this position, you do not need to make any adjustments. If you are unsure, continue on without making any adjustments.

3. Obtain Control Valve Mid-Travel

Make sure the instrument is “In Service” and that there is supply pressure to the instrument. Adjust the input signal to position the valve at mid-travel. (The important thing here is to make sure that Output B is not fully saturated with full air supply or fully vented with no air supply.) If mid-travel cannot be obtained, perform the Travel Calibration routine to roughly calibrate the instrument. If the instrument will not calibrate, return to step 1.

4. Balance the Beam

Visually examine the Travel Stops on the Beam Assembly with respect to the Relay Body. The gap between the Travel Stops and the Relay Body should be equal on both sides of the Beam Assembly (figures 4-5 and 4-6). If the gap is not equal, rotate the Adjustment Disc as follows:

- Rotate the Adjustment Disc in the “+” direction to move the lower Travel Stop away from the Relay Body.
- Rotate the Adjustment Disc in the “-“ direction to move the lower Travel Stop closer to the Relay Body.

5. Proper Calibration

When both Travel Stops are equidistant from the Relay Body, the reverse acting relay is properly calibrated. The nominal clearance on each side should be 0.14 mm (0.055 inches). Perform a final Travel Calibration routine.

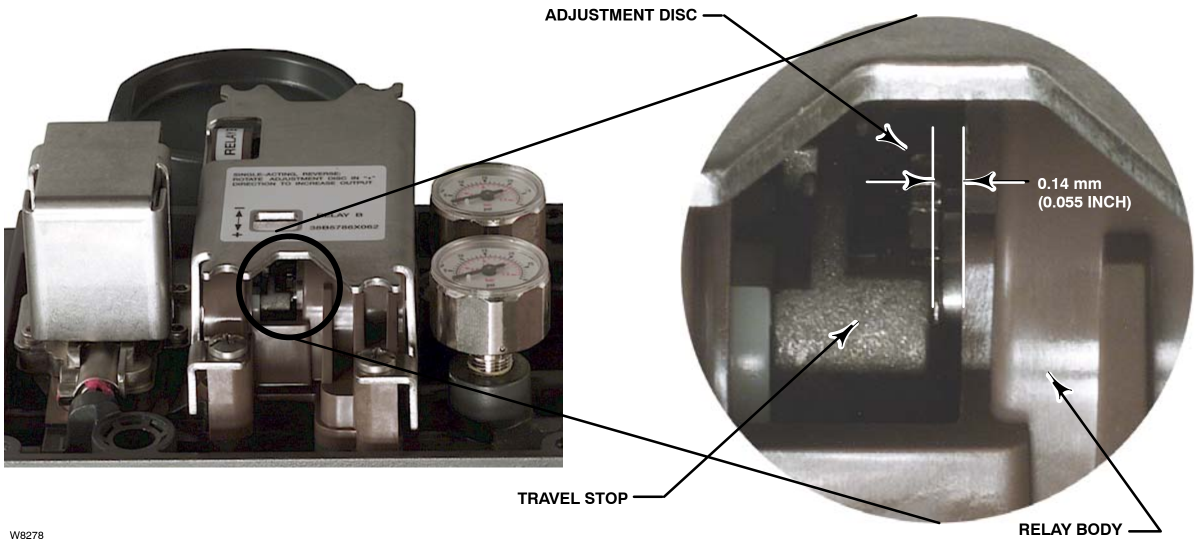


Figure 4-6. Relay Beam, Lower View

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

WARNING

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

The following briefly describes Auto Calibrate Travel. For a more detailed description, see the Calibration section. User interaction is only required when the Feedback Connection is SStem - Standard. If the Feedback Connection is Rotary - All, SStem - Roller, no user interaction is required. For valves with the SStem - Standard Feedback Connection, interaction provides a more accurate crossover adjustment. Select *Auto Calib Travel* 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 adjustment is recommended.

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 4). If you select Default, an approximate value for the crossover is sent to the instrument and there are no further user interactions with the auto-calibration routine (go to step 4). If you select Manual, 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 2. If you wish to adjust the current source digitally, select Digital and go to step 3.

2. 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 4-7. After you have made the adjustment, press OK and go to step 4.

3. 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 4-7. 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 3. Otherwise, select Done and go to step 4.

4. The remainder of the auto-calibration procedure is automatic. It is completed when the *Calibrate* menu appears.

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

If the unit does not calibrate, refer to table 4-5 for error messages and possible remedies.

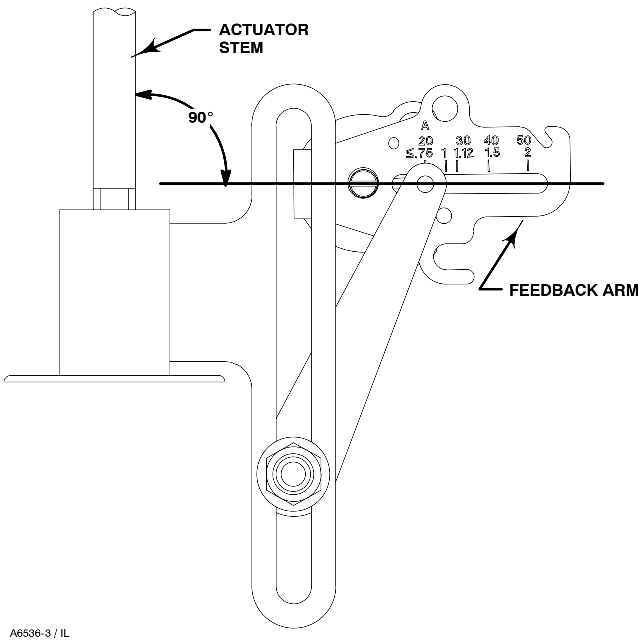
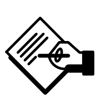


Figure 4-7. Crossover Point

Using the Performance Tuner  (1-1-1-5)



Note

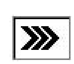
The performance tuner is not available for instrument levels AC or HC.

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 *Auto Setup* menu. Follow the prompts on the Field Communicator display to optimize digital valve controller tuning.

Table 4-5. 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.

Stabilizing or Optimizing Valve Response  

If after completing setup and calibration the valve seems slightly unstable or unresponsive, you can improve operation by pressing the Hot Key  and selecting *Stabilize/Optimize,* or select *Stabilize/Optimize* from the *Auto Setup* menu.

Stabilize/Optimize permits you to adjust valve response by changing the digital valve controller tuning. Two selections are available: Standard or Advanced. Standard permits you to adjust valve response by changing the tuning set. Advanced not only permits you to change the tuning set but also permits you to change the damping.

4

To change the valve response by changing the tuning set, select *Standard*. 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 *Advanced*. 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. You can also select a different tuning set while in Advanced. Select *Decrease Response* to select the next lower tuning set. Select *Increase Response* to select the next higher tuning set.

Section 5 Detailed Setup

Note

Detailed setup is not available for instrument level AC.

The *Detailed Setup* selection from the *Setup & Diag* menu allows you to configure the digital valve controller to your application. Table 5-1 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.

Setting Modes

To view or change the mode, select the *Setup & Diag* Menu*, Detailed Setup*, and *Mode.* Follow the prompts on the Field Communicator display to view or change information in the following fields: *Instrument Mode, Control Mode, Restart Ctrl Mode* (Restart Control Mode), *Restart,* and *Burst.*

Instrument Mode

You can change the instrument mode by selecting *Instrument Mode* from the *Mode* 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.

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.

Table 5-1. Factory Default Detailed Setup Parameters

Setup Parameter	Default Setting[1]
Control Mode	Analog
Restart Control Mode	Resume Last
Burst Mode Enabled	No
Burst Mode Command	3
HART Tag	As specified on order
Message	Blank
Descriptor	Blank
Date	Factory Calibration Date
Valve Serial Number	Blank
Polling Address	0
Max Supply Pressure	20[2]
Feedback Connection	Rotary - All[2]
Zero Control Signal	Open[2]
Travel Sensor Motion	Clockwise[2]
Analog Input Units	mA
Analog In Range High	20 mA
Analog In Range Low	4.0 mA
Travel Range High	100%
Travel Range Low	0%
Pressure Units	PSI
Temperature Units	F
Tuning Set	F[2]
Input Characteristic	Linear
Set Point Filter Time	Filter Off
Travel Limit High	125%
Travel Limit Low	-25%
Travel Cutoff High	99.5%
Travel Cutoff Low	0.5%
Minimum Opening Time	0 secs
Minimum Closing Time	0 secs
Integral Gain	9.4 repeats/minute
Integral Deadband	0.25%
Travel Hi/Lo Alert Enabled	No
Travel Hi Hi/Lo Lo Alert Enabled	No
Travel Alert High Point	125%
Travel Alert Low Point	-25%
Travel Alert High-High Point	125%
Travel Alert Low-Low Point	-25%
Travel Alert Deadband	1%
Travel Deviation Alert Enable	No
Travel Deviation Alert Point	125%
Travel Deviation Time	5 secs
Cycle Counter Alert Enable	No
Cycle Counter Alert Point	2,147,483,646
Cycle Counter Deadband	3%
Cycle Counter	0
Travel Accumulator Alert Enable	No
Travel Accumulator Alert Point	2,147,483,646%
Travel Accumulator Deadband	3%
Travel Accumulator	0
Auxiliary Input Alert Enable	No
Auxiliary Input Alert State	Closed
Supply Pressure Alert Point	0 psi
Drive Alert Enable	No
Flash ROM Fail	No
No Free Time	No
Ref Voltage Fail	No
Drive Current Fail	No
Critical NVM Fail	No
Temperature Sensor Fail	No
Pressure Sensor Fail	No
Travel Sensor Fail	No

1. The settings listed are for standard factory configuration. DVC6000 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.

Control Mode

You can change the control mode by selecting *Control Mode* from the *Mode* 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 if the instrument is to receive its set point over the 4–20 mA loop. Normally the instrument control mode is Analog.

Choose Digital if the instrument is to receive its set point digitally, 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 Control Mode

(1-2-1-3)

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

Burst Mode

(1-2-1-5)

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 Model 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.

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.

Command 3 provides the following variables:

- Primary variable—analog input in % or ma,
- Secondary variable—travel target (valve set point) in % of ranged travel,
- Tertiary variable—supply or output pressure in psig, bar, or kPa. 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.
- Quaternary variable—travel in % of ranged travel.

To enable burst mode, from the *Online* menu, select *Setup & Diag*, *Detailed Setup, Mode, Burst,* and *Burst Enable.* To send a burst mode command, select *Setup & Diag*, *Detailed Setup, Mode, Burst,* and *Burst Command.* Burst mode must be enabled before you can change the burst mode command.

Restarting the Instrument

(1-2-1-4)

Restart resets the instrument in the same manner as when power to the instrument is interrupted. When Restart is issued, all of the newly entered configuration variables become active. Otherwise, they may not take effect until the instrument is placed In Service.

Setting Protection

Some setup parameters may require changing the protection with the Field Communicator. To remove protection (change protection to *None*) requires placing a jumper across the Auxiliary terminals in the terminal box in order to change protection.

Note

If the Aux Terminal Mode is configured for Auto Travel Calibration, be sure the jumper remains across the auxiliary terminals until the Field Communicator prompts you to remove it. Removing the jumper too soon will cause the instrument to begin auto travel calibration.

WARNING

If the jumper is removed too soon, and auto travel calibration begins, the valve will move full stroke. 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.

Two levels of protection are available:

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

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

Table 5-2 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 select *Protection* from the *Detailed Setup* menu*.* Select the desired level of protection. Follow the prompts on the Field Communicator display to set the protection level. If necessary, temporarily attach the jumper to the AUX + and AUX - terminals in the instrument terminal box when prompted by the Field Communicator.

General Information

(1-2-3)

Select *Setup & Diag, Detailed Setup,* and *General*. Follow the prompts on the Field Communicator display to enter or view information in the following fields: HART *Tag*, *Message*, *Descriptor*, *Date*, *Valve Serial Num* (Valve Serial Number), *Inst Serial Num* (Instrument Serial Number), and *Polling Address*.

- *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 in the same

5

Table 5-2. Conditions for Modifying DVC6000 Series Digital Valve Controller Parameters

Parameters	In Service/ Config Protected	In Service/ Config Unprotected	Out of Service/ Config Protected	Out of Service/ Config Unprotected
Control Mode	- - -	- - -	✓	✓
Restart Ctrl Mode	- - -	- - -	- - -	✓
Burst Mode Enable	✓	✓	✓	✓
Burst Mode Command	- - -	- - -	- - -	✓
Protection	✓	✓	✓	✓
HART Tag	- - -	✓	- - -	✓
Message	- - -	✓	- - -	✓
Descriptor	- - -	✓	- - -	✓
Date	- - -	✓	- - -	✓
Valve Serial Num	- - -	✓	- - -	✓
Inst Serial Num	- - -	- - -	- - -	✓
Polling Address	- - -	- - -	- - -	✓
Relay Type	- - -	- - -	- - -	✓
Max Supply Pressure	- - -	- - -	- - -	✓
Actuator Style	- - -	- - -	- - -	✓
Feedback Connection	- - -	- - -	- - -	✓
Travel Sensor Motion	- - -	- - -	- - -	✓
Valve Style	- - -	- - -	- - -	✓
Zero Ctrl Signal	- - -	- - -	- - -	✓
Analog In Units	- - -	- - -	- - -	✓
Input Range High	- - -	- - -	- - -	✓
Input Range Low	- - -	- - -	- - -	✓
Pressure Units	- - -	- - -	- - -	✓
Temp Units	✓	✓	✓	✓
Tuning Set	- - -	- - -	- - -	✓
Prop Gain	- - -	- - -	- - -	✓
Velocity Gain	- - -	- - -	- - -	✓
MLFB Gain	- - -	- - -	- - -	✓
Input Char	- - -	- - -	- - -	✓
Define Custom Char	- - -	- - -	- - -	✓
Set Pt Filter Time	- - -	- - -	- - -	✓
Tvl Limit High	- - -	- - -	- - -	✓
Tvl Limit Low	- - -	- - -	- - -	✓
Tvl Cutoff High	- - -	- - -	- - -	✓
Tvl Cutoff Low	- - -	- - -	- - -	✓
Min Opening Time	- - -	- - -	- - -	✓
Min Closing Time	- - -	- - -	- - -	✓
Tvl Hi/Lo Enab	✓	✓	✓	✓
Tvl HH/LL Enab	✓	✓	✓	✓
Tvl Alert Hi Pt	✓	✓	✓	✓
Tvl Alert Lo Pt	✓	✓	✓	✓
Tvl Alert HiHi Pt	✓	✓	✓	✓
Tvl Alert LoLo Pt	✓	✓	✓	✓
Tvl Alrt DB	✓	✓	✓	✓
Tvl Dev Alrt Enab	✓	✓	✓	✓
Tvl Dev Alrt Pt	✓	✓	✓	✓
Tvl Dev Time	✓	✓	✓	✓
Cycl Cnt Alrt Enab	✓	✓	✓	✓
Cycl Count Alrt Pt	✓	✓	✓	✓
Cycl Count DB	✓	✓	✓	✓
Cycl Count	✓	✓	✓	✓
Tvl Acum Alrt Enab	✓	✓	✓	✓
Tvl Acum Alrt Pt	✓	✓	✓	✓
Tvl Acum DB	✓	✓	✓	✓
Tvl Acum	✓	✓	✓	✓
Aux Terminal Mode	- - -	- - -	- - -	✓
Aux In Alrt Enab	- - -	- - -	- - -	✓
Aux In Alrt State	- - -	- - -	- - -	✓
Drive Alrt Enab	✓	✓	✓	✓
Supply Press Alrt	✓	✓	✓	✓

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

-Continued-

Table 5-2. Conditions for Modifying DVC6000 Series Digital Valve Controller Parameters (Continued)

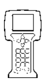
Parameters	In Service/ Config Protected	In Service/ Config Unprotected	Out of Service/ Config Protected	Out of Service/ Config Unprotected
Flash ROM Fail	- - -	- - -	- - -	✓
No Free Time	- - -	- - -	- - -	✓
Ref Voltage Fail	- - -	- - -	- - -	✓
Drive Current Fail	- - -	- - -	- - -	✓
Critical NVM Fail	- - -	- - -	- - -	✓
Temp Sensor Fail	- - -	- - -	- - -	✓
Press Sensor Fail	- - -	- - -	- - -	✓
Tvl Sensor Fail	- - -	- - -	- - -	✓

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

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 Model 375 Field Communicator Basics section.

Measured Variable Units and Ranges



(1-2-4)

To define the measured variable units and ranges, select *Setup & Diag, Detailed Setup,* and *Measured Var.* Follow the prompts on the Field Communicator display to enter or view information in the following fields: *Analog In Units* (Analog Input Units), *Analog In Range Hi (*Analog Input Range High), *Analog In Range Lo* (Analog Input Range Low) *Pressure Units,* and *Temp Units* (Temperature Units).

● *Analog Input Units*—Permits defining the Analog Input Units in mA or percent of 4-20 mA range.

● *Analog In Range Hi*—Permits setting the Input Range High value. Input Range High should correspond to Travel Range High, if the Zero Control Signal is configured as closed. If the Zero Control Signal is configured as open, Input Range High corresponds to Travel Range Low. See figure 5-1.

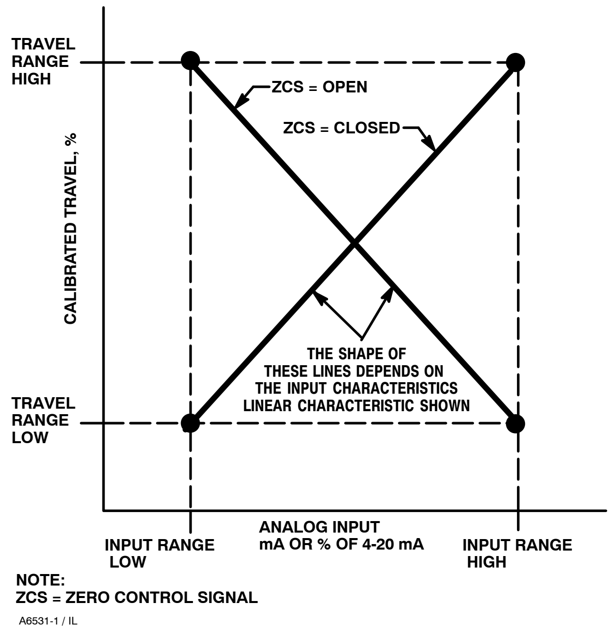


Figure 5-1. Calibrated Travel to Analog Input Relationship

● *Analog In Range Lo*—Permits setting the Input Range Low value. Input Range Low should correspond to Travel Range Low, if the Zero Control Signal is configured as closed. If the Zero Control Signal is configured as open, Input Range Low corresponds to Travel Range High. See figure 5-1.

● *Pressure Units*—Defines the output and supply pressure units in either psi, bar, or kPa.

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

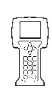
Table 5-3. Actuator Information for Initial Setup

Actuator Manufacturer	Actuator Model	Actuator Size	Actuator Style	Starting Tuning Set	Feedback Connection	Travel Sensor Motion	
						Relay A	Relay B
Fisher Controls	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 5-4	
Baumann	Air to Extend	16 32 570	Spring & Diaphragm	C E K	SStem-Standard	Clockwise	Counterclockwise
	Air to Retract					Counterclockwise	Clockwise
	Rotary	10 25 54		E H J	Rotary	Specify	
Gulde	3024	GA 1.21 GA 1.31 GA 1.41	Spring & Diaphragm	E H K	SStem-Standard	For P_o operating mode (air opens), Counterclockwise For P_s operating mode (air closes), Clockwise	For P_o operating mode (air opens), Clockwise For P_s operating mode (air closes), Counterclockwise
	3025	P460, P462, P900		M	Rotary	Specify	

Table 5-4. Travel Sensor Motion Selections for Type DVC6030 on Type 1066SR Actuators

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

Actuator and Valve Information



(1-2-5)

Select *Setup & Diag, Detailed Setup,* and *Actuator & Valve.* Follow the prompts on the Field Communicator display to enter or view information in the following fields: *Relay Type, Max Supply Press* (Maximum Supply Pressure), *Actuator Style, Feedbck Connection, Tvl Sensor Motion* (Travel Sensor Motion)*, Valve Style,* and *Zero Ctrl Signal* (Zero Control Signal)*.* Actuator information for Fisher, Baumann, and Gulde actuators is given in table 5-3.

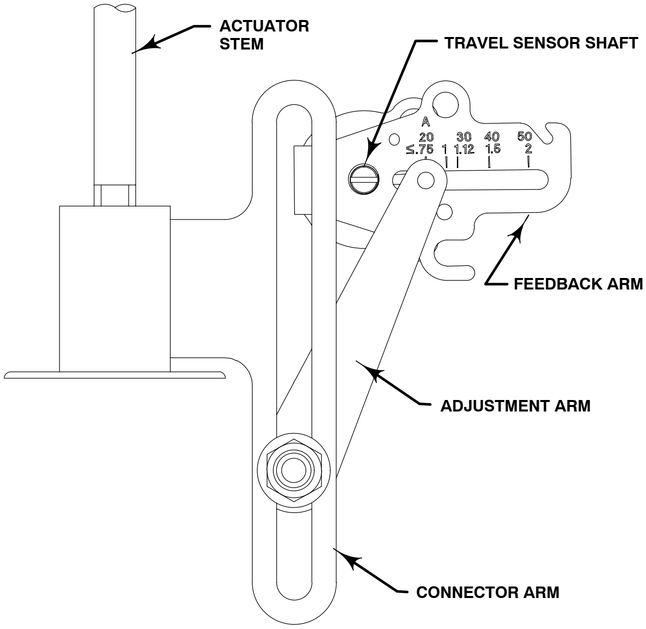


Figure 5-2. Feedback Connection for Typical Sliding-Stem Actuator (Up to 4-inch Travel)

- *Relay Type*—Enter the type of relay, A or B, installed in the digital valve controller. Relay type A is used for double-acting and single-acting direct applications. Relay type B is used for single-acting reverse applications.

- *Max Supply Press*—Enter the maximum supply pressure in psi, bar, or kPa, depending on what was selected for pressure units.

- *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.

- *Feedbck Connection*—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 5-2), enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam (similar to figure 5-3), enter Rotary All, SStem - Roller.

- *Travel 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.

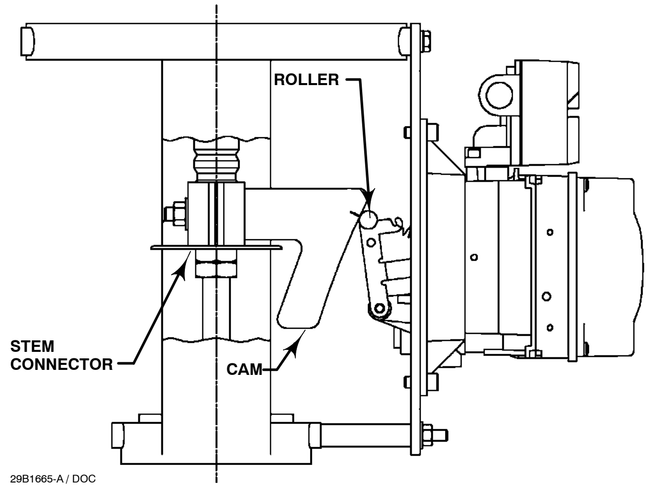


Figure 5-3. Feedback Connection for Typical Long-Stroke Sliding-Stem Actuator (4 to 24-Inches Travel)

5

For instruments with Relay Type A. If increasing air pressure at output A causes the shaft to turn clockwise, enter Clockwise. If it causes the shaft to turn counter-clockwise, enter Cntrclockwise.

For Instruments with Relay Type B. If decreasing air pressure at output B causes the shaft to turn clockwise, enter Clockwise. If it causes the shaft to turn counterclockwise, enter Cntrclockwise.

- *Valve Style*—Enter the valve style, rotary or sliding-stem.

- *Zero Ctrl Signal*—Identifies whether the valve is fully open or fully closed when the input is 0%. If you are unsure how to set this parameter, disconnect the current source to the instrument. The resulting valve travel is the Zero Control Signal. (With direct acting digital valve controllers, disconnecting the current source is the same as setting the output pressure to zero.)

Setting Response

 **(1-2-6)**

Select *Setup & Diag, Detailed Setup,* and *Response Control.* Follow the prompts on the Field Communicator display to configure the following response control parameters: *Tuning Set, Input Char* (Input Characteristic)*, Set Pt Filter Time* (Set Point Filter Time).

Table 5-5. Gain Values for Preselected Tuning Sets

TUNING SET	PROPORTIONAL GAIN	VELOCITY GAIN	MINOR LOOP FEEDBACK GAIN
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

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. 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.

- *Tuning Set*—There are eleven tuning sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings.

Tuning set C provides the slowest response and M provides the fastest response. Table 5-5 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 and performance tuner may be used to achieve the desired results more rapidly than Expert tuning.

Table 5-3 provides tuning set selection guidelines for Fisher, Baumann, and Gulde 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. See the Calibration section for information on using the performance tuner.

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.

- *Input Char*—Defines the relationship between the travel target and ranged set point. Ranged set point is the input to the characterization function. If the zero control signal equals closed, then a set point of 0% corresponds to a ranged input of 0%. If the zero control signal 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 5-4 or you can select a custom characteristic. Figure 5-4 shows the relationship between the travel target and ranged set point for the fixed input characteristics, assuming the Zero Control Signal 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.

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).

- *Set Point Filter Time*—Time constant for the set point filter, in seconds. The set point filter slows the

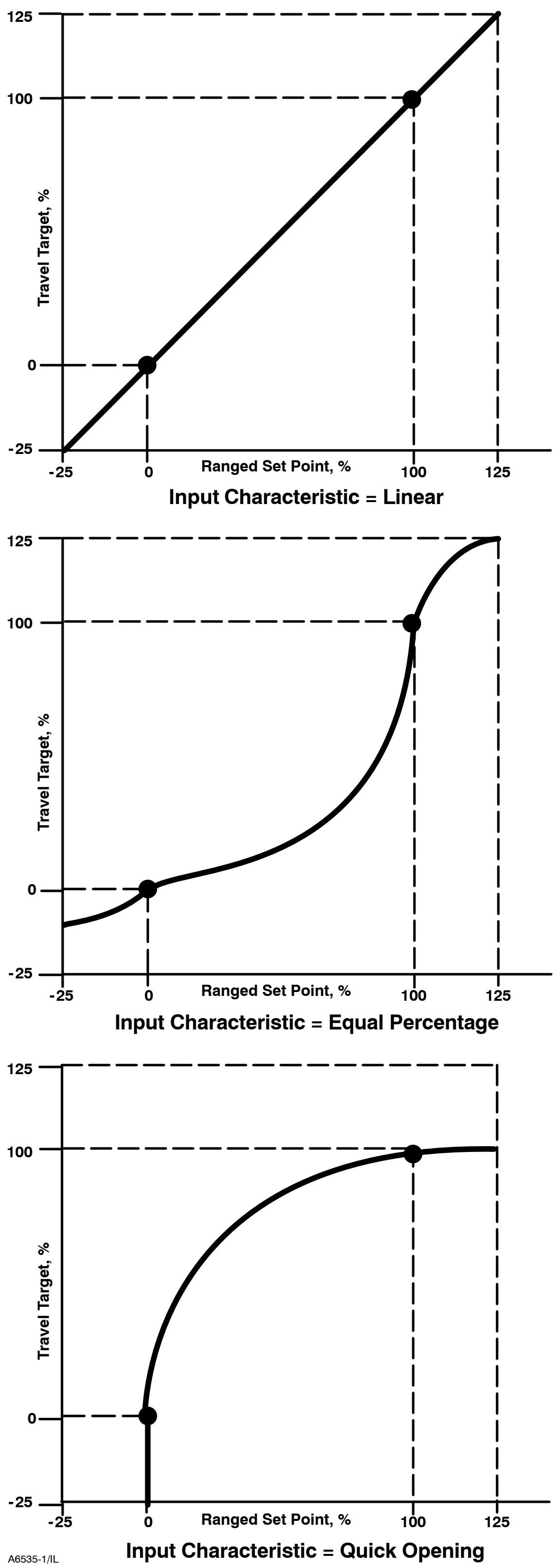


Figure 5-4. Travel Target Versus Ranged Set Point, for Various Input Characteristics (Zero Control Signal = Closed)

response of the digital valve controller and is typically used with noisy or fast processes. The filter provides improved closed loop process control. To disable the filter, set the time constant to 0 seconds.

- *Min Opening Time*—Minimum Opening Time is configured in seconds and defines the minimum time for the travel to increase the entire ranged travel. This rate is applied to any travel increases. A value of 0.0 seconds deactivates this feature and allows the valve to stroke open as fast as possible.

- *Min Closing Time*—Minimum Closing Time is configured in seconds and defines the minimum time for the travel to decrease the entire ranged travel. This rate is applied to any travel decreases. A value of 0.0 seconds deactivates this feature and allows the valve to stroke closed as fast as possible.

5

Setting Travel Limits and Cutoffs

(1-2-6-4)

Select *Setup & Diag, Detailed Setup, Response Control,* and *Limits & Cutoffs*. Follow the prompts on the Field Communicator display to set the *Tvl Limit High* (Travel Limit High), *Tvl Limit Low* (Travel Limit Low), *Tvl Cutoff High* (Travel Cutoff High), and *Tvl Cutoff Low* (Travel Cutoff Low).

- *Tvl Limit High*—Travel Limit High defines the high limit for the travel in percent (%) of ranged travel. It is the maximum allowable travel (in percent of ranged travel) for the valve. During operation, the travel target will not exceed this limit. When a Travel Limit High is set, the Travel Cutoff High is deactivated, since only one of these parameters can be active. Travel Limit High is deactivated by setting it to 125.0%.

- *Tvl Limit Low*—Travel Limit Low defines the low limit for the travel in percent (%) of ranged travel. It is the minimum allowable travel (in percent of ranged travel) for the valve. During operation, the travel target will not exceed this limit. When a Travel Limit Low is set, the Travel Cutoff Low is deactivated, since only one of these parameters can be active. Travel Limit Low is deactivated by setting it to -25.0%.

- *Tvl Cutoff High*—Travel Cutoff High defines the high cutoff point for the travel set point in percent (%) of ranged input current. Above this cutoff, the travel target is set to 123.0% of the ranged input current. When a Travel Cutoff High is set, the Travel Limit High is deactivated, since only one of these parameters can be active. Travel Cutoff High is deactivated by setting it to 125%

● *Tvl Cutoff Low*—Travel Cutoff Low defines the low cutoff point for the travel set point. Travel Cutoff Low can be used to ensure proper seat load is applied to the valve. When below the travel cutoff low, the output is set to zero or to full supply pressure, depending upon the zero control signal. A Travel Cutoff Low of 0.5% is recommended to help ensure maximum shutoff seat loading.

When a Travel Cutoff Low is set, the Travel Limit Low is deactivated, since only one of these parameters can be active. Travel Cutoff Low is deactivated by setting it to -25%.

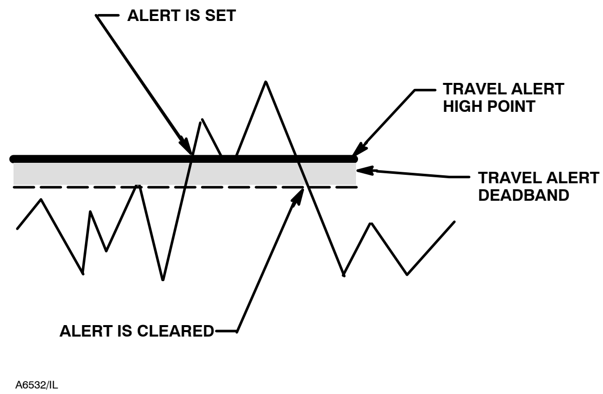


Figure 5-5. Travel Alert Deadband

Integral Action

(1-2-6-6)

Select *Setup & Diag, Detailed Setup, Response Control,* and *Integral Settings.* Follow the prompts on the Field Communicator display to set: *Enab Int Settings* (Enable Integral Settings), *Integral Gain,* and *Integral Dead Zone.*

● *Enab Int Settings*—Yes or No. Enable the integral setting to improve static performance by correcting for error that exists between the travel target and actual travel. Integral Setting is disabled by default.

● *Integral Gain*—Integral gain (also called reset) 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. The Integral Gain is user adjustable.

● *Integral Dead Zone*—Integral Dead Zone is a window around the Primary Setpoint in which the integral action is disabled. The dead band is configurable from 0 to 2%.

Setting Alerts

The following menus are available for configuring Alerts. 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.

Note

Alerts are not available with instrument level AC.

Setting Travel Alerts

(1-2-7-1)

Setting High, High-High, Low and Low-Low Alerts

Select *Setup & Diag, Detailed Setup, Alerts*, and *Travel Alerts*. Follow the prompts on the Field Communicator display to set: *Tvl Hi/Lo Enab* (Travel High and Low Alert Enable), *Tvl HH/LL Enab* (Travel High High and Low Low Alert Enable), *Tvl Alert Hi Pt* (Travel Alert High Point), *Tvl Alert Lo Pt* (Travel Alert Low Point), *Tvl Alert Hi Hi Pt* (Travel Alert High High Point), *Tvl Alert Lo Lo Pt* (Travel Alert Low Low Point), and *Tvl Alrt DB* (Travel Alert Deadband).

● *Tvl Hi/Lo Enab*—Yes or No. Travel Hi/Lo Enable activates checking of the ranged travel against the Travel Alert High and Low Points. 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 5-5.

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. See figure 5-5.

- *Tvl HH/LL Enab*—Yes or No. Travel HH/LL Enable activates checking of the ranged travel against the Travel Alert High-High and Low-Low Points. Travel Alert Hi Hi is set if the ranged travel rises above the alert high-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 5-5.

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. See figure 5-5.

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

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

- *Tvl Alert 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.

- *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 5-5.

Note

The Travel Alert Deadband applies to the Travel Deviation as well as Travel Alert Hi/Lo and Travel Alert Hi Hi/Lo Lo.

Setting Travel Deviation Alert

(1-2-7-2)

Select *Setup & Diag, Detailed Setup, Alerts, and Travel Dev Alert*. Follow the prompts on the Field Communicator display to configure the following: *Tvl Dev Alrt Enab* (Travel Deviation Alert Enable), *Tvl Dev Alrt Pt* (Travel Deviation Alert Point), and *Tvl Dev Time* (Travel Deviation Time).

- *Tvl Dev Alrt Enab*—Yes or No. When enabled, checks the difference between the travel target and the actual travel. If the difference 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 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.

- *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.

Setting Travel Accumulation Alert

(1-2-7-3)

Select *Setup & Diag, Detailed Setup, Alerts,* and *Travel Accum Alert*. Follow the prompts on the Field Communicator display to configure the following: *Tvl Acum Alrt Enab* (Travel Accumulator Alert Enable), *Tvl Acum Alrt Pt* (Travel Accumulator Alert Point), *Tvl Acum DB* (Travel Accumulator Deadband), *Tvl Acum* (Travel Accumulator).

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

- *Tvl Acum 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.

- *Tvl Acum DB*—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 5-6.

- *Tvl Acum*—Travel Accumulator records the total change in travel, in percent (%) of ranged travel, since

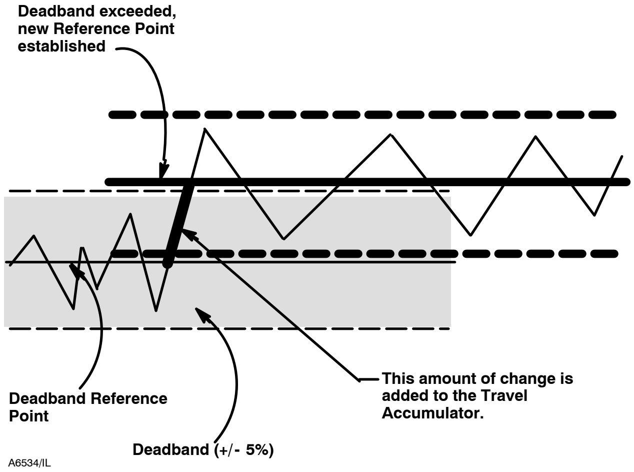


Figure 5-6. Travel Accumulator Deadband (set at 10%)

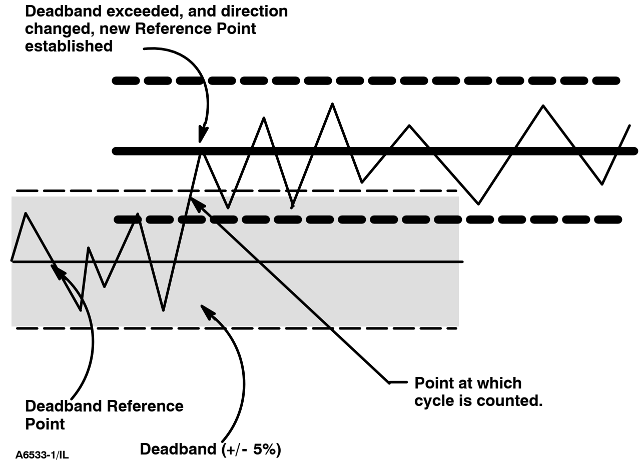


Figure 5-7. Cycle Counter Deadband (set at 10%)

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 5-6. You can reset the Travel Accumulator by configuring it to zero.

Cycle Counter Alert

(1-2-7-4)

Select *Setup & Diag, Detailed Setup, Alerts,* and *Cycle Count Alert*. Follow the prompts on the Field Communicator display to configure the following: *Cycl Cnt Alrt Enab* (Cycle Counter Alert Enable), *Cycl Count Alrt Pt* (Cycle Counter Alert Point), *Cycl Count DB* (Cycle Counter Deadband), *Cycl Count* (Cycle Counter).

• *Cycl Cnt 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.

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

• *Cycl Count DB*—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 5-7.

• *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 cycle. See figure 5-7. You can reset the Cycle Counter by configuring it as zero.

Other Alerts

(1-2-7-5)

Select *Setup & Diag, Detailed Setup, Alerts,* and *Other Alerts*. Follow the prompts on the Field Communicator display to configure the *Aux Terminal Mode* (Auxiliary Terminal Mode)*, Aux In Alrt Enab* (Auxiliary Input Alert Enable), *Aux In Alrt State* (Auxiliary Input Alert State), *Drive Alrt Enab* (Drive Alert Enable), and *Supply Press Alrt Pt* (Supply Pressure Alert Point).

• *Aux Term Mode*—Aux Input Alert or Auto Travel Calib. Selecting *Aux Input Alert* then *Aux In Alrt Enab* activates checking the status of the auxiliary input contacts. Selecting *Auto Travel Calib* permits starting an automatic travel calibration procedure by placing a jumper across the auxiliary input terminals for 3 to 5 seconds.

• *Aux In Alrt Enab*—Yes or No. Auxiliary Input Alert Enable activates checking the status of the auxiliary input when the *Auxiliary Terminal Mode* is *Aux Input Alert*. The auxiliary input is a contact or discrete input, which may be open or closed. When enabled, the Auxiliary Input Alert is set when the auxiliary input terminals are either open or closed, depending upon the selection for the *Aux In Alrt State*.

Table 5-6. 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

- *Aux In Alrt State*—Open or Closed. Determines which state of the contacts (open or closed) connected to the auxiliary input terminals causes the auxiliary input alert to be active.

- *Drive Alrt Enab*—Yes or No. Drive Alert Enable activates checking of the relationship between the Drive Signal and the calibrated travel. If one of the following conditions exists for more than 20 seconds, the Drive Alert is set.

For the case where Zero Control Signal is defined as closed:

Drive Signal < 10% and Calibrated Travel > 3%

Drive Signal > 90% and Calibrated Travel < 97%

For the case where Zero Control Signal is defined as open:

Drive Signal < 10% and Calibrated Travel < 97%

Drive Signal > 90% and Calibrated Travel > 3%

Note

Supply Pressure Alert Point is not available for instrument level HC.

- *Supply Press Alrt Pt*—Supply Pressure 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.

Alert Record

(1-2-7-6)

The alert record can store up to 11 alerts from any of the enabled alert groups: Valve Alerts, Failure Alerts or Miscellaneous Alerts. Select *Setup & Diag, Detailed Setup, Alerts,* and *Alert Record*. Follow the prompts on the Field Communicator display to *Display Record, Clear Record*, set the *Inst Date & Time* (Instrument Date and Time), and enable *Record Groups*.

- **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.

- **Inst Date & 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. Enter the date and time in the form: MM/DD/YYYY HH:MM:SS, where MM is two digits for the month (1 through 12), DD is two digits for the day (1 through 31), and YYYY is four digits for the year (1980 through 2040), HH is two digits for the hour (00 to 23), MM is two digits for the minutes (00 to 59), and SS is two digits for the seconds (00 through 59).

- **Record Group Enab**—Permits enabling one or more alert groups. Table 5-6 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.

Self Test Failures for Instrument Shutdown (1-2-8)

Select *Setup & Diag, Detailed Setup,* and *Self Test Shutdown.* Follow the prompts on the Field Communicator display to determine the self test shutdown criteria from the following selections: *Done*, *Flash ROM Fail* (Flash Read Only Memory Failure), *No Free Time*, *Ref Voltage Fail* (Reference Voltage Failure), *Drive Current Fail, Critical NVM Fail* (Critical Non-Volatile Memory Failure), *Temp Sensor Fail* (Temperature Sensor Failure), *Press Sensor Fail* (Pressure Sensor Failure), or *Tvl Sensor Fail* (Travel Sensor Failure). Upon shutdown, the instrument attempts to drive its output pressure to the zero current condition and no longer executes its control function. In addition, the appropriate failure statuses are set. Once the problem that caused the shutdown has been fixed, the instrument can be restarted by cycling the power or selecting Restart from the *Mode* menu of the Field Communicator. Also see the DVC6000 Series Digital Valve Controller Instrument Status section on page 8-3 for further details about failures.

- *Done*—Select this if you are done modifying the self test shutdown criteria.

- *Flash ROM Fail*—When enabled, the instrument shuts down whenever there is a failure associated with flash ROM (read only memory).

- *No Free Time*—When enabled, the instrument shuts down whenever there is a failure associated with No Free Time.

- *Ref Voltage Fail*—When enabled, the instrument shuts down whenever there is a failure associated with the internal voltage reference.

- *Drive Current Fail*—When enabled, the instrument shuts down whenever the drive current does not read as expected.

- *Critical NVM Fail*—When enabled, the instrument shuts down whenever there is a failure associated with critical NVM (non-volatile memory).

- *Temp Sensor Fail*—When enabled, the instrument shuts down whenever there is a failure associated with the internal temperature sensor.

- *Press Sensor Fail*—When enabled, the instrument shuts down whenever there is a failure associated with one of the pressure sensors.

- *Tvl Sensor Fail*—When enabled, the instrument shuts down whenever there is a failure associated with the travel sensor.

Section 6 Calibration

When a DVC6000 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 remote-mounted digital valve controllers, the Type DVC6005 base unit ships separately from the control valve and does not include tubing, fittings or wiring.

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 *Auto Calib Travel* from the *Auto Setup* or *Manual Setup* menus. For more detailed calibration information, refer to the following calibration procedures, available from the *Calibrate* menu:

- **Restore Calibration**—This procedure permits you to restore the calibration settings back to the factory settings.

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

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

- **Manual Calibrate Travel**—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.

- **Performance Tuner**—Use the Performance Tuner to optimize instrument tuning.

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

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

- **Calibrate Location**—Indicates the location of the last instrument calibration. The calibration location is either FACTORY or FIELD. A new instrument will display FACTORY. As soon as calibration is performed on one of the measured variables, such as Analog Input, Travel, or if the tuning set is changed, the Calibration Location is set to FIELD. When you select *Restore Calib*, under the *Calibrate* menu, the calibration parameters are reset to the original factory settings.

- **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.

To display the calibrate menu, from the *Online* menu, select *Setup & Diag,* then select *Calibrate* from the *Setup & Diag* menu.

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 with calibration. Once calibration is complete, burst mode may then be turned back on.

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.

Restoring Calibration to Factory Settings (1-4-5)

From the *Online* menu, select *Setup & Diag*, then select *Calibrate, and Restore Calib.* 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.

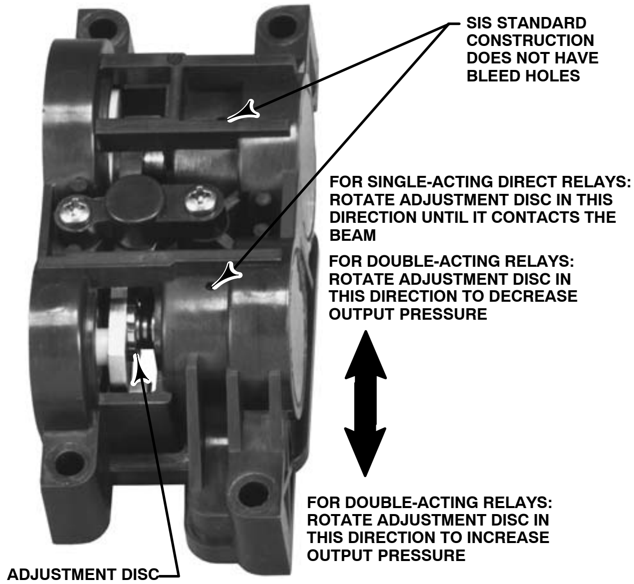


Figure 6-1. Location of Relay Adjustment (Shroud Removed for Clarity)

Relay Adjustment

(1-4-7)

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.

Single-Acting Actuators

For single-acting direct digital valve controllers, make sure the adjustment disc is against the beam, as shown in figure 6-1. For single-acting reverse digital valve controllers, the relay is adjusted at the factory, no further adjustment is necessary.

Double-Acting Actuators

Note

Converting a Type A relay from single-acting to double-acting requires several full turns of the adjustment disc in the + direction (increasing output pressure). The first few turns will not produce any change in output, however as you approach the correct position, both Output A and Output B will begin to change rapidly with very little additional disc rotation. Watch the output gauges to detect nearing the correct position and avoid rotating the adjustment disc too far. If using the Field Communicator and no gauges are available, listen for an audible change in relay bleed to detect nearing the correct adjustment disc position.

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 6-1, 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).

If the low bleed relay option has been ordered stabilization may take approximately two minutes longer than the standard relay.

Reverse Acting Relay

Note

Do not install a reverse-acting relay (Relay Type B) in instruments used for SIS applications.

The reverse acting relay is designated by “Relay B” on a label affixed to the relay itself. In single acting mode,

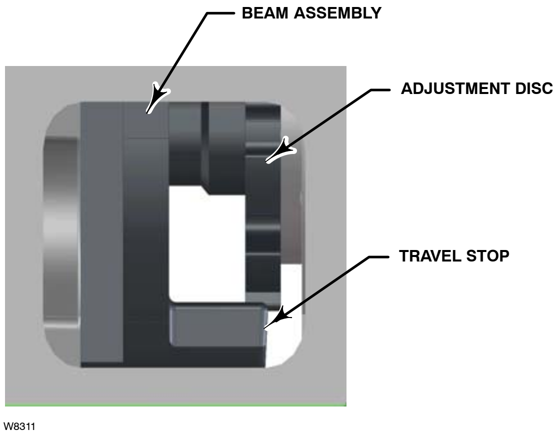


Figure 6-2. Shroud Opening Showing Rough Alignment of Adjustment Disc

pneumatic reverse action can only be achieved with "Relay B" and cannot be achieved through adjustment of the standard direct acting "Relay A". Normally "Relay B" is calibrated at the factory and requires no further adjustment. However, if you feel that the relay needs adjustment, perform the following steps.

1. Verify Configuration

A reverse acting DVC6000 Series digital valve controller requires different configuration settings for proper operation. First verify that these settings are correct:

a. Relay Type - "B"

b. Travel Sensor Motion – "Clockwise or Counterclockwise"

What direction does the potentiometer shaft rotate on increasing Input Signal (and therefore decreasing Output Pressure B)?

c. Zero Control Signal – "Open or Closed"

When the input signal is 4 mA (Output Pressure B at full supply), what is the valve position?

2. Rough Relay Adjustment Check

Visually examine the location of the Adjustment Disc in relation to the end of the Travel Stop on the Beam Assembly. You can view the adjustment disc through the opening in the metal shroud. It should be located approximately as shown in Figure 6-2. If it is not in the position shown, rotate the Adjustment Disc until the correct position is attained.

Note

This is just a rough adjustment to position the Adjustment Disc in the correct range. Unless the disc has substantially deviated from this position, you do not need to make any adjustments. If you are unsure, continue on without making any adjustments.

3. Obtain Control Valve Mid-Travel

Make sure the instrument is "In Service" and that there is supply pressure to the instrument. Adjust the input signal to position the valve at mid-travel. (The important thing here is to make sure that Output B is not fully saturated with full air supply or fully vented with no air supply.) If mid-travel cannot be obtained, perform the Travel Calibration routine to roughly calibrate the instrument. If the instrument will not calibrate, return to step 1.

4. Balance the Beam

Visually examine the Travel Stops on the Beam Assembly with respect to the Relay Body. The gap between the Travel Stops and the Relay Body should be equal on both sides of the Beam Assembly (Figures 6-3 & 6-4). If the gap is not equal, rotate the Adjustment Disc as follows:

- Rotate the Adjustment Disc in the "+" direction to move the lower Travel Stop away from the Relay Body.

- Rotate the Adjustment Disc in the "-" direction to move the lower Travel Stop closer to the Relay Body.

5. Proper Calibration

When both Travel Stops are equidistant from the Relay Body, the reverse acting relay is properly calibrated. The nominal clearance on each side should be 0.14 mm (0.055 inches). Perform a final Travel Calibration routine.

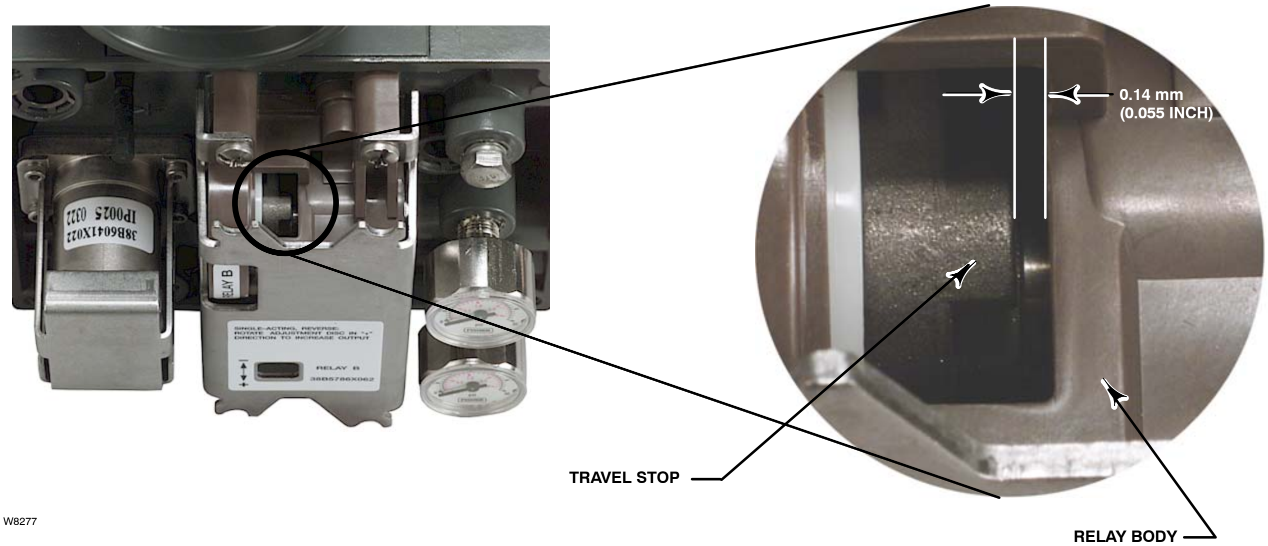


Figure 6-3. Relay Beam, Upper View

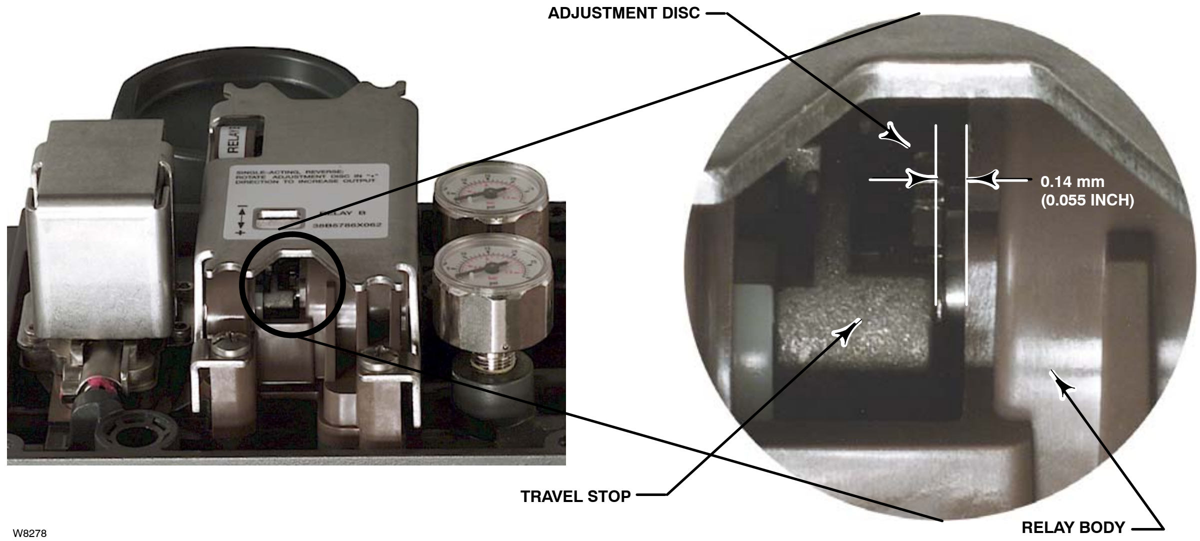


Figure 6-4. Relay Beam, Lower View

Travel Calibration

There are two procedures available for calibrating travel:

- Automatically (Auto Calibrate Travel)
- Manually (Manual Calibrate Travel)

Once the travel is calibrated by performing either the Auto Calibrate Travel or Manual Calibrate Travel procedures, the travel calibration can be “touched-up” using Touch-Up Travel Calibration.

Auto Calibrate Travel

 **(1-4-2)**

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.

Select *Auto Calib Travel* 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. 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.

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 6-5. 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 6-5. 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.

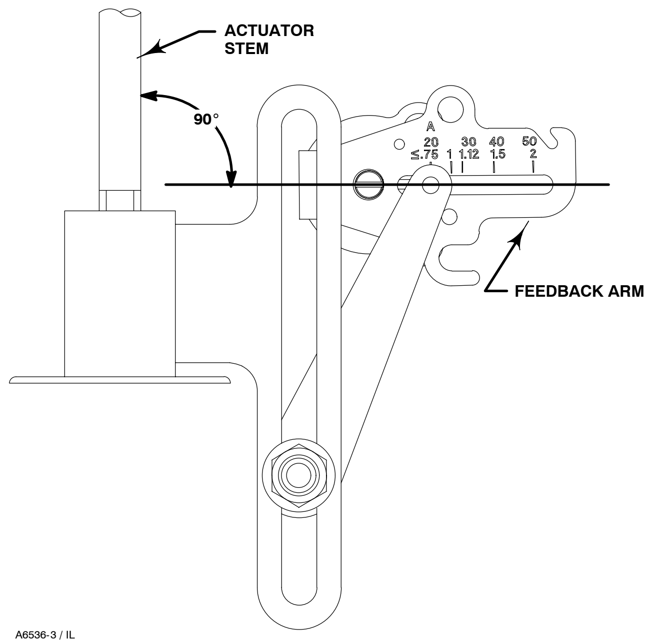


Figure 6-5. Crossover Point

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. It is completed when the *Calibrate* menu appears.

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.

The instrument then seeks the 5 and 95% points to create a set of linear correction factors intended to get the travel set point to agree more closely with the actual travel.

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

Manual Calibrate Travel

(1-4-3)

Two procedures are available to manually calibrate travel:

- Analog Adjust
- Digital Adjust

Analog Calibration Adjust

(1-4-3-1)

From the *Calibrate* menu, select *Man Calib Travel* and *Analog Adjust.* Connect a variable current source to the instrument LOOP + and LOOP - terminals. The current source should be capable of generating 4 to 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 6-5. 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

(1-4-3-2)

From the *Calibrate* menu, select *Man Calib Travel* 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 pressing OK to get to 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 6-5. 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.

Touch-Up Travel Calibration

Once the travel is calibrated by performing either the Auto Calibrate Travel or Manual Calibrate Travel procedures, the travel calibration can be “touched-up” by shorting the Aux Terminal Connections for 3 to 5 seconds to activate Touch-Up Calibration. Touch-Up Travel Calibration uses Last Value for the crossover adjustment. You can abort the procedure by shorting the auxiliary terminals for 1 second.

To enable Touch-Up Travel Calibration the *Aux Terminal Mode* must be *Auto Travel Calib*. Touch-Up Travel Calibration automatically sets the Instrument Mode to Out of Service. When calibration is finished, if the instrument was In Service at the start of calibration, it will be returned to In Service. The instrument *Operational Status* during calibration is *Auto Calibration in Progress*.

Use Touch-Up Calibration to calibrate the digital valve controller travel whenever the I/P converter or relay is replaced. Do not use Touch-Up calibration for initial calibration when mounting the instrument on an actuator, or if the travel sensor assembly or printed wiring board assembly was replaced.

You can use Touch-Up Travel Calibration to calibrate the digital valve controller if you suspect calibration has changed due to drift. However, prior to initiating Touch-Up Travel Calibration, perform a Valve Signature diagnostic test, using AMS ValveLink Software. This will capture the as found data for future root cause analysis.

Performance Tuner

(1-4-9)

Note

The performance tuner is not available for instrument levels AC or HC.

The performance tuner is used to optimize digital valve controller tuning. It can be used on most sliding-stem and rotary designs, 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 *Calibrate* menu. Follow the prompts on the Field Communicator display to optimize digital valve controller tuning.

Analog Input Calibration

(1-4-1)

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. Select *Analog In Calib* from the *Calibrate* menu, then 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 target.**

Press OK when you have read this message.

3. The value of the Analog Input appears on the display. Press OK to display the adjustment menu.

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. If the displayed value does not match the current source, press OK, then repeat this step (step 4) to further adjust the displayed value. When the displayed value 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 target.**

Press OK when you have read this message.

7. The value of the Analog Input appears on the display. Press OK to display the adjustment menu.

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. If the displayed value does not match the current source, press OK, then repeat this step (step 8) to further adjust the displayed value. When the displayed value 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.

Pressure Sensor Calibration

(1-4-4)

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

(1-4-4-1) or (1-4-4-2)

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 *Pressure Calib.* 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.

6

1. Adjust the supply pressure regulator to the maximum instrument supply pressure. Press OK.

2. The instrument reduces the output pressure to 0. 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.

3. The value of the output pressure appears on the display. Press OK to display the adjustment menu.

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. If the displayed value does not match the output pressure, press OK, then repeat this step (step 4) to further adjust the displayed value. When the displayed value matches the output pressure, select Done and go to step 5.

5. 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.

6. The value of the output pressure appears on the display. Press OK to display the adjustment menu.

7. 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. If the displayed value does not match the output pressure, press OK, then repeat this step (step 7) to further adjust the displayed value. When the displayed value matches the output pressure, select Done and go to step 8.

8. Place the instrument In Service and verify that the displayed pressure matches the measured output pressure.

Supply Pressure Sensor Calibration

(1-4-4-3)

Note

Supply Pressure Sensor Calibration is not available for instrument level HC.

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 *Pressure Calib* then select *Supply Sensor.* Follow the prompts on the Field Communicator display to calibrate the instrument's supply pressure sensor.

1. Adjust the supply pressure regulator to remove supply pressure from the instrument. Press OK.

2. The following message appears.

Use the Increase and Decrease selections until the displayed pressure matches the instrument supply.

Press OK when you have read this message.

3. The value of the pressure appears on the display. Press OK to display the adjustment menu.

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. If the displayed value does not match the supply pressure, press OK, then repeat this step (step 4) to further adjust the displayed value. When the displayed value matches the supply pressure, select Done and go to step 5.

5. Adjust the supply pressure regulator to the maximum instrument supply pressure or maximum actuator rating, whichever is lower. Press OK.

6. The following message appears.

Use the Increase and Decrease selections until the displayed pressure matches the instrument supply.

Press OK when you have read this message.

7. The value of the pressure appears on the display. Press OK to display the adjustment menu.

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 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. If the displayed value does not match the supply pressure, press OK, then repeat this step (step 8) to further adjust the displayed value. When the displayed value matches the supply pressure, select Done and go to step 9.

9. Place the instrument In Service and verify that the displayed pressure matches the measured supply pressure.

Travel Sensor Adjust

(1-4-8)

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.

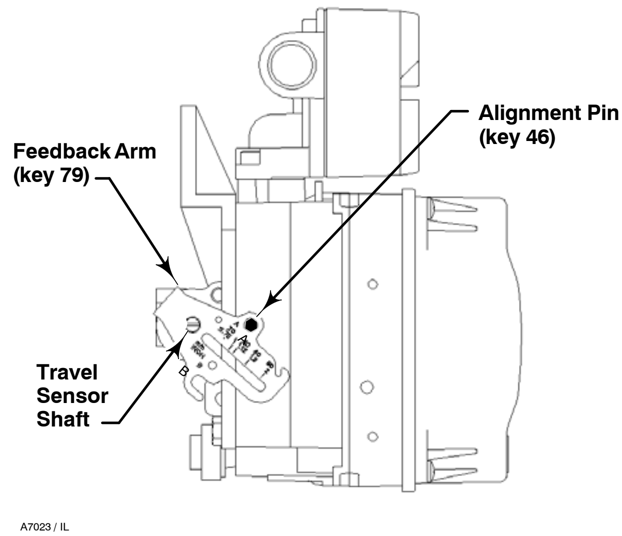


Figure 6-6. Type DVC6010 Digital Valve Controller Showing Feedback Arm in Position for Travel Sensor Adjustment

6

DVC6010, DVC6015, DVC6030 and DVC6035 Digital Valve Controllers

1. Remove supply air and remove the instrument from the actuator.

WARNING

Failure to remove air pressure may cause personal injury or property damage from bursting parts.

2. As shown in figure 6-6, 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.

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.

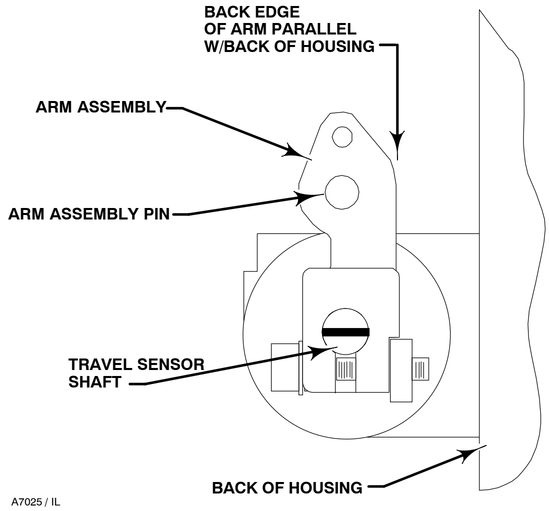


Figure 6-7. Type DVC6020 Travel Sensor Arm/Housing Back Plane Alignment

Table 6-1. DVC6000 Series Digital Valve Controller Travel Sensor Counts

Digital Valve Controller	Travel Sensor Counts
Type DVC6010 / DVC6015	600 ±150
Type DVC6020 / DVC6025	1950 ±150
Type DVC6030 / DVC6035	600 ±150

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 *Tvl Sensor Adjust.* Follow the prompts on the Field Communicator display to adjust the travel sensor counts to the value listed in table 6-1.

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 6-1. 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 and DVC6025 Digital Valve Controllers

1. Remove supply air and remove the instrument from the actuator.

WARNING

Failure to remove air pressure may cause personal injury or property damage from bursting parts.

2. See figure 6-8 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 6-7.

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 *Tvl Sensor Adjust.* Follow the prompts on the Field Communicator display to adjust the travel sensor counts to the value listed in table 6-1.

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

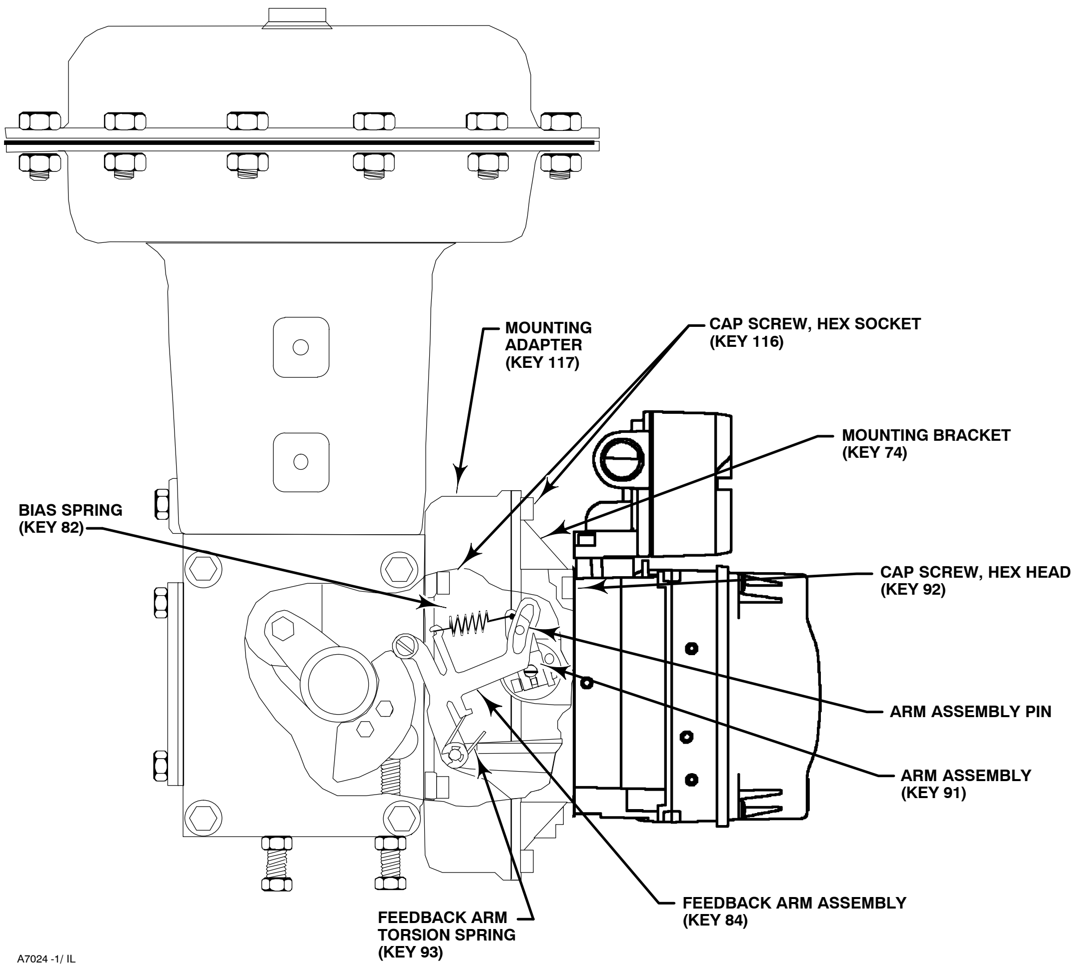


Figure 6-8. Type DVC6020 Digital Valve Controller Mounted on Type 1052, Size 33 Actuator

sensor shaft. Be sure the travel sensor counts remain within the tolerances listed in table 6-1. Paint the screw to discourage tampering with the connection.

8. Disconnect the Field Communicator and current source from the instrument.

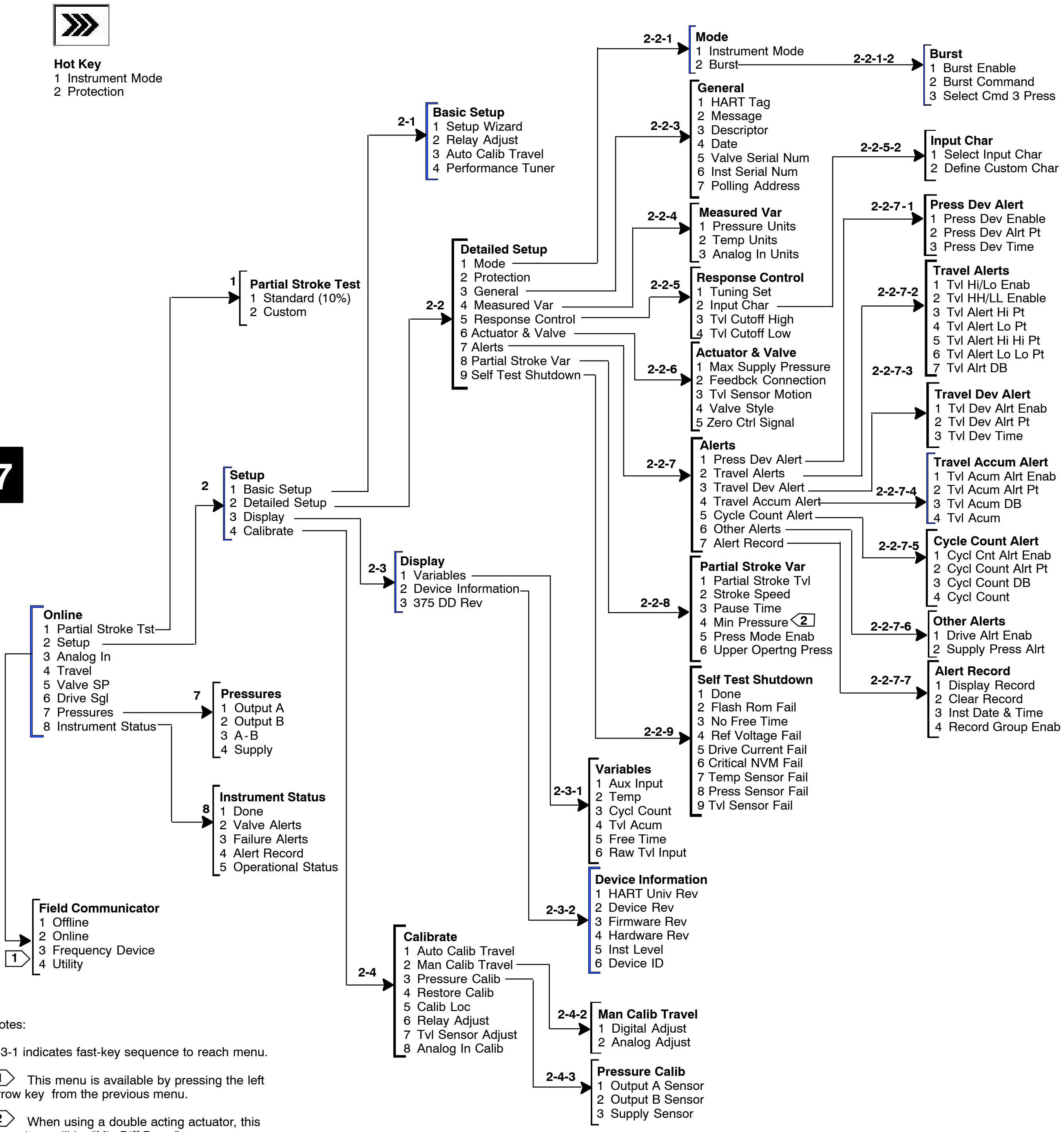
9. Apply lubricant (key 63) to the pin portion of the arm assembly (key 91).

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.

Section 7 Safety Instrumented System Applications

Model 375 Field Communicator Menu Structure for FIELDVUE® DVC6000 Instrument Level SIS



Notes:

3-3-1 indicates fast-key sequence to reach menu.

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

2 When using a double acting actuator, this menu item will be "Min Diff Press".

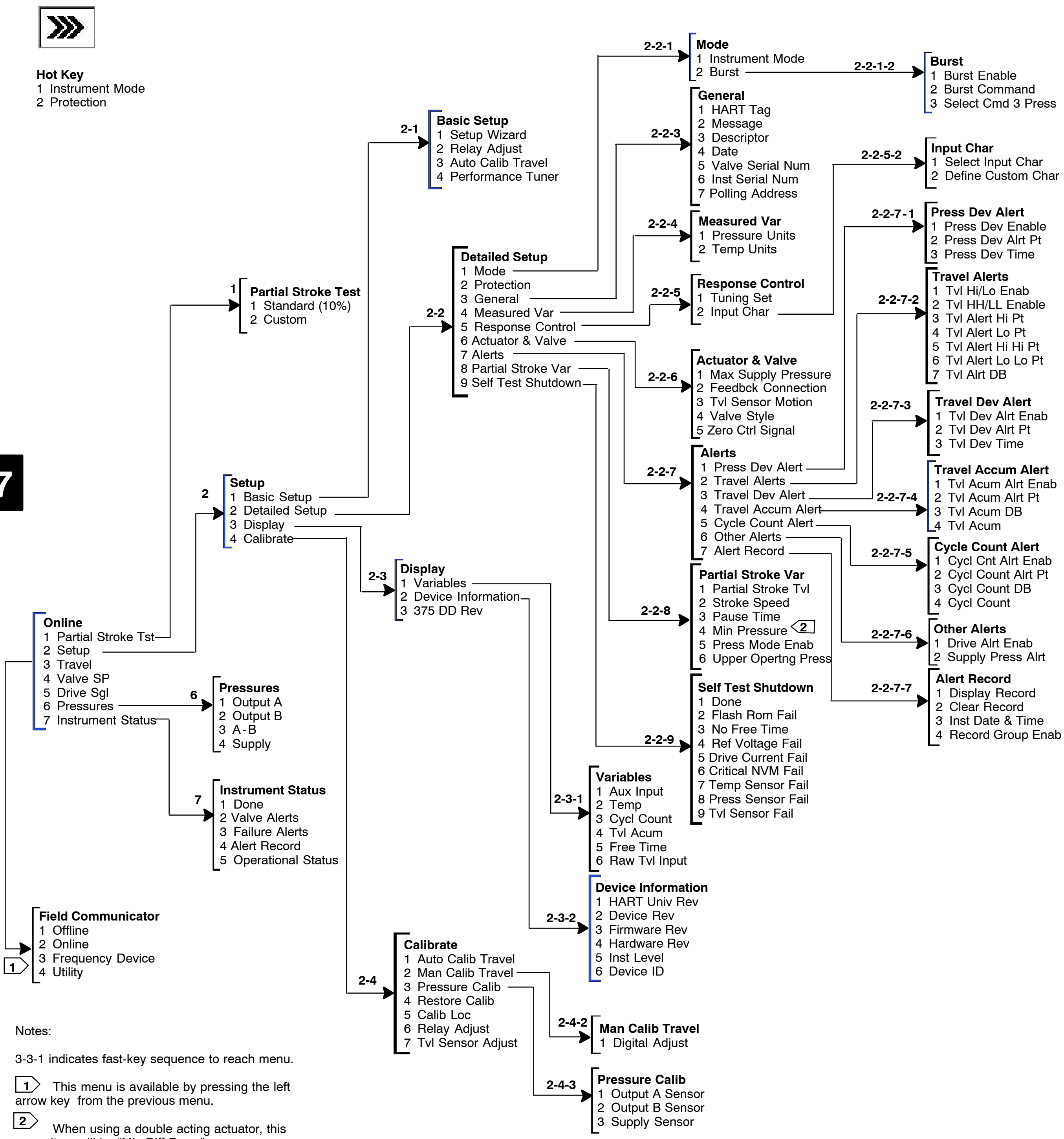
Model 375 Field Communicator Menu Structure for Device Description Revision 4 for Instruments in 4-Wire Systems (Point-to-Point Operation)

Table 7-1. Model 375 Field Communicator Fast-Key Sequence, 4-Wire Systems (Point-to-Point Operation)

Function/Variable	Fast-Key Sequence	Coordinates[(1)]	Function/Variable	Fast-Key Sequence	Coordinates[(1)]
Alert Record	2-2-7-7	4-E	Pressure Deviation Enable	2-2-7-1-1	6-C
Analog Input	3	1-E	Pressure Deviation Time	2-2-7-1-3	6-C
Analog Input Units	2-2-4-3	4-C	Pressure, Output A	7-1	2-F
Auxiliary Input	2-3-1-1	4-F	Pressure, Output A - Output B	7-3	2-F
Basic Setup	2-1	2-D	Pressure, Output B	7-2	2-F
Burst	2-2-1-2	4-A	Pressure, Supply	7-4	2-F
Calibrate	2-4	3-G	Pressure Units	2-2-4-1	4-C
Calibrate, Analog Input	2-4-8	3-H	Protection	Hot Key-2	1-A
Calibrate Travel (Auto)	2-4-1	3-G	Raw Travel Input	2-3-1-6	4-G
Calibrate, Travel (Manual)	2-4-2	3-G	Relay Adjust	2-4-6	3-H
Calibrate, Pressure Sensors	2-4-3	3-G	Self-Test Shutdown	2-2-9	3-C
Calibration Location	2-4-5	3-H	Setup Wizard	2-1-1	3-B
Calibration Restore	2-4-4	3-H	Supply Pressure Alert	2-2-7-6-2	6-E
Cycle Count	2-2-7-5-4	6-E	Temperature, Internal	2-3-1-2	4-F
Cycle Counter Deadband	2-2-7-5-3	6-E	Temperature Units	2-2-4-2	4-C
Cycle Counter Alert Enable	2-2-7-5-1	6-E	Travel	4	1-E
Cycle Counter Alert Point	2-2-7-5-2	6-E	Travel Accumulator	2-2-7-4-4	6-D
Date	2-2-3-4	4-B	Travel Accumulator Alert Enable	2-2-7-4-1	6-D
Descriptor	2-2-3-3	4-B	Travel Accumulator Alert Point	2-2-7-4-2	6-D
Device Description Revision, Field Communicator	2-3-3	3-E	Travel Accumulator Deadband	2-2-7-4-3	6-D
Device Information	2-3-2	3-E	Travel Alert Deadband	2-2-7-2-7	6-C
Drive Alert Enable	2-2-7-6-1	6-E	Travel Alert Hi/Lo Enable	2-2-7-2-1	6-C
Drive Signal	6	1-F	Travel Alert High Point	2-2-7-2-3	6-C
Feedback Connection	2-2-6-2	4-D	Travel Alert High High Point	2-2-7-2-5	6-C
HART Tag	2-2-3-1	4-G	Travel Alert HiHi/LoLo Enable	2-2-7-2-2	6-C
Input Characteristic	2-2-5-2	4-C	Travel Alert Low Low Point	2-2-7-2-6	6-C
Instrument Level	2-3-2-5	4-G	Travel Alert Low Point	2-2-7-2-4	6-C
Instrument Mode	Hot Key-1	1-A	Travel Cutoff High	2-2-5-3	4-C
Instrument Serial Number	2-2-3-6	4-B	Travel Cutoff Low	2-2-5-4	4-C
Instrument Status	8	4-C	Travel Deviation Alert Enable	2-2-7-3-1	6-D
Maximum Supply Pressure	2-2-6-1	4-C	Travel Deviation Alert Point	2-2-7-3-2	6-D
Message	2-2-3-2	4-B	Travel Deviation Time	2-2-7-3-3	6-D
Partial Stroke Test	1	1-E	Travel Sensor Adjust	2-4-7	3-H
Partial Stroke, Custom	1-2	2-C	Travel Sensor Motion	2-2-6-3	4-D
Partial Stroke, Standard	1-1	2-C	Tuning Set	2-2-5-1	4-C
Partial Stroke Variables	2-2-8	4-E	Valve Serial Number	2-2-3-5	4-B
Performance Tuner	2-1-4	3-B	Valve Set Point	5	1-F
Polling Address	2-2-3-7	4-B	Valve Style	2-2-6-4	4-D
Pressure Deviation Alert Point	2-2-7-1-2	6-C	Zero Control Signal	2-2-6-5	4-D

1. Coordinates are to help locate the item on the menu structure.

Model 375 Field Communicator Menu Structure for FIELDVUE® DVC6000 Instrument Level SIS (ESD)



Notes:

3-3-1 indicates fast-key sequence to reach menu.

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

2 When using a double acting actuator, this menu item will be “Min Diff Press”.

Model 375 Field Communicator Menu Structure for Device Description Revision 4 for Instruments in 2-Wire Systems (Multidrop Operation)

Table 7-2. Model 375 Field Communicator Fast-Key Sequence, 2-Wire Installations (Multidrop Operation)

Function/Variable	Fast-Key Sequence	Coordinates(1)	Function/Variable	Fast-Key Sequence	Coordinates(1)
Alert Record	2-2-7-7	4-E	Pressure Deviation Time	2-2-7-1-3	6-C
Auxiliary Input	2-3-1-1	4-F	Pressure, Output A	6-1	2-F
Basic Setup	2-1	2-D	Pressure, Output A - Output B	6-3	2-F
Burst	2-2-1-2	4-A	Pressure, Output B	6-2	2-F
Calibrate	2-4	3-G	Pressure, Supply	6-4	2-F
Calibrate Travel (Auto)	2-4-1	3-G	Pressure Units	2-2-4-1	4-C
Calibrate, Travel (Manual)	2-4-2	3-G	Protection	Hot Key-2	1-A
Calibrate, Pressure Sensors	2-4-3	3-G	Raw Travel Input	2-3-1-6	4-G
Calibration Location	2-4-5	3-H	Relay Adjust	2-4-6	3-H
Calibration Restore	2-4-4	3-H	Self-Test Shutdown	2-2-9	3-C
Cycle Count	2-2-7-5-4	6-E	Setup Wizard	2-1-1	3-B
Cycle Counter Deadband	2-2-7-5-3	6-E	Supply Pressure Alert	2-2-7-6-2	6-E
Cycle Counter Alert Enable	2-2-7-5-1	6-E	Temperature, Internal	2-3-1-2	4-F
Cycle Counter Alert Point	2-2-7-5-2	6-E	Temperature Units	2-2-4-2	4-C
Date	2-2-3-4	4-B	Travel	3	1-E
Descriptor	2-2-3-3	4-B	Travel Accumulator	2-2-7-4-4	6-D
Device Description Revision, Field Communicator	2-3-3	3-E	Travel Accumulator Alert Enable	2-2-7-4-1	6-D
Device Information	2-3-2	3-E	Travel Accumulator Alert Point	2-2-7-4-2	6-D
Drive Alert Enable	2-2-7-6-1	6-E	Travel Accumulator Deadband	2-2-7-4-3	6-D
Drive Signal	5	1-F	Travel Alert Deadband	2-2-7-2-7	6-C
Feedback Connection	2-2-6-2	4-D	Travel Alert Hi/Lo Enable	2-2-7-2-1	6-C
HART Tag	2-2-3-1	4-G	Travel Alert High Point	2-2-7-2-3	6-C
Input Characteristic	2-2-5-2	4-C	Travel Alert High High Point	2-2-7-2-5	6-C
Instrument Level	2-3-2-5	4-G	Travel Alert HiHi/LoLo Enable	2-2-7-2-2	6-C
Instrument Mode	Hot Key-1	1-A	Travel Alert Low Low Point	2-2-7-2-6	6-C
Instrument Serial Number	2-2-3-6	4-B	Travel Alert Low Point	2-2-7-2-4	6-C
Instrument Status	7	1-F	Travel Deviation Alert Enable	2-2-7-3-1	6-D
Maximum Supply Pressure	2-2-6-1	4-C	Travel Deviation Alert Point	2-2-7-3-2	6-D
Message	2-2-3-2	4-B	Travel Deviation Time	2-2-7-3-3	6-D
Partial Stroke Test	1	1-E	Travel Sensor Adjust	2-4-7	3-H
Partial Stroke, Standard	1-1	2-C	Travel Sensor Motion	2-2-6-3	4-D
Partial Stroke, Custom	1-2	2-C	Tuning Set	2-2-5-1	4-C
Partial Stroke Variables	2-2-8	4-E	Valve Serial Number	2-2-3-5	4-B
Performance Tuner	2-1-4	3-B	Valve Set Point	4	1-F
Polling Address	2-2-3-7	4-B	Valve Style	2-2-6-4	4-D
Pressure Deviation Alert Point	2-2-7-1-2	6-C	Zero Control Signal	2-2-6-5	4-D
Pressure Deviation Enable	2-2-7-1-1	6-C			

1. Coordinates are to help locate the item on the menu structure.

This section describes using the Model 375 Field Communicator with device description revision 2 or higher, used with firmware revision 3 or higher instruments, to setup and calibrate a DVC6000 Series digital valve controller with instrument level SIS. You can also use AMS ValveLink Software version 4.3 or higher to setup, calibrate, and diagnose the valve and instrument. Refer to AMS ValveLink Software help or documentation for information on using AMS ValveLink Software with the instrument.

Installation

Digital Valve Controller Installation

A DVC6000 Series digital valve controller with instrument level SIS may be used in a Safety Instrumented System (SIS) to control operation of a safety block valve or vent valve. The valve actuator may be either single-acting or double-acting with spring return. The suitability of a given system is a

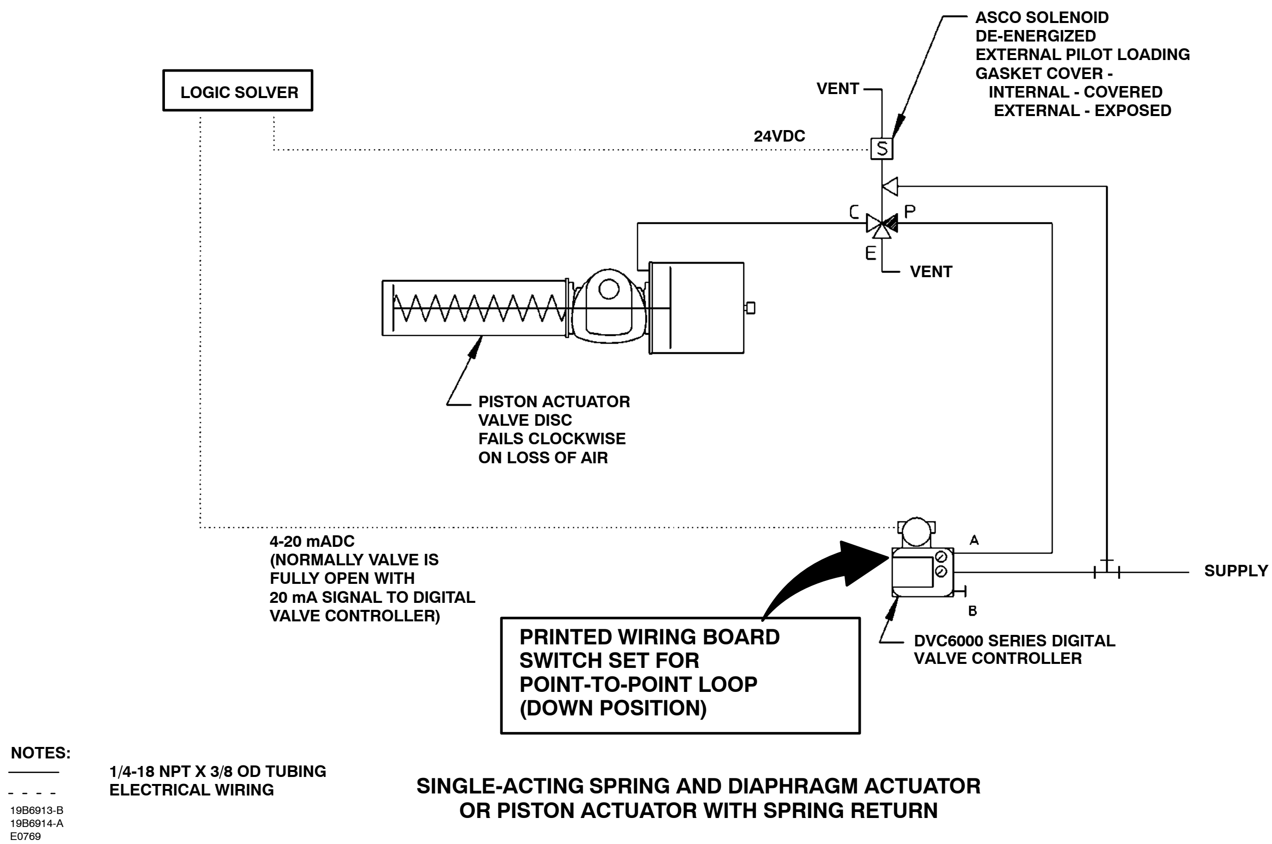


Figure 7-1. Example of DVC6000 Series Digital Valve Controller Installed in a 4-Wire SIS System

function of the required Safety Integrity Level (SIL), the failure rates of all the equipment involved, and other constraints of applicable safety standards. Particular attention has been given to IEC61508 in the design and analysis of the digital valve controller with instrument level SIS. Some safety system requirements will be satisfied through the use of the digital valve controller operating on a single current or voltage output from the logic solver and connected directly to the actuator. In these cases, the electrical and pneumatic connections are equivalent to a typical control application. Instruments with instrument level SIS will have the label shown in figure 7-2 on the terminal box cover.

The digital valve controller may be installed with a solenoid valve in either a 4-wire system, shown in figure 7-1, or in a 2-wire system, as shown in figure 7-3. The digital valve controller ships from the factory with the switch on the back of the printed wiring board set to the position as per ordered option.

When installed in a 4-wire system, the digital valve controller is assumed to be operating with a current signal and must be setup for operation in a point-to-point loop. When installed in a 2-wire system, the digital valve controller is assumed to be operating with a voltage signal and must be setup for operation in a multidrop loop. The operational mode is determined by a switch on the printed wiring board. The required DIP switch setting depends upon the system in which the digital valve controller is installed. As shown in figure 7-4, 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 the Maintenance section.

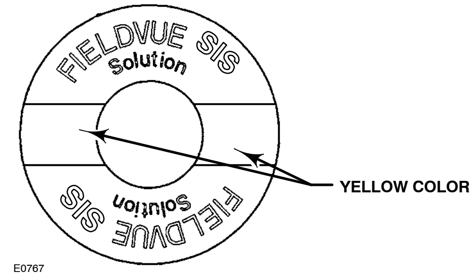


Figure 7-2. Terminal Box Cover Label on DVC6000 Digital Valve Controllers with Instrument Level SIS.

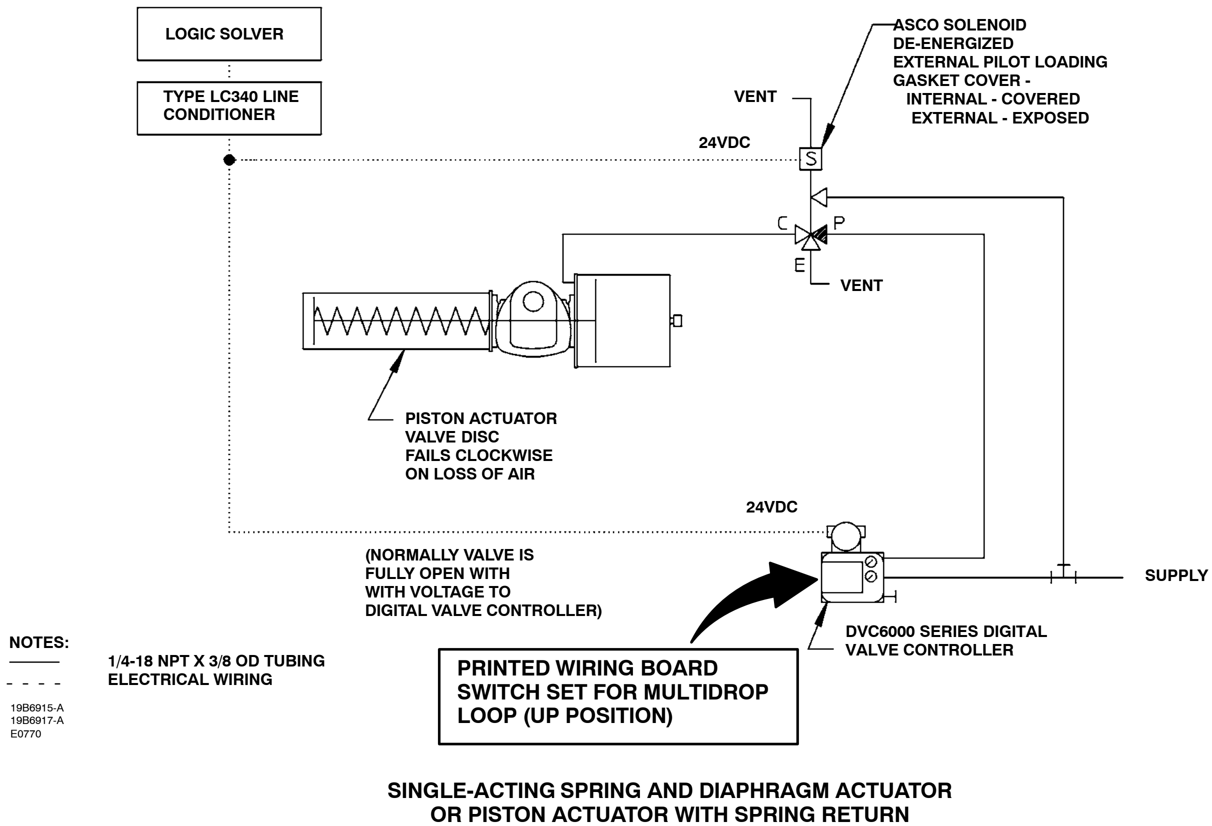


Figure 7-3. Example of DVC6000 Series Digital Valve Controller Installed in a 2-Wire SIS System

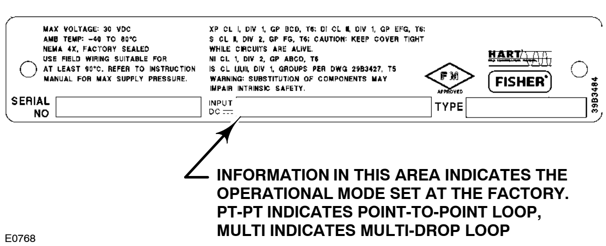


Figure 7-4. Typical DVC6000 Series Digital Valve Controller Nameplate

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.

Note

The option for remote mount is available for an SIS application. Refer to the Installation section of this manual.

Installation in a 4-Wire System

Figure 7-1 is an example of the digital valve controller installed in a 4-wire system. In this installation, the logic solver provides two separate signals: a 4-20 mA dc signal for the digital valve controller and a 24 Volt dc signal for the solenoid valve. The digital valve controller Control Mode is set to Analog. When a shutdown condition exists, the logic solver activates the solenoid valve and cuts the current to 4 mA, thus causing the valve to move to its zero travel position. To operate in this installation, the switch on the digital valve controller printed wiring board must be set for operation in a point-to-point loop.

To set the digital valve controller Control Mode for operation 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 switch setting.

Installation in a 2-Wire System

Figure 7-3 is an example of the digital valve controller installed in a 2-wire system. In this installation the logic solver provides a single 24 Volt dc signal that powers both the digital valve controller and the solenoid valve. The digital valve controller 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, thus causing the valve to move to it's zero travel position. A Type LC340 line conditioner is required to allow HART communications over the segment.

The line conditioner introduces an approximate 2.0 volt drop in the SIS system wiring. If used with a low power solenoid valve (such as the ASCO® model EF8316G303 or EF8316G304) a guaranteed engagement voltage of 20.4 Volts at maximum temperature must be used.

This solenoid valve requires up to 42 mA to pull in. The digital valve controller set for multidrop operation draws approximately 8 mA. Based on these conditions, table 7-3 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.

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 multidrop operation.

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

Table 7-3. Maximum Loop Wire Resistance per Logic Solver Output Voltage(2)

Logic Solver Output Voltage (volts dc)	Maximum Loop Wire Resistance (Ohms)	Maximum Wire Length (feet)(1)			
		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. Wire length includes both wires in a twisted pair.
2. Installation includes line conditioner and low power solenoid valve with a 20.4 volt engagement voltage.

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.

Using the digital valve controller in a 2-wire system (multi-drop operation) with a line conditioner, requires an ASCO Low Power Solenoid Valve, Model EF8316G303 or EF8316G304 (or equivalent low power solenoid valve). Using a low power solenoid valve requires a separate air supply. Ensure that the solenoid valve's "selection gasket" is in the "External Position". A minimum of 15 psi operating pressure differential is required. For more information, refer to the ASCO catalog or contact your Fisher sales office.

See the separate FIELDVUE Type LC340 SIS Line Conditioner Instruction Manual - Form 5719 for detailed installation information.

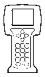
To set the digital valve controller Control Mode for operation in an SIS 2-wire system select *Setup, Basic Setup,* and *Setup Wizard* from the *Online* menu.

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

Note

To ensure correct installation, follow the Basic Setup and Calibration procedures as described in this section.

Partial Stroke Test


(1)

⚠ 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, provide some temporary means of control for the process.

The Partial Stroke Test allows the DVC6000 Series digital valve controllers with instrument level SIS to perform a Valve Signature type of test while the instrument is in service and operational. In an SIS application, it is important to be able to exercise and test the shut down valve to verify that it will operate when commanded. This feature allows the user to partially stroke the valve while continually monitoring the shut down 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.

Initiating the Partial Stroke Test

When enabled, a partial stroke test may be initiated via a remote push button, the Model 375 Field Communicator, or AMS ValveLink Software.

Remote Push Button

A partial stroke test command may be sent to the DVC6000 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 AMS ValveLink Software.

Guidelines for Auxiliary Terminal Wiring Length

The Auxiliary Input Terminals of a DVC6000 SIS tier can be used with a locally-mounted switch for initiating a partial stroke test when used in a Safety Instrumented Function Loop. 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.

Model 375 Field Communicator

1. Connect the Model 375 Field Communicator to the LOOP terminals on the digital valve controller.

2. Turn on the Field Communicator.

3. From the *Online* menu, select *Partial Stroke Tst*.

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 valve begins to move and the actual travel reported by the digital valve controller is displayed on the Field Communicator.

6. Once the valve has reached the endpoint, check that the valve has reached the desired set point. The valve should return to its original position.

For information on configuring the Partial Stroke Test, see Partial Stroke Variables in this section.

Demand Mode Tests

The following steps assume the use of single acting spring and diaphragm actuators or double-acting spring return actuators.

Perform the following steps to check valve operation:

a. Point-to-Point Mode

If the DVC6000 is used in series with a solenoid valve,

1. Disconnect power (24 volt dc or as specified on nameplate) from the solenoid valve, but maintain a 20mA 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 20mA 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 DVC6000 is used alone, without a solenoid valve,

1. Adjust the current to the digital valve controller from 20mA to 4mA. The valve should move to its “fail safe” position.

b. Multidrop Mode

If the DVC6000 is used in series with a solenoid valve, in a pneumatic path, with a single power source shared by both the digital valve controller and the solenoid valve,

1. Disconnect power to both devices. The valve should go to its “fail safe” position.

If DVC6000 is used alone, without a solenoid valve,

1. Disconnect power to digital valve controller. The valve should go to its “fail safe” position.

Basic Setup and Calibration

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 Series instrument in operation as an SIS solution. The Setup Wizard sets up the required parameters for SIS solutions.

When the DVC6000 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

(2-1-1)

Note

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

Use the Setup Wizard in the Model 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 *Setup, Basic Setup, and Setup Wizard*.

1. The Setup Wizard first prompts for the pressure units (psi, bar, or kPa) and then the maximum instrument supply pressure.

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

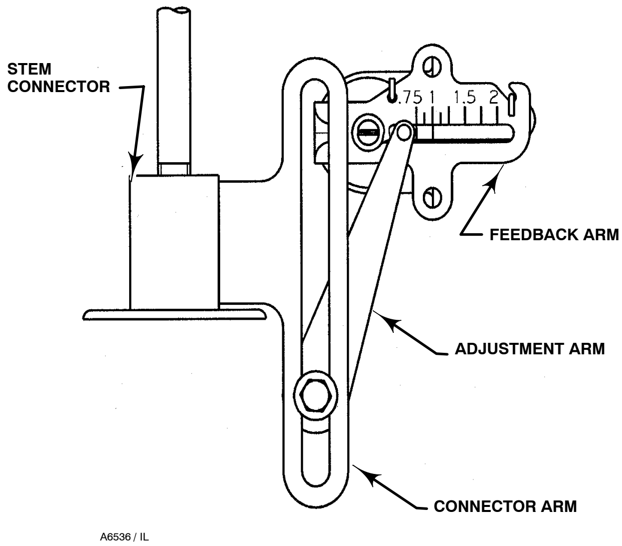


Figure 7-5. Feedback Connection for Type 657 Sliding-Stem Actuator

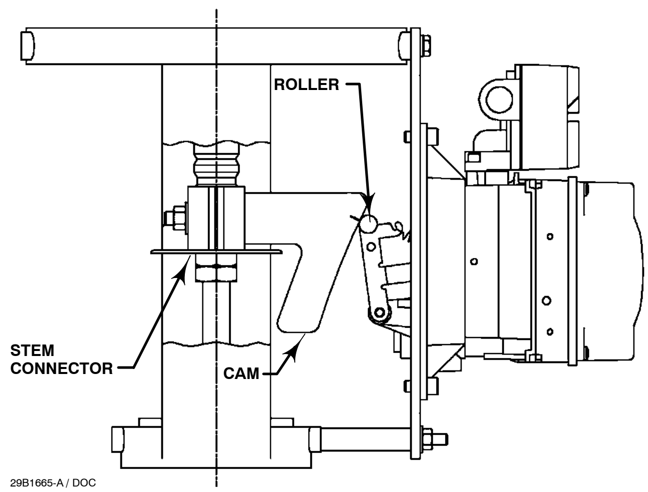


Figure 7-6. Feedback Connection for Long-Stroke Sliding-Stem Actuator

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

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

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

5. Enter the actuator size.

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)*—Identifies whether the valve is fully open or fully closed when the input is 0%. If you are unsure how to set this parameter, disconnect the current source to the instrument. Enter the resulting valve travel.

- *Feedback Connection*—Select Rot-All, SS-roller, or SStem-Standard. For rotary valves, enter Rot - All, SS-Roller. For sliding-stem valves, if the feedback linkage consists of a connector arm, adjustment arm, and feedback arm, similar to the linkage shown in figure 7-5, enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam, similar to the linkage shown in figure 7-6, enter Rotary All, SS-Roller.

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

- *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):

For instruments with Relay Type A (all SIS digital valve controllers). 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.

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. 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.

- *Tuning Set*—There are eleven tuning sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings. Tuning set C provides the slowest response and M provides the fastest response. Table 7-5 lists the 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 can specify the proportional gain. An algorithm in the Field Communicator calculates the other gains. With Expert you can specify not only the proportional gain but the velocity and minor loop feedback gain as well.

Table 5-3 provides tuning set selection guidelines for Fisher, Baumann, and Gulde actuators. These tuning sets are only recommended starting points. After you finish setting up and calibrating the instrument, you can further adjust the tuning to get the desired response.

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

After choosing the appropriate tuning set, a message appears on the display, asking if you would like to use factory defaults for Setup. Yes is recommended for Initial Setup. Refer to table 7-4 for factory defaults.

When the Setup Wizard is complete, you are asked if you want to run the Relay Adjustment calibration at this time. Select yes to adjust the relay. For additional information, refer to Relay Adjustment in this section.

After completing the relay adjustment, you can choose to run the Auto Travel Calibration. Select yes to automatically calibrate instrument travel at this time. 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 this section.

Table 7-4. SIS Factory Default Settings

Setup Parameter	Default Setting
Travel Deviation Alert Enable	Enabled
Travel Deviation Alert Pt	5.0%
Travel Deviation Alert Time	5.0 seconds for sliding stem valve 10.0 seconds for rotary valve
Pressure Deviation Alert Pt	1.0 psi (or equivalent in bar or kPa)
Pressure Deviation Alert Time	30.0 seconds
Pressure Deviation Alert Enable	Enabled
Partial Stroke Pressure	10%
Partial Stroke Speed	Standard (1%/second)
Partial Stroke Pause Time	5 seconds

Once Auto Calibration is complete for the SIS tier an additional test is run to determine the default value or the minimum partial stroke pressure for single acting actuators (this will be differential pressure for double acting) and upper operating pressure.

After instrument setup is completed, and you have placed the instrument in service, you are asked if you would like to enable the Pressure Control Mode. Select yes or no. Refer to Partial Stroke Variables in this 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 Using the Performance Tuner in this section.

Relay Adjustment


(2-1-2)

Before beginning calibration, check the relay adjustment. To check relay adjustment, select *Relay Adjust* then follow the prompts on the Field Communicator display. Replace the digital valve controller cover when finished.

Single-Acting Actuators

For single-acting direct digital valve controllers, make sure the adjustment disc is against the beam, as shown in figure 7-7.

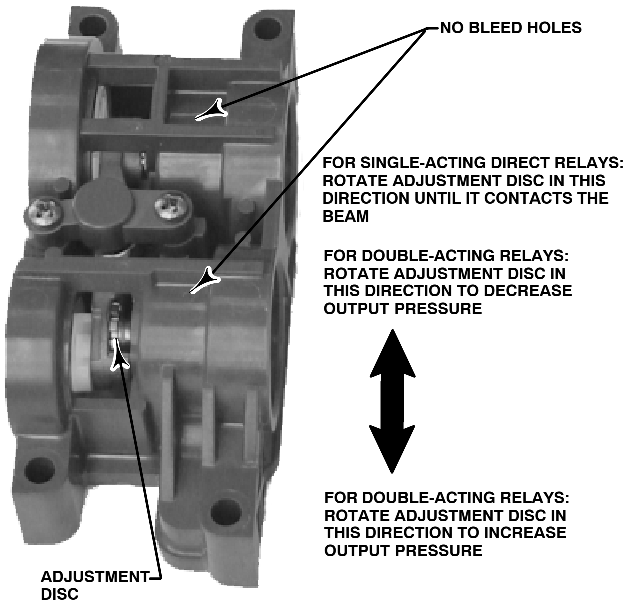


Figure 7-7. Location of Relay Adjustment (Shroud Removed for Clarity)

Double-Acting Actuators with Spring Return

Note

Converting a Type A relay from single-acting to double-acting requires several full turns of the adjustment disc in the + direction (increasing output pressure). The first few turns will not produce any change in output, however as you approach the correct position, both Output A and Output B will begin to change rapidly with very little additional disc rotation. Watch the output gauges to detect nearing the correct position and avoid rotating the adjustment disc too far. If using the Field Communicator and no gauges are available, listen for an audible change in relay bleed to detect nearing the correct adjustment disc position.

Table 7-5. Gain Values for Preselected Tuning Sets

TUNING SET	Proportional Gain	Velocity Gain	Minor Loop Feedback Gain
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

For double-acting actuators with spring return, 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 7-7, 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 (if a standard relay is used, stabilization may take up to 30 seconds or more for large actuators).

DVC6000 SIS tier is supplied with the low bleed relay unless otherwise specified. Atmospheric bleed holes are removed in such relays to reduce static air consumption. Depending upon the size of the actuator, stabilization may take longer (approximately two minutes) than the Standard Relay.

Auto Calibrate Travel

(2-1-3)

WARNING

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

User interaction is only required with Auto Calibrate Travel when the Feedback Connection is SStem - Standard. If the Feedback Connection is Rotary - All, SStem - Roller, no user interaction is required. For valves with the SStem - Standard Feedback Connection, interaction provides a more accurate crossover adjustment. Select *Auto Calib Travel* then follow the prompts on the Field Communicator display to automatically calibrate travel.

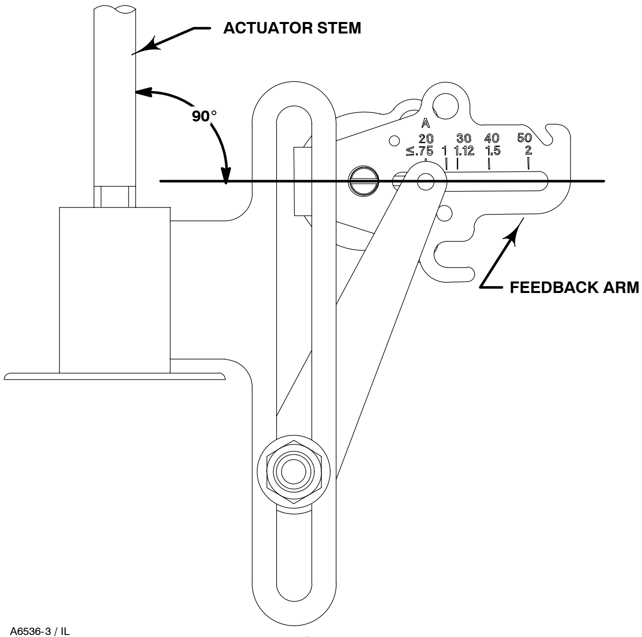


Figure 7-8. Crossover Point

1. Select the method of crossover adjustment: manual, last value, or default. Manual adjustment is recommended.

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 4). If you select Default, an approximate value for the crossover is sent to the instrument and there are no further user interactions with the auto-calibration routine (go to step 4). If you select Manual, for instruments in a 4-wire installation (point-to-point operation) you are asked to select an adjustment source, either analog or digital. For instruments in a 2-wire installation (multidrop operation) go to step 3.

If you use a current source to adjust the crossover, select Analog and go to step 2. If you wish to adjust the current source digitally, select Digital and go to step 3.

2. 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 7-8. After you have made the adjustment, press OK and go to step 4.

3. 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 7-8. 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 3. Otherwise, select Done and go to step 4.

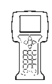
4. The remainder of the auto-calibration procedure is automatic.

5. Place the instrument In Service. You are now asked if you would like to enable the Pressure Control Mode. Select yes or no. Refer to Partial Stroke Variables in this section for more information.

If the unit does not calibrate, refer to table 4-5 for error messages and possible remedies.

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.

Using the Performance Tuner



(2-1-4)

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.

Detailed Setup

Setting Modes

To view or change the mode, select *Setup* Menu, *Detailed Setup*, and *Mode* from the *Online* menu. Follow the prompts on the Field Communicator display to view or change information in the following fields: *Instrument Mode,* and *Burst.*

Instrument Mode

You can change the instrument mode by selecting *Instrument Mode* from the *Mode* 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.

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.

Burst Mode

(2-2-1-2)

Enabling burst mode provides continuous communication from the digital valve controller. This allows HART feedback of Valve Travel, Travel Set point, or Pressure.

Access to information in the instrument is normally obtained through the poll/response of HART communication. The Model 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.

Firmware 3 or higher allows the Burst mode to be active for instrument level SIS. This allows HART feedback of Valve Travel, Travel Set Point, or Pressure. Burst Command 3 is typically used with DVC6000 Series instruments to provide this information. The pressure feedback can be reported as Actuator Pressure A, Actuator Pressure B, Actuator Differential Pressure A-B, or Supply Pressure.

Note

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

To setup the digital valve controller to operate in burst mode, from the *Online* menu, select *Setup*, *Detailed Setup, Mode, Burst,* and *Burst Enable.* To send a burst mode command, select *Setup*, *Detailed Setup, Mode, Burst,* and *Burst Command.* Burst mode must be enabled before you can change the burst mode command.

Setting 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*.*

General Information

(2-2-3)

To enter or view information in the following fields: HART *Tag*, *Message*, *Descriptor*, *Date*, *Valve Serial Num* (Valve Serial Number), *Inst Serial Num* (Instrument Serial Number) and *Polling Address*, from the *Online* menu select *Setup, Detailed Setup,* and *General*. Follow the prompts on the Field Communicator display.

- *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 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 Model 375 Field Communicator Basics section.

Measured Variable Units and Ranges

(2-2-4)

To define the measured variable units and ranges, from the *Online* menu select *Setup, Detailed Setup,* and *Measured Var.* Follow the prompts on the Field Communicator display to enter or view information in the following fields: *Pressure Units, Temp Units* (Temperature Units) and *Analog In Units* (Analog Input Units).

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

- *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-wire installation (point-to-point operation).

Setting Response

(2-2-5)

Select *Setup, Detailed Setup,* and *Response Control* from the *Online* menu*.* Follow the prompts on the Field Communicator display to configure the following response control parameters: *Tuning Set, Input Char* (Input Characteristic)*, Travel Cutoff High* and *Travel Cutoff Low.*

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. 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.

- *Tuning Set*—There are eleven tuning sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings.

Tuning set C provides the slowest response and M provides the fastest response. Table 7-5 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.

Table 5-3 provides tuning set selection guidelines for Fisher, Baumann, and Gulde 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.

- *Input Char*—Defines the relationship between the travel target and ranged set point. Ranged set point is the input to the characterization function. If the zero control signal equals closed, then a set point of 0% corresponds to a ranged input of 0%. If the zero control signal 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 7-9 or you can select a custom characteristic by selecting *Custom Char.* Figure 7-9 shows the relationship between the travel target and ranged set point for the fixed input characteristics, assuming the Zero Control Signal is configured as closed.

- *Travel Cutoff High*—Travel Cutoff High defines the high cutoff point for the travel in percent (%) of ranged travel.

- *Travel Cutoff Low*—Travel Cutoff Low defines the low cutoff point for the travel.

Travel Cutoffs are adjustable when the DVC6000 SIS is operating with a 4-20 mA current. The Setup Wizard automatically sets travel cutoffs at 50%, making the DVC6000 SIS tier 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.

A user 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% open, but work as an on-off valve between 0% to 10% and 90% to 100% opening. The user now has a standard throttling control valve between 10% and 90% opening, but has an SIS outside of this range.

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.

While in SIS mode in the above example, partial stroke and pressure control mode can be enabled during travel greater than 90%. Travel Cutoffs are configurable from 5 to 95% for DVC6000SIS, while operating with a 4 to 20 mA current.

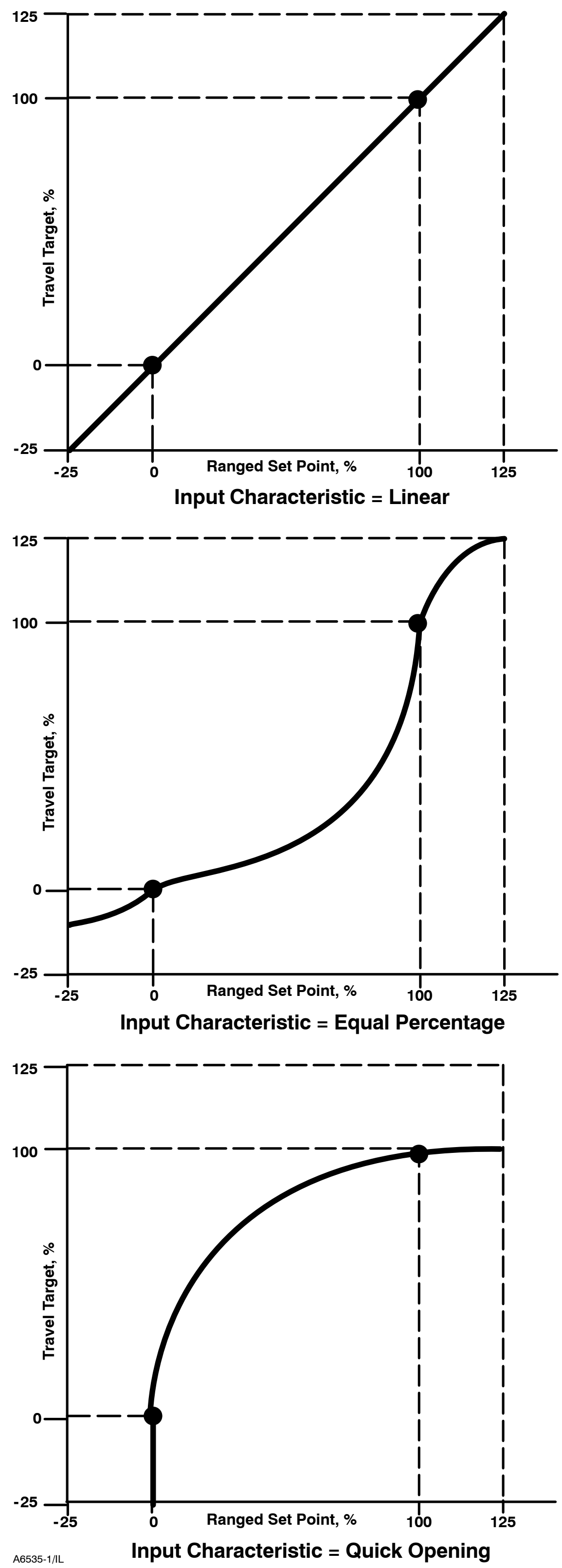


Figure 7-9. Travel Target Versus Ranged Set Point, for Various Input Characteristics (Zero Control Signal = Closed)

7

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 test while the DVC6000 digital valve controller is in normal travel control mode may cause changes in output pressure and travel, resulting in process instability. Depending on the application, these changes may upset process variables, which may result in personal injury or property damage.

If the Aux Terminal button is pressed while in regular control mode 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 Fail Close Valve, and 0% travel for Fail Open Valve, and perform the partial stroke test for the configured travel. Once the partial stroke test is completed, the digital valve controller will bring the valve back to its original travel, corresponding to mA current value.

Note

When installed in a 0-24 VDC operating system (2-wire, multidrop operation), the digital valve controller will provide full output pressure when 24VDC is applied, and will have minimum output pressure when 0VDC is applied.

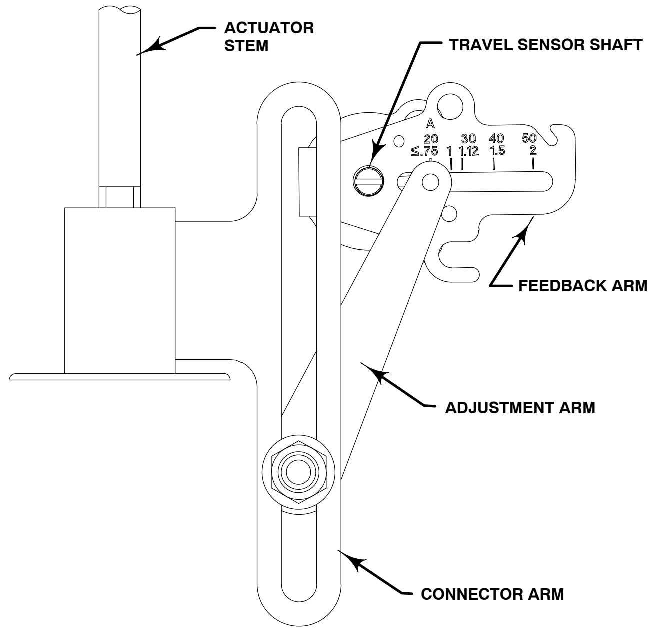


Figure 7-10. Feedback Connection for Typical Sliding-Stem Actuator (Up to 4-inch Travel)

Actuator and Valve Information

(2-2-6)

Select *Setup, Detailed Setup,* and *Actuator & Valve* from the *Online* menu. Follow the prompts on the Field Communicator display to enter or view information in the following fields: *Max Supply Press* (Maximum Supply Pressure), *Feedback Connection, Tvl Sensor Motion* (Travel Sensor Motion), *Valve Style,* and *Zero Ctrl Signal* (Zero Control Signal). Actuator information for Fisher, Baumann, and Gulde actuators is given in table 5-3.

- *Max Supply Press*—Enter the maximum supply pressure in psi, bar, or kPa, depending on what was selected for pressure units.

- *Feedback Connection*—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 7-10), enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam (similar to figure 7-11), enter Rotary All, SStem - Roller.

- *Travel Sensor Motion*—Select Clockwise, or Counterclockwise. Travel Sensor Motion establishes

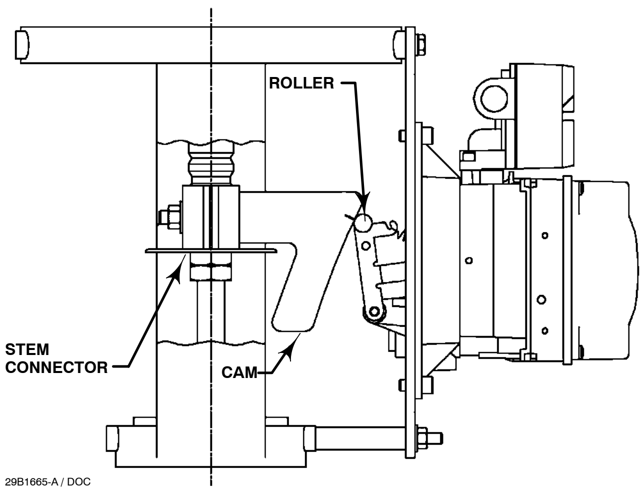


Figure 7-11. Feedback Connection for Typical Long-Stroke Sliding-Stem Actuator (4 to 24-Inches Travel)

the proper travel sensor rotation. Determine the rotation by viewing the end of the travel sensor shaft.

For instruments with Relay Type A [all SIS digital valve controllers]. If increasing air pressure at output A causes the shaft to turn clockwise, enter Clockwise. If it causes the shaft to turn counter-clockwise, enter Cntrclockwise.

- *Valve Style*—Enter the valve style, rotary or sliding-stem

- *Zero Ctrl Signal*—Identifies whether the valve is fully open or fully closed when the input is 0%. If you are unsure how to set this parameter, disconnect the current source to the instrument. The resulting valve travel is the Zero Control Signal. (With direct acting digital valve controllers, disconnecting the current source is the same as setting the output pressure to zero.)

Setting Alerts

The following menus are available for configuring Alerts. Items on the menu may be changed with the Instrument In Service. Protection does not need to be removed (no need to set it to *None*).

Pressure Deviation Alert

(2-2-7-1)

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 enabled) to the actuator (rather than valve position) to prevent saturation of the pneumatic output. If the target pressure deviates from the actual pressure within a certain band of time, the alert will activate. The pressure deviation alert point and deviation alert time are configurable and can be disabled altogether.

To setup the pressure deviation alert from the *Online* menu select *Setup, Detailed Setup, Alerts,* and *Press Dev Alert.* Follow the prompts on the Field Communicator to enter or view information in the following fields: *Press Dev Enable* (Pressure Deviation Enable), *Press Dev Alert Pt* (Pressure Deviation Alert Point), and *Press Dev Time* (Pressure Deviation Time).

- *Press Dev Enable*—Yes or No. 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.

- *Press Dev Alert Pt*—Pressure Deviation Alert Point is the alert point for the difference, expressed in pressure (psi/bar), 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.

- *Press Dev Time*—Pressure Deviation Time, is the time, in seconds, that the pressure deviation must exceed the Pressure Deviation Alert Point before the alarm is set.

A default value would set the Pressure Deviation Alert Point at 1 psi after completion of Setup Wizard step or Auto Travel Calibration step. This will cause the alert to trip when the actuator pressure is within ±1 psi of the Upper Operating Pressure. Set the Pressure Deviation Time for 30 seconds.

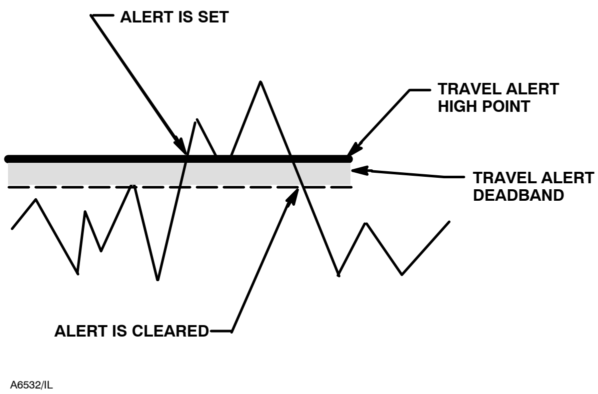


Figure 7-12. Travel Alert Deadband

Setting Travel Alerts

 **(2-2-7-2)**

Setting High, High-High, Low and Low-Low Alerts

Select *Setup, Detailed Setup, Alerts*, and *Travel Alerts* from the *Online* menu. Follow the prompts on the Field Communicator display to set: *Tvl Hi/Lo Enab* (Travel High and Low Alert Enable), *Tvl HH/LL Enab* (Travel High High and Low Low Alert Enable), *Tvl Alert Hi Pt* (Travel Alert High Point), *Tvl Alert Lo Pt* (Travel Alert Low Point), *Tvl Alert Hi Hi Pt* (Travel Alert High High Point), *Tvl Alert Lo Lo Pt* (Travel Alert Low Low Point), and *Tvl Alrt DB* (Travel Alert Deadband).

- *Tvl Hi/Lo Enable*—Yes or No. Travel Hi/Lo Enable activates checking of the ranged travel against the Travel Alert High and Low Points. 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 7-12.

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. See figure 7-12.

- *Tvl HH/LL Enable*—Yes or No. Travel HH/LL Enable activates checking of the ranged travel against the Travel Alert High-High and Low-Low Points. Travel Alert Hi Hi is set if the ranged travel rises above the alert high-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 7-12.

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. See figure 7-12.

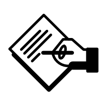
- *Tvl Alert Hi Pt*—Travel Alert High Point is the value of the travel, in percent (%) of ranged travel, which, when exceeded, sets the Travel Alert High alert.

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

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

- *Tvl Alert 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.

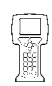
- *Tvl Alrt DB*—Travel Alert Deadband is the travel, in percent (%) of ranged travel, required to clear a travel alert, once it has been set. The deadband applies to both Travel Alert Hi/Lo and Travel Alert Hi Hi/Lo Lo. See figure 7-12.



Note

The Travel Alert Deadband applies to the Travel Deviation as well as Travel Alert Hi/Lo and Travel Alert Hi Hi/Lo Lo.

Setting Travel Deviation

 **(2-2-7-3)**

This alert notifies a monitoring system when a deviation in the valve travel has occurred. If the target valve position deviates from the actual valve position within a certain band of time, the alert will activate. The travel deviation alert point and deviation alert time is configurable and can be disabled altogether.

To setup the travel deviation alert from the *Online* menu, select *Setup, Detailed Setup, Alerts* and *Travel Dev Alert* (Travel Deviation Alert). Follow the prompts on the Field Communicator display to enter or view information in the following fields: *Tvl Dev Alrt Enab* (Travel Deviation Alert Enable), *Tvl Dev Alert Pt* (Travel Deviation Alert Point) and *Tvl Dev Time* (Travel Deviation Time).

- *Tvl Dev Alrt Enab*—Yes or No. When enabled checks the difference between the travel target and the actual travel. If the difference 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.

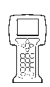
- *Tvl Dev Alert Pt*—Travel Deviation Alert Point is the alert point for the difference, expressed in percent (%), between the travel target and the actual travel. When the difference exceeds the alert point for more than the Travel Deviation Time, the Travel Deviation ALert is set.

- *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.

A default value for rotary valves, if you do not know the fluid dynamics, unbalance forces, and seating forces, will be set for Travel Deviation Alert Point at 5% and the Travel Deviation Alert time for 10 seconds after completion of Setup Wizard step or Auto Travel Calibration step.

A default value for sliding stem valves will be set for Travel Deviation Alert Point at 5% and the Travel Deviation Alert Time for 5 seconds after completion of Setup Wizard step or Auto Travel Calibration step.

Setting the Travel Accumulator



(2-2-7-4)

To set up the Travel Accumulator Alert, select *Setup, Detailed Setup, Alerts,* and *Travel Accumulator Alert* from the *Online* menu. Follow the prompts on the Field Communicator display to configure the *Tvl Acum Alrt Enab* (Travel Accumulator Alert Enable), *Tvl Acum Alrt Pt* (Travel Accumulator Alert Point), *Tvl Acum DB* (Travel Accumulator Deadband), and *Tvl Acum* (Travel Accumulator).

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

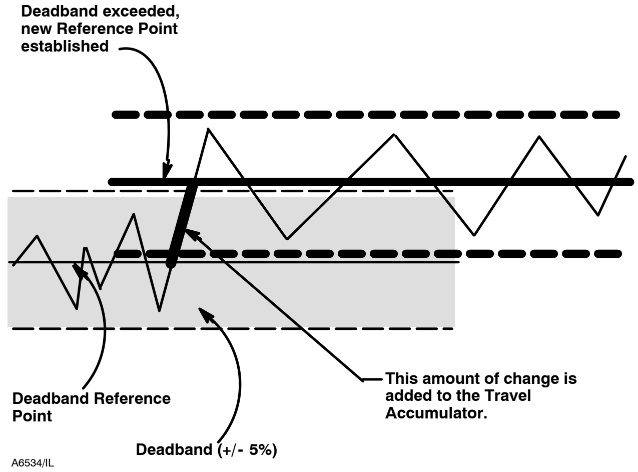


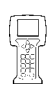
Figure 7-13. Travel Accumulator Deadband (set at 10%)

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

- *Tvl Acum DB*—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 7-13.

- *Tvl Acum*—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 Dead-band. See figure 7-13. You can reset the Travel Accumulator by configuring it to zero.

Setting the Cycle Counter



(2-2-7-5)

Select *Setup, Detailed Setup, Alerts* and *Cycle Counter Alert* from the *Online* menu. Follow the prompts on the Field Communicator display to configure the *Cycl Cnt Alrt Enab* (Cycle Count Alert Enable), *Cycl Count Alrt Pt* (Cycle Count Alert Point), *Cycl Count DB* (Cycle Counter Deadband),and *Cycl Count* (Cycle Counter).

- *Cycl Cnt 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 that is less than the alert point.

7

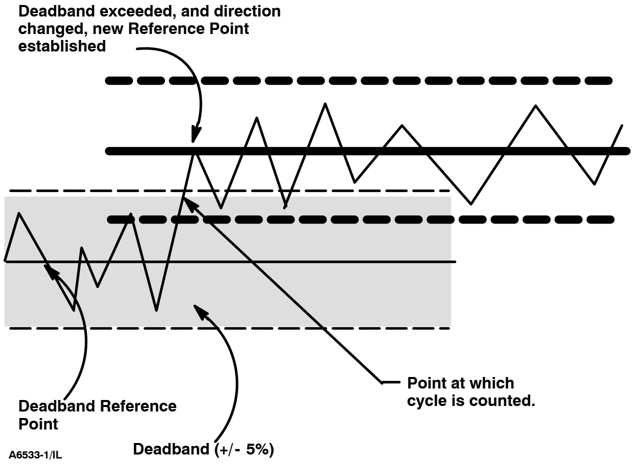


Figure 7-14. Cycle Counter Deadband (set at 10%)

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

- *Cycl Count DB*—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 7-14 .

- *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 cycle. See figure 7-14. You can reset the Cycle Counter by configuring it as zero.

Other Alerts

(2-2-7-6)

Select *Setup, Detailed Setup, Alerts,* and *Other Alerts.* Follow the prompts on the Field Communicator display to configure the *Drive Alrt Enab* (Drive Alert Enable), and *Supply Press Alrt Pt* (Supply Pressure Alert Point).

- *Drive Alrt Enab*—Yes or No. Drive Alert Enable activates checking of the relationship between the Drive Signal and the calibrated travel. If one of the following conditions exists for more than 20 seconds, the Drive Alert is set.

For the case where Zero Control Signal is defined as closed:

Drive Signal < 10% and Calibrated Travel > 3%

Drive Signal > 90% and Calibrated Travel < 97%

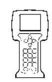
For the case where Zero Control Signal is defined as open:

Drive Signal < 10% and Calibrated Travel < 97%

Drive Signal > 90% and Calibrated Travel > 3%

- *Supply Press Alrt Pt*—Supply Pressure 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.

Alert Record



(2-2-7-7)

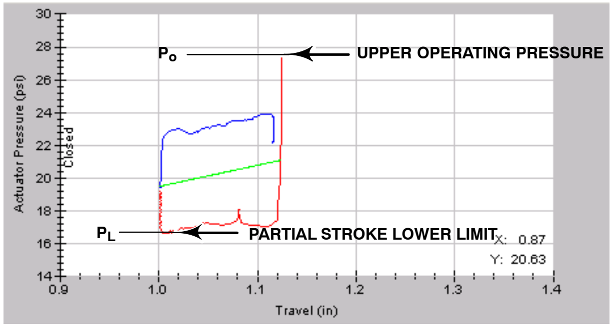
The alert record can store up to 11 alerts from any of the enabled alert groups: Valve Alerts, Failure Alerts or Miscellaneous Alerts. Select *Setup, Detailed Setup, Alerts,* and *Alert Record* from the *Online* menu. Follow the prompts on the Field Communicator display to *Display Record, Clear Record*, set the *Inst Date & Time* (Instrument Date and Time), and *Record Group Enab* (Record Group Enable).

- *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.

- *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. Enter the date and time in the form: MM/DD/YYYY HH:MM:SS, where MM is two digits for the month (1 through 12), DD is two digits for the day (1 through 31), and YYYY is four digits for the year (1980 through 2040), HH is two digits for the hour (00 to 23), MM is two digits for the minutes (00 to 59), and SS is two digits for the seconds (00 through 59).

- *Record Groups Enab*—Permits enabling one or more alert groups. Table 5-6 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.



E0773

Figure 7-15. Example Partial Stroke Test Result for Single-acting Actuator. Pressure Control Mode Enabled (Fail-Closed Valve Shown)

Partial Stroke Variables

(2-2-8)

Configuring the Partial Stroke Test

To configure the Partial Stroke Test select from the *Online* menu *Setup, Detailed Setup* and *Partial Stroke Var.* Follow the prompts on the Field Communicator display to enter or view information in the following fields: *Partial Stroke Tvl* (Partial Stroke Travel), *Stroke Speed, Pause Time, Min Pressure* (Minimum Partial Stroke Pressure), *Press Mode Enable* (Pressure Mode Enable) and *Upper Opertng Press* (Upper Operating Pressure). For more information on the partial stroke test see Partial Stroke Test in this section.

- *Partial Stroke Tvl*—The default value for Partial Stroke Travel is 10%. It may be set to a value between 1 and 30% in 0.1% increments.

- *Stroke Speed*—The default value for Partial Stroke Speed is Standard (1%/second). It can also be set to Slow (0.5%/second), or Slowest (0.25%/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.

- *Min Press* (single acting actuators)—During the Setup Wizard, or Auto Travel Calibration, the Minimum Partial Stroke Pressure value will be set to a positive value for single acting actuators.

- *Min Diff Press* (double acting actuators)—During the Setup Wizard, or Auto Travel Calibration, the Minimum Differential Pressure value will be set to a negative value for double acting actuators.

Note

For double acting actuators, a value of -90% of supply pressure will be set if the Zero Control Signal is OPEN, or -50% of supply pressure if the Zero Control Signal is CLOSE. For single acting actuators, and double-acting spring return actuators, this number is calculated by data previously recorded by the instrument.

To set the minimum partial stroke pressure manually for single acting actuators select *min pressure.* Select *min diff press* for double acting actuators.

Note

In order to manually set the minimum partial stroke pressure with the correct value, you must be able to run a valve signature test using AMS ValveLink Software (see figure 7-16). It is then possible to set the minimum partial stroke pressure with the Field Communicator, using the information generated by the valve signature test.

The default value is 0.

Set the minimum partial stroke pressure (the pressure value read on the lower line of the valve signature) at the travel set by the partial stroke travel plus 40%. This is illustrated for a fail-close valve in figure 7-16, (partial stroke travel is 20% in this example). You can set the minimum partial stroke pressure for a fail-open valve in the same way.

Note

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

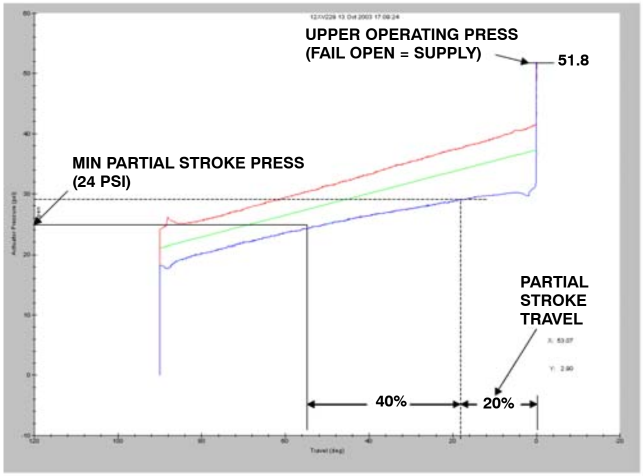


Figure 7-16. Manually Calculating the Minimum Partial Stroke Pressure using the Valve Signature Test

7

For double acting valves, the differential pressure is used.

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 close, resulting in equipment damage.

While performing the partial stroke test, if for any reason the valve is stuck, the digital valve controller will not exhaust the actuator pressure. 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 Minimum Partial Stroke pressure. If the Travel Deviation alert is not configured, then the Minimum Partial Stroke pressure 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 Minimum Partial Stroke pressure) the Valve Stuck alert will still be generated.

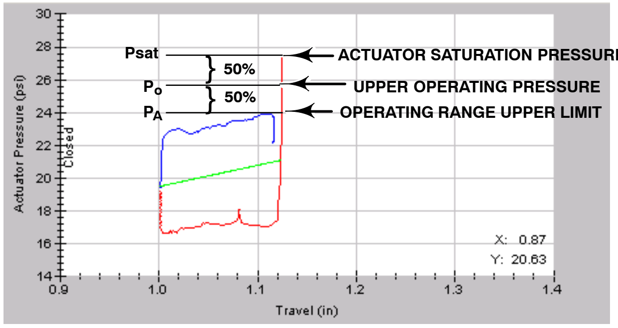
- *Press Mode Enable*—Yes or No. This feature is available only for units with instrument level SIS. It allows the digital valve controller to pull back from saturation of the pneumatic output after reaching the travel extreme. Rather than having the instrument provide full supply pressure (saturation) continuously at the travel extreme, the digital valve controller switches to a “pressure control mode” whereby the output pressure (Pressure controller set point) to the actuator is maintained at a certain value. This value is configured through the “Upper Operating Pressure” feature. 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, setup the alert as described under Pressure Deviation Alert.

- *Upper Opertng Press*—Used in conjunction with “Pressure Control Mode,” this feature allows the user to select a pressure to be delivered by the instrument at the travel extreme. For a fail-closed valve, this pressure must be sufficient to maintain the fully open position. For a fail-open valve, this pressure (which is automatically set to supply pressure) must be sufficient to fully close the valve and 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

The upper operating pressure will be set automatically during the Setup Wizard, or during the Auto Calibration Travel procedure.

To set the upper operating pressure manually, select *Upper Opertng Press.*



E0771

Figure 7-17. Example Partial Stroke Test Result for Single-acting Actuator. Pressure Control Mode Disabled (Fail-Closed Valve Shown)

Note

In order to manually set the upper operating pressure with the correct value, you must be able to run a valve signature test using AMS ValveLink Software (see figure 7-17). It is then possible to set the upper operating pressure with the Field Communicator, using the information generated by the valve signature test.

The default value is 0.

As shown in figure 7-17, for a single-acting spring actuator with a fail-closed valve, set the upper operating pressure (P_o) at a value halfway between the actuator saturation pressure (P_{sat}) and the operating range upper limit (P_A)

$$P_O = \frac{(P_{sat} + P_A)}{2}$$

or set P_o equal to P_A plus 3 psi, ($P_o = P_A + 3$), whichever is greater. The operating range is the actual calculated value for the application, not the operating range specified in the customer specification sheet.

For double acting actuators with springs, the same equation is used, substituting differential pressures.

Self Test Failures for Instrument Shutdown

(2-2-9)

Select *Setup, Detailed Setup,* and *Self Test Shutdown* from the *Online* menu*.* Follow the prompts on the Field Communicator display to determine the self test shutdown criteria from the following selections: *Done*, *Flash ROM Fail* (Flash Read Only Memory Failure)*, No Free Time*, *Ref Voltage Fail* (Reference Voltage Failure), *Drive Current Fail, Critical NVM Fail* (Critical Non-Volatile Memory Failure), *Temp Sensor Fail* (Temperature Sensor Failure), *Press Sensor Fail* (Pressure Sensor Failure), or *Tvl Sensor Fail* (Travel Sensor Failure). Upon shutdown, the instrument attempts to drive its output pressure to the zero current condition and no longer executes its control function. In addition, the appropriate failure statuses are set. Once the problem that caused the shutdown has been fixed, the instrument can be restarted by cycling the power or selecting Restart from the *Mode* menu of the Field Communicator. Also see the DVC6000 Series Digital Valve Controller Instrument Status section on page 8-3 for further details about failures.

- *Done*—Select this if you are done modifying the self test shutdown criteria.
- *Flash ROM Fail*—When enabled, the instrument shuts down whenever there is a failure associated with flash ROM (read only memory).
- *No Free Time*—When enabled, the instrument shuts down whenever there is a failure associated with No Free Time.
- *Ref Voltage Fail*—When enabled, the instrument shuts down whenever there is a failure associated with the internal voltage reference.
- *Drive Current Fail*—When enabled, the instrument shuts down whenever the drive current does not read as expected.
- *Critical NVM Fail*—When enabled, the instrument shuts down whenever there is a failure associated with critical NVM (non-volatile memory).
- *Temp Sensor Fail*—When enabled, the instrument shuts down whenever there is a failure associated with the internal temperature sensor.
- *Press Sensor Fail*—When enabled, the instrument shuts down whenever there is a failure associated with one of the pressure sensors.

- *Tvl Sensor Fail*—When enabled, the instrument shuts down whenever there is a failure associated with the travel sensor.

Additional Instrument Variables

(2-3-1)

The *Variables* menu is available to view additional variables, such as the status of the auxiliary input, the instrument internal temperature, cycle count, travel accumulation, device free time, and travel sensor counts. To view one of these variables, from the *Online* menu select *Setup, Display,* and *Variables.* If a value for a variable does not appear on the display, select the variable and a detail 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 the variable requires special processing, such as Free Time or Aux Input.

- *Aux Input*—The Auxiliary Input is a discrete input. It is required to initiate partial stroke test. Its value is either open or closed.

- *Temp*—The internal temperature of the instrument is displayed in either degrees Fahrenheit or Celsius.

- *Cycl 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 *Cycle Counter Deadband* under Setting the Cycle Counter for more details.

- *Tvl Acum*—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 Alert* menu. See *Travel Accumulator Deadband* under Setting the Travel Accumulator for more details.

- *Free Time*—Free Time is the percent of time that the firmware is idle. A typical value is 25%. The actual value depends on the number of functions in the instrument that are enabled and also on the amount of communication currently in progress.

Note

Do not use the 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.

Other Device Information

(2-3-2)

The *Device Information* menu is available to view information about the instrument. From the *Online* menu, select *Setup, Display,* and *Device Information.* Follow the prompts on the Field Communicator display to view information in the following fields: *HART Univ Rev* (HART Universal Revision), *Device Rev* (Device Revision), *Firmware Rev* (Firmware Revision), *Hardware Rev* (Hardware Revision), *Inst Level* (Instrument Level), and *Device ID*.

- *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.

- *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 Fisher firmware in the instrument.

- *Hardware Rev*—Hardware Revision is the revision number of the Fisher instrument hardware.

- *Inst Level*—Indicates the instrument level - SIS

- *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.

375 DD Revision

(2-3-3)

375 DD Rev (375 DD Revision) indicates the device description revision number of the Field communicator. To access *375 DD Rev,* from the *OnLine* menu, select *Setup, Display* and *375 DD Rev.*

Calibration

(2-4)

Refer to the Calibration section for complete calibration information.

To access Calibration, from the *Online* menu select *Setup* and *Calibration.* Follow the prompts on the Field Communicator display to access the following Calibration procedures.

- *Auto Calib Travel* (Auto Calibration Travel)
- *Man Calib Travel* (Manual Calibration Travel)
- *Pressure Calib* (Pressure Calibration)
- *Restore Calib* (Restore Calibration)
- *Calib Loc* (Calibration Location)
- *Relay Adjust*
- *Tvl Sensor Adjust* (Travel Sensor Adjust)
- *Analog In Calib* (Analog In Calibration)—This calibration procedure is only available if the DVC6000 SIS tier is installed in a 4-wire system (point-to-point loop).

Viewing Device Information

Analog Input, Travel, Valve Set Point, Drive Signal, Supply and Output Pressure

The following variables are displayed on the *Online* menu:

Analog In This variable is only available on instruments installed in 4-wire systems (point-to-point operation). This variable shows the value of the instrument analog input in mA (milliamperes) or % (percent) of ranged input.

Travel This variable shows the valve travel in % (percent) of ranged travel. Travel always represents how far the valve is open.

Valve SP This variable shows the requested valve position in % of ranged travel.

Drive Sgl This variable shows the value of the instrument drive signal in % (percent) of maximum drive.

Pressures This variable shows the value of the instrument supply and output pressures in psi, bar, or kPa. It 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.

Viewing Instrument Status

To view the instrument status, from the *Online* menu select *Instrument Status*. The following describes the various displays for the Instrument Status menu.

- ***Done***—Select this when you are done viewing the instrument status.
- ***Valve Alerts***—If a valve alert is active, it will appear when the Valve Alerts menu item is selected. If more than one alert is active, they will appear on the display one at a time in the order they are listed below.

1. Aux Terminal Alert
2. Alert Record has Entries
3. Alert Record is full
4. Instrument Time is Invalid
5. Tvl Accumulation Alert
6. Cycle Counter Alert
7. Non-critical NVM Alert
8. Power Starvation Alert
9. Supply Pressure Alert
10. Drive Signal Alert
11. Tvl Lim/Cutoff Low
12. Tvl Lim/Cutoff High
13. Tvl Deviation Alrt
14. Tvl Alert Hi Hi

15. Tvl Alert Hi
16. Tvl Alert Lo Lo
17. Tvl Alert Lo

- ***Failure Alerts***—If a self-test failure has occurred, it will appear when the Failure Alerts menu item is selected. If there are multiple failures, they will appear on the display one at a time in the order listed below.

1. *Offline/Failed*—This failure is indicated when a failure causes an instrument shutdown. Press Enter to see which of the specific failures caused the Offline/Failed indication.

2. *Travel Sensor Fail*—This failure is indicated when the sensed travel is outside of the range of -25.0 to 125.0% of the calibrated travel. If this failure 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 PWB assembly. After restarting the instrument, if the failure does not clear, replace the PWB Assembly.

3. *Pressure Sensor Fail*—This failure is indicated when the actuator pressure is outside the range of -25.0 to 125.0% of the calibrated pressure for more than 60 seconds. If this failure is indicated, check the instrument supply pressure. If the failure persists, ensure the PWB assembly is properly mounted onto the Module Base Assembly, and the pressure sensor O-rings are properly installed. If the failure does not clear after restarting the instrument, replace the PWB Assembly.

4. *Temperature Sensor Fail*—This failure 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 failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the PWB Assembly.

5. *Critical NVM Fail*—This failure 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.

6. *Drive Current Fail*—This failure is indicated when the drive current does not read as expected. If this failure 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.

7. *Ref Voltage Fail*—This failure is indicated if the internal supply used by the electronics is outside the operating range. If this failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

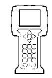
8. *No Free Time*—This failure is indicated if the instrument is unable to complete all of the configured tasks. This will not occur with a properly functioning instrument.

9. *Flash ROM Fail*—This failure is indicated when the flash ROM (read-only memory) integrity test fails. If this failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

- ***Alert Record***—The instrument contains an alert record that can store up to 11 alerts from any of the enabled alert groups: Valve Alerts, Failure Alerts or Miscellaneous Alerts. Table 8-2 lists the alerts included in each of the groups. The alert record also includes the date and time (from the instrument clock) the alerts occurred.

- ***Operational Status***—This menu item indicates the status of the Operational items listed below. The status of more than one operational may be indicated. If more than one Operational status is set, they will appear on the display one at a time in the order listed below.

1. Out of Service
2. Auto Calibration in Progress
3. Diagnostic in Progress
4. Calibration in Progress

Section 8 Viewing Device Information 

The following menus are available to define and/or view information about the instrument.

Viewing Variables

Analog Input, Travel, Valve Set Point, Drive Signal, and Supply and Output Pressure

Note

These variables are not available for instrument level AC.

The following variables are displayed on the Online menu:

Analog In shows the value of the instrument analog input in mA (milliamperes) or % (percent) of ranged input.

Travel shows the value of the DVC6000 Series digital valve controller travel in % (percent) of ranged travel. Travel always represents how far the valve is open.

Valve SP shows the requested valve position in % of ranged travel.

Drive Sgl shows the value of the instrument drive signal in % (percent) of maximum drive.

Pressures shows the value of the instrument supply and output pressures in psi, bar, or kPa. 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.

Additional Instrument Variables

(1-3-1)

Note

These variables are not available for instrument level AC.

The *Variables* menu is available to view additional variables, such as the status of the auxiliary input, the instrument internal temperature, cycle count, travel accumulation, device free time, and travel sensor counts. To view one of these variables, from the *Online* menu select *Setup & Diag, Display,* 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 Free Time or 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.

- *Temp*—The internal temperature of the instrument is displayed in either degrees Fahrenheit or Celsius.

- *Cycl 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 *Cycle Counter Deadband* in the Detailed Setup section for more details.

- *Tvl Acum*—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 Alert* menu. See *Travel Accumulator Deadband* in the Detailed Setup section for more details.

- *Free Time*—Free Time is the percent of time that the firmware is idle. A typical value is 25%. The actual value depends on the number of functions in the instrument that are enabled and also on the amount of communication currently in progress.

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.

Viewing Device Information

(1-3-2)

The *Device Information* menu is available to view information about the instrument. From the *Online* menu, select *Setup & Diag, Display,* and *Device Information.* Follow the prompts on the Field Communicator display to view information in the following fields: *HART Univ Rev* (HART Universal Revision), *Device Rev* (Device Revision), *Firmware Rev* (Firmware Revision), *Hardware Rev* (Hardware Revision), *Inst Level* (Instrument Level), and *Device ID*.

- *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.

- *Device Rev*—Device Revision is the revision number of the software for communication between the Field Communicator and the instrument.

Table 8-1. Functions Available for Instrument Level

Instrument Level	Functions Available
AC	Communicates with Model 375 Field Communicator Provides basic setup and calibration.
HC	Communicates with Model 375 Field Communicator and AMS ValveLink Software. In addition to above, 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.
AD	Includes all functions listed above plus (with ValveLink software) all offline diagnostic tests (dynamic error band, drive signal, step response, and valve signature) plus online trending
SIS	Includes all functions listed above plus partial stroke test
PD	Except SIS, includes all functions listed above plus online valve signature test (friction analysis)

- *Firmware Rev*—Firmware Revision is the revision number of the Fisher 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
  AC—Auto Calibrate
  HC—HART Communicating
  AD—Advanced Diagnostics
  PD—Performance Diagnostics
  SIS—Safety Instrumented System

Table 8-1 lists the functions available for each instrument level.

- *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.

Viewing Instrument Status

Note

Instrument Status is not available for instrument level AC.

To view the instrument status, from the *Online* menu select *Instrument Status*. The following describes the various displays for the Instrument Status menu.

• **Done**—Select this when you are done viewing the instrument status.

Note

Alerts are not available with instrument level AC.

• **Valve Alerts**—If a valve alert is active, it will appear when the Valve Alerts menu item is selected. If more than one alert is active, they will appear on the display one at a time in the order listed below.

1. Aux Terminal Alert
2. Alert Record has Entries
3. Alert Record is full
4. Instrument Time is Invalid
5. Tvl Accumulation Alert
6. Cycle Counter Alert
7. Non-critical NVM Alert
8. Power Starvation Alert
9. Supply Pressure Alert (not available for instrument level HC)
10. Drive Signal Alert
11. Tvl Lim/Cutoff Low
12. Tvl Lim/Cutoff High
13. Tvl Deviation Alrt
14. Tvl Alert Hi Hi
15. Tvl Alert Hi
16. Tvl Alert Lo Lo
17. Tvl Alert Lo

• **Failure Alerts**—If a self-test failure has occurred, it will appear when the Failure Alerts menu item is selected. If there are multiple failures, they will appear on the display one at a time in the order listed below.

1. *Offline/Failed*—This failure indicates 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.

2. *Travel Sensor Fail*—This failure indicates the sensed travel is outside the range of -25.0 to 125.0% of calibrated travel. If this failure 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 failure does not clear, replace the printed wiring board assembly or travel sensor.

3. *Pressure Sensor Fail*—This failure indicates the actuator pressure is outside the range of -24.0 to 125.0% of the calibrated pressure for more than 60 seconds. If this failure 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 failure does not clear after restarting the instrument, replace the printed wiring board Assembly.

4. *Temperature Sensor Fail*—This failure 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 failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board Assembly.

5. *Critical NVM Fail*—This failure 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 printed wiring board Assembly.

6. *Drive Current Fail*—This failure is indicated when the drive current does not read as expected. If this failure 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.

7. *Ref Voltage Fail*—This failure is indicated whenever there is a failure associated with the internal voltage reference. If this failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

8. *No Free Time*—This failure is indicated if the instrument is unable to complete all of the configured tasks. This will not occur with a properly functioning instrument.

9. *Flash ROM Fail*—This failure indicates that the Read Only Memory integrity test failed. If this failure is indicated, restart the instrument and see if it clears. If it does not clear, replace the printed wiring board assembly.

• **Alert Record**—The instrument contains an alert record that can store up to 10 alerts from any of the enabled alert groups: Valve Alerts, Failure Alerts or

Miscellaneous Alerts. See the Detailed Setup section for information on enabling alert groups. Table 8-2 lists the alerts included in each of the groups. The alert record also includes the date and time (from the instrument clock) the alerts occurred.

- **Operational Status**—This menu item indicates the status of the Operational items listed below. The status of more than one operational may be indicated. If more than one Operational status is set, they will appear on the display one at a time in the order listed below.

1. Out of Service
2. Auto Calibration in Progress
3. Input Char Selected
4. Custom Char Selected
5. Diagnostic in Progress
6. Calibration in Progress
7. Set Point Filter Active

Table 8-2. 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

8

8

Section 9 Principle of Operation

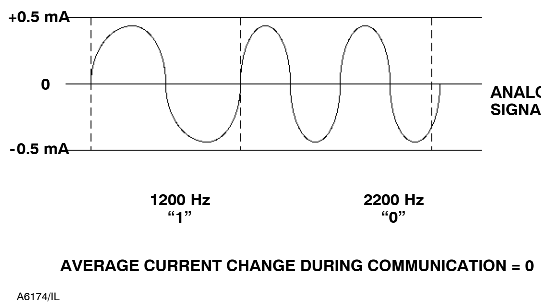


Figure 9-1. HART Frequency Shift Keying Technique

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.

9

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 9-1). 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 multidropping, 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 10-3 for instructions on changing the printed wiring board DIP switch configuration to multidrop.

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

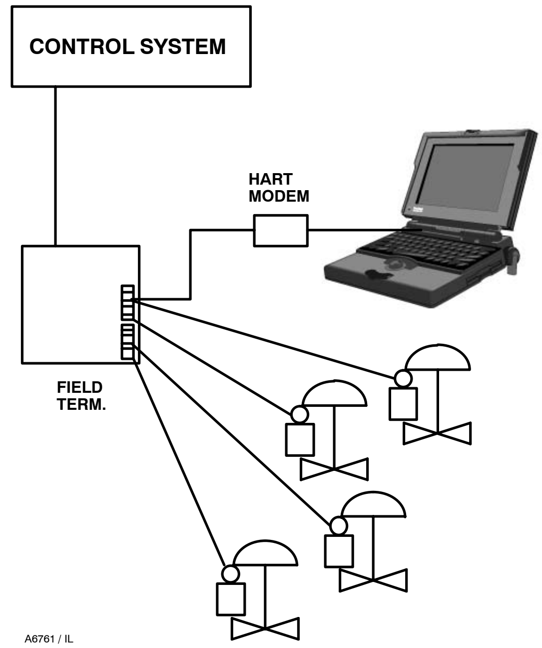


Figure 9-2. Typical FIELDVUE® Instrument to Personal Computer Connections for AMS ValveLink® Software

converter, printed wiring board (pwb) assembly, and pneumatic relay. The module base can be rebuilt by replacing the submodules. See figures 9-3 and 9-4.

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 Type 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 double-acting and single-acting reverse applications. As shown in figure 9-3 the increased output A pressure causes the actuator stem to move

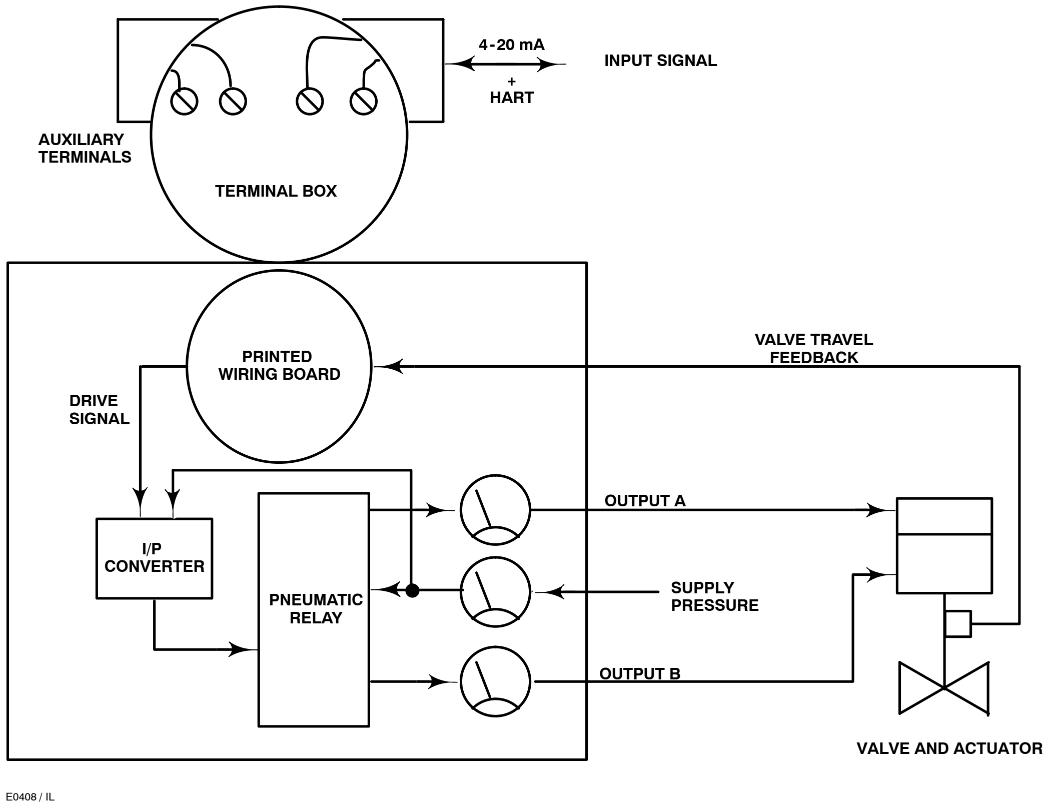


Figure 9-3. DVC6000 Series Digital Valve Controller Block Diagram

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.

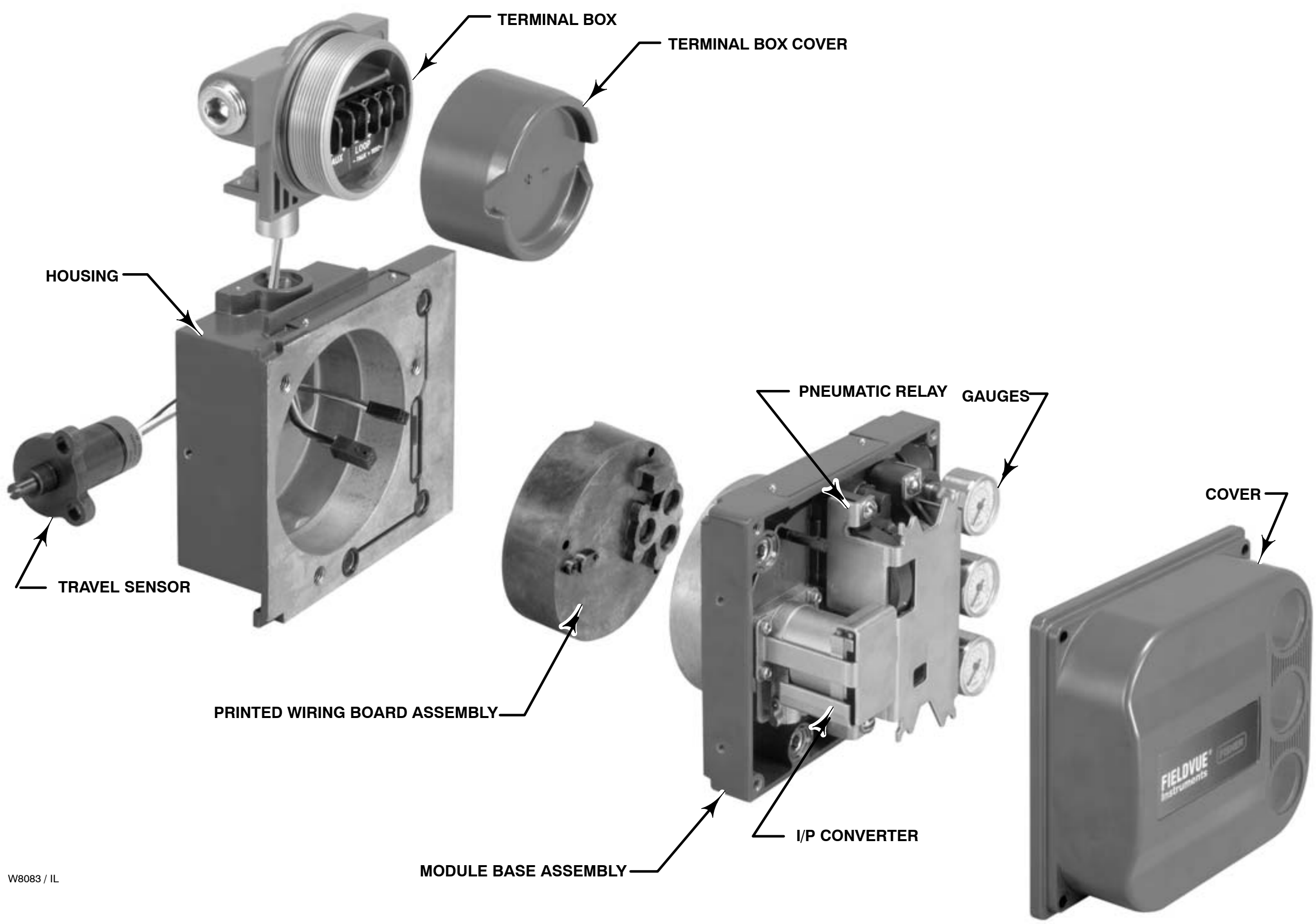


Figure 9-4. DVC6000 Series Digital Valve Controller Assembly

Section 10 Maintenance

10

The DVC6000 Series digital valve controller enclosure is rated NEMA 4X and IP66, therefore periodic cleaning of internal components is not required. If the DVC6000 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

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance procedures on the DVC6000 Series digital valve controller:

- **Always wear protective clothing 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. Drain the process media 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.**

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.

Because of the diagnostic capability of the DVC6000 Series digital valve controllers, predictive maintenance is available through the use of 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.

Stroking the Digital Valve Controller Output

(1-5)

Note

Stroke Valve is not available with instrument level AC.

From the *Online* menu, select *Setup & Diag* 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.

- *Stop*—stops the command.

Instrument Troubleshooting

If communication or output difficulties are experienced with the instrument, refer to the troubleshooting chart in table 10-1.

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 2-23 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 2-23 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 10-1. 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 10-3 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 -

Table 10-1. 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 control signal 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. Cannot perform advanced diagnostics.	5a. Variable not available in printed wiring board.	5a. Instrument does not have AD instrument level.
6. Field Communicator does not turn on.	6a. Battery pack not charged.	6a. 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.

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Table 10-2. 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

Module Base Maintenance

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.

Tools Required

Table 10-2 lists the tools required for maintaining the DVC6000 Series digital valve controller.

Removing the Module Base

To remove the module base for DVC6010, DVC6020 and DVC6030 digital valve controllers, perform the following steps. Refer to figures 11-2, 11-4 and 11-6, respectively, 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 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.

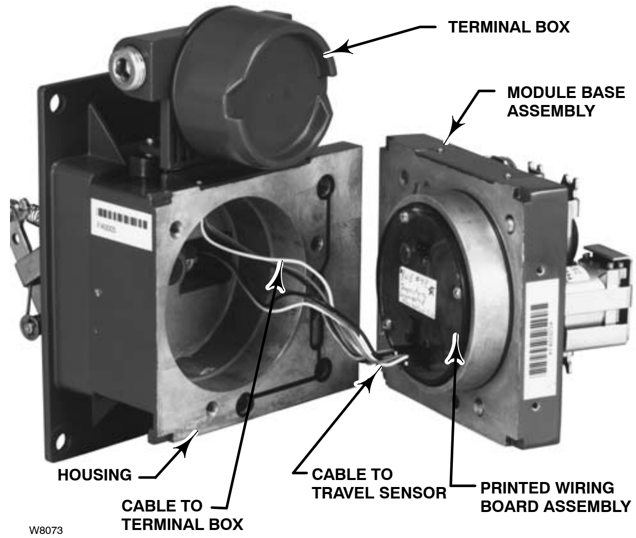

Figure 10-1. Printed Wiring Board Cable Connections

5. The digital valve controller has two cable assemblies, shown in figure 10-1, 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.

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.

Replacing the Module Base

To replace the module base, for DVC6010, DVC6020 and DVC6030 digital valve controllers, perform the following steps. Refer to figures 11-2, 11-4 and 11-6, respectively, for key number locations.

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Note

To avoid affecting performance of the instrument, inspect the guide surface on the module and the corresponding seating area in the housing before installing the module base assembly. 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

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.

Note

Exercise care when performing maintenance on the module base. Reinstall the cover to protect the I/P converter and gauges when servicing other submodules.

CAUTION

In order to maintain accuracy specifications, do not strike or drop the I/P converter during submodule maintenance.

I/P Converter

Refer to figures 11-1 through 11-8 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 10-2.

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.

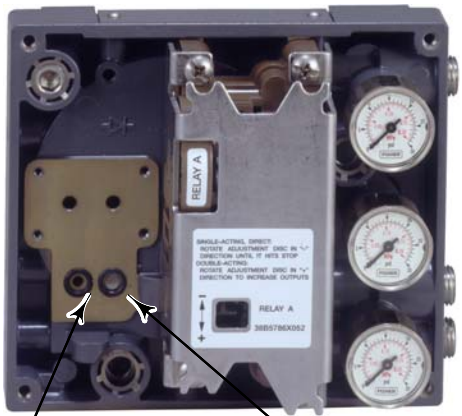


Figure 10-2. I/P Filter Location

Removing the I/P Converter

1. Remove the front cover (key 43), if not already removed.

2. Refer to figure 10-3. 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 10-2. Inspect the condition of the O-ring (key 39) and screen (key 231) in the module base (key 2). Replace them, if necessary. Apply lubricant (key 65) to the O-rings.

2. Ensure the two boots (key 210) shown in figure 10-3 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).

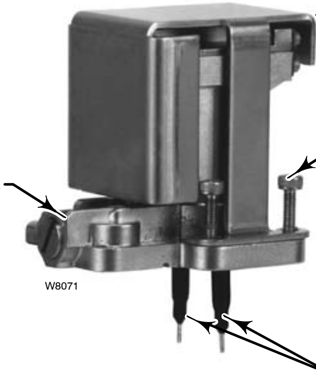
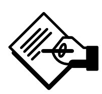


Figure 10-3. I/P Converter

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 11-1 through 11-8 for key number locations. The PWB assembly (key 50) is located on the back of the module base assembly (key 2).



Note

If the PWB assembly submodule is replaced, calibrate and configure the digital valve controller to maintain accuracy specifications.

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.

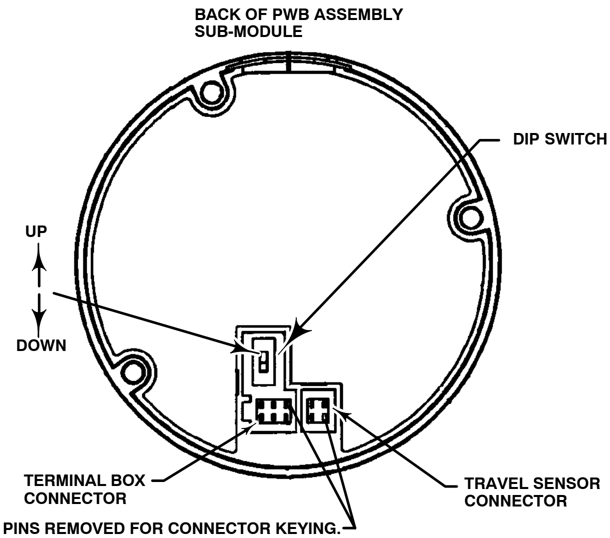


Figure 10-4. DVC6000 Series Digital Valve Controller DIP Switch Location

Table 10-3. DIP Switch Configuration(1)

OPERATIONAL MODE	SWITCH POSITION
Multidrop Loop	UP ↑
Point-to-Point Loop	DOWN ↓

1. Refer to figure 10-4 for switch location.

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Replacing the PWB Assembly and Setting the DIP Switch

1. Apply sealant (key 65) 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 10-3.

Note

For the digital valve controller to operate with a 4 to 20 mA control signal, be sure the DIP switch is in the point-to-point loop position, i.e., switch in down position.

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 11-1 through 11-8 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.

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 lubricant (key 65) to the relay seal and position it in the grooves on the bottom of the relay as shown in figure 10-5. 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 or perform touch-up calibration to maintain accuracy specifications

Figure 10-5. Pneumatic Relay Assembly

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 11-8). 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 11-1 through 11-8 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 sealant (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

Refer to figures 11-1 through 11-8 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 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 sealant (key 65) 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 sealant (key 65) 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 sealant (key 64) to the conduit entrance plug (key 62) and install it into the unused conduit entry of the terminal box.

Travel Sensor

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.

Type DVC6010 Digital Valve Controller and Type DVC6015 Remote Feedback Unit

Refer to figure 11-2 for Type DVC6010 and 11-3 for Type 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 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 terminals.

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.

Type DVC6020 Digital Valve Controller and Type DVC6025 Remote Feedback Unit

Refer to figure 11-4 for Type DVC6020 and 11-5 for Type 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 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 terminals.

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.

Type DVC6030 Digital Valve Controller and Type DVC6035 Remote Feedback Unit

Refer to figure 11-6 for Type DVC6030 and 11-7 for Type DVC6035 key number locations.

1. Remove piping and fittings from the instrument.

2. Remove the digital valve controller from the actuator. Loosen the screw (key 80) that secures the feedback arm (key 79) to the travel sensor shaft. Remove the feedback arm from the travel sensor shaft.

If disassembling a DVC6030 digital valve controller use step 3a. If disassembling a DVC6035 remote feedback unit use step 3b.

3. 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 terminals.

4. 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.

Type DVC6010 Digital Valve Controller and Type DVC6015 Remote Feedback Unit

Refer to figure 11-2 for Type DVC6010 and 11-3 for Type 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.

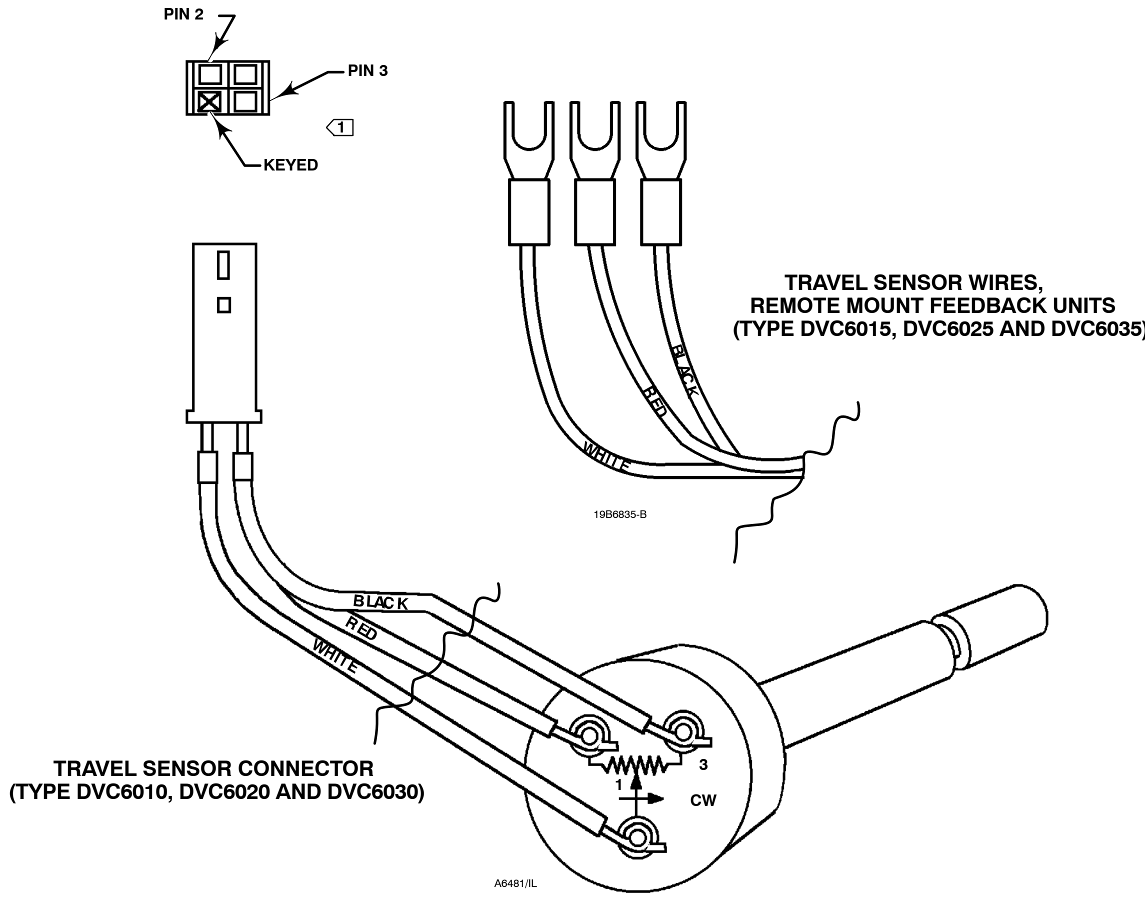
Note

For the Type 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



NOTE:
1 THE POTENTIOMETER RESISTANCE BETWEEN PINS 2 AND 3 CAN BE MEASURED AT THE CONNECTOR. INSERT TWO SHORT LENGTHS OF 22 AWG WIRE INTO THE PIN 2 AND 3 RECEPTACLES IN THE CONNECTOR. CLIP ON LEADS FROM A DVM (DIGITAL VOLTMETER) TO MEASURE THE RESISTANCE.

Figure 10-6. Potentiometer Resistance Measurement

Calibration section. To use the multimeter, perform steps 5 through 11. To use the Field Communicator, skip to step 12.

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 3000 ohms to pins 2 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location.

7. Adjust the travel sensor shaft to obtain a measured resistance of 1950 to 2050 ohms.

Note

In the next step, be sure the feedback arm surface remains flush with the end of the travel sensor shaft.

8. 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. Paint the screw to discourage tampering with the connection.

9. Disconnect the multimeter from the travel sensor connector.

10. For the DVC6010, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

11. 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.

12. For the DVC6010, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

13. For both the DVC6010 and the DVC6015, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Type DVC6020 Digital Valve Controller and Type DVC6025 Remote Feedback Unit

Refer to figure 11-4 for Type DVC6020 and 11-5 for Type 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 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 Type 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 15. To use the Field Communicator, skip to step 16.

Travel Sensor Adjustment with a Multimeter

5. Connect a multimeter set to a resistance range of 7000 ohms to pins 2 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location.

6. 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.

7. Adjust the travel sensor shaft to obtain a measured resistance of 6250 to 6350 ohms.

Note

In the next step, be sure the arm assembly outer surface remains flush with the end of the travel sensor shaft.

8. 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. Paint the screw to discourage tampering with the connection.

9. Disconnect the multimeter from the travel sensor connector.

10. Apply lubricant (key 63 or equivalent) to the pin portion of the arm assembly (key 91).

11. 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.

12. Install the mounting bracket (key 74).

13. Install the bias spring (key 82) as shown in figure 10-7.

14. For the DVC6020 only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

15. Travel sensor replacement is complete. Install the digital valve controller on the actuator.

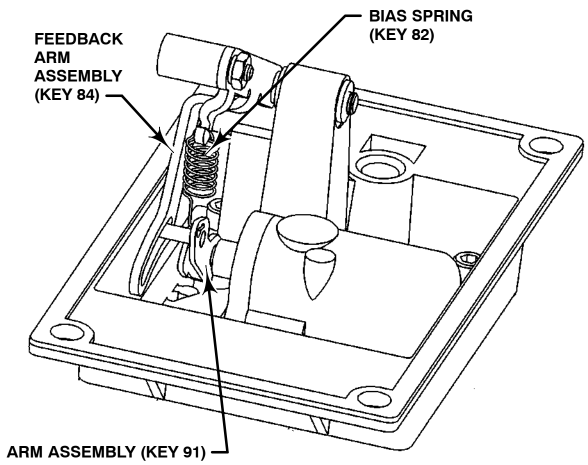


Figure 10-7. Type DVC6020 digital Valve Controller, bias Spring (key 82) Installation

Travel Sensor Adjustment with the Field Communicator

10

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.

16. For the DVC6020 only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

17. For both the DVC6020 and the DVC6025, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Type DVC6030 Digital Valve Controller and Type DVC6035 Remote Feedback Unit

Refer to figure 11-6 for Type DVC6030 and 11-7 for Type 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 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 Type DVC6035 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3

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 12. To use the Field Communicator, skip to step 13.

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 3000 ohms to pins 2 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location.

8. Adjust the travel sensor shaft to obtain a measured resistance of 1950 to 2050 ohms.

Note

In the next step, be sure the feedback arm outer surface remains flush with the end of the travel sensor shaft.

9. 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. Paint the screw to discourage tampering with the connection.

10. Disconnect the multimeter from the travel sensor connector.

11. For the DVC6030 only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

12. 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.

13. For the DVC6030 only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

14. For both the DVC6030 and the DVC6035, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Section 11 Parts

11

Parts Ordering

Whenever corresponding with your Fisher 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.

Note

Use only genuine Fisher replacement parts. Components that are not supplied by Fisher should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Fisher will void your warranty, might adversely affect the performance of the valve, and might jeopardize worker and workplace safety.

Note

Neither Emerson, Emerson Process Management, Fisher, 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.

Parts Kits

Conversion kit 3 listed below provides the parts required to convert a DVC6010 to a DVC6020 or a DVC6015 ot a DVC6025. Conversion kit 4 provides the parts required to convert a DVC6020 to a DVC6010 or a DVC6025 ot 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 to DVC6020 or DVC6015 to DVC6025)	
	Also see note below	19B5405X012

Note

When converting a DVC6010 to a DVC6020 for pipe-away construction, also order pipe-away bracket kit, item 6.

Kit	Description	Part Number
4	Conversion Kit (DVC6020 to DVC6010 or DVC6015 to DVC6025)	14B5072X112
5	Alignment Pin Kit [kit contains 15 alignment pins (key 46)]	14B5072X092
6	Pipe-Away Bracket Kit (DVC6020) [kit contains mounting bracket (key 74) and O-ring (key 75)]	
	Standard	19B5404X012
	Extreme Temperature option (fluorosilicone elastomers)	19B5404X022
7*	Seal Screen Kit [kit contains 25 seal screens (key 231) and 25 O-rings (key 39)]	
	Standard	14B5072X152
	Extreme Temperature option (fluorosilicone elastomers)	14B5072X182
8	Terminal Box Kit, aluminum	
	Standard	19B5401X012
	Extreme Temperature option (fluorosilicone elastomers)	19B5401X022
9	I/P Converter Kit	
	Standard	38B6041X052
	For Extreme Temperature option (fluorosilicone elastomers)	38B6041X062
10	Vent with extension	
	For a DVC6020 replacing a DVC5020 on an existing mounting	19B3407X012
	Adjustment Arm Kit (includes washer, nut and adjustment arm	14B5072X132
	Teflon Sleeve Kit [For pot bushing assembly (kit includes 10 sleeves and Nye Lubricant)]	
	DVC6010 and DVC6020	GE08726X012
	DVC6030	GE08727X012

*Recommended spare

Key	Description	Part Number
Remote Mount Kits		
	Remote Terminal Box Kit	
	Standard	GE00418X012
	Feedback Unit	
	DVC6015	49B7986X012
	DVC6025 long arm	49B7987X012
	DVC6025 Short Arm	49B7987X022
	DVC6035	49B7988X012
	Feedback Unit Termination Strip Kit	GE00419X012
	Pipestand/Wall Mounting Kit	GE00420X012
SIS Preventative Maintenance Kits		
	DVC6010 and DVC6020	19B4032X012
	DVC6030	19B4031X012

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.

Common Parts

Key	Description	Part Number
1	Housing	
	Aluminum	
	DVC6010 and DVC6020	48B7709X012
	DVC6030	48B9604X012
	316 SST	
	DVC6010 and DVC6020	GB0113X0012
	DVC6030	GB0114X0012
43	Cover Assembly (includes cover screws)	
	Aluminum Construction	
	Standard	38B9580X012
	Extreme temperature option (fluorosilicone elastomers)	38B9580X032
	Stainless Steel Construction	
	Standard	38B9580X022
	Extreme temperature option (fluorosilicone elastomers)	38B9580X042
48	Nameplate	
52	Vent, plastic[2]	
	DVC6010 and DVC6030 only	
63	Lubriplate Mag-1 Lubricant (not furnished with the instrument)	
64	Zink-Plate No. 770 Anti-Seize Compound (not furnished with the instrument)	
65	Dow Corning 111 Lubricant (not furnished with the instrument)	
74	Mounting Bracket	
	DVC6005 and DVC6020 only	
	Std[3] or pipe-away[6]	
75*	O-Ring[6,10]	
	DVC6020 Vent-away only	
128	Pipe Plug, pl stl[6]	
	DVC6020 Vent-away only	
211	Lubricant, Nyogel 760G (not furnished with the instrument)	
237	Module Base Seal[1,10]	

Module Base

Key	Description	Part Number
	The following parts are included in the module base.	
2	Module Base Assembly	
	Aluminum	38B9578X012
	Stainless Steel	GB0116X0012
12*	O-ring[1,10]	
16*	O-ring[1,10] (3 req'd)	
24	Relay Module (See Relay listing)	
33	Mach Screw, pan hd, SST[2] (3 req'd)	
38	Cap Screw, hex socket, SST[2] (3 req'd)	
41	I/P Assembly (See I/P Assembly listing)	
154	Retaining Ring[2] (3 req'd)	

I/P Converter Assembly[10]

Key	Description	Part Number
23	Cap Screw, hex socket, SST[2] (4 req'd)	
39*	O-ring [1,9]	
41	I/P Converter[9]	
169	Shroud[9,10]	
210*	Boot, nitrile[1,9] (2 req'd)	
231*	Seal Screen[1,7,9]	

Relay

Key	Description	Part Number
24	Relay Assembly, includes shroud, relay seal, and mounting screws [10]	
	Standard	
	Double-acting and single-acting direct	38B5786X052
	Single-acting reverse	38B5786X062
	Double-acting and single-acting direct (low bleed)	38B5786X072
	Extreme Temperature option (fluorosilicone elastomers)	
	Double-acting and single-acting direct	38B5786X032
	Single-acting reverse	38B5786X042

Terminal Box

Key	Description	Part Number
4	Terminal Box Cap,	
	Aluminum Construction	38B7714X012
	Stainless Steel Construction	GB0108X0012
34*	O-ring[1,8,10]	
36*	O-ring[1,8,10]	
44	Wire Retainer, pl stl[2] (6 req'd) (not shown)	
58	Set Screw, hex socket, SST[2]	
62	Pipe Plug, hex hd, SST	1H5137X0012
72	Cap Screw, hex socket, SST[2]	
164	Terminal Box Assembly[8]	
246	SIS Label	

*Recommended spare
1. Available in the Elastomer Spare Parts Kit
2. Available in the Small Hardware Spare Parts Kit
3. Available in the DVC6010 to DVC6020 Conversion Kit
6. Available in the Pipe-Away Bracket Kit
7. Available in the Seal Screen Kit
8. Available in the Terminal Box Kit
9. Available in the I/P Converter Kit
10. Available in the SIS Preventative Maintenance Kit

Key	Description	Part Number

PWB Assembly

Key	Description	Part Number
50*	PWB Assembly	
	Standard	
	For instrument level AC	19B3865X012
	For instrument level HC	19B3866X012
	For instrument level AD	19B3867X012
	For instrument level SIS	19B3868X012
	For instrument level PD	19B3869X012
	Extreme Temperature option (fluorosilicone elastomers)	
	For instrument level AC	19B3865X022
	For instrument level HC	19B3866X022
	For instrument level AD	19B3867X022
	For instrument level SIS	19B3868X022
	For instrument level PD	19B3869X022

Pressure Gauges, Pipe Plugs, or Tire Valve Assemblies

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)	
	Plated steel	1D829328982
	SST	1D8293X0012
	For all units w/o gauges (3 req'd)	
	Plated steel	1D829328982
	SST	1D8293X0012
67	Tire Valve Assembly (3 req'd)	1N908899012
236	Screen	
	For single-acting direct units only	18B9610X012

Feedback Parts

Common Feedback Parts

Key	Description	Part Number
80	Cap Screw, hex socket, SST(2)	
81	Square Nut, SST(2)	
223*	Potentiometer/Bushing Assy(10)	
	Standard Elastomers	
	DVC6010, DVC6020	18B9576X012
	DVC6030	17B4030X032
	DVC6015 and DVC6025	19B6834X012
	DVC6035	19B6835X012
	Extreme Temperature option (fluorosilicone elastomers)	
	DVC6010 and DVC6020	GE01028X012
	DVC6030	GE01027X012
163	Plain Washer, SST(2)	

For DVC6010, DVC6015, DVC6030, and DVC6035

Key	Description	Part Number
46	Alignment Pin(5)	
72	Cap Screw, hex socket (2 req'd)	
	Aluminum Construction	
	DVC6010 and DVC6015 only	11B9076X032
	Cap Screw, hex socket, (2 req'd)	
	Stainless Steel Construction	
	DVC6010 only	11B9076X052
78	Bias Spring, SST(2)	
79	Feedback Arm,	
	Aluminum Construction	
	DVC6010 and DVC6015	37B5270X042
	DVC6030 and DVC6035	34B2179X022
	Stainless Steel Construction	
	DVC6010	37B5270X052
	DVC6030	34B2179X042
104	Cap Screw, hex hd (4 req'd)	
	Aluminum Construction	
	DVC6010 and DVC6015	1A3917X0072
	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 (oversized) (4 req'd)	1A4116X0012
	Not for mounting on 1250 and 1250R actuators.	
107	Mounting Bracket DVC6010 and DVC6015 only(4)	
	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	39B2268X012
	50.4 mm (2-inch) to 104mm (4-inch) travel	
	All sliding-stem actuators except 585C size 60	49B2267X012
	Type 585C size 60, 19 mm (0.75 inch) to 104mm (4-inch) travel	49B3844X012

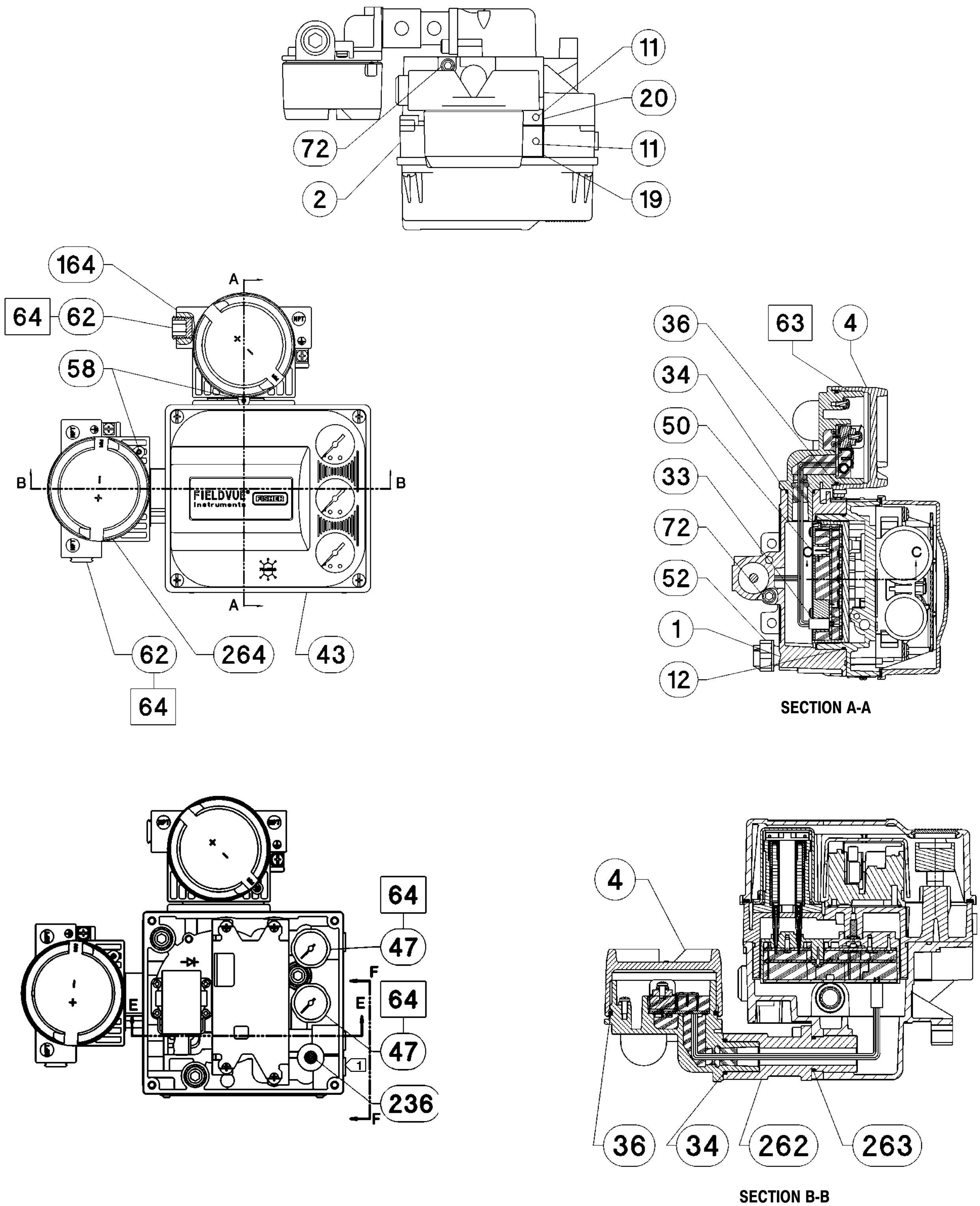
For DVC6020 and DVC6025

Key	Description	Part Number
82	Bias Spring, SST(3)	
83	Flange Bearing, Rulon(3) (2 req'd)	
84	Feedback Arm Assy, SST(3)	
85	E-ring, pl stl(3)) (2 req'd)	
86	Plain Washer, pl stl(3) (2 req'd)	
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(3)	
92	Cap Screw, hex socket(3) (4 req'd)	
93	Torsion Spring, Feedback Arm(3)	

HART® Filters

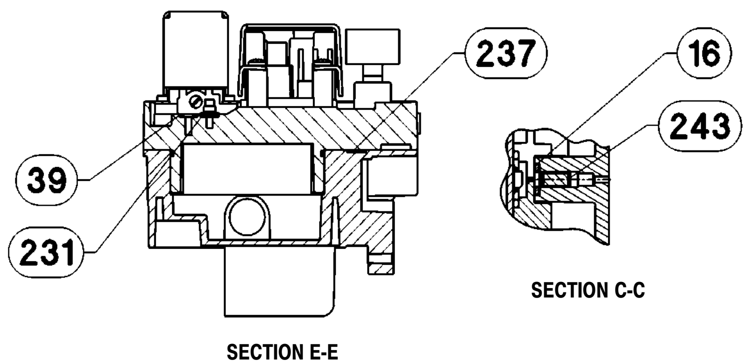
Key	Description	Part Number
	HF340, DIN rail mount	39B5411X012
	HF341, DIN rail Mount, pass through (no filter)	39B5412X012
	LC340 Line conditioner (For use with SIS tier)	39B5416X012

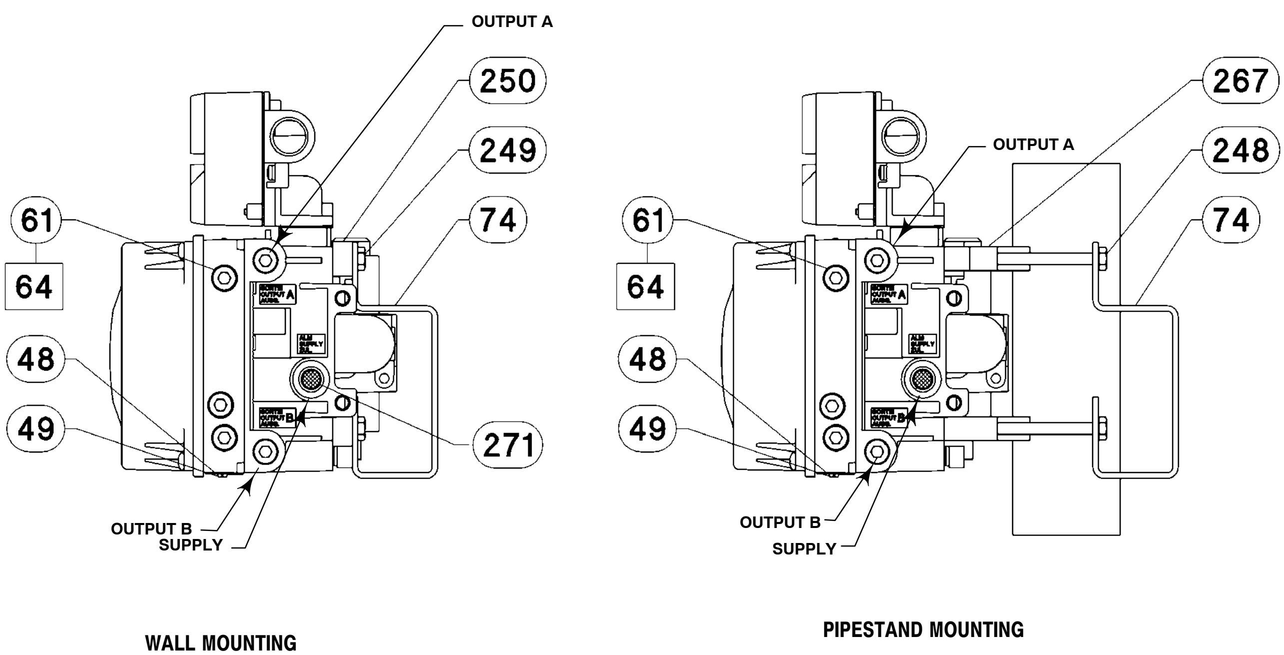
*Recommended spare
2. Available in the Small Hardware Spare Parts Kit
3. Available in the DVC6010 to DVC6020 Conversion Kit
4. Available in the DVC6020 to DVC6010 Conversion Kit
5. Available in the Alignment Pin Kit
10. Available in the SIS Preventative Maintenance Kit



☐ APPLY LUB, SEALANT
NOTES:
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED
49B3261-B SHT 1, 2 & 3

Figure 11-1. Type DVC6005 Base Unit

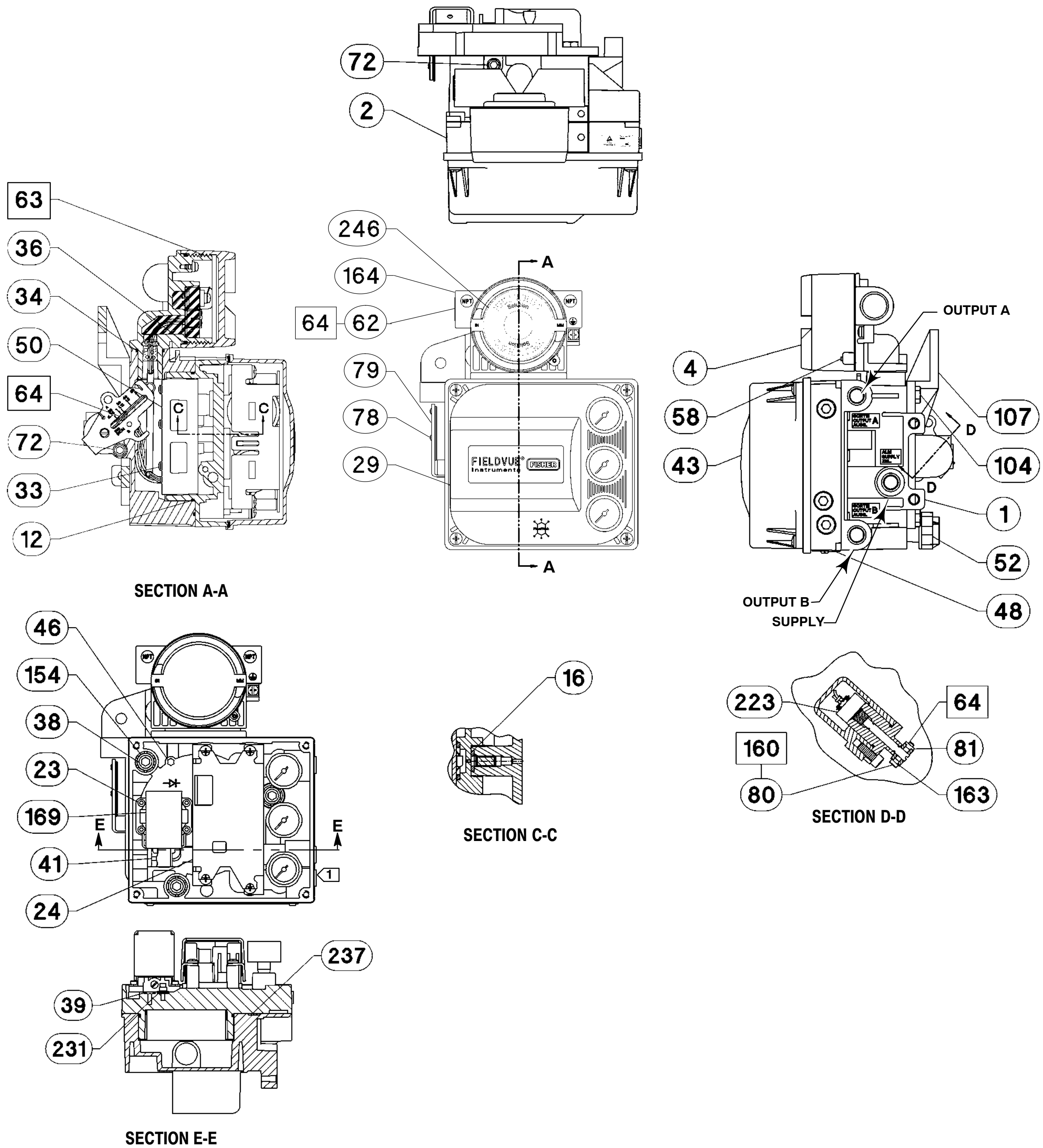




☐ APPLY LUB, SEALANT
NOTES:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B2361 SHT 3 / DOC

Figure 11-1. Type DVC6005 Base Unit (continued)



☐ APPLY LUB, SEALANT

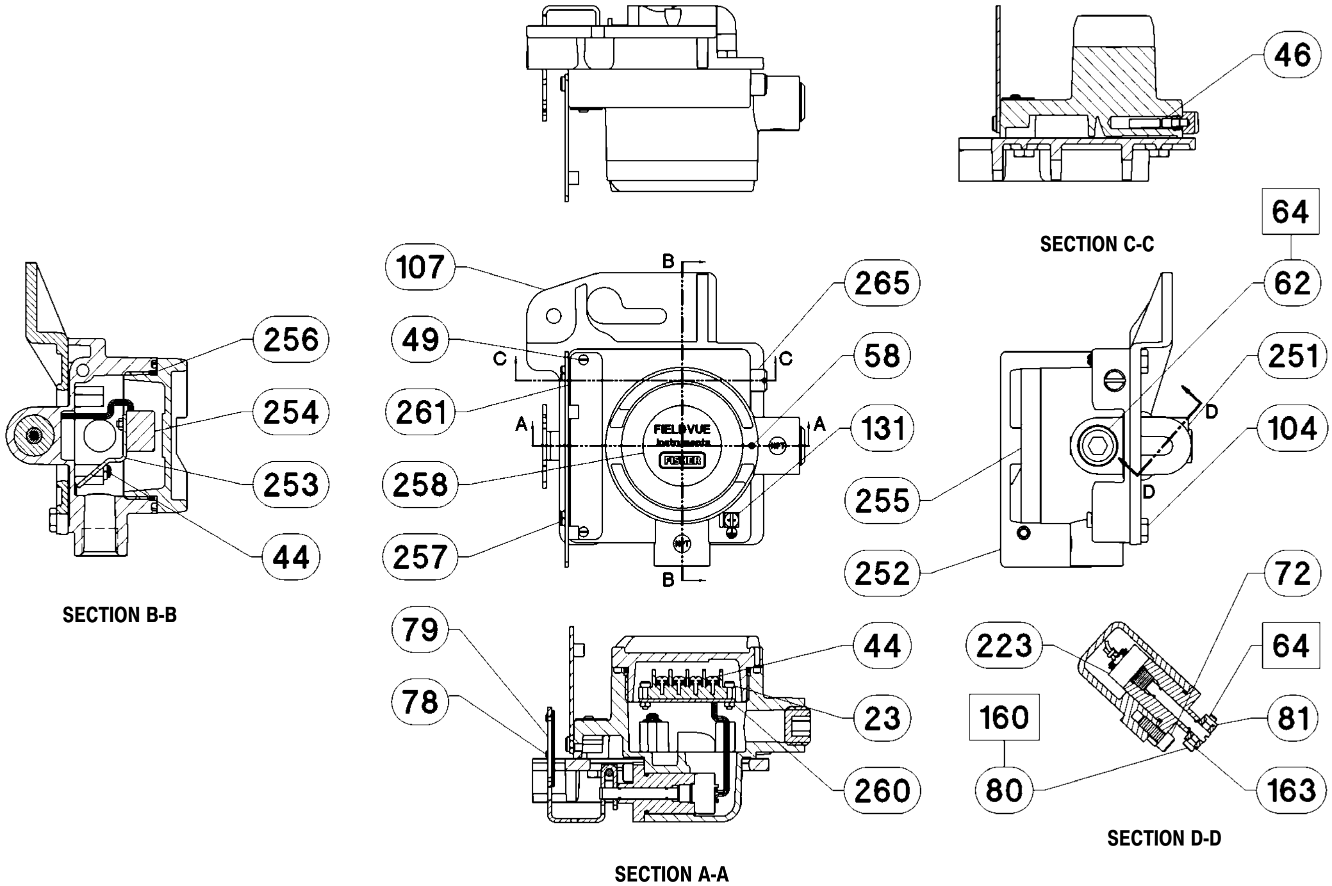
NOTES:

1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS

2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B7710-E/G SHT 1 & 2 / DOC

Figure 11-2. Type DVC6010 Digital Valve Controller Assembly

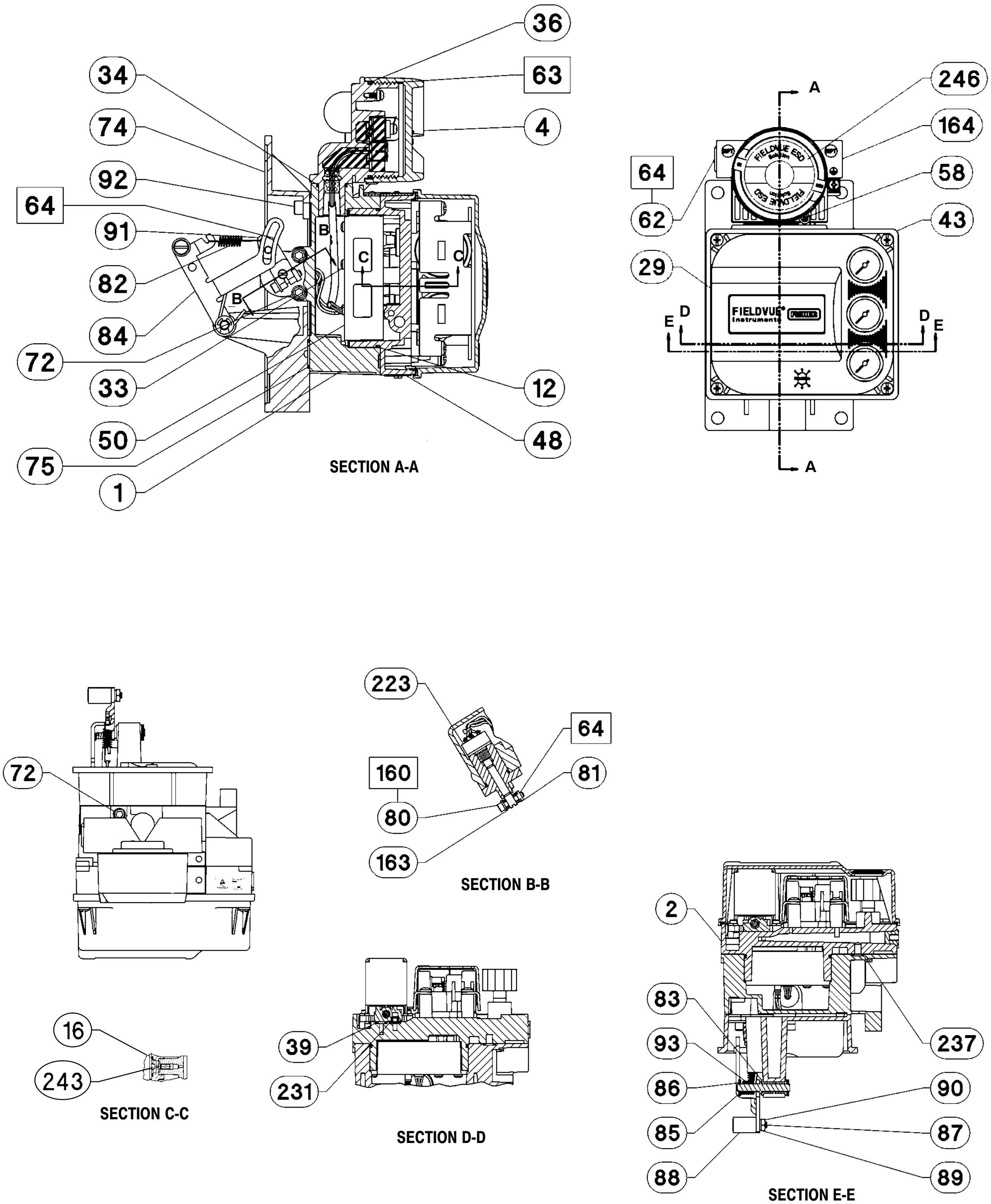


☐ APPLY LUB, SEALANT
NOTE:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

11

48B7986-A

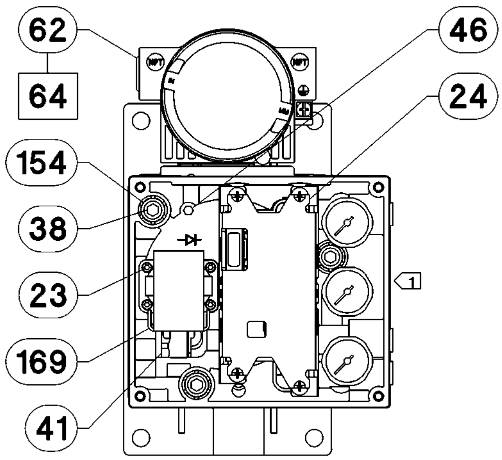
Figure 11-3. Type DVC6015 Digital Valve Controller Assembly



☐ APPLY LUB, SEALANT

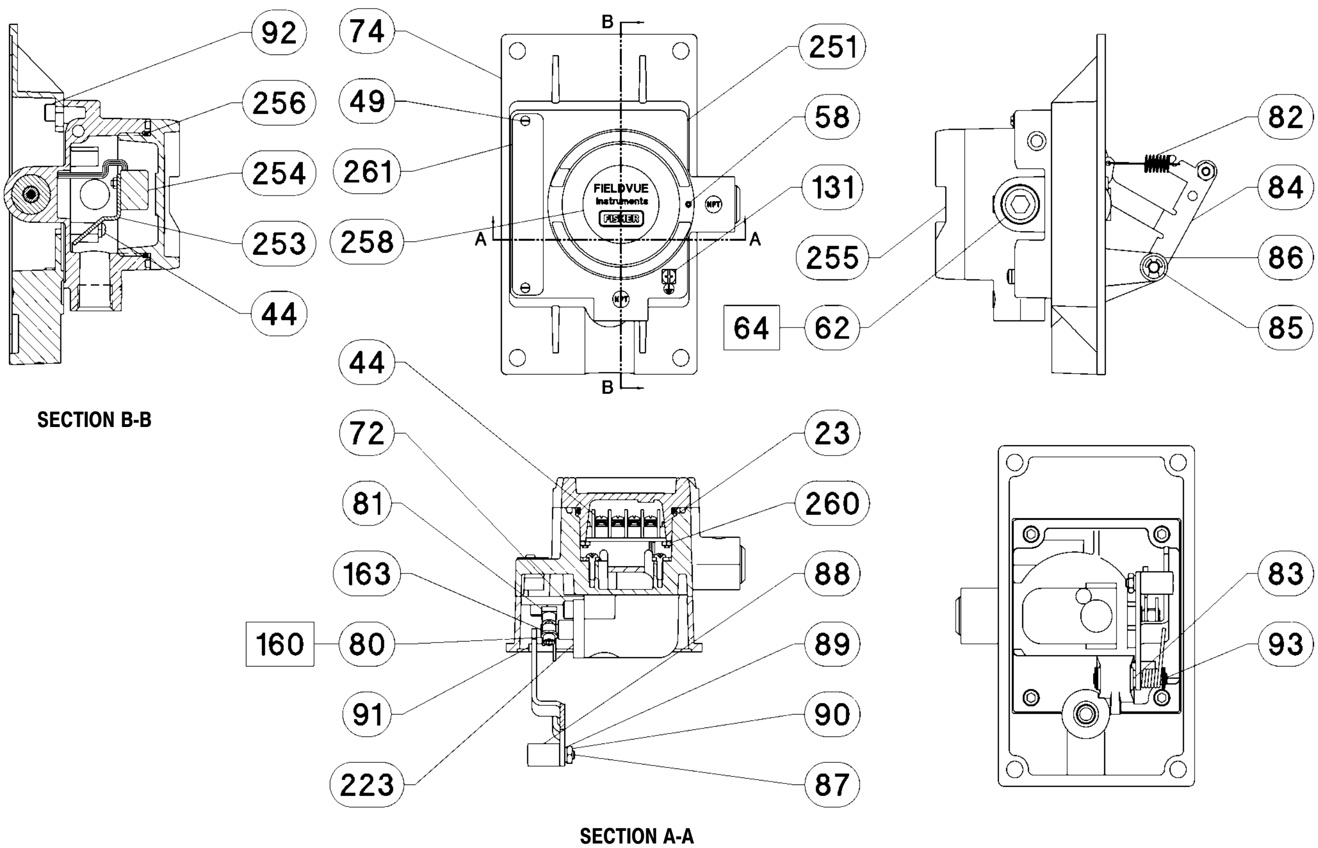
48B9596-E/G SHT 1 & 2 / DOC

Figure 11-4. Type DVC6020 Digital Valve Controller Assembly



☐ **APPLY LUB, SEALANT**
NOTES:
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED
48B9596-E SHT 3 / DOC

Figure 11-4. Type DVC6020 Digital Valve Controller Assembly (continued)

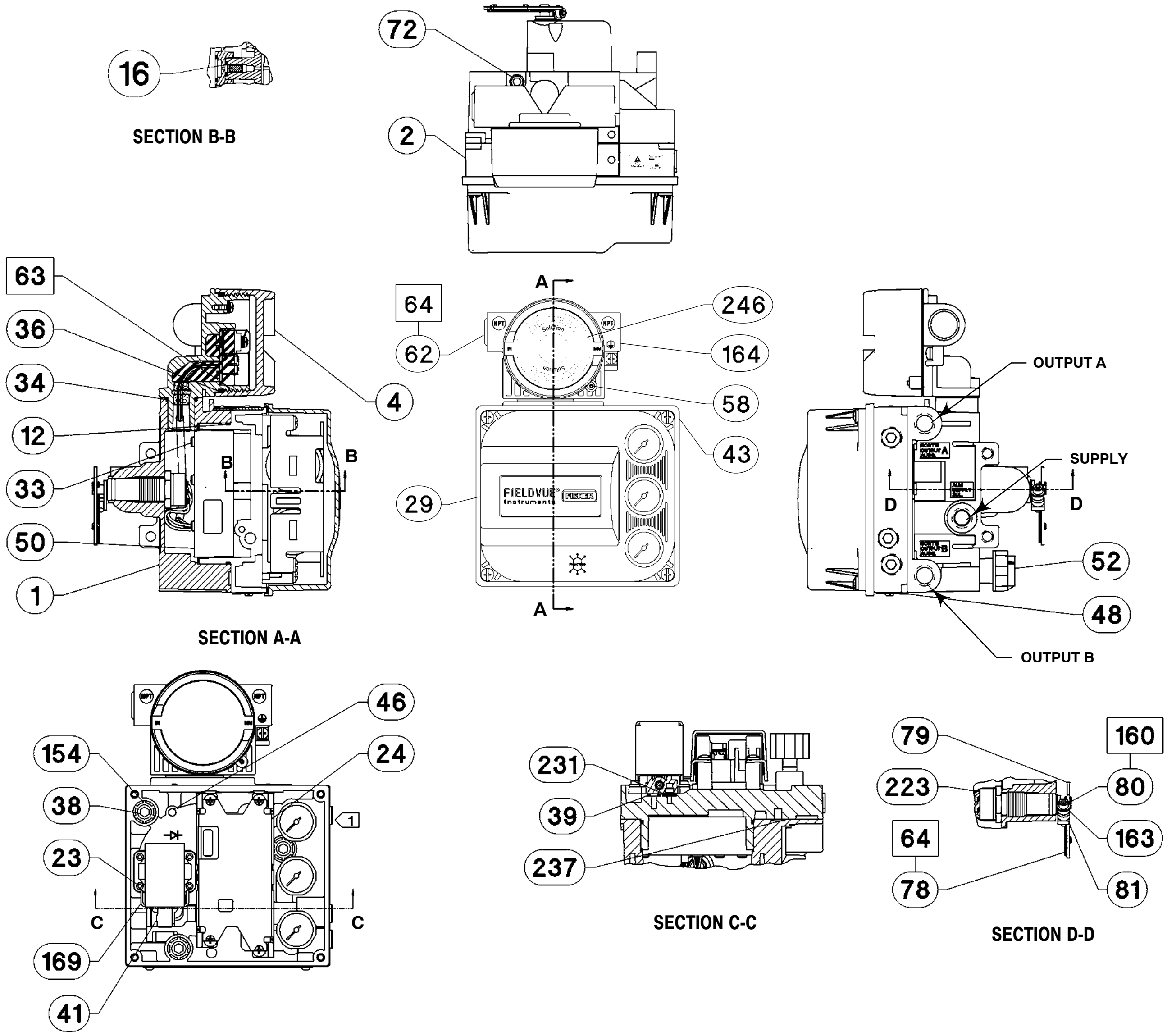


☐ APPLY LUB, SEALANT, THREAD LOCK
NOTE:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B7987-A

Figure 11-5. Type DVC6025 Digital Valve Controller Assembly

11



☐ APPLY LUB, SEALANT, THREAD LOCK

NOTES:

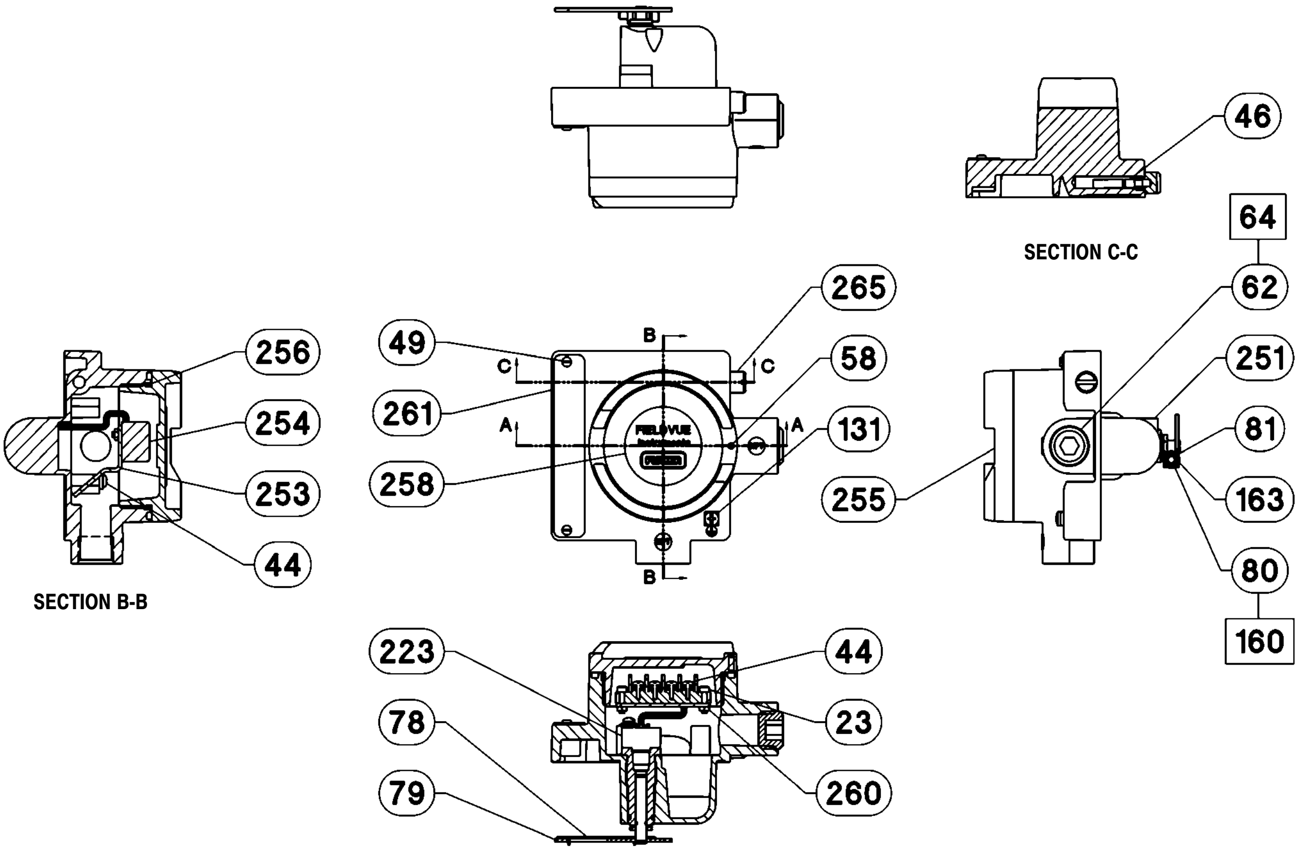
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS

2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B9597-E/G SHT 1 & 2 / DOC

Figure 11-6. Type DVC6030 Digital Valve Controller Assembly

11



☐ APPLY LUB, SEALANT, THREAD LOCK
NOTE:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED
48B7988-A

Figure 11-7. Type DVC6035 Digital Valve Controller Assembly

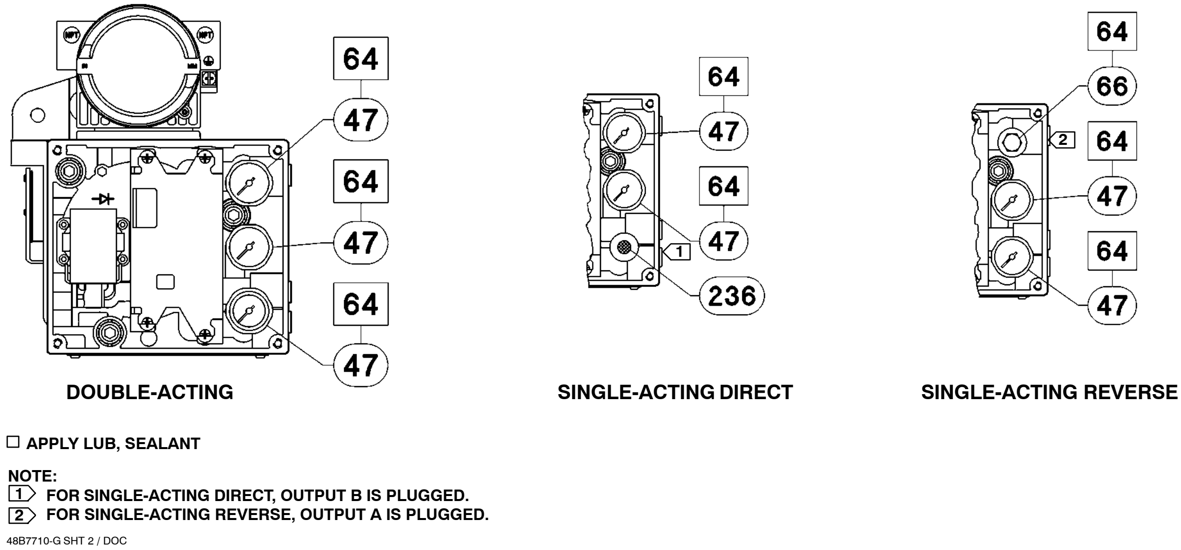


Figure 11-8. Typical DVC6000 Series Digital Valve Controller Gauge Configuration

11

Section 12 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 Fisher sales office.

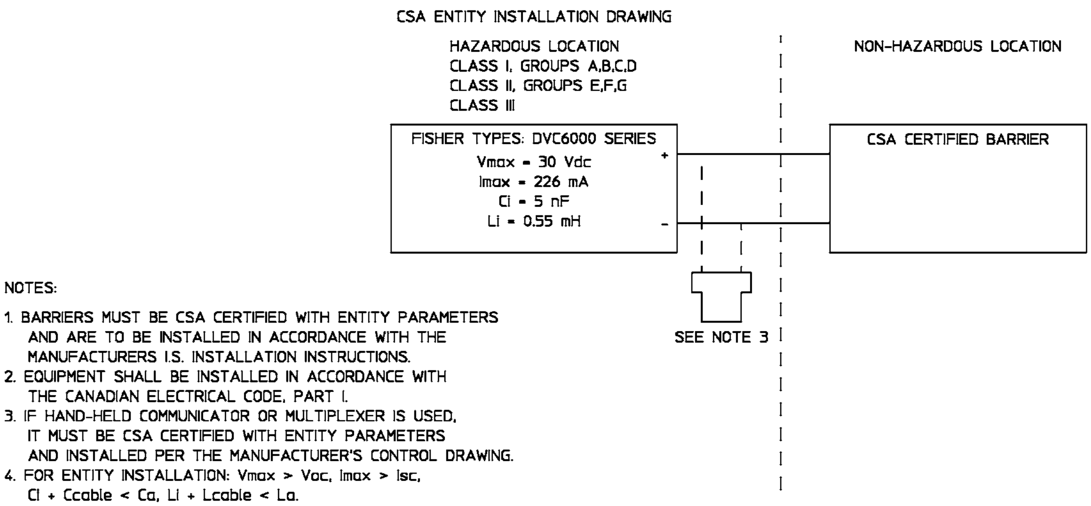
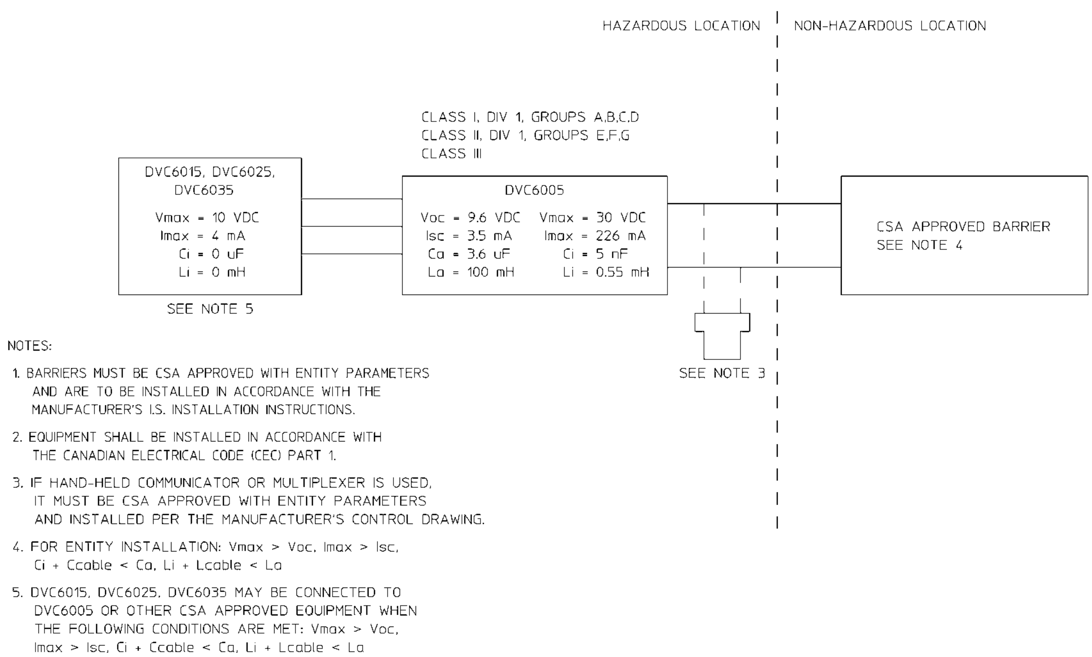
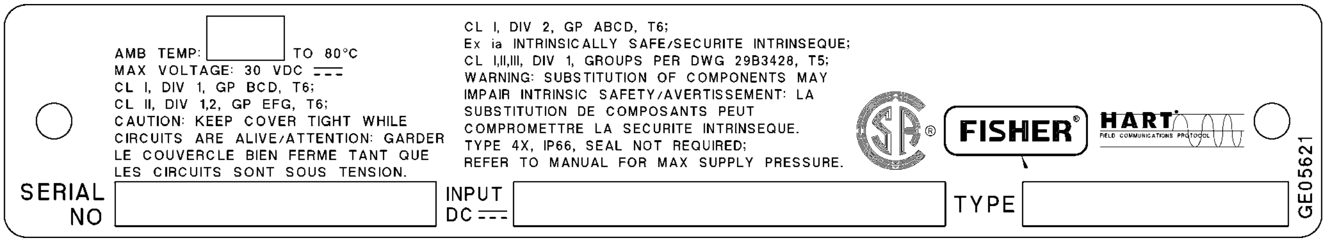


Figure 12-1. CSA Schematic for Type DVC6000 and Type DVC6000S

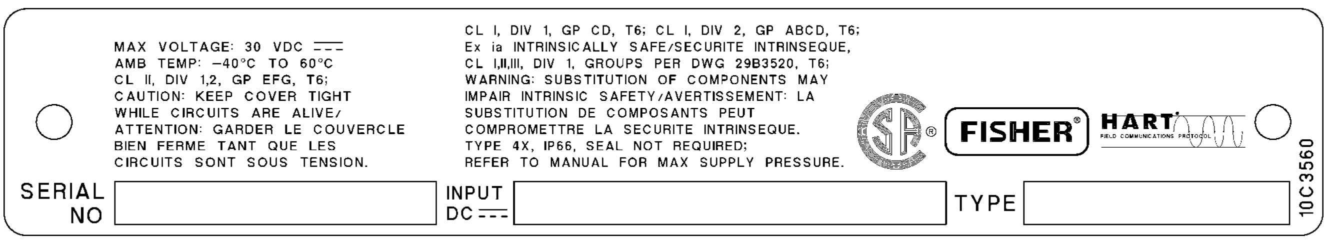


29B3520

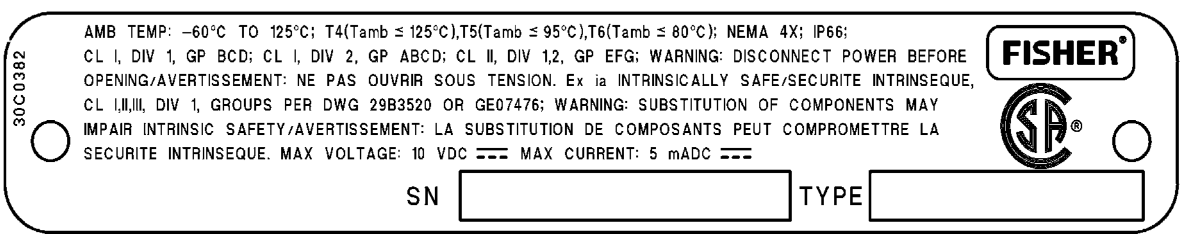
Figure 12-2. CSA Schematic for Type DVC6005



TYPES DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S



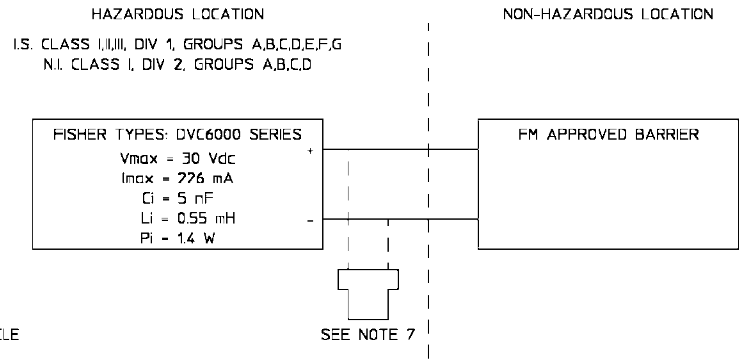
TYPE DVC6005



TYPES DVC6015, DVC6025, DVC6035

Figure 12-3. Available CSA Nameplates

12

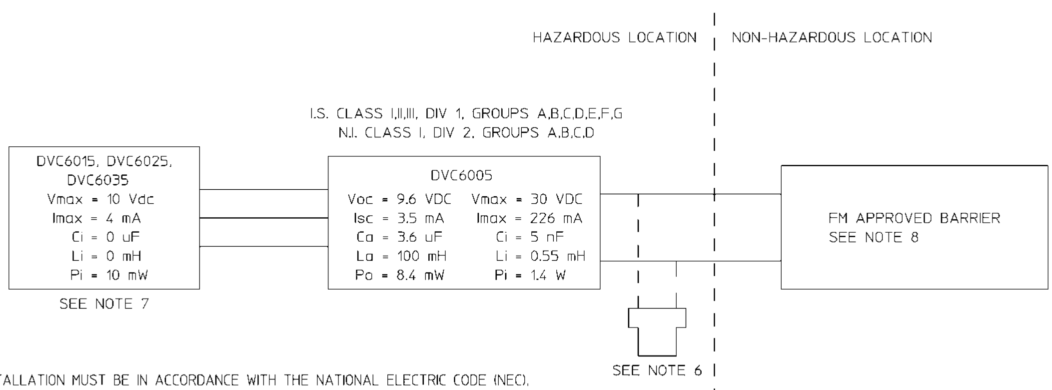


NOTES:

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-A / DOC

Figure 12-4. FM Schematic for Type DVC6000 and Type DVC6000S



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 12-5. FM Schematic for Type DVC6005

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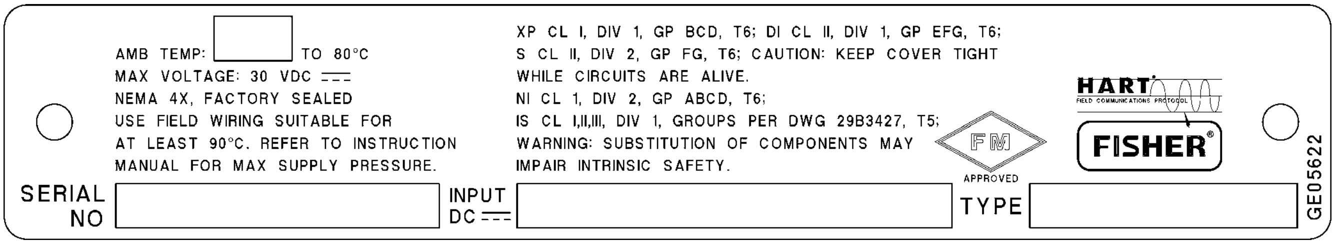
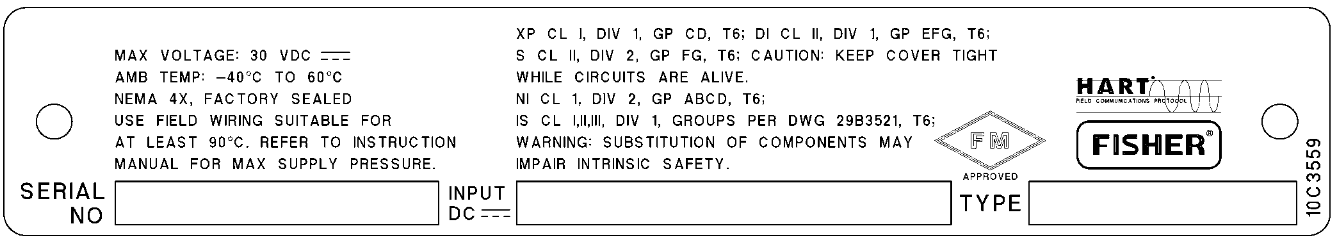
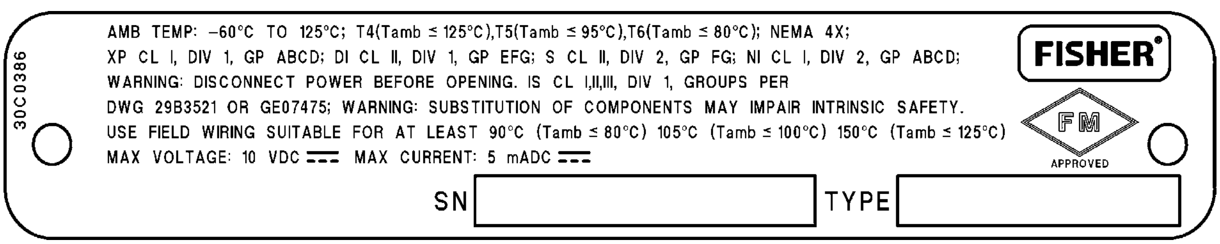


TYPES DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S



TYPE DVC6005



TYPES DVC6015, DVC6025, DVC6035

Figure 12-6. Available FM Nameplates

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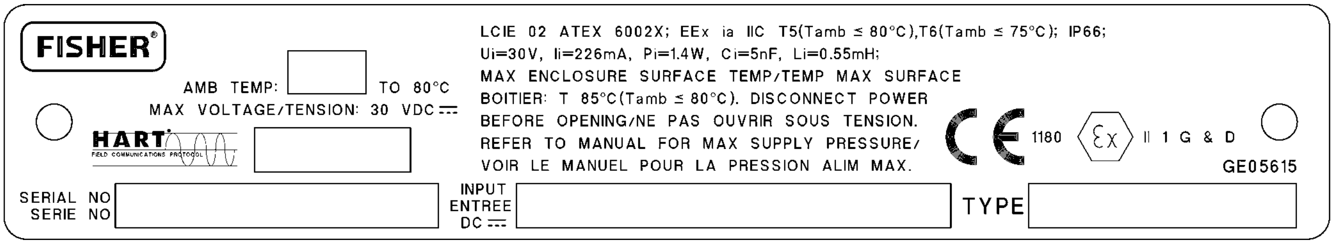
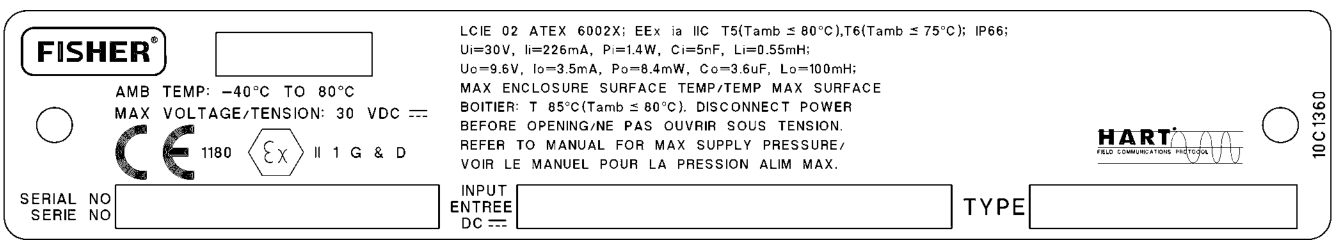


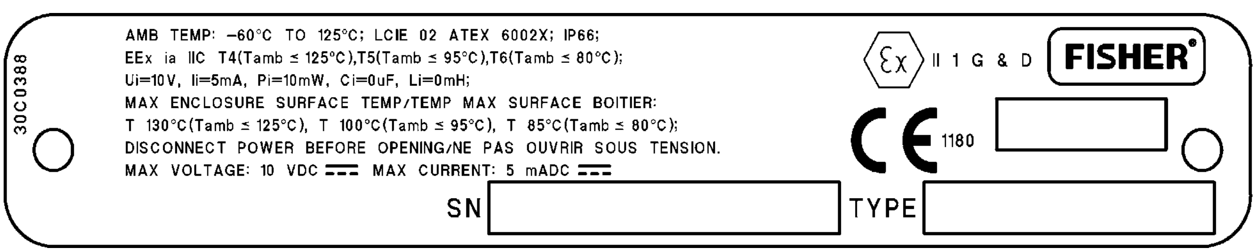
SPECIAL CONDITIONS FOR SAFE USE:
1. THE APPARATUS CAN ONLY BE CONNECTED TO AN INTRINSICALLY SAFE CERTIFIED EQUIPMENT AND THIS COMBINATION MUST BE COMPATIBLE AS REGARDS THE INTRINSICALLY SAFE RULES.
2. THE ELECTRICAL PARAMETERS OF THIS EQUIPMENT MUST NOT EXCEED ANY FOLLOWING VALUES:
$U_O \leq$ 30 Vdc; $I_O \leq$ 226 mA; $P_O \leq$ 1.4 W

3. OPERATING AMBIENT TEMPERATURE: -52°C or -40°C TO + 80°C

TYPES DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S

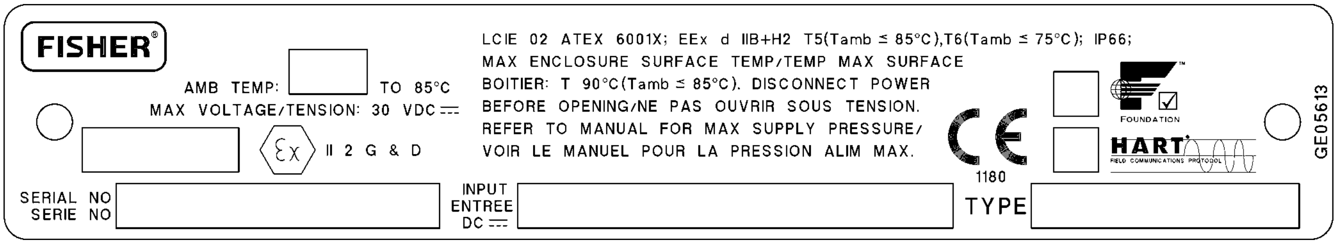


TYPE DVC6005



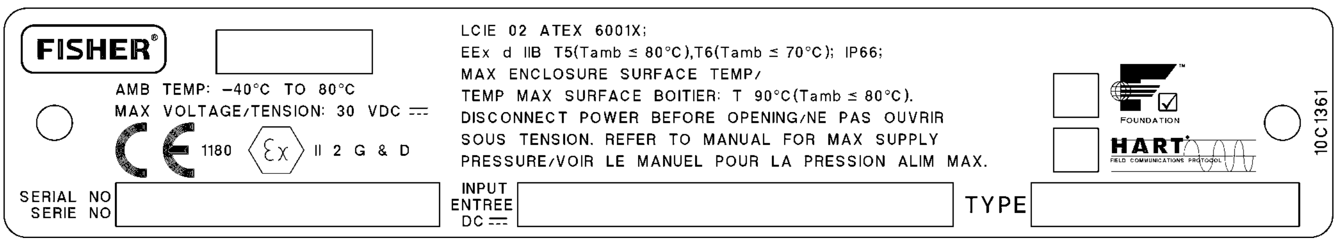
TYPES DVC6015, DVC6025, DVC6035

Figure 12-7. Available ATEX (LCIE) Nameplates; Intrinsically Safe, Dust-Tight



NOTE: SPECIAL CONDITIONS FOR SAFE USE:
OPERATING AMBIENT TEMPERATURE: -52°C or -40°C TO +85°C

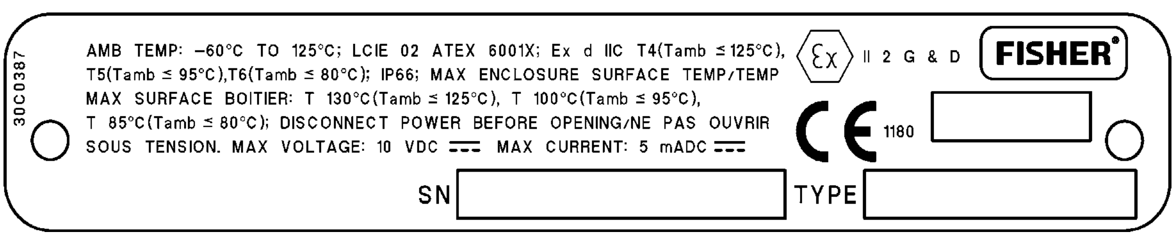
TYPES DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S



NOTE: SPECIAL CONDITIONS FOR SAFE USE:
OPERATING AMBIENT TEMPERATURE AS INDICATED.

TYPE DVC6005

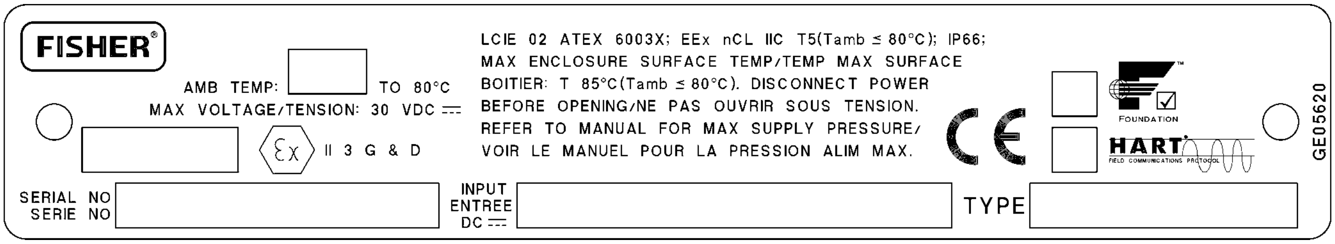
12



NOTE: SPECIAL CONDITIONS FOR SAFE USE:
OPERATING AMBIENT TEMPERATURE AS INDICATED.

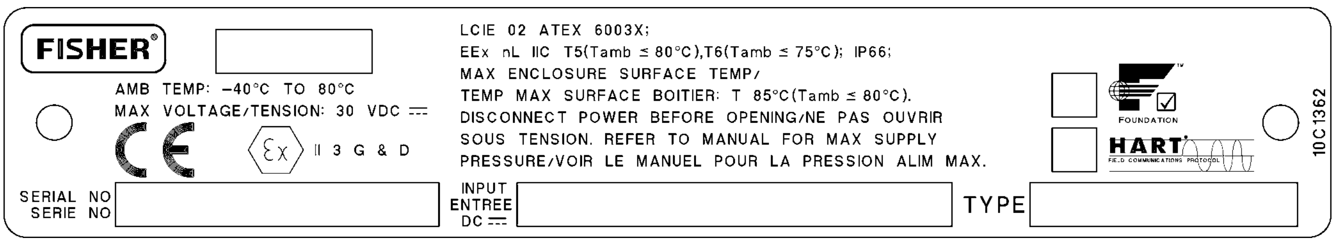
TYPE DVC6015, DVC6025, DVC6035

Figure 12-8. Available ATEX (LCIE) Nameplates; Flameproof, Dust-Tight



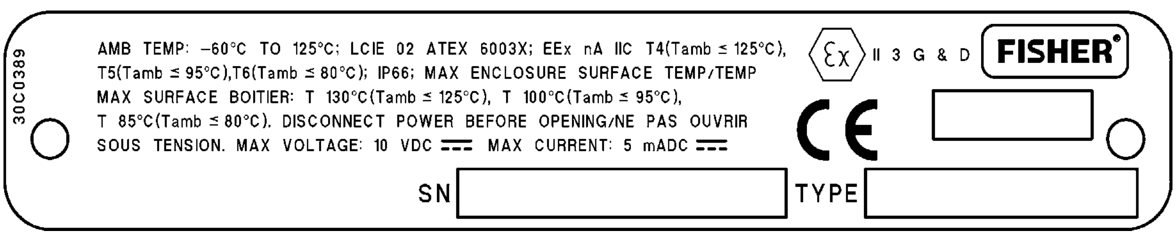
NOTE: SPECIAL CONDITIONS FOR SAFE USE:
OPERATING AMBIENT TEMPERATURE: -52°C or -40°C TO +80°C

TYPES DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S



NOTE: SPECIAL CONDITIONS FOR SAFE USE:
OPERATING AMBIENT TEMPERATURE AS INDICATED.

TYPE DVC6005



NOTE: SPECIAL CONDITIONS FOR SAFE USE:
OPERATING AMBIENT TEMPERATURE AS INDICATED.

TYPES DVC6015, DVC6025, DVC6035

Figure 12-9. Available ATEX (LCIE) Nameplates; Type n, Dust-Tight

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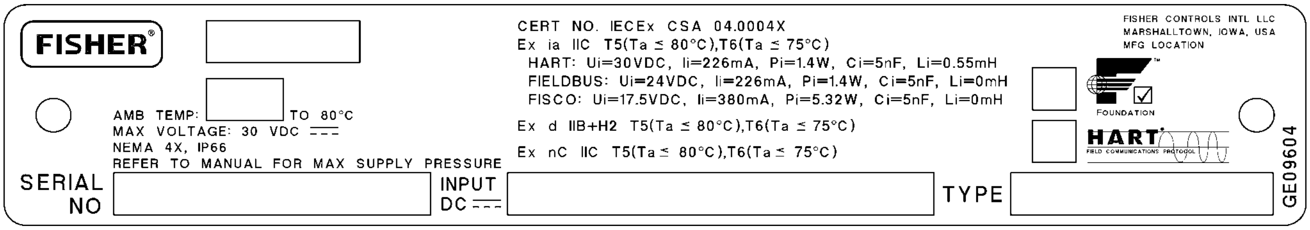
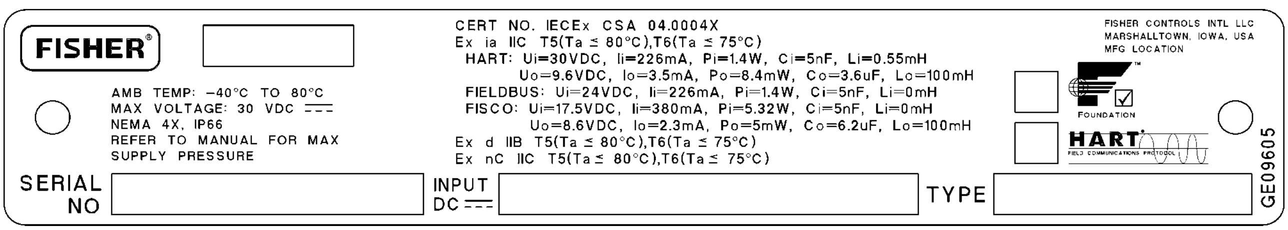


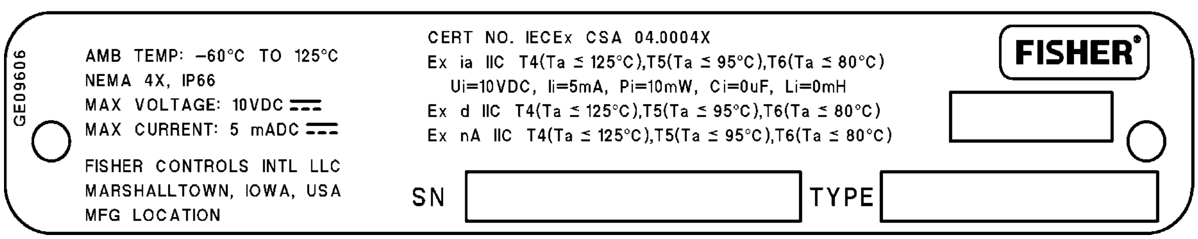
CONDITIONS OF CERTIFICATION:
Ex ia / Ex d / Ex n
1. WARNING: ELECTROSTATIC CHARGE HAZARD. DO NOT RUB OR CLEAN WITH SOLVENTS. TO DO SO COULD RESULT IN AN EXPLOSION.
Ex d / Ex n
2. DO NOT OPEN WHILE ENERGIZED.

TYPES DVC6010, DVC6020, DVC6030, DVC6010S, DVC6020S, DVC6030S



CONDITIONS OF CERTIFICATION:
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.

TYPE DVC6005



CONDITIONS OF CERTIFICATION:
Ex d / Ex n
1. DO NOT OPEN WHILE ENERGIZED.

TYPES DVC6015, DVC6025, DVC6035

Figure 12-10. Available IECEx Nameplates; Intrinsically Safe, Type n, Flameproof

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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.

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 Control Signal = Closed

The alert is active when:

drive signal <10% and calibrated travel >3%

drive signal >90% and calibrated travel <97%

If Zero Control Signal = Open

The alert is active when:

drive signal <10% and calibrated travel <97%

drive signal >90% and calibrated travel >3%

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 Instrument. See also, Linear and Quick Opening.

Feedback Arm
The mechanical connection between the valve stem linkage and the FIELDVUE Instrument 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 Fisher Controls 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. See table 8-1, page 8-3.

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 Instrument. 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.

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 ValveLink VL2000 Series 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 Instrument. 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 Zero Control Signal 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 Control Signal
A setup parameter that determines whether the valve is fully open or fully closed when the input signal is 0%.

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