Fisher™ FIELDVUE™ DVC7K Digital Valve Controller

This manual applies to

Device Type	1312
Hardware Revision	1
Firmware Revision	1
Device Revision	1
DD Revision	1

X1963

Contents

Contents (continued)

Section 1 Introduction

Installation, Pneumatic and Electrical Connections, and Initial Configuration

Refer to the DVC7K Quick Start Guide (D104766X012) for DVC7K installation, connection, and initial configuration information. If a copy of this quick start guide is needed scan or click the QR code at the right, contact your Emerson sales office, or visit our website at Fisher.com.

emrsn.co/FieldSupportDVC7K

Scan or click code for Installation Documents & Field Support

Scope of Manual

This instruction manual is a supplement to the DVC7K Quick Start Guide (D104766X012). This instruction manual includes product specifications, reference materials, custom setup information, maintenance procedures, and replacement part details.

This instruction manual describes using an Emerson handheld communicator and the Local User Interface (LUI) to set up and calibrate the instrument.

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

Conventions Used in this Manual

Navigation paths are included for procedures and parameters that can be accessed using the Device Description (DD) with a handheld communicator or the Local User Interface (LUI).

For example, to access Guided Setup:

Handheld Communicator (DD)	Device Settings > Setup Overview > Guided Setup
Local User Interface (LUI)	Configure > Guided Setup

Refer to Appendix B for handheld communicator menu trees and Appendix C for the Local User Interface flow chart.

Description

DVC7K digital valve controllers (figures 1-1 and 1-2) are communicating, microprocessor-based current-to-pneumatic instruments. In addition to the traditional function of converting an input current signal to a pneumatic output pressure, the DVC7K 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 Local User Interface (LUI) at the valve or a Device Description at the valve, at a field junction box, or at the operator's console within the control room. Additionally, an option is available which provides isolated circuitry for a valve position transmitter (for separate valve position feedback) and two integrated switches that can be set as limit switches or alert switches.

Figure 1-1. FIELDVUE DVC7K Digital Valve Controller Mounted on a Fisher Sliding-Stem Valve Actuator

X1968

Figure 1-2. FIELDVUE DVC7K Digital Valve Controller Mounted to a Fisher 8580 Control Valve

X1976

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.

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

The DVC7K digital valve controller is designed to directly replace standard pneumatic and electro-pneumatic valve mounted positioners.

Specifications

WARNING

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

Specifications for DVC7K digital valve controllers are shown in table 1-1.

Table 1-1. Specifications

Available Mounting

- ■ Direct actuator mounting to Fisher 657i/667i or GX actuators
- ■ Integral mounting to Fisher sliding-stem and rotary actuators
- ■ Quarter-turn rotary actuators

DVC7K digital valve controllers can also be mounted on other actuators that comply with IEC 60534-6-1, IEC 60534-6-2, VDI/VDE 3845 and NAMUR mounting standards

Communication Protocol

HART 7

Input Signal

Point-to-Point

Analog Input Signal: 4-20 mA DC, nominal; split ranging available

Minimum voltage available at instrument terminals must be 10.2 VDC for analog control, 10.7 VDC for HART communication
Minimum Control Current: 4.0 mA
Minimum Current w/o Microprocessor Restart: 3.8 mA
Maximum Voltage: 30 VDC
Overcurrent protected
Reverse Polarity protected

Supply Pressure(1)

Minimum Recommended: 0.3 bar (5 psig) higher than maximum actuator requirements

Maximum: 10.0 bar (145 psig) or maximum pressure rating of the actuator, whichever is lower

Supply medium must be clean, dry and noncorrosive

Per ISA Standard 7.0.01
A maximum 40 micrometer particle size in the air system is acceptable. Further filtration down to 5 micrometer particle size is recommended. Lubricant content is not to exceed 1 ppm weight (w/w) or volume (v/v) basis. Condensation in the air supply should be minimized.

Pressure dew point: At least 10°C less than the lowest ambient temperature expected

Per ISO 8573-1
Maximum particle density size: Class 7
Oil content: Class 3
Pressure dew point: Class 3

Output Signal

Pneumatic signal, up to full supply pressure

Maximum Span: 9.5 bar (140 psig)
Action: ■ Double, ■ Single Direct, or ■ Reverse

Steady-State Air Consumption(2)(3)

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)

Maximum Output Capacity(2)(3)

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)

Operating Ambient Temperature Limits(1)(4)

Standard: -40 to 80°C (-40 to 176°F) includes nitrile elastomers
Extreme Temperature Option: -45 to 80°C (-49 to 176°F) includes fluorosilicone elastomers
High Temperature Option: -40 to 80°C (-40 to 176°F) includes fluorosilicone elastomers

Independent Linearity(5)

Typical Value: ±0.5% of output span

Electromagnetic Compatibility

Meets EN 61326-1:2013
Immunity—Industrial locations per Table 2 of the EN 61326-1 standard.
Emissions—Class A
ISM equipment rating: Group 1, Class A

General Electrical Safety - Environmental Conditions

Use: Indoor and Outdoor

Altitude: up to 2000 m

Temperature: see operating ambient temperature limits

Relative Humidity: Max. R.H 80% for temperatures up to 31°C, decreasing linearly to R.H. 50 % at 40°C

Supply Voltage Fluctuations: N/A, not connected to Mains

Transient Overvoltage: Category I

Pollution Degree: 2

Wet Locations: Yes

-continued-

Table 1-1. Specifications (continued)

Vibration Testing Method

Tested per ANSI/ISA-S75.13.01 Section 5.3.5.

Input Impedance

An equivalent impedance of 550 ohms may be used. This value corresponds to 11 V @ 20 mA.

Humidity Testing Method

Tested per IEC 61514-2

Hazardous Area Approvals (PENDING)

cCSAus— Intrinsically Safe, Explosion-proof, Dust-Ignition-proof, Increased Safety, Class/Div/Zone

ATEX— Intrinsically Safe, Flameproof, Dust-Ignition-proof, Increased Safety

IECEx— Intrinsically Safe, Flameproof, Dust-Ignition-proof, Increased Safety

NEPSI— Intrinsically Safe, Flameproof, Dust-Ignition-proof, Increased Safety

Not all certifications apply to all constructions. Contact your Emerson sales office or refer to the DVC7K product page at Fisher.com for approval specific information.

Electrical Housing (PENDING)

CSA— Type 4X, IP66

FM— Type 4X, IP66

ATEX— IP66

IECEx— IP66

Connections

Supply Pressure: 1/4 NPT internal or G1/4 and integral pad for mounting 67CFR regulator
Output Pressure: 1/4 NPT internal or G1/4
Tubing: 3/8-inch recommended
Vent: 1/2 NPT internal
Electrical: 1/2 NPT internal or M20

Actuator Compatibility

Stem Travel (Sliding-Stem Linear)
Linear actuators with rated travel between 6.35 mm (0.25 inch) and 606 mm (23.375 inches)

Shaft Rotation (Quarter-Turn Rotary)
Rotary actuators with rated travel between 45 degrees and 180 degrees(6)

Weight

Aluminum: 3.9 kg (8.9 lbs)

Options

■ Integral mounted filter regulator ■ Low-Bleed Relay(7) ■ Extreme Temperature ■ High Temperature ■ Integral 4-20 mA Position Transmitter(8)(9) ■ Integral Switches(10) ■ Pipe-away Vent Connection

Declaration of SEP

Fisher Controls International LLC declares this product to be in compliance with Article 4 paragraph 3 of the PED Directive 2014/68/EU and Part 1, Requirement 8 of the PESR Regulation. It was designed and manufactured in accordance with Sound Engineering Practice (SEP) and cannot bear the CE marking related to PED compliance or the UKCA mark related to the PESR Regulation.

However, the product *may* bear the CE or UKCA marking to indicate compliance with *other* applicable European Community Directives or UK Regulations (Statutory Instruments).

NOTE: Specialized instrument terms are defined in ANSI/ISA Standard 51.1 - Process Instrument Terminology.
1. The pressure/temperature limits in this document and any other applicable code or standard should not be exceeded.
2. 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.
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. Temperature limits vary based on hazardous area approval.
5. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also not applicable for digital valve controllers in long-stroke applications.
6. Rotary actuators with 180 degree rated travel require a special mounting kit; contact your Emerson sales office for kit availability.
7. The Quad O steady-state consumption requirement of 6 scfh can be met by a DVC7K with low bleed relay A option, when used with up to 4.8 bar (70 psi) supply of Natural Gas at 16°C (60°F). The 6 scfh requirement can be met by low bleed relay B and C when used with up to 5.2 bar (75 psi) supply of Natural Gas at 16°C (60°F).
8. 4-20 mA output, isolated; *Supply Voltage:* 11-30 VDC; *Reference Accuracy:* 1% of travel span.
9. Position transmitter meets the requirements of NAMUR NE43; selectable to show failure low (< 3.6 mA) or failure high (> 22.5 mA). Fail high available only when the positioner is powered.
10. Two isolated switches, configurable throughout the calibrated travel range or actuated from a device alert; *Off State:* 0 mA (nominal); *On State:* up to 1 A; *Supply Voltage:* 30 VDC maximum; *Reference Accuracy:* 2% of travel span.

Related Documents

This section lists other documents containing information related to the DVC7K digital valve controller. These documents include:

- Bulletin 62.1:DVC7K - Fisher FIELDVUE DVC7K Digital Valve Controller (D104765X012)
- Fisher FIELDVUE DVC7K Digital Valve Controller Quick Start Guide (D104766X012)
- FIELDVUE Digital Valve Controller Split Ranging (D103262X012)
- Using FIELDVUE Instruments with the Smart HART Loop Interface and Monitor (HIM) (D103263X012)
- Using FIELDVUE Instruments with the Smart Wireless THUM Adapter and a HART Interface Module (HIM) (D103469X012)
- Audio Monitor for HART Communications (D103265X012)
- Implementation of Lock-in-Last Strategy (D103261X012)
- Fisher HF340 Filter Instruction Manual (D102796X012)
- AMS Trex Device Communicator User Guide

All documents are available from your Emerson sale office or at Fisher.com.

Educational Services

Emerson Educational Services
Phone: +1-800-338-8158
e-mail: education@emerson.com
emerson.com/mytraining

Section 2 Wiring Practices

Control System Requirements

There are several parameters that should be checked to ensure the control system is compatible with the DVC7K digital valve controller.

HART Filter

Depending on the control system you are using, a HART filter may be needed to allow HART communication. Refer to the Fisher HF340 Filter Instruction Manual (D102796X012) for more details.

Voltage Available

The voltage available at the DVC7K digital valve controller must be at least 10.5 VDC. The voltage available at the instrument is not the actual voltage measured at the instrument when the instrument is connected. The voltage measured at the instrument is limited by the instrument and is typically less than the voltage available.

As shown in figure 2-1, the voltage available at the instrument depends upon:

- the control system compliance voltage
- if a filter, wireless THUM adapter, 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 10.5 volts DC.

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

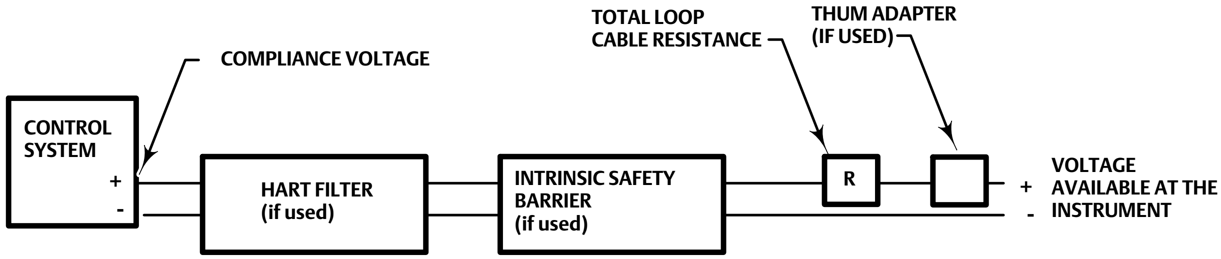
The following example shows how to calculate the voltage available for a Honeywell™ TDC2000 control system with a HF340 HART filter, and 1000 feet of Belden™ 9501 cable:

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

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

Voltage available = 15.19 volts

Figure 2-1. Determining Voltage Available at the Instrument



<u>Calculate Voltage Available at the Instrument as follows:</u>	Example Calculation
Control system compliance voltage	**18.5 volts (at 21.05 mA)**
– Filter voltage drop (if used) 1	**– 2.3 volts (for HF300 filter)**
– Intrinsic safety barrier resistance (if used) x maximum loop current	**– 2.55 volts (121 ohms x 0.02105 amps)**
– Smart Wireless THUM adapter voltage drop (if used) 2	
– 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 3	**= 15.19 volts, available—if safety barrier (2.55 volts) is not used**

NOTES:

1 Obtain filter voltage drop. The measured drop will be different than this value. The measured filter voltage drop depends upon control system output voltage, the intrinsic safety barrier (if used), and the instrument. See note 3.

2 The voltage drop of the THUM adapter is linear from 2.25 volts at 3.5 mA to 1.2 volts at 25 mA.

3 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 8.0 to 9.5 volts.

Table 2-1. Cable Characteristics

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

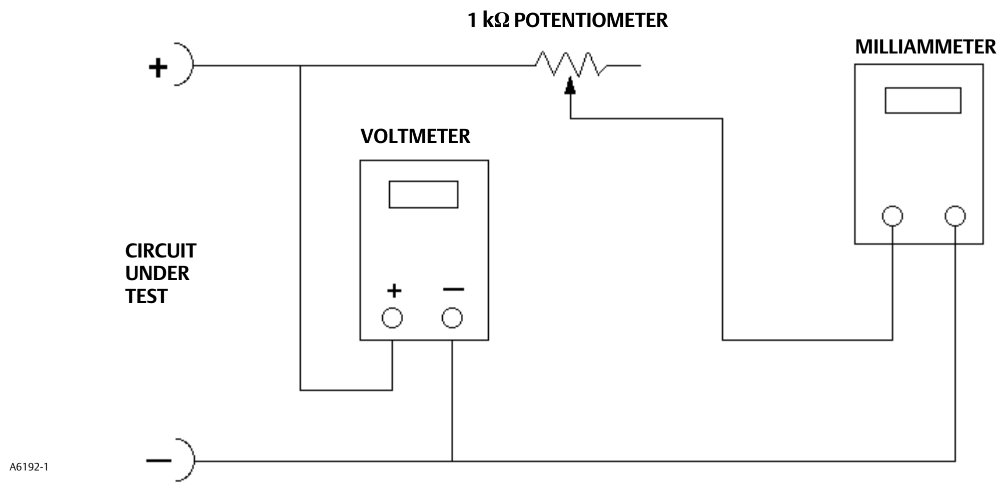
1. The capacitance values represent capacitance from one conductor to all other conductors and shield. This is the appropriate value to use in the cable length calculations.
2. The resistance values include both wires of the twisted pair.

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 2-2 to the control system terminals.

Figure 2-2. Voltage Test Schematic



2. Set the control system to provide maximum output current.
3. Increase the resistance of the 1 kΩ potentiometer, shown in figure 2-2, until the current observed on the milliammeter begins to drop quickly.
4. Record the voltage shown on the voltmeter. This is the control system compliance voltage.

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

Maximum Cable Capacitance

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

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

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

where:

160,000 = a constant derived for FIELDVUE instruments to ensure that the HART network RC time constant will be no greater than 65 μs (per the HART specification).

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

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

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

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

Length = 2200 ft.

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

Section 3 Configuration

Guided Setup

Handheld Communicator (DD)	Device Settings > Setup Overview > Guided Setup
Local User Interface (LUI)	Configure > Guided Setup

To quickly setup the instrument, Guided Setup will guide you through the following steps.

1. **Select the Language** (LUI only).
2. **Provide Construction Information** which is used to configure the unique parameters for the actuator, instrument, and accessory construction.
3. **Relay Adjustment** (Relay A only)
4. **Auto Calibration** is used to establish the limits of physical travel. During this process, the valve will fully stroke from one travel extreme to the other.
5. **Apply Custom Configuration** (factory purchased custom configurations only).
6. **Return to Previous State** (Instrument Mode and Write Protection).

Note

Refer to the DVC7K Quick Start Guide (D104766X012) for detailed instructions on Guided Setup.

Manual Setup

Handheld Communicator (DD)	Device Settings > Setup Overview
Local User Interface (LUI)	Configure

Manual Setup allows you to configure the digital valve controller to your application. Table 3-1 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 change the Write Protection mode.

Table 3-1. Default Parameter Configuration

Setup Parameter		Default Setting[1]
Instrument Configuration	Tag	[truncated serial number]
	Long Tag	[truncated serial number]
	Setpoint Source	Input Current
	Restart Setpoint Option	No effect
	Input Range Low	0%
	Input Range High	100%
	Input Current Units[2]	%
	Polling Address	0
	Temperature Unit[2]	Fahrenheit (°F)
	Pressure Unit[2]	psi
	Zero Power Condition[2]	Closed
	Application Mode[2][3]	Throttling
	Travel Sensor Motion	Counterclockwise/Toward Top of Instrument
Local User Interface	Language[2]	English
	Decimal Separator[2]	Period
	LED Setup[2][4]	LED Enable
Dynamic Response and Tuning	Input Characterization	Linear
	Tuning Set[2]	H
	Travel Integral Deadzone	0.25%
	Travel Integral Gain	9.6 repeats/minute
	Enable Integrator Control	Yes
	Travel Limit High Point	125%
	Cutoff High Trip Point	99.5%
	Cutoff Rate High	0.0%/sec
	Travel Limit Low Point	-25%
	Cutoff Low Trip Point	0.5%
	Cutoff Rate Low	0.0%/sec

1. The settings listed are for standard factory configuration. DVC7K instruments can also be ordered with custom configuration settings. Refer to the order requisition for the custom settings.
2. Configurable with the LUI
3. Only user configurable if the Control Tier is Throttling Control
4. Not configurable with the DD.

Note

Refer to table5-2 for Default Alert Settings.

Note

Refer to Appendix B for Handheld Communicator Menu Trees.

Mode and Protection

Handheld Communicator (DD)	Device Settings > Setup Overview Device Settings > Input/Output Device Settings > Communication Device Settings > Display Device Settings > Tuning
Local User Interface (LUI)	Configure > Instrument Mode Configure > Security > Write Protect

Instrument Mode

There are three instrument modes for the DVC7K; Automatic (AUTO) , Manual (MAN), and Local Override (Override).

- Automatic is the normal operating mode such that the instrument follows the control signal.
- Manual is required in some cases to modify configuration parameters or to run diagnostics.
- Local Override is when the device is latched to a Zero Power Condition. It occurs when the device is reset in Automatic mode which is caused by loss of power. To reset and clear the latch, set the Instrument Mode to Manual. Then the user can return the Instrument Mode to Automatic. Local Override is not a user configurable instrument mode.

Note

In the DVC6200 digital valve controller, Automatic was referred to as In Service and Manual was referred to as Out of Service.

Note

Some changes that require the instrument to be in Manual will not take effect until the instrument is placed back in Automatic or the instrument is restarted.

Write Protection

There are two Write Protection modes for the DVC7K: Unprotected or Protected. The default setting is Unprotected. Protected prevents configuration and calibration changes to the instrument. Write Protection can be changed to Protected with the handheld communicator or at the Local User Interface (LUI).

For DVC7K devices with Local User Interfaces (LUIs), there are two Write Protection LUI Validation modes: Enabled and Disabled. The default setting is Disabled. If LUI Validation is Enabled, changing Write Protection to Unprotected requires you to remove Write Protection with the LUI. If LUI Validation is Disabled, changing Write Protection to Unprotected can be done with the LUI or with the handheld communicator.

Tuning

Handheld Communicator (DD)	Device Settings > Tuning
Local User Interface (LUI)	Configure > Tuning > Manual Tuning

Travel Tuning

⚠ WARNING

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

- Travel 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 3-2 lists the proportional gain, velocity gain and minor loop feedback gain values for preselected tuning sets.

Table 3-2. Gain Values for Preselected Travel 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	4.85	27
J	11.3	5.65	23
K	13.1	6.0	18
L	15.5	6.0	12
M	18.0	6.0	12
X (Expert)	User Adjusted	User Adjusted	User Adjusted

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

Note

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

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

Table 3-3. Actuator Information for Initial Setup

Actuator Manufacturer	Actuator Model	Actuator Size	Actuator Style	Starting Tuning Set	Travel Sensor Motion(2) Relay A or C(3)
Fisher	585C & 585CR	25 50 60 68, 80 100, 130	Piston Dbl w/ or w/o Spring. See actuator instruction manual and nameplate.	E I J L M	User Specified
Fisher	657	30, 30i 34, 34i, 40, 40i 45, 45i, 50, 50i 46, 46i, 60, 60i, 70, 70i, & 80-100	Spring & Diaphragm	H K L M	Towards bottom of instrument
Fisher	667	30, 30i 34, 34i, 40, 40i 45, 45i, 50, 50i 46, 46i, 60, 60i, 70, 70i, 76, 76i & 80-100	Spring & Diaphragm	H K L M	Towards top of instrument
Fisher	1051 & 1052	20, 30 33 40 60, 70	Spring & Diaphragm (Window-mount)	H I K M	Towards bottom of instrument
Fisher	1061	30 40 60 68, 80, 100, 130	Piston Dbl w/o Spring	J K L M	Depends upon pneumatic connections. See description for Travel Sensor Motion
Fisher	1066SR	20 27, 75	Piston Sgl w/Spring	G L	Mounting Style / Travel Sensor Motion: A: Towards bottom of instrument B: Towards top of instrument C: Towards top of instrument D: Towards bottom of instrument
Fisher	2052	1 2 3	Spring & Diaphragm (Window-mount)	H J M	Towards bottom of instrument
Fisher	3024C	30, 30E 34, 34E, 40, 40E 45, 45E	Spring & Diaphragm	E H K	For P_o operating mode (air opens): Towards top of instrument For P_S operating mode (air closes): Towards bottom of instrument
Fisher	GX	225 750 1200	Spring & Diaphragm	X(1) K M	**Air to Open** Towards top of instrument **Air to Close** Towards bottom of instrument
Baumann	Air to Extend	16 32 54	Spring & Diaphragm	C E H	Towards bottom of instrument
Baumann	Air to Retract		Spring & Diaphragm		Towards top of instrument
Baumann	Rotary	10 25 54	Spring & Diaphragm	E H J	Specify

1. X = Expert Tuning. Proportional Gain = 4.2; Velocity Gain = 3.0; Minor Loop Feedback Gain = 18.0
2. Travel Sensor Motion in this instance refers to the motion of the magnet assembly.
3. Values shown are for Relay A and C. Reverse for Relay B.

- **Integral Deadzone**— A window around the Primary Setpoint in which integral action is disabled. The Dead Zone is configurable from 0% to 2%, corresponding to a symmetric window from 0% to +/-2% around the Primary Setpoint.

  Integral Dead Zone is used to eliminate friction induced limit cycles around the Primary Setpoint when the integrator is active. This dead zone value is used during the Auto Calibration of Travel procedure even if the travel integral is disabled; in the case of Auto Calibration travel failures with piston actuators, this value should be set to 1%. Default value is 0.26%.

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

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

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

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

Inputs

Handheld Communicator (DD)	Device Settings > Input/Output > Inputs

Input Current Range

- **Input Current High Calibration**— input current for 20 mA

- **Input Current Low Calibration**— input current for 4 mA

Outputs

Handheld Communicator (DD)	Device Settings > Input/Output > Outputs
Local User Interface (LUI)	Configure > Outputs

HART Variable Assignments

Instrument variables can be reported via four different HART variable assignments. The Primary Variable is always configured as Input Current. However, the remaining three variables have additional options as listed below

Note

The HART Variable Assignments are not configurable with the Local User Interface.

Note

Write Protect must be disabled to configure the HART Variables.

Primary Variable (PV)	Input Current
Secondary Variable (SV)	Travel, Travel Setpoint (Default), Travel De-Characterization, Pressure A, Pressure B, Differential Pressure, Supply Pressure, Internal Main Board Temperature, Setpoint, or Input Current
Tertiary Variable (TV)	Travel, Travel Setpoint, Travel De-Characterization, Pressure A (Default), Pressure B, Differential Pressure, Supply Pressure, Internal Main Board Temperature, Setpoint, or Input Current
Quaternary Variable (QV)	Travel (Default), Travel Setpoint, Travel De-Characterization, Pressure A, Pressure B, Differential Pressure, Supply Pressure, Internal Main Board Temperature, Setpoint, or Input Current

Output Terminal Configuration

Note

These menu items are only available on units that have the optional 4-20 mA position transmitter and two switches hardware installed. For information on position transmitter/discrete switch wiring and configuration refer to the DVC7K Series Quick Start Guide, D104766X012.

Position Transmitter

If the DVC7K device was purchased with I/O options, the device has an optional output circuit for a 4-20 position transmitter. The output circuits must be enabled with a user interface tool or the Local User Interface (LUI). Below are the configuration parameters for the position transmitter.

- **Function:** This configures the relationship between the valve travel and the position transmitter output signal. The position transmitter can have the following Functions: Disabled, 4mA Open, or 4mA Closed.

- **Fail Signal:** If the position transmitter is enabled, select the Fail Signal as either: Hi (>22.5mA) or Lo (<3.6mA).

Switch 1 and Switch 2

If the DVC7K device was purchased with I/O options, the device has optional output circuits for two solid state dry contact switches. Switch 1 is a normally open circuit and Switch 2 is a normally closed circuit. The output circuits must be enabled with a user interface tool or the Local User Interface (LUI). Below are the configuration parameters for Switch 1 and Switch 2.

- Function: Can be configured as Disabled, Limit Switch, or Alert Switch.

  If Limit Switch was selected, the following needs to be configured:

  - Action: Can be configured as Closed Above Trip or Closed Below Trip
  - Trip Point: Defines the threshold, in percent of travel, for the limit switch.

  If Alert Switch was selected, the following needs to be configured:

  - Alert Action: Determines the switch action when one of the configured alerts is active or inactive. The Alert Switches can have the following Alert Action: Alert Active or Alert Inactive.
  - Alert Source Enable: Defines which alerts activate or deactivate the switch based on the Alert Action.

Note
Alert Switches cannot be configured with the LUI.

Alert Setup

Handheld Communicator (DD)	Diagnostics > Alerts
Local User Interface (LUI)	Configure > Alert Setup

An alert is a notification that the instrument has detected a condition that has exceeded the alert conditions. Alerts that are enabled and active will be recorded in the instrument memory within the Alert Record (see Section 5). Some alerts are also defined in the HART Command 48 response structure which can be read by any HART communicating host system.

Alerts may be enabled or disabled with the instrument in Automatic, in Manual, Protected, or Unprotected.

For a detailed explanation of the alerts and the recommended actions, refer to Section 5.

Section 4 Calibration

Calibration Overview

When a DVC7K digital valve controller is ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator and connects the necessary tubing, then sets up and calibrates the controller.

For digital valve controllers that are ordered separately, recalibration of the analog input or pressure sensors generally is unnecessary. However, after mounting on an actuator, perform Guided Setup to configure and calibrate your device. For more detailed calibration information, refer to the following calibration procedures.

Handheld Communicator (DD)	Device Settings > Calibration
Local User Interface (LUI)	Configure > Calibration

Auto Calibration - see page 21

Manual Calibration - see page 23

Pressure Sensor Calibration - see page 24

Input Current Calibration - see page 26

Relay Adjustment - see page 27

Note

The Instrument Mode must be in Manual and Write Protect must be disabled before the instrument can be calibrated.

⚠ WARNING

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

Travel Calibration

Auto Calibration

1. Auto Calibration prompts you to remove Write Protection if enabled and then sets the Instrument Mode to Manual if in Automatic.

   Auto Calibration establishes the limits of physical travel (i.e. the actual travel 0 and 100% positions). During this process, the valve will fully stroke from one travel extreme to the other. Auto Calibration also determines how far the relay beam swings to calibrate the sensitivity of the MLFB sensor. The relay and I/P biases are then set.

2. If the Instrument Mode was changed to Manual you are prompted to return the Instrument Mode to Automatic after Auto Calibration is complete.

3. If Write Protection was disabled, you are prompted to re-enable the Write Protection.
4. Verify that the travel properly tracks the input signal.

Note

The Instrument Mode must be Automatic to track the input signal.

If the unit does not calibrate, refer to table 4-1 for error messages and possible remedies.

Table 4-1. Auto Calibration Error Messages

Error Message	Possible Problem and Remedy
Error Low Power	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.
Error Timeout	The problem may be one of the following: 1. The tuning set selected is too low and the valve does not reach an end point in the allotted time. Select a higher tuning set (i.e. if tuning set is D change to E). 2. 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). 3. The pressure sensors may need calibrating. The device is waiting for pressure readings below a certain threshold on the low end and if it is not reached the device may timeout.
Error Failed Sensor	The travel sensor data is bad. Check that the magnet assembly is mounted correctly. If there is no problem with the mounting, then there is a problem with the travel sensor and the instrument will need to be replaced.
Error No Movement	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 and checking the magnet assembly for proper alignment. Additionally, check that the correct magnet assembly size was selected.
Error Invalid Endpoint	The device is traveling outside of the expected travel range. Travel Counts for Low OR High Travel Counts are outside of the factory travel calibrated range. The problem may be one of the following: • The wrong magnet assembly size was selected. • The magnet assembly was not mounted correctly.
Error Memory Write	The analog input signal to the instrument is reading less than 3.8 mA. Adjust the current output from the control system or the current source to provide at least 4.0 mA.
Warning Default Relay Bias	The problem may be one of the following: 1. The tuning set selected is too low and the valve does not reach an end point in the allotted time. Select a higher tuning set (i.e. if tuning set is D change to E). 2. The tuning set selected is too high, valve operation is unstable and does not stay at an end point for the allotted time. Select a lower tuning set (i.e. if tuning set is D change to C). 3. Excessive valve friction was detected. The valve was unable to settle out. Check the mechanical assembly.
Warning Default I/P Bias	The problem may be one of the following: 1. The tuning set selected is too low and the valve does not reach an end point in the allotted time. Select a higher tuning set (i.e. if tuning set is D change to E). 2. The tuning set selected is too high, valve operation is unstable and does not stay at an end point for the allotted time. Select a lower tuning set (i.e. if tuning set is D change to C). 3. Excessive valve friction was detected. The valve was unable to settle out. Check the mechanical assembly.

Manual Calibration

1. Manual Calibration prompts you to remove Write Protection if enabled and then sets the Instrument Mode to Manual if in Automatic.
2. The digital valve controller will find the low drive endpoint.
3. When the valve is done moving, mark the low drive endpoint by selecting Accept.
4. The digital valve controller will then find the high drive endpoint.
5. When the valve is done moving, mark the high drive endpoint by selecting Accept.
6. The digital valve controller will then stroke the valve to mid travel to find the bias points.
7. When the valve is stable select Accept.
8. The valve will find the relay bias and then the I/P bias to complete the calibration.
9. If the Instrument Mode was changed to Manual you are prompted to return the Instrument Mode to Automatic.
10. If Write Protection was disabled, you are prompted to re-enable the Write Protection.
11. Verify that the travel properly tracks the input signal.

Note
The Instrument Mode must be Automatic to track the input signal.

If the unit does not calibrate, refer to table 4-2 for error messages and possible remedies.

Table 4-2. Manual Calibration Error Messages

Error Message	Possible Problem and Remedy
Error Invalid Endpoint	The device is traveling outside of the expected travel range. Travel Counts for Low OR High Travel Counts are outside of the factory travel calibrated range. The problem may be one of the following: 1. The wrong magnet assembly size was selected. 2. The magnet assembly was not mounted correctly.
Error No Movement	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 and checking the magnet assembly for proper alignment. If using a device description, there may be insufficient travel between marked end points. The problem may be one of the following: 1. The wrong magnet assembly size was selected. 2. The magnet assembly was not mounted correctly. 3. Not enough of the travel array is being used.
Error Invalid Bias	The problem may be one of the following: 1. The tuning set selected is too low and the valve does not reach an end point in the allotted time. Select a higher tuning set (i.e. if tuning set is D change to E). 2. The tuning set selected is too high, valve operation is unstable and does not stay at an end point for the allotted time. Select a lower tuning set (i.e. if tuning set is D change to C). 3. Excessive valve friction was detected. The valve was unable to settle out. Check the mechanical assembly.
Error Memory Write	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.
Error Timeout	The problem may be one of the following: 1. The tuning set selected is too low and the valve does not reach an end point in the allotted time. Select a higher tuning set (i.e. if tuning set is D change to E). 2. If using the Local User Interface (LUI), the screen will time out after 10 minutes without user input. Be sure to promptly respond with the Local User Interface.

Sensor Calibration

Pressure Sensor Calibration

Handheld Communicator (DD)	Device Settings > Calibration > Pressure Sensor

Note
The pressure sensor is calibrated at the factory and should not require calibration.

Note
The input current must be more than 4.0 mA to run the pressure sensor calibration.

Note
The instrument cannot be locked out by a primary or secondary master, Write Protect must be disabled, and the Instrument Mode must be in Manual before the instrument can be calibrated.

1. Pressure Sensor Calibration prompts you to:
   a. Unlock the instrument if locked out by a Primary or Secondary HART master.
   b. Remove Write Protection if enabled.
   c. Set the Instrument Mode to Manual if in Automatic.
2. You are then prompted to select which pressure sensor to calibrate.

Note
Only pressure sensors with a bad status will be listed.
- Pressure sensors for double-acting assemblies may include Supply Pressure, Output A, or Output B.
- Pressure sensors for single-acting direct / reverse assemblies may include Supply Pressure or Output A.

3. Select Zero Only or Zero and Span (gauge required).

Note
Continue with the appropriate step below based on your selection and the sensor being calibrated.

Step 4: Zero Only, Supply Pressure sensor
Step 5: Zero Only, Output A sensor
Step 6: Zero Only, Output B sensor
Step 7: Zero and Span, Supply Pressure sensor

Step 8: Zero and Span, Output A sensor

Step 9: Zero and Span, Output B sensor

Continue with Step 10 once you have completed the appropriate sensor calibration.

Note

An external reference pressure gauge is required to run Zero and Span. The gauge should be capable of measuring maximum instrument supply pressure.

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4. For Zero Only, Supply Pressure sensor calibration:

   a. Adjust the supply regulator to remove the instrument supply pressure.

   b. Select continue when the air is fully exhausted.

   c. Go to step 10.

5. For Zero Only, Output A sensor calibration:

   a. Wait until Output A pressure has fully exhausted.

   b. Select continue.

   c. Go to step 10.

6. For Zero Only, Output B sensor calibration:

   a. Wait until Output B pressure has fully exhausted.

   b. Select continue.

   c. Go to step 10.

7. For Zero and Span, Supply Pressure sensor calibration:

   a. Adjust the supply regulator to remove the instrument supply pressure.

   b. Select continue when the air is fully exhausted.

   c. Attach an external reference pressure gauge to the Supply Pressure port.

   d. Select continue.

   e. Adjust the supply regulator to the desired supply pressure.

   f. Select continue.

   g. Go to step 10.

8. For Zero and Span, Output A sensor calibration:

   a. Wait until Output A pressure has fully exhausted.

   b. Select continue.

c. Attach an external reference pressure gauge to the Output A port

d. Select continue.

e. Wait until Output A has reached full regulated supply pressure.

f. Select continue.

g. Go to step 10.

9. For Zero and Span, Output B sensor calibration:

    a. Wait until Output B pressure has fully exhausted.

    b. Select continue.

    c. Attach an external reference pressure gauge to the Output B port

    d. Select continue.

    e. Wait until Output B has reached full regulated supply pressure.

    f. Select continue.

    g. Go to step 10.

10. If the Instrument Mode was changed to Manual you are prompted to return the Instrument Mode to Automatic.
11. If Write Protection was disabled, you are prompted to re-enable the Write Protection.

Input Current Calibration

Handheld Communicator (DD)	Device Settings > Calibration > Input Current

Note

The DIP Switch must be set to 4-20 mA to run Input Current Calibration. The Input Current Calibration method will not run if the DIP Switch is set to 24 VDC.

Note

The Input Current sensor is calibrated at the factory and should not require calibration.

Note

The instrument cannot be locked out by a primary or secondary master, Write Protect must be disabled, and the Instrument Mode must be in Manual before the instrument can be calibrated.

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 4-20 mA. Follow the prompts on the handheld communicator display to calibrate the analog input sensor.

1. Input Current Calibration prompts you to:

a. Unlock the instrument if locked out by a Primary or Secondary HART master.

b. Remove Write Protection if enabled.

c. Set the Instrument Mode to Manual if in Automatic.

2. Adjust the current source to approximately 4 mA.
3. Select continue.
4. Use the increase and decrease selections until the displayed current matches the current source.
5. When the displayed current matches the current source select Done to continue.
6. Adjust the current source to approximately 20 mA.
7. Select continue.
8. Use the increase and decrease selections until the displayed current matches the current source.
9. When the displayed current matches the current source select Done to continue.
10. If the Instrument Mode was changed to Manual you are prompted to return the Instrument Mode to Automatic.
11. If Write Protection was disabled, you are prompted to re-enable the Write Protection.
12. Verify that the analog input displayed matches the current source.

Note

The Instrument Mode must be Automatic to track the input signal.

Relay Adjustment

Handheld Communicator (DD)	Device Settings > Calibration > Travel

Before beginning travel calibration, check the relay adjustment. Replace the digital valve controller cover when finished.

Note

Relay B and C are not user-adjustable.

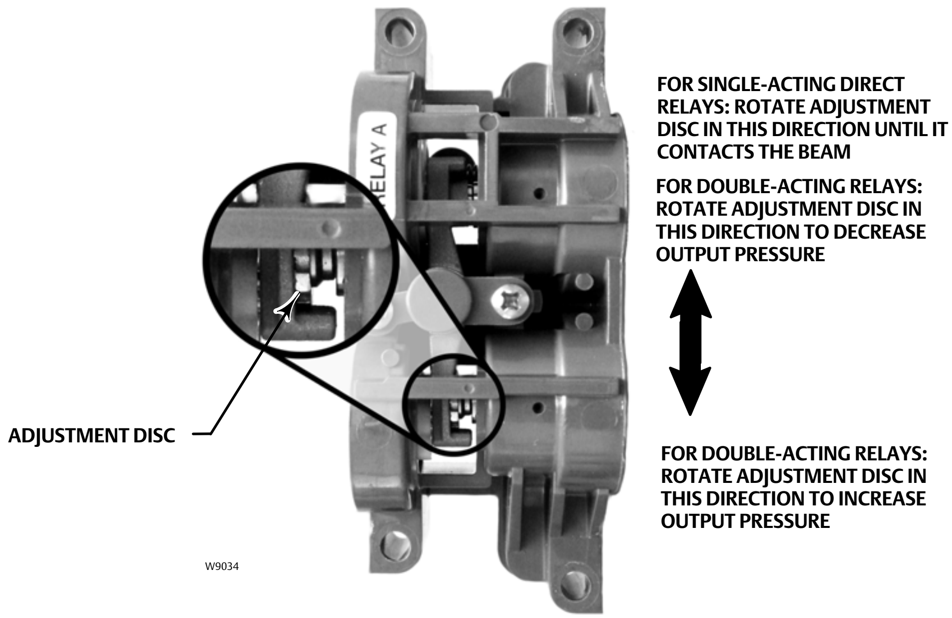
Double-Acting Relay

The double-acting relay is designated by “Relay A” on a label affixed to the relay itself. For double-acting actuators, the valve must be near mid-travel to properly adjust the relay. The handheld communicator will automatically position the valve when *Relay Adjust* is selected.

Rotate the adjustment disc, shown in figure 4-1, until the output pressure displayed on the handheld 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.

Figure 4-1. Relay A Adjustment (Shroud Removed for Clarity)



Relay A may also be adjusted for use in single-acting- direct applications. Rotate the adjustment disc as shown in figure 4-1 for single-acting direct operation.

Note

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

Single-Acting Relays

Single-Acting Direct Relay

The single-acting direct relay is designated by “Relay C” on a label affixed to the relay itself. Relay C requires no adjustment.

Single-Acting Reverse Relay

The single-acting reverse relay is designated by “Relay B” on a label affixed to the relay itself. Relay B is calibrated at the factory and requires no further adjustment.

Section 5 Device Information, Diagnostics, and Variables

Overview

Status & Primary Purpose Variables

Handheld Communicator (DD)	Overview
Local User Interface (LUI)	Overview > Primary Variables

The overview section provides basic information about the current state of the instrument and gives you access to the current values of the following:

Status / Primary Purpose Variable	Available in DD	Available in LUI
Alert Status	X	X
Communication Status	X	
Instrument Mode	X	
Input Current	X	X
Setpoint	X	X
Travel	X	X
Travel Deviation	X	X
Drive Signal	X	
Input Characteristic	X	
Supply Pressure	X	X
Output A Pressure	X	X(1)
Output B Pressure	X	X(2)
1. Available only for Direct or Double Acting assemblies 2. Available only for Reverse or Double Acting assemblies		

Device Information

Handheld Communicator (DD)	Device Settings > Device Information
Local User Interface (LUI)	Overview > Device Information

Device Information provides details about the instrument construction including:

	Status / Primary Purpose Variable	Available in DD	Available in LUI
Identification	Tag	X	X
	Long Tag	X	X
	Polling Address	X	X
	Manufacturer	X	X
	Device Type	X	X
	Application Mode	X	X
	Device ID Unique number used to prevent the instrument from accepting commands intended for other instruments	X	X
	Control Tier		X
Serial Number	Work Order Serial Number	X	X
	Instrument Serial Number	X	X
	Valve Serial Number	X	X
Revisions	HART Protocol Revision	X	X
	Device Revision	X	X
	Hardware Revision	X	X
	Firmware Revision	X	X
DD Information	Device Type	X	
	DD Revision	X	
	Build Date	X	
	Build Number	X	
Blink Device	Blink Device (Squawk method) When run, the LED cycles through Green, Blue, and Red. This method is used to locate or identify a device.	X	

Diagnostics

Alerts

Active Alerts

Handheld Communicator (DD)	Diagnostics > Alerts > Active Alerts
Local User Interface (LUI)	Service Tools > Active Alerts

In addition to on-board storage of alerts, the DVC7K can report active alerts via HART Command 48 - Read Additional Status. Active alerts will be displayed with their NE107 status and recommended action. The alerts will be listed in NE107 status priority. Refer to table 5-1 for the NE107 status priority. If there are no alerts currently active, this display will be empty.

Refer to table 5-2 for a summary of the default alert settings from the factory. Following is a detailed description of the meaning of each alert.

Note
Active alerts are cleared when the instrument is rebooted.

Table 5-1. NE107 Priority

NE107 Status	Priority	Description
Failure	1	Output signal is invalid due to malfunction in the field device or its peripherals
Out of Specification	2	Deviations from the permissible ambient or process conditions determined by the device itself through self-monitoring or faults in the device itself indicate that the measuring un-certainty of sensors or deviations from the set value in actuators is probably greater than expected under operating conditions.
Function Check	3	Output signal temporarily invalid due to ongoing work on the device.
Maintenance Required	4	Although the output signal is valid, the wear reserve is nearly exhausted, or a function will soon be restricted due to operational conditions.

History

Handheld Communicator (DD)	Diagnostics > Alerts > History

The DVC7K will store up to 1,000 alert events and will auto remove older logs when full using the First In First Out (FIFO) method.

Alert events occur when:

- Alerts are activated or deactivated (Refer to table 5-2 for a full list of alerts)
- At instrument startup
- Alert simulation is entered or exited
- Auto calibration is entered or exited
- Manual calibration is entered or exited

Table 5-2. Default Alert Settings

Name	Default	Default NE107 Category
Non-Volatile Memory	Enabled(1)	Failure
Volatile Memory	Enabled(1)	Failure
Drive Signal	Enabled	Out of Specification
Alert Point	20 sec	
Drive Current	Enabled	Failure
Alert Point	10%	
Deviation Time	2 sec	
Transmitter Open Circuit	Disabled	Function Check
Electronic Defect	Enabled(1)	Failure
Device Misconfigured	Enabled(1)	Function Check
Instrument Time Bad	Disabled	Maintenance Required
Calibration in Progress	Disabled	Function Check
Diagnostic in Progress	Disabled	Function Check
Temperature High	Enabled	Out of Specification
Threshold	80C (176F)	
Temperature Low	Enabled	Out of Specification
Threshold	-40C (-40F)	
Loop Current Fixed Category	Enabled(1)	No Effect
Loop Current Saturated Category	Enabled(1)	Out of Specification
Instrument Mode	Disabled	Function Check
Supply Pressure High	Disabled	Out of Specification
Threshold	145psi	
Supply Pressure Low	Enabled	Out of Specification
Threshold	15psi	
Port A Overpressurized	Disabled	Failure
Threshold	146psi	
Travel Feedback Error	Enabled	Out of Specification
Travel Deviation	Enabled	Out of Specification
Threshold	5%	
Time	5sec	
Travel High	Disabled	No Effect
Alert Point	99%	
Travel Low	Disabled	No Effect
Alert Point	1%	
Travel Limit / Cutoff High	Disabled	No Effect
Type	Cutoff	
Cutoff High	99.5%	
Limit High	125%	
Cutoff Rate High	0.0%/sec	
Travel Limit / Cutoff Low	Disabled	No Effect
Type	Cutoff	
Cutoff Low	0.5%	
Limit Low	-25%	
Cutoff Rate Low	0.0%/sec	
Cycle Counter High	Disabled	Maintenance Required
Threshold	500,000	
Travel Accumulator High	Disabled	Out of Specification
Alert Point	500,000	
Travel Deadband Value	2%	

-continued-

Table 5-2. Default Alert Settings

Name	Default	Default NE107 Category
Stroke Time Open	Disabled	Out of Specification
Stroke Open Time Baseline	NaN	
Min Stroke Open Time Threshold	0	
Max Stroke Open Time Threshold	60	
Valve Open Threshold	98%	
Stroke Time Close	Disabled	Out of Specification
Stroke Close Time Baseline	NaN	
Min Stroke Close Time Threshold	0	
Max Stroke Close Time Threshold	60	
Valve Closed Threshold	2%	

1. These default alert configurations cannot be changed.

Calibration in Progress is active when calibration is in progress. Wait for completion of the process or cancel calibration.

Cycle Counter High is active if the Cycle Counter exceeds the Cycle Count Alert Point. The Cycle Count records the number of times the travel changes direction when it is outside of the deadband. See figure 5-2. This typically means that a valve component has reached a point where it should be inspected or replaced. To clear the alert, set the Cycle Counter to a value less than the alert point.

Device Misconfigured is active if the instrument identifies a configuration error that prevents the assembly from calibrating and/or working properly. The errors and their recommended actions are as follows:

- Travel Thresholds: check the cutoff and travel limit values.
- Pressure A, Pressure B, and Supply Pressure: recalibrate the pressure sensors
- Loop: Recalibrate the analog input current.
- Latching: configured latching is invalid for on/off applications
- Alert Switch: check alert source mask of Switch 1 and Switch 2
- Input Characterization: check characterization table
- Hold Last Relay: replace hold last pneumatics module

Diagnostics in Progress is active when a diagnostic test is in progress.

Drive Current is active when the drive current to the I/P converter is not flowing as expected. If this alert occurs, check the connection between the Sensor Assembly and the Front Cover Assembly. Try removing the I/P converter and reinstalling it. If the alert does not clear, replace the I/P converter or the Front Cover Assembly.

Drive Signal monitors the drive signal and calibrated travel. If one of the following conditions exists for more than the Drive Signal Deviation Time (default value is 20 seconds), the alert is set. Check the actuator and tubing pneumatics for air leaks. If no leaks, check the I/P and replace as needed.

For the case where Zero Power Condition is defined as closed:
Drive Signal < 10% and Calibrated Travel > 3%
Drive Signal > 90% and Calibrated Travel < 97%

For the case where Zero Power Condition is defined as open:
Drive Signal < 10% and Calibrated Travel < 97%
Drive Signal > 90% and Calibrated Travel > 3%

Electronic Defect is active if a sensor causes an electronic defect. To clear the alert, restart the instrument. If the alert persists, replace the instrument.

Instrument Mode is active if the Instrument Mode is not Automatic (AUTO).

Instrument Time Bad is active if the real time clock errors. Power has been lost or the time was not set in the device. Figure out what caused the power cycle, try resetting the instrument time and/or install a new battery in the Front Cover Assembly.

Loop Current Fixed is active when the loop current is being held at a fixed value and is not responding to process variations. Check that the Instrument Mode is Automatic.

Loop Current Saturated is active when the loop current has reached its upper (or lower) endpoint limit and cannot increase (or decrease) any further. Check the loop current calibration.

Non-Volatile Memory (NVM) Defect is active if there is a failure associated with the Non-Volatile Memory (NVM) that is critical for instrument operation. To clear the alert, restart the instrument. If the alert persists, replace the Front Cover Assembly.

Port A Overpressurized applies to single acting direct applications only. The alert is active if the output pressure from Port A of the DVC7K exceeds the configured alert point. Ensure the alert point is set below the actuator maximum casing pressure to protect the actuator from being over pressurized. Check the supply pressure regulator for damage and verify its pressure set point.

Stroke Time Close is active when the stroke time on close is faster than Stroke Close Time Fast Trip Point or is slower than the Stroke Close Time Slow Trip Point. If the stroke time is faster than the Fast Trip Point, verify the stem/shaft integrity, check the packing, and/or reduce process pressure. If the stroke time is slower than the Slow Trip Point, check for buildup and/or increased valve friction, check for air leaks, and verify supply pressure.

Stroke Time Open is active when the stroke time on open is faster than Stroke Open Time Fast Trip Point or is slower than the Stroke Open Time Slow Trip Point. If the stroke time is faster than the Fast Trip Point, verify the stem/shaft integrity, check the packing, and/or reduce process pressure. If the stroke time is slower than the Slow Trip Point, check for buildup and/or increased valve friction, check for air leaks, and verify supply pressure.

Supply Pressure High is active if the supply pressure falls above the Supply Pressure High Alert point. Check the regulated supply pressure and make sure it is set appropriately.

Supply Pressure Low is active if the supply pressure falls below the Supply Pressure Low Alert Point. Check the supply pressure regulator. Confirm proper air supply and volume. Verify the Alert Point is not set too close to Actual Supply Pressure. The Alert Point should be at least 5 psi less than Actual Supply Pressure but could be more for larger valves.

Temperature High is active when the temperature falls above the Temperature High Alert Point. Check the instruments environment.

Temperature Low is active when the temperature falls below the Temperature Low Alert Point. Check the instruments environment.

Transmitter Open Circuit is active when the output transmitter has been enabled but no loop current is detected on the terminals. Check the transmitter terminals for loose wiring, that the analog wiring is connected at the AI card, and that power is applied.

Travel Accumulator High is active if the Travel Accumulator exceeds the Travel Accumulator Alert Point. The Travel Accumulator totalizes the travel of the valve when the deadband is exceeded. See figure 5-2. This typically means that a valve component has reached a point where it should be inspected or replaced. To clear the alert, set the Travel Accumulator to a value less than the alert point.

Travel Deviation— If the difference between the Travel Target and the Travel 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 between the Travel Target and the Travel is less than the Travel Deviation Alert Point minus the Travel Alert Deadband. See figure 5-1. The instrument is not doing what you have asked it to do within the time you asked it to do it. Check the valve friction, the supply air, and/or the instrument tuning.

Travel Feedback Error is active if the sensed travel is outside the range of -25.0 to 125.0% of calibrated travel. If this alert is active, check the instrument mounting. Also, check that the electrical connection from the travel sensor is properly plugged into the Sensor Assembly from the Front Cover Assembly. After restarting the instrument, if the alert persists, troubleshoot the Sensor Assembly or Travel Sensor.

Travel High is active when the Travel exceeds the Travel High Alert Point. Once the alert is active, the alert will clear when the Travel falls below the Travel High Alert Point minus the Travel Alert Deadband. See figure 5-1. Move the valve below the alert point and/or check the process loop.

Travel Low is active when the Travel is below the Travel Low Alert Point. Once the alert is active, the alert will clear when the Travel exceeds the Travel Low Alert Point plus the Travel Alert Deadband. See figure 5-1. Move the valve above the alert point and/or check the process loop.

Travel Limit/Cutoff High is active if either the Travel Threshold High Action is Cutoff and Travel exceeds the Travel Cutoff High Point or Travel Threshold High Action is Limit and Travel exceeds the Travel Limit High Point. Move the valve below the limit or cutoff.

Travel Limit/Cutoff Low is active if either the Travel Threshold Low Action is Cutoff and Travel is below the Travel Cutoff Low Point or Travel Threshold Low Action is Limit and Travel falls below the Travel Limit Low Point. Move the valve above the limit or cutoff.

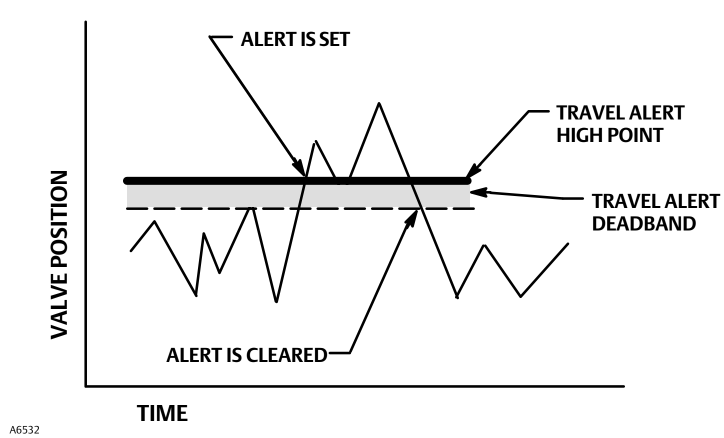
Volatile Memory is active when there is a failure associated with the Volatile Memory. Restart the instrument. If the alert persists, replace the Front Cover Assembly.

Deadband Principle of Operation

The deadband is the percent (%) of ranged travel around a travel reference point where no change in alert status will occur. This prevents the alert from toggling on and off when operating near the alert point.

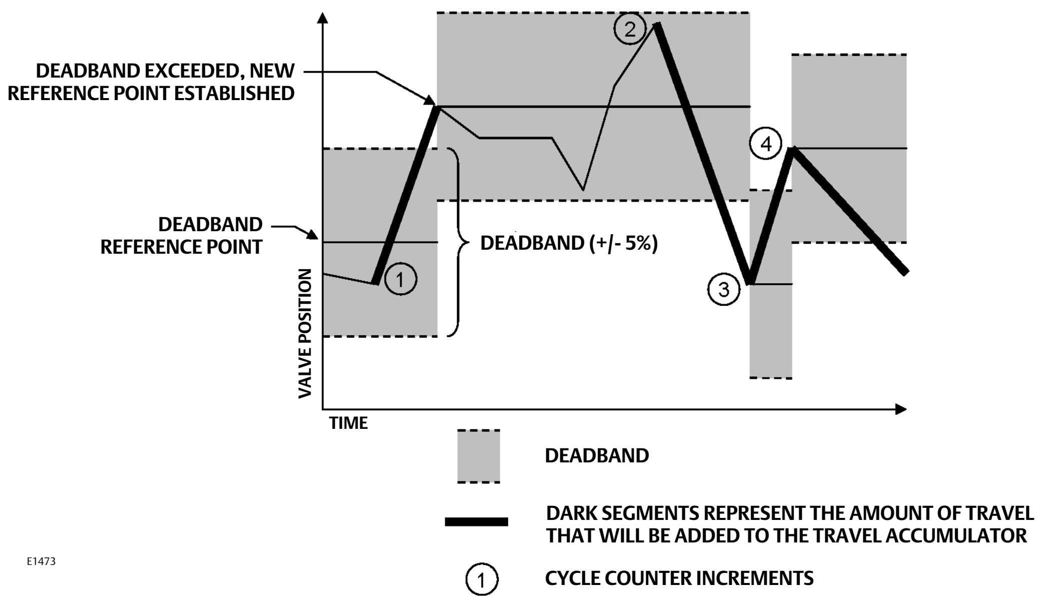
The Travel Deadband applies to the Travel Deviation Alert as well as the Travel High and Low Alerts. Figure 5-1 illustrates the principle behind setting and clearing a Travel High Alert. The alert is set when the travel exceeds the alert point and is cleared when it falls below the deadband.

Figure 5-1. Travel Alert Deadband



The Travel Deadband applies to both the Cycle Count High Alert and the Travel Accumulator High Alert. The deadband establishes a zone around a travel reference point. The travel reference point gets reestablished to the point of travel reversal that occurs outside of the deadband. The deadband must be exceeded before a change in travel direction will be counted as a cycle and the accumulated travel (up to the point of travel reversal) is added to the total accumulation. See figure 5-2.

Figure 5-2. Cycle Counter and Travel Accumulator Deadband Example (set at 10%)



Stroke Valve

Handheld Communicator (DD)	Maintenance > Proof Test > Valve Diagnostics > Stroke Valve
Local User Interface (LUI)	Service Tools > Stroke Valve

Note

The Instrument Mode must be in Manual and Write Protect must be disabled before the instrument can be stroked.

1. Stroke Valve first prompts the you to remove Write Protection if it’s enabled and then sets the Instrument Mode to Manual if in Automatic.
2. The screen will show the current Setpoint and Travel. Select a target setpoint to stroke the valve.

3. Select Accept to apply the target setpoint.
   a. Target Setpoint Options:
      i. 100%
      ii. 75%
      iii. 50%
      iv. 25%
      v. 0%
      vi. +2% (which strokes the valve 2% more than the current setpoint)
      vii. -2% (which strokes the valve 2% less than the current setpoint)
4. Repeat step 2 as many times as needed. Once finished, select Back to return to the menus.
5. If the Instrument Mode was changed to Manual to perform Stroke Valve, you are prompted to return the Instrument Mode to Automatic.
6. If Write Protection was disabled, you are prompted to re-enable the Write Protection.

Variables

Handheld Communicator (DD)	Diagnostics > Variables
Local User Interface (LUI)	Service Tools > Variables

The Variables section provides current values of the instrument variables. Below is a list of the variables available for viewing:

- Mapped Variables (see note 1 below)
  - Primary Variable (see note 1 below)
  - Secondary Variable (see note 1 below)
  - Tertiary Variable (see note 1 below)
  - Quaternary Variable (see note 1 below)
- Status:
  - Status

    If one or more alerts are active, the highest priority NE107 status will be displayed. Refer to table 5-1 for details. If there are no alerts currently active, this display will be empty.
  - Write Protection (also provides a procedure to enable/disable)
  - Runtime
  - Powerups
  - Temperature
- Travel
  - Input Current
  - Setpoint
  - Travel
  - Cycle Count

- Pressure
  - Supply Pressure
  - Output A (see note 2 and 4 below)
  - Output B (see note 3 and 4 below)
  - Differential Pressure (see note 3 below)
- Stroke Information (see note 5 below)
  - Stroke Open Baseline (see note 5 below)
  - Stroke Open Time (see note 5 below)
  - Stroke Closed Baseline (see note 5 below)
  - Stroke Closed Time (see note 5 below)
- Configuration
  - Setpoint Source
  - Application Mode
  - Zero Power Condition
  - Restart Latch Status
  - Restart Latch Configuration
  - Relay Type
- Outputs (see note 6 below)
  - Switch 1 Status (see note 6 below)
  - Switch 2 Status (see note 6 below)

Notes

1. Not available in the LUI.
2. Single Acting Direct Assemblies only.
3. Single Acting Reverse Assemblies only.
4. Double Acting Assemblies only.
5. On/Off Application Modes only.
6. I/O Options Package only.

Section 6 Maintenance and Troubleshooting

The DVC7K digital valve controller enclosure is rated Type 4X and IP66, therefore periodic cleaning of internal components is not required. If the DVC7K is installed in an area where the exterior surfaces tend to get heavily coated or layered with industrial or atmospheric contaminants, it is recommended that the vent be periodically removed and inspected to ensure there is no partial or full obstruction. If the vent appears to be partially or fully obstructed, it must be cleaned or replaced. Clean the vent as described in the Cleaning the Vent procedure.

⚠ WARNING

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

⚠ WARNING

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

⚠ WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance procedures on the DVC7K digital valve controller:

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

⚠ WARNING

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

- **Remove electrical power before removing the housing cap. Personal injury or property damage from fire or explosion may result if power is not disconnected before removing the cap.**
- **Remove electrical power before disconnecting any of the pneumatic connections.**
- **When disconnecting any of the pneumatic connections or any pressure retaining part, natural gas will seep from the unit and any connected equipment into the surrounding atmosphere. Personal injury or property damage may result from fire or explosion if natural gas is used as the supply medium and appropriate preventive measures are not taken.**

Preventive measures may include, but are not limited to, one or more of the following: ensuring adequate ventilation and the removal of any ignition sources.

- **Ensure that the cover is correctly installed before putting this unit back into service. Failure to do so could result in personal injury or property damage from fire or explosion.**

WARNING

When replacing components, use only components specified by the factory. Always use proper component replacement techniques, as presented in this manual. Improper techniques or component selection may invalidate the approvals and the product specifications, as indicated in table 1-1. It may also impair operations and the intended function of the device and could cause personal injury and property damage.

Because of the diagnostic capability of the DVC7K, predictive maintenance is available through the use of the Local User Interface or Handheld Communicator (DD). Using the digital valve controller, valve and instrument maintenance can be enhanced, thus avoiding unnecessary maintenance.

Removing the Magnetic Feedback Array Assembly

To remove the Magnet Feedback Array Assembly from the actuator stem, perform the following basic steps.

1. Make sure that the valve is isolated from the process.
2. Open the front cover.
3. Turn the lock screw counterclockwise to unlock the cap so that the cap can be unscrewed from the terminal box.
4. After removing the cap, note the location of field wiring connections and disconnect the field wiring from the terminal box.
5. Shut off the instrument air supply.
6. Disconnect the pneumatic tubing and remove the digital valve controller from the actuator.
7. Remove the screws holding the Magnet Feedback Array Assembly to the connector arm.

When replacing the instrument, be sure to follow the mounting guidelines in the quick start guide (D104766X012). Setup and calibrate the instrument prior to returning to service.

Component Replacement

The DVC7K contains the following components: front cover assembly, I/P converter, pneumatic relay, terminal box, vent, and optional gauge block. If problems occur, these components may be removed from the digital valve controller and replaced with new components.

When replacing any of the components of the digital valve controller, the maintenance should be performed in an instrument shop whenever possible. Make sure that the electrical wiring and pneumatic tubing is disconnected prior to disassembling the instrument.

Tools Required

Table 6-1 lists the tools required for maintaining the DVC7K digital valve controller.

Table 6-1. Tools Required

Tool	Size	Component
Phillips Screwdriver	#2	Front Cover Assembly Screws, Relay Screws, Terminal Box Ground Screws, Terminal Box Cover Lock Screw, Vent Screws, and Module Base Assembly Screws
Phillips Screwdriver	#1	Terminal Box Center Screw and Sensor Assembly Kit Screws
Flathead Screwdriver	3.5 mm (1/8 in)	Terminal Box Cage Clamps and Battery Removal
Allen Wrench	Metric Construction: 10 mm Imperial Construction: 3/8 in	Terminal Box Electrical Pipe Plugs
Allen Wrench	Metric Construction: 7 mm Imperial Construction: 1/4 in	Pneumatic Pipe Plugs
Allen Wrench	5 mm	Integral Mount Pneumatic Pipe Plug
Hex Key	2.5 mm	I/P Converter Screws
Hex Key	3/16 in	Gauge Block Screws
Socket	27 mm (1 1/16 in)	Gauge Block Gauges
Pliers		E-Clip Removal

I/P Converter

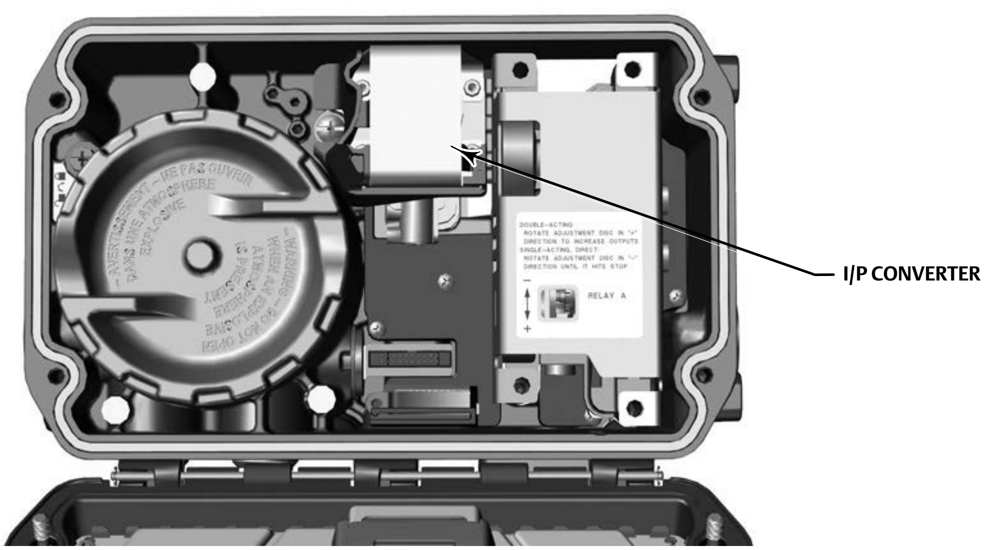
NOTICE

Exercise care when performing maintenance on the digital valve controller.

In order to maintain accuracy specifications, do not strike or drop the I/P converter during component replacement

The I/P Converter is located between the Terminal Box and the Relay.

Figure 6-1. I/P Converter Location



Note

After I/P Converter component replacement, calibrate the digital valve controller to maintain accuracy specifications.

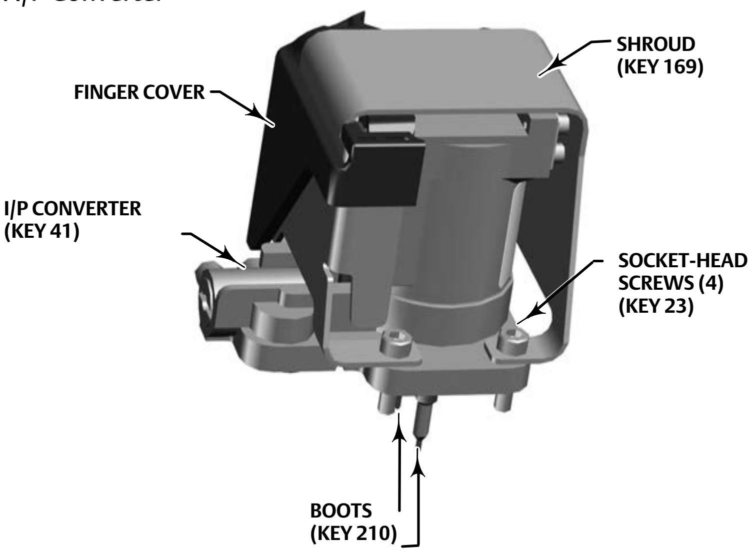
Removing the I/P Converter

1. Open the front cover, if not already opened.
2. Refer to figure 6-2. Using a 2.5 mm hex socket wrench, remove the four socket-head screws that attach the shroud and I/P converter to the module base.
3. Remove the shroud and finger protector.
4. Pull the I/P converter straight out of the module base. Be careful not to damage the two electrical leads that come out of the base of the I/P converter.
5. Refer to figure 6-2. Ensure that the O-ring and screen stay in the module base and do not come out with the I/P converter.

Replacing the I/P Converter

1. Refer to figure 6-2. Inspect the condition of the O-ring and screen in the module base and replace them if necessary.
2. Ensure the two boots, shown in figure 6-2, are properly installed on the electrical leads.

Figure 6-2. I/P Converter



3. Install the I/P converter straight into the module base , taking care that the two electrical leads feed into the guides in the Sensor Assembly.

Note

The guides in the Sensor Assembly route the leads to the Front Cover Assembly.

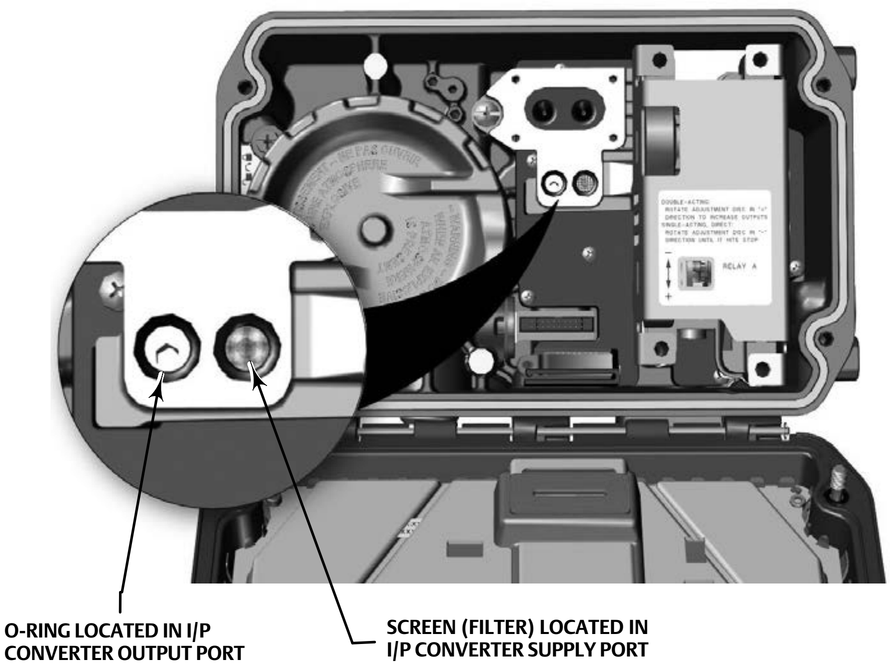
4. Install the four socket-head screws and evenly tighten them in a crisscross pattern to a final torque of 1.6 N • m (14 lbf • in).
5. Install the shroud over the I/P converter.
6. Attach the finger protector to the I/P shroud.
7. After replacing the I/P converter, calibrate travel or perform touch-up calibration 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, shroud, and finger protector as described in the Removing the I/P Converter procedure.
2. Remove the screen from the supply port.
3. Install a new screen in the supply port as shown in figure 6-3.

Figure 6-3. I/P Filter Location



4. Inspect the O-ring in the I/P output port and replace if necessary.
5. Reinstall the I/P converter, shroud, and finger protector as described in the Replacing the I/P Converter procedure.

Front Cover Assembly

The Front Cover Assembly is located on the front of the instrument.

Note
If the Front Cover Assembly is replaced, calibrate and configure the digital valve controller to maintain accuracy specifications.

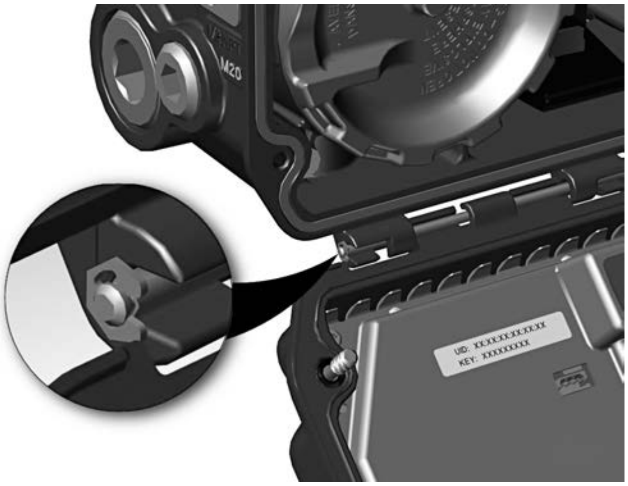
Removing the Front Cover Assembly

1. Unscrew the four Front Cover Assembly screws.
2. Unplug the Front Cover Assembly's Ribbon Cable from the terminal box ribbon cable connection, see figure 6-4 for cable location.

Figure 6-4. Sensor Board Ribbon Cable Connections

3. Unscrew the bottom left most screw on the sensor board.
4. Unplug the Front Cover Assembly’s Ribbon Cable from the Sensor Board ribbon cable connection (see figure 6-4).
5. Remove the E-ring (location shown in figure 6-5) with the slip joint pliers.
6. Remove the hinge pin.

Figure 6-5. E-Ring and Hinge Pin Location



Replacing the Front Cover Assembly and Setting the DIP Switch

1. Remove the Front Cover Assembly, if not already removed.

Note

Refer to the Removing the Front Cover Assembly procedure.

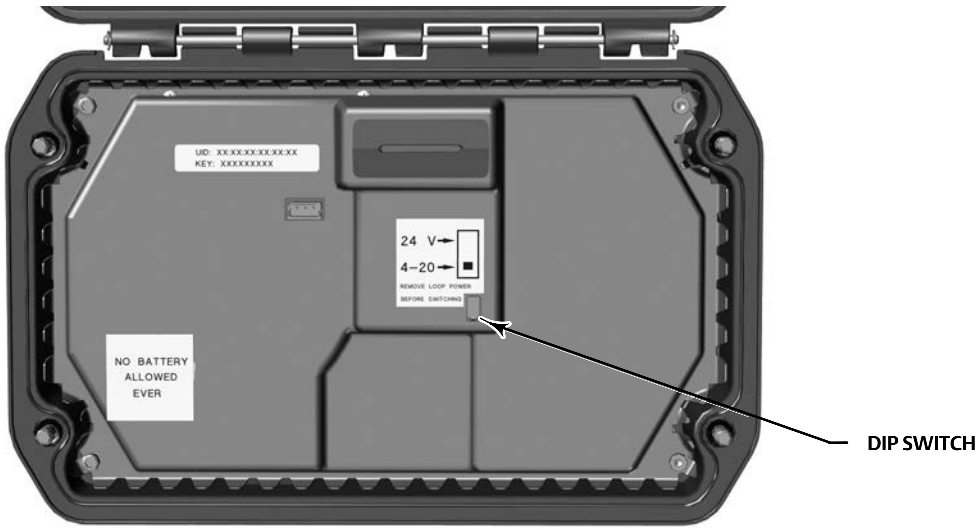
2. Align the new Front Cover Assembly with the Housing and slide the hinge pin through the opening.
3. Attach the E-ring to the end of the hinge pin.
4. Attach the Sensor Board Ribbon Cable.
5. Screw in the bottom left most screw on the sensor board.
6. Attach the Terminal Box Ribbon Cable.
7. Set the DIP switch on the Front Cover Assembly (figure 6-6) according to table 6-2.

Table 6-2. DIP Switch Configuration(1)

Operational Mode	DIP Switch Position
4-20 mA Point-to-Point Loop	DOWN
24 VDC Multi-Drop Loop	UP

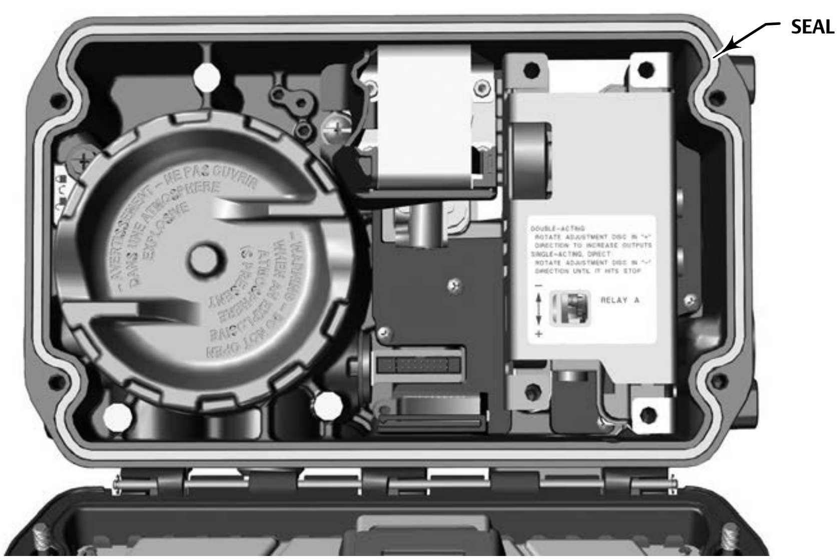
1. Refer to figure 6-6 for switch location.

Figure 6-6. Printed Circuit Board (PCB) Connections and Settings



8. Ensure the seal is in place (figure 6-7) and reattach the Front Cover Assembly. Tighten the four screws in a crisscross pattern.

Figure 6-7. Seal Location



9. Setup and calibrate the digital valve controller.

Replacing the Battery Backup

⚠ WARNING

USE ONLY FISHER BATTERY, PART NUMBER GH19606X012

The Battery is not a standard, off the shelf battery. Use of a non-approved battery will void your Hazardous Area Approvals. Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson may void your warranty, might adversely affect the performance of the instrument, and could cause personal injury and property damage.

Note

A battery is not included in Extreme Temperature units because the batteries are only rated down to -40°C (-40°F).

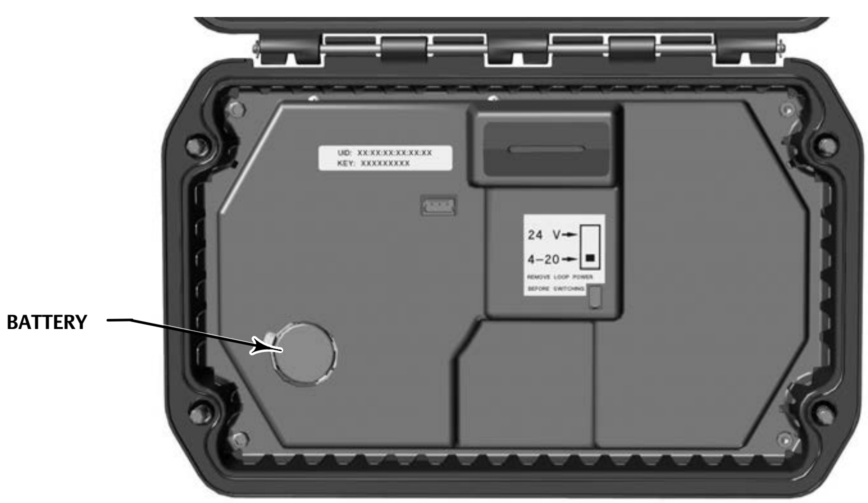
---

1. Open the front cover, if not already opened.
2. Remove the sticker covering the battery.
3. Align the flathead screwdriver with the rectangular notch and insert the flathead screwdriver under the battery.
4. Hold the battery with one of your fingers and hinge up the screwdriver to remove the battery from the Front Cover Assembly.

Note

Ensure you have hold of the battery with one of your fingers when removing it to prevent the battery from falling under the metal cover shield.

Figure 6-8. Battery Location



NOTE: BATTERY WILL BE COVERED BY A STICKER

5. Angle the new battery under the two metal clips and push to insert into the Front Cover Assembly.
6. Cover the battery hold with the sticker.

Pneumatic Relay

The pneumatic relay is located on the right side of the module base, as shown in figure 6-9.

Figure 6-9. Pneumatic Relay Location

Removing the Pneumatic Relay

1. Open the front cover, if not already opened.
2. Loosen the four screws that attach the relay to the module base.
3. Remove the relay.

Replacing the Pneumatic Relay

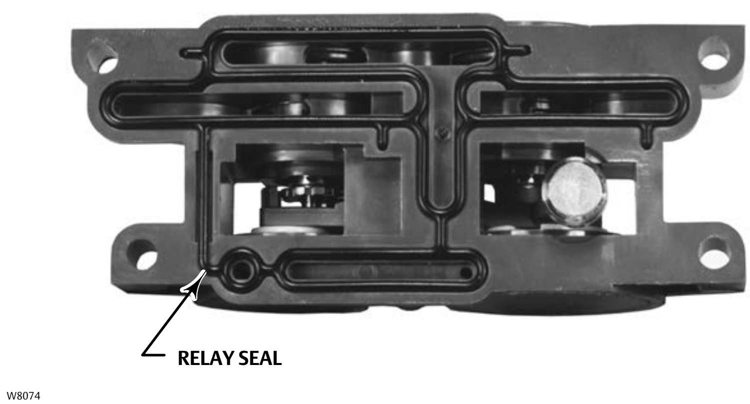
1. Open the front cover, if not already opened.
2. Visually inspect the holes in the module base to ensure they are clean and free of obstructions.

Note

If cleaning is necessary, do not enlarge the holes.

3. Ensure the relay seal is installed at the bottom of the relay as shown in figure 6-10.

Figure 6-10. Pneumatic Relay Assembly



4. Position the relay (with shroud) on the module base.
5. Use the four longer screws from the Relay Assembly kit; tighten in a crisscross pattern to a final torque of 2 N • m (20.7 lbf • in).
6. Using the Local User Interface (LUI) or handheld communicator (DD), verify that the value for Relay Type parameter matches the relay type installed.
7. After replacing the relay and verifying the relay type, calibrate travel or perform touch-up calibration to maintain accuracy specifications

Terminal Box

The terminal box is located within the housing as shown in figure 6-11 and contains the terminal strip assembly for field wiring connections.

Figure 6-11. Terminal Box Location

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. Open the front cover, if not already opened.
2. Turn the lock screw counterclockwise to unlock the cap so that the cap can be unscrewed from the terminal box.
3. After removing the cap note the location of field wiring connections and disconnect the field wiring from the terminal box.
4. Unscrew the center and ground screws.
5. Pull the terminal cup and label plate straight out of the housing.

Replacing the Terminal Box

1. Open the front cover, if not already opened.

NOTICE

This is a blind assembly. Install gently to avoid damage to the electronics assembly.

2. Align the black alignment pins and position the terminal cup so that the holes for the screws in the terminal cup align with the threaded holes in the housing.
3. Insert the terminal cup into the housing.
4. Place the label plate over the terminal cup.
5. Install the center and ground screws.
6. Reconnect the field wiring as noted in step 3 in the Removing the Terminal Box procedure.
7. Apply lithium grease to the external threads on the terminal box cap.
8. Install the lock screw by turning it counterclockwise.
9. Screw the cap onto the terminal box until no gap remains.
10. Lock the lock screw by turning it clockwise into the cap and engaging the lock screw.

Vent

The Vent is located on the bottom right of the instrument (see figure 6-12)

Figure 6-12. Vent

Cleaning the Vent (figure 6-13)

1. Remove the vent by unscrewing the two screws and removing the O-ring.
2. Carefully disassemble the vent.

Note

There are three parts to the vent, two vent housing components and a filter.

3. Clean each component with a mild water/detergent solution.
4. Allow the components to dry before reinstalling.
5. Reassemble the vent by inserting the filter and umbrella valve between the two vent housing components as shown in figure 6-13.
6. Insert the O-ring into the Main Housing Assembly.
7. Align the Vent so that the hardware holes are aligned.
8. Insert and tighten the two screw to 1.3 N • m (11.5 in • lbs) to secure the Vent to the Main Housing Assembly.

Replacing the Vent

1. Remove the vent by unscrewing the two screws and removing the O-ring.
2. Insert the new O-ring from the Vent Parts Kit.
3. Align the Vent so that the hardware holes are aligned.
4. Insert and tighten the two screw to 1.3 N • m (11.5 in • lbs) to secure the Vent to the Main Housing Assembly.

Replacing the Pipe-Away Vent (figure 6-14)

1. Remove the Pipe-Away Vent by unscrewing the two screws and removing the O-ring.
2. Insert the new O-ring from the Pipe-Away Vent Connection Assembly Kit.
3. Align the Pipe-Away Vent so that the hardware holes are aligned.
4. Insert and tighten the two screw to 1.3 N • m (11.5 in • lbs) to secure the Vent to the Main Housing Assembly.

Figure 6-13. Vent Assembly

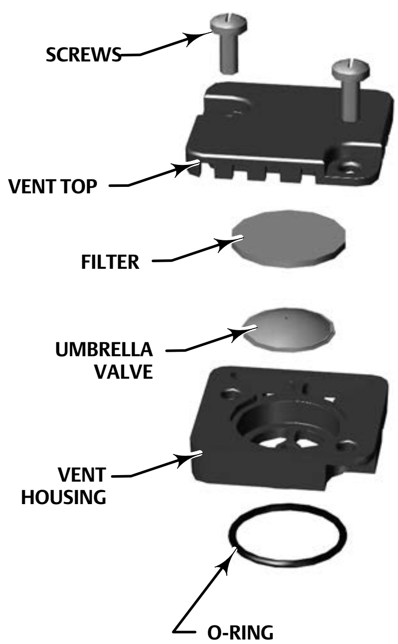
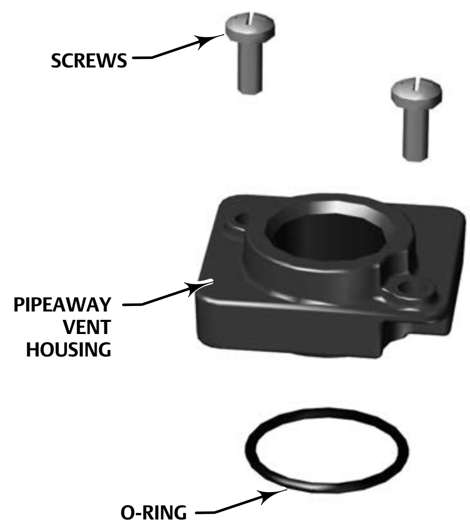


Figure 6-14. Pipe-Away Vent



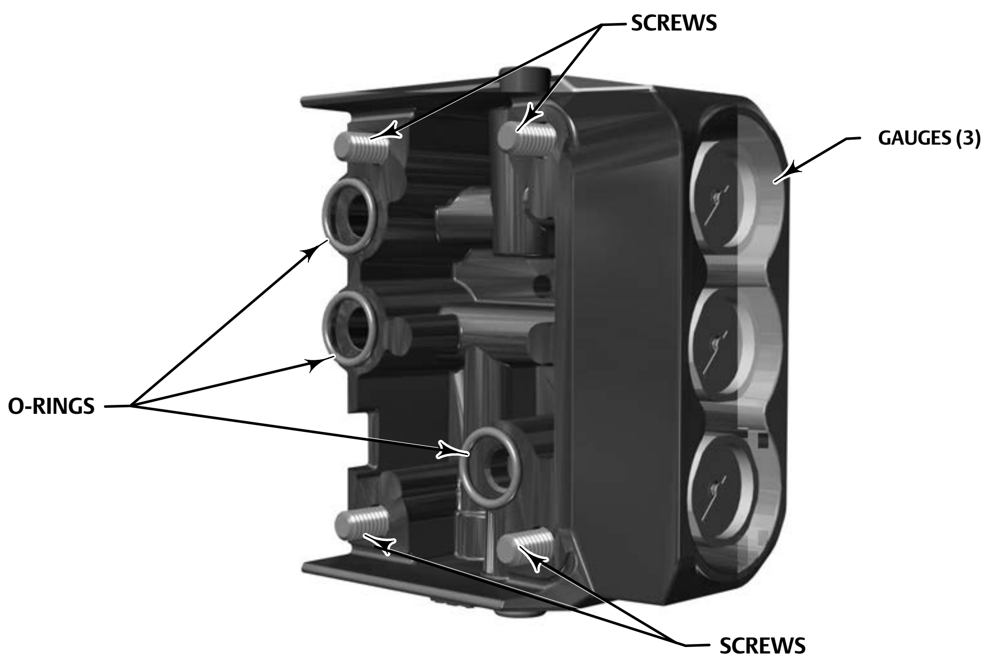
Gauge Block

The Gauge Block is an optional feature to the DVC7K.

Removing the Gauge Block

1. Remove all accessories connected to the Gauge Block (for example: regulators).
2. Unscrew the four screws and remove the three O-rings.

Figure 6-15. Gauge Block O-Rings and Screws



Replacing the Gauge Block

1. Remove the Gauge Block as described in the Removing the Gauge Block procedure above.
2. Install the new Gauge Block as described in Step 2—Connect the Pneumatic Tubing in the quick start guide (D104766X012).

Troubleshooting

If communication or output difficulties are experienced with the instrument, refer to the troubleshooting chart in table 6-3. Also see the DVC7K Technical Support Checklist on page 57.

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 2-2 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 2-2 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 10.0 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.

Restore

Handheld Communicator (DD)	Device Settings > Restore/Restart Maintenance > Restore/Restart

There are two methods to restore a digital valve controller to a known state: Restore Custom Configuration or Restore Factory Configuration.

Restore Factory Configuration restores the digital valve controller to factory defaults.

Restore Custom Configuration restores the digital valve controller to a custom configuration defined by the user when ordered from the Factory.

Both methods require Write Protection to be disabled and Instrument Mode to be in Manual.

Table 6-3. Instrument Troubleshooting

Symptom	Possible Cause	Action
1. Input Current reading at instrument does not match actual current provided.	1a. The Dip Switch is set to 24V and not 4-20mA	1a. Check the Dip Switch on the Front Cover Assembly of the digital valve controller to ensure it is set to 4-20mA.
	1b. Low control system compliance voltage.	1b. Check system compliance voltage (see Wiring Practices in the Installation section.
	1c. Input Current Sensor not calibrated.	1c. Calibrate the Input Current Sensor (see Input Current Calibration in the Calibration section).
	1d. Current leakage.	1d. 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 10.5 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 from Terminal Box to Front Cover Assembly.	2g. Verify the wiring cable to the Terminal Box is plugged in correctly.
	2h. Front Cover Assembly DIP switch not set properly.	2h. Check for incorrect setting or broken DIP switch on the Front Cover Assembly. Reset switch or replace Front Cover Assembly, if switch is broken. See table 6-2 for switch setting information
	2j. Front Cover Assembly 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 8.0 to 9.5 VDC. If the terminal voltage is not 8.0 to 9.5 VDC, replace the Front Cover Assembly.
	2k. Polling address incorrect.	2k. Use the handheld communicator to set the polling address to 0 (Device Settings >Setup Overview or Device Settings > Communications sections).
	2l. Defective terminal box.	2l. Check that the terminal block screws are fully screwed in. If necessary, replace the terminal box assembly.
	2m. Defective handheld communicator or modem cable.	2m. If necessary, repair or replace cable.

Table 6-3. Instrument Troubleshooting (continued)

Symptom	Possible Cause	Action
3. Instrument will not calibrate, has sluggish performance or oscillates.	3a. Configuration errors.	3a. Verify configuration: If necessary, disable Write Protection. If in Manual, place in Automatic. Check: Travel Sensor Motion Tuning set Zero Power Condition Feedback Connection The Dip Switch (should be 4-20mA)
	3b. Restricted pneumatic passages in I/P converter.	3b. Check screen in I/P converter supply port. Replace if necessary. If passages in I/P converter are restricted, replace I/P converter.
	3c. O-ring(s) between I/P converter assembly missing or hard and flattened losing seal.	3c. Replace O-ring(s).
	3d. I/P converter assembly damaged/corroded/clogged.	3d. Check for bent flapper, open coil (continuity), contamination, staining, or dirty air supply. Coil resistance should be between 1680 - 1860 ohms. Replace I/P assembly if damaged, corroded, clogged, or open coil.
	3e. I/P converter assembly out of spec.	3e. I/P converter assembly 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 assembly if drive signal is continuously high or low.
	3f. Defective Module Base and Sensor Assembly seal.	3f. Check the Module Base and Sensor Assembly O-rings for condition and position. If necessary, replace the O-rings.
	3g. Defective relay.	3g. 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 assembly is good and air passages not blocked. Check relay adjustment.
	3h. Defective 67CFR regulator, supply pressure gauge jumps around.	3h. Replace 67CFR regulator.
4. Handheld communicator does not turn on.	4a. Battery pack not charged.	4a. Charge battery pack. Note: Battery pack can be charged while attached to the handheld communicator or separately. The handheld communicator is fully operable while the battery pack is charging. Do not attempt to charge the battery pack in a hazardous area.

DVC7K Technical Support Checklist

Have the following information available prior to contacting your Emerson sales office for support.

1. Instrument serial number as read from nameplate ______________________________
2. What are you experiencing issues with? ☐ Position Control ☐ Outputs (Transmitters and Switches)

Position Control

3. Is the digital valve controller responding to the control signal? ☐ Yes, ☐ No
   If No, describe ____
4. Measure the voltage across the “Loop -” and Loop +” terminal box screws when the commanded current is 4.0 mA and 20.0 mA: ____ V @ 4.0 mA ____ V @ 20.0 mA.
   (These values should be around 8.6 V @ 4.0 mA and 9.5 V @ 20 mA).
5. Is it possible to communicate via HART to the digital valve controller? ☐ Yes, ☐ No
6. Do you have a Local User Interface (LUI)? ☐ Yes, ☐ No
   a. If yes, are you able to navigate the LUI? ☐ Yes, ☐ No
7. What is the Control Tier? _______________
8. What is the Application Mode? _______________
9. What is the firmware version of the digital valve controller? _______________
10. What is the hardware version of the digital valve controller? _______________
11. What is the digital valve controller's Instrument Mode? ☐ Automatic, ☐ Manual, ☐ Local Override
12. Is simulation active? ☐ Yes, ☐ No
13. What is the digital valve controller's Setpoint Source Dip Switch position set to? ☐ 4-20 mA, ☐ 24 V
14. What are the following parameter readings?

a.	Input Signal	__________	Drive Signal	__________%		
b.	Supply Pressure	__________	Pressure A	__________	Pressure B	__________
c.	Travel Target	__________%	Travel	__________%		

15. What alerts are active? ____

Outputs

16. Measure the current in series for the Transmitter when the valve is at 0% and 100% travel:
    ____ mA @ 0% ____mA @ 100%.
    a. Does the Transmitter output track actual valve position (example: 12 mA at 50%)? ☐ Yes, ☐ No
       If No, what issues are you seeing with the transmitter? __________________________________
    b. What is the Transmitter Function? ☐ Disabled, ☐ 4mA = Valve Open, ☐ 4mA = Valve Closed
    c. What is the Transmitter Fail Signal?
       ☐ Fail High (transmitter output >22.5mA), ☐ Fail Low (transmitter output <3.6mA)

17. Measure the voltage across the “Switch 1 -” and “Switch 1 +” terminal box screws when the valve is at 0% and 100% travel: ____ V @ 0% ____V @ 100%.

    a. What is the Switch 1 Function configured to? ☐ Disabled, ☐ Alert Switch, ☐ Limit Switch

        i. Alert Switch

            1. What is the Switch 1 Alert Action? ☐ Alert Active, ☐ Alert Inactive

            2. Which Alert enables Switch 1? _______________

        ii. Limit Switch

            1. What is the Switch 1 Limit Action? ☐ Above Trip Point, ☐ Below Trip Point

            2. What is the Switch 1 Trip Point? _______________

18. Measure the voltage across the “Switch 2 -” and “Switch 2 +” terminal box screws when the valve is at 0% and 100% travel: ____ V @ 0% ____V @ 100%.

    a. What is the Switch 2 Function configured to? ☐ Disabled, ☐ Alert Switch, ☐ Limit Switch

        i. Alert Switch

            1. What is the Switch 2 Alert Action? ☐ Alert Active, ☐ Alert Inactive

            2. Which Alert enables Switch 2? _______________

        ii. Limit Switch

            1. What is the Switch 2 Limit Action? ☐ Above Trip Point, ☐ Below Trip Point

            2. What is the Switch 2 Trip Point? _______________

Mounting

1. What Make, Brand, Style, Size, etc. actuator is the DVC7K mounted on?

    Make: __________ Drive Signal: __________ Style: __________ Size: __________

2. What is the full travel of the valve? _______________
3. What Array is being used on the valve (i.e. what number is on it? _______________
4. What is the Mounting Kit part number? _______________
5. If mounting kits are made by Impact Partner/Customer, please provide pictures of installation.
6. Is the Mounting kit installed per the instructions? ☐ Yes, ☐ No
7. What is the Zero Power Condition of the valve? ☐ Fail closed, ☐ Fail open

Section 7 Parts

Parts Ordering

Whenever corresponding with your Emerson sales office about this equipment, always mention the controller serial number.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson may void your warranty, might adversely affect the performance of the instrument, and could cause personal injury and property damage.

Parts Kits

Note

All Standard kits with elastomers include internal nitrile elastomers and environmental seal silicone elastomers. Extreme temperature kits include fluorosilicone elastomers and environmental seal silicone elastomers.

Kit	Description	Part Number
1*	Elastomer Spare Parts Kit [kit contains parts to service one digital valve controller]	
	Standard	GK01832X012
2*	Small Hardware Spare Parts Kit [kit contains parts to service one digital valve controller]	GK01833X012
3*	Seal Screen Kit [kit contains 25 seal screens and 25 O-rings	14B5072X182
4*	Integral Mount Seal Kit (for 667 size 30i - 76i and GX actuators) [kit contains 5 seals]	19B5402X032
5*	Terminal Box Kit (see figure 7-1) [kit contains Terminal Box Cup qty. 1, Cup Screw qty. 1, Ground Screw qty. 1, Lock Screw qty. 1, Terminal Shield qty. 1, Terminal Box Cap qty. 1, and Terminal boards qty. 1]	

Note

Use only with replace in-kind.

	without I/O Package	GK01834X012
	with I/O Package	GK01835X012

Figure 7-1. Terminal Box

WITH I/O OPTIONS **WITHOUT I/O OPTIONS**

Kit	Description	Part Number
6	Terminal Box Cap [kit contains Lock Screw qty. 1 and Terminal Box Cap qty. 1]	GG77096X012
7	Front Cover Assembly (see figure 7-2)	

Note

Contact your Emerson sales office if a replacement front cover is needed. Front cover must match the terminal box kit (example: if terminal box has I/O package, the front cover must also have the I/O package).

Note

A battery is not included in Extreme Temperature units because the batteries are only rated down to -40°C.

	Standard [kit contains Front Cover Assembly with two Ribbon Cables attached qty. 1, Battery qty. 1, E-Ring qty. 2, and Hinge pin qty. 1]	
	Without I/O Package and with Local User Interface (LUI)	GH17465X012
	With I/O Package and with Local User Interface (LUI)	GG77692X012

*Recommended spare parts

Kit	Description	Part Number
8	Front Cover Assembly (see figure 7-2) (continued)	
	Extreme Temperature [kit contains Front Cover Assembly with two Ribbon Cables attached qty. 1; E-Ring qty. 2; and Hinge pin qty. 1]	
	Without I/O Package and with Local User Interface (LUI)	GK01926X012
	With I/O Package and with Local User Interface (LUI)	GK01836X012
9	Battery Assembly [kit contains Battery qty. 1 and Sticker qty. 1]	GH19606X012

Note

A battery is not included in Extreme Temperature units because the batteries are only rated down to -40°C.

Kit	Description	Part Number
10*	I/P Converter Kit [kit contains I/P qty. 1; Screws qty. 4; I/P Shroud qty. 1 Finger Protector qty. 1; O-Ring qty. 1; and Seal Screen qty. 1] (see figure 6-2 and 6-3).	
	Standard	38B6041X152
	Extreme Temperature	38B6041X132
11*	Relay Assembly [kit contains Shroud qty. 1; Relay Seal qty. 1; and Mounting Screws qty. 8] (refer to figure 6-10 and figure 7-2)	

Note

The four longer screws in the Relay Assembly kit are for the DVC7K. The four shorter screws are for the DVC6200.

Kit	Description	Part Number
	Standard	
	Standard Bleed	
	For GX actuators	
	Single-acting direct (relay C)	38B5786X682
	Single-acting reverse (relay B)	38B5786X672
	For all actuators except GX	
	Single-acting direct (relay C)	38B5786X632
	Double-acting (relay A)	38B5786X552
	Single-acting reverse (relay B)	38B5786X592
	Low Bleed	
	For GX actuators	
	Single-acting direct (relay C)	38B5786X702
	Single-acting reverse (relay B)	38B5786X692
	For all actuators except GX	
	Single-acting direct (relay C)	38B5786X652
	Double-acting (relay A)	38B5786X572
	Single-acting reverse (relay B)	38B5786X612
11*	Relay Assembly (continued)	
	Extreme Temperature	
	Standard Bleed	
	Single-acting direct (relay C)	38B5786X642
	Double-acting (relay A)	38B5786X532
	Single-acting reverse (relay B)	38B5786X602
	Low Bleed	
	Single-acting direct (relay C)	38B5786X662
	Double-acting (relay A)	38B5786X582
	Single-acting reverse (relay B)	38B5786X622
12*	Spare Module Base and Sensor Assembly Kit [kit contains Module Base qty. 1; Sensor Assembly qty. 1; Pipe Plug qty. 4; Seal qty. 1; screws for sensor assembly qty. 6; screws for module base qty. 5; finger guard qty. 1; and O-Ring qty. 6	GG76831X012
13	Vent Kit [kit contains screws qty. 2, O-Ring qty. 1, vent housing qty. 1, and vent cover qty. 1] (see figure 6-13)	GK01837X012
14	Pipe-Away Vent Connection Assembly for 1/2” Pipe [kit contains pipe-away vent qty. 1; screws qty. 2; and O-Ring, qty. 1] (see figure 6-14)	GK01925X012
15*	Spare I/P Shroud Kit [kit contains Shroud qty. 1 and Hex Socket Cap Screw qty. 4]	GE29183X012
16	Feedback Array Kit Sliding Stem (Linear) [kit contains Feedback Array and Hex Socket Cap Screws qty. 2; Washer, Plain qty. 2; External Tooth Lock Washer qty. 2 (only with aluminum feedback array kit); and Alignment Template 210 mm (8-1/4 inch) kit contains Feedback Array and Hex Socket Cap Screws qty. 4; Washer, Plain qty. 4; External Tooth Lock Washer qty. 4 (only with aluminum feedback array kit); and Alignment Template and Insert	
	7 mm (1/4-inch)	
	Aluminum	GG20240X012
	19 mm (3/4-inch)	
	Aluminum	GG20240X022
	25 mm (1-inch)	
	Aluminum	GG20240X032
	38 mm (1-1/2 inch)	
	Aluminum	GG20240X042
	50 mm (2-inch)	
	Aluminum	GG20240X052
	110 mm (4-1/8 inch)	
	Aluminum	GG20240X082
	210 mm (8-1/4 inch)	
	Aluminum	GG20243X012

*Recommended spare parts

Kit	Description	Part Number
16	Feedback Array Kit (continued)	
	Rotary [Kit contains Feedback Assembly, Pointer Assembly, Travel Indicator Scale and M3 Machine Pan Head Screws qty. 2]	
	Aluminum	GG10562X012
	Rotary Array kit with coupler [Kit contains Feedback Assembly and NAMUR coupler]	
	Aluminum	GE71982X012
17	Gauge Block [kit contains Gauge Block qty. 1; Screws qty. 4; O-Ring qty. 3; Pipe Plug qty. 6; and Gauges qty. 3] (see figure 7-3)	
	Imperial	GK01861X012
	Metric	GK01862X012
18	Gauge Block Hardware Spare Parts kit [kit contains Screws qty. 4] see figure	GK01864X012
19	Gauge Block Elastomer Spare Parts [kit contains O-Rings qty. 3]	GK01865X012
20	VDI/VDE Spare Parts Kit [kit contains O-Rings and screws]	GK01866X012

Note
The VDI/VDE Mounting Block is selectable through Fisher Mounting selection.

Figure 7-2. DVC7K Assembly Drawings

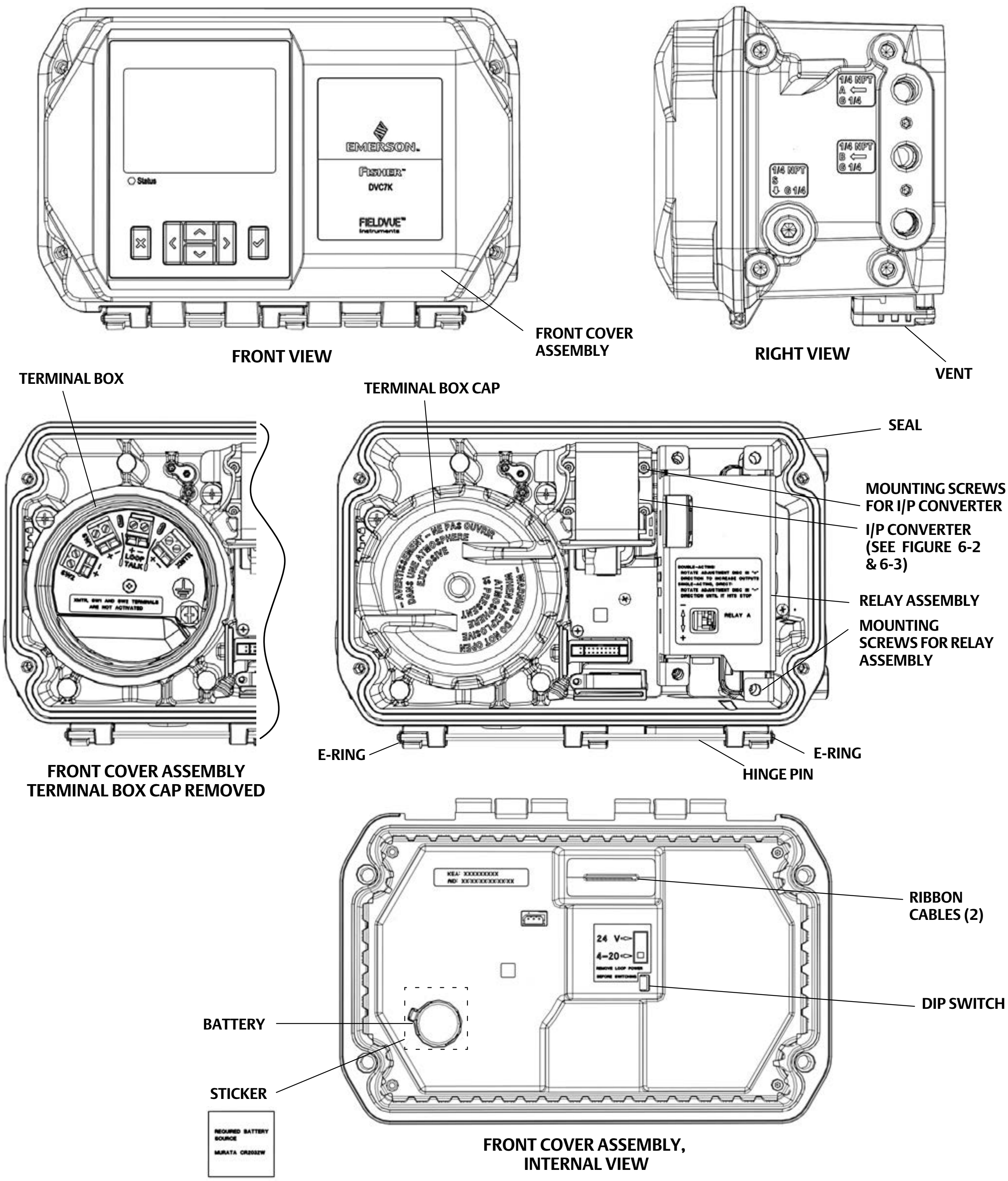


Figure 7-2. DVC7K Assembly Drawings (continued)

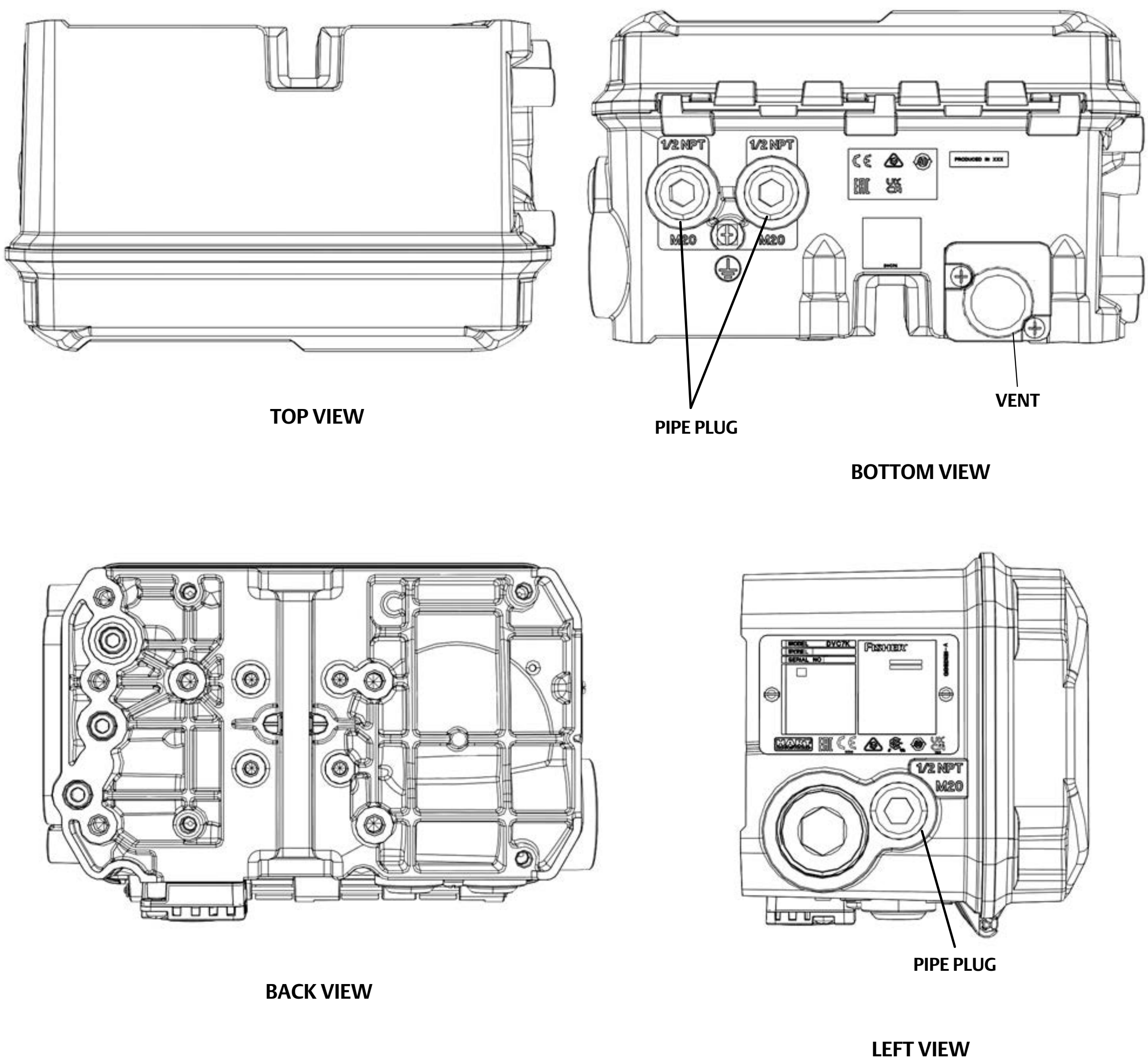
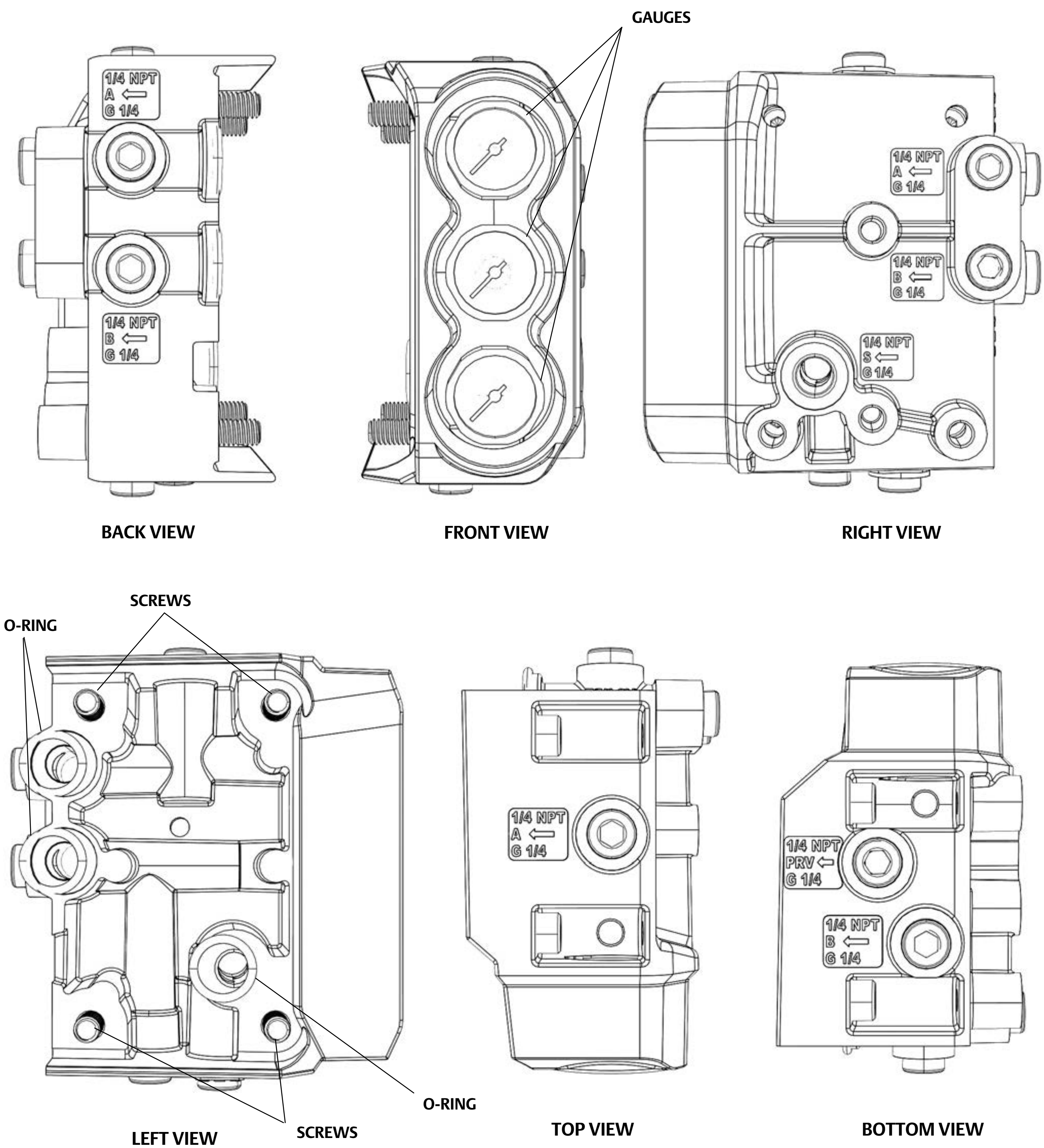


Figure 7-3. Gauge Block



NOTE: PIPE PLUGS ARE NOT SHOWN

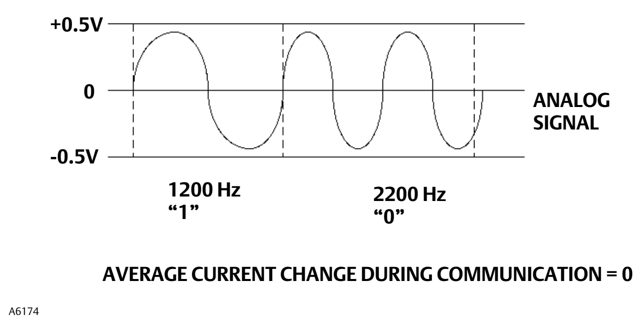
Appendix A Principle of Operation

HART Communication

The HART (Highway Addressable Remote Transducer) protocol gives field devices the capability of communicating instrument and process data digitally. This digital communication occurs over the same two-wire loop that provides the 4-20 mA process control signal, without disrupting the process signal. In this way, the analog process signal, with its faster update rate, can be used for control. At the same time, the HART protocol allows access to digital diagnostic, maintenance, and additional process data. The protocol provides total system integration via a host device.

The HART protocol uses frequency shift keying (FSK). Two individual frequencies of 1200 and 2200 Hz are superimposed over the 4-20 mA current signal. These frequencies represent the digits 1 and 0 (see figure A-1). By superimposing a frequency signal over the 4-20 mA current, digital communication is attained. The average value of the HART signal is zero, therefore no DC value is added to the 4-20 mA signal. Thus, true simultaneous communication is achieved without interrupting the process signal.

Figure A-1. HART Frequency Shift Keying Technique

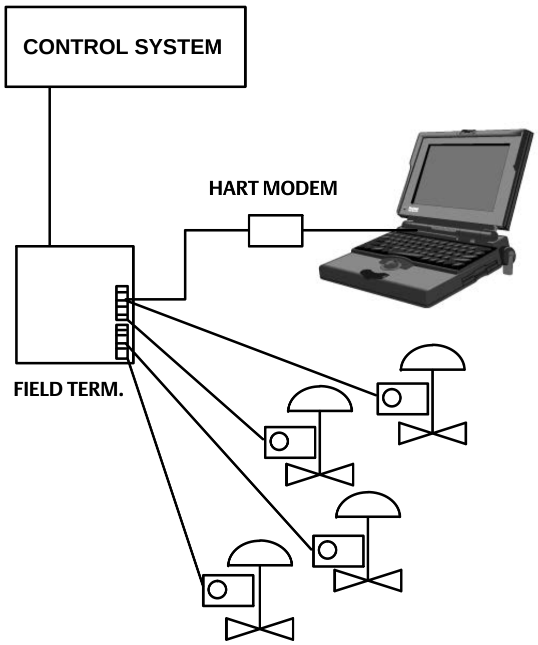


The HART protocol allows the capability of multidropping, i.e., networking several devices to a single communications line. This process is well suited for monitoring remote applications such as pipelines, custody transfer sites, and tank farms. See table 6-2 for instructions on changing the Front Cover Assembly DIP switch configuration to 24V for multidrop.

DVC7K Digital Valve Controller

The DVC7K digital valve controller housing contains the module base and sensor assembly, terminal box, pneumatic input and output connections, I/P converter, pneumatic relay, front cover assembly, and vent. The relay position is detected by sensing the magnet on the relay beam via a detector on the sensor assembly. This sensor is used for the minor loop feedback (MLFB) reading.

Figure A-2. Typical FIELDVUE Instrument to Personal Computer Connections for Device Description (DD) Software



DVC7K 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 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 circuit board in the Front Cover Assembly 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 A-3 and A-4, the increased output A pressure causes the actuator stem to move downward. Stem position is sensed by the non-contact travel feedback sensor. The stem continues to move downward until the correct stem position is attained. At this point the printed circuit board in the Front Cover 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 circuit board in the Front Cover Assembly stabilizes the I/P drive signal. This positions the flapper to prevent any further decrease in nozzle pressure.

Figure A-3. FIELDVUE DVC7K Digital Valve Controller Block Diagram

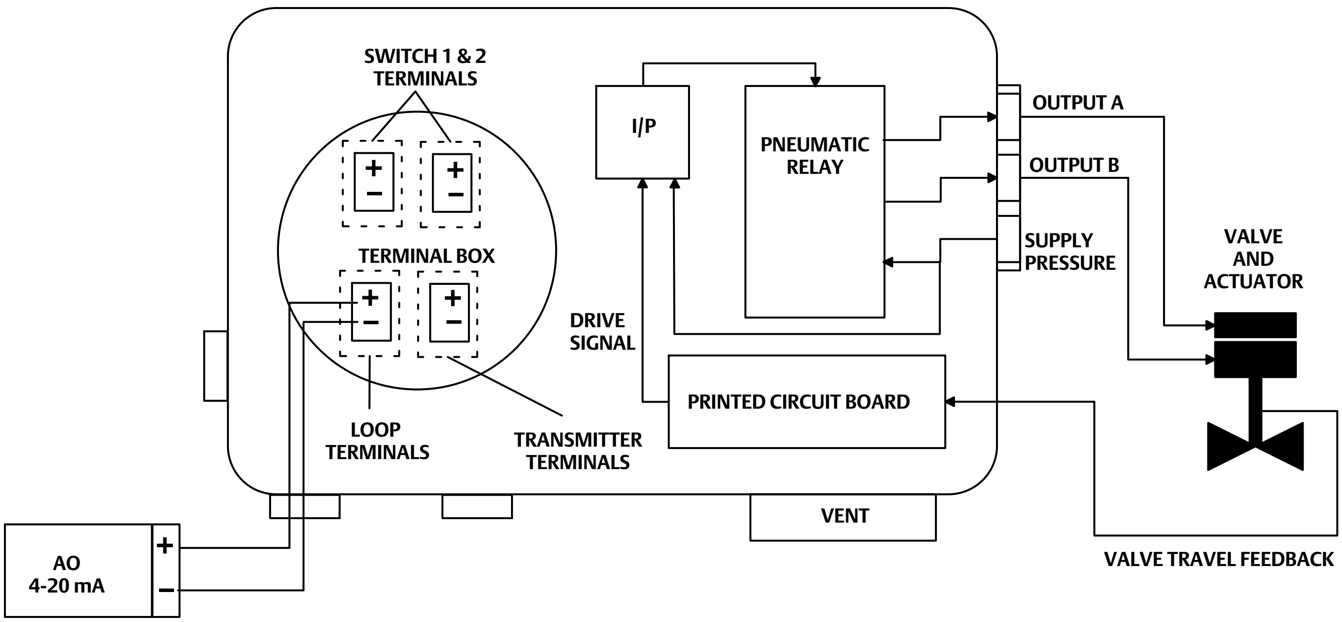


Figure A-4. FIELDVUE DVC7K Digital Valve Controller with Position Transmitter and Switches Block Diagram

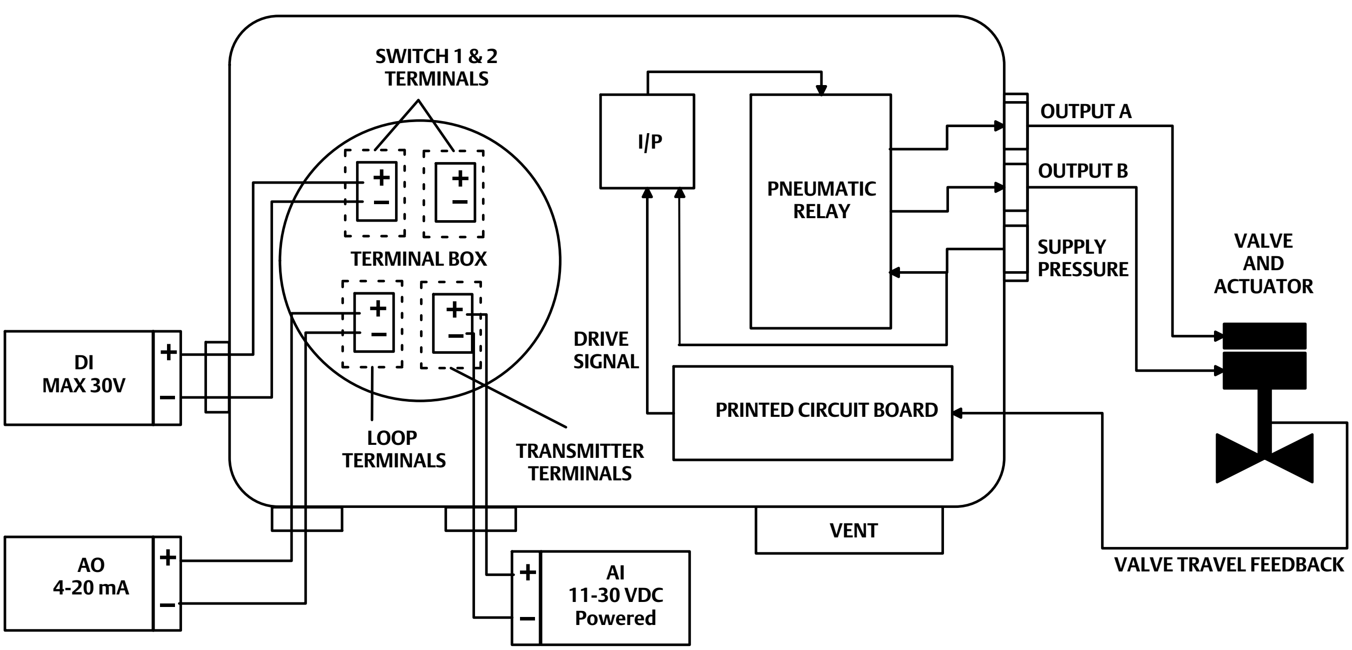
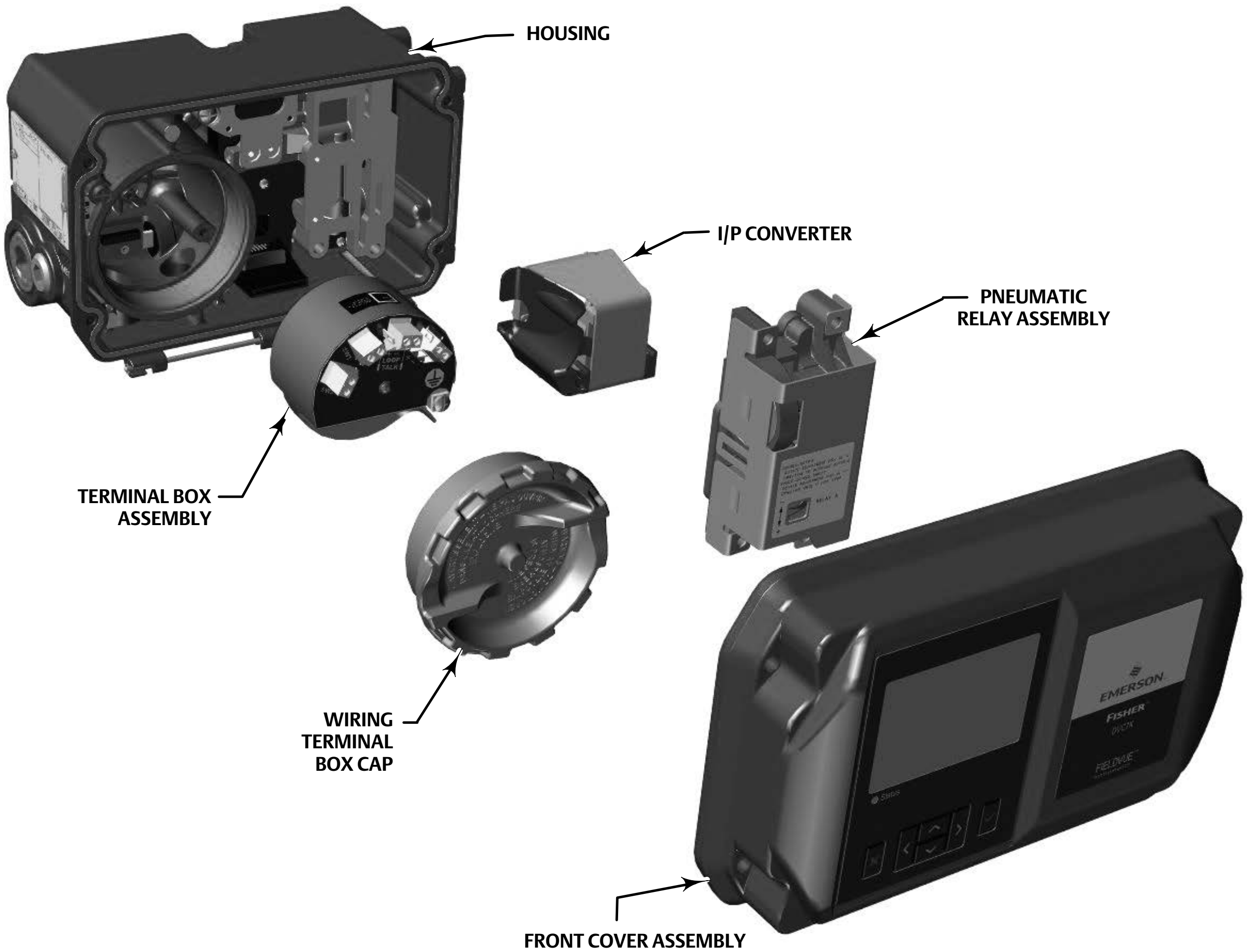


Figure A-5. FIELDVUE DVC7K Digital Valve Controller Assembly



Appendix B Handheld Communicator Menu Trees

Figure B-1. Favorites

Favorites

- Tag
- Long Tag
- Instrument
- Change Mode
- Write Protection

Figure B-2. Process Variables

Process Variables

Device Overview

- Active Alerts
- Comm Status: Polled
- Instrument Mode
- Input Current[1]
- Setpoint
- Travel
- Travel Deviation
- Input Characterization
- Drive Signal
- Pressures
  - Supply Pressure
  - Output A[2]
  - Output B[3]

Variables

Mapped Variables
- Primary Variable
- Secondary Variable
- Tertiary Variable
- Quaternary Variable

Status
- Mode and Protection
  - Instrument Mode
  - Change Instrument Mode
  - Protection
  - Change Protection
- Run Time
- Power Ups
- Current Temperature

Travel/Pressure
- Travel
  - Input Current
  - Setpoint
  - Travel
  - Cycle Count
- Pressure
  - Supply Pressure
  - Output 1[2]
  - Output 2[3]
  - Differential Pressure[4]

Stroke Information[5]
- Stroke Open Baseline
- Stroke Open Time
- Stroke Close Baseline
- Stroke Close Time

Configuration
- Setpoint Source
- Application Mode
- Zero Power Condition
- Restart Latch Options
- Restart Latch Status
- Relay Type

Outputs
- Switch 1
  - Enabled/Disabled
  - Closed/Open
- Switch 2
  - Enabled/Disabled
  - Closed/Open

Trends

- Setpoint/Travel
- Travel/Pressure

NOTES:
1 FOR 4 - 20 mA ONLY
2 FOR DOUBLE-ACTING AND SINGLE-ACTING
3 FOR DOUBLE-ACTING AND REVERSE-ACTING
4 FOR DOUBLE-ACTING ONLY
5 FOR ON/OFF TIER ONLY

Figure B-3.1. Device Settings

Device Settings

Setup Overview

Mode and Protection

- Instrument Mode
- Change Instrument Mode
- Protection
- Change Protection

Guided Setup

- Guided Setup

Positioner

- Mode and Protection
  - Instrument Mode
  - Change Instrument Mode
  - Protection
  - Change Protection
- Identification
  - Tag
  - Long Tag
  - Polling Address
  - Manufacturer
  - Device Type
  - Instrument Serial Number
  - Device Identifier
  - Message
  - Descriptor
- Tiers
  - Feature Tier
  - Control Tier
  - Application Mode
- Revisions
  - Hardware Revision
  - Device Revision
  - HART Protocol Revision
  - Main Firmware Revision
- Units
  - Pressure
  - Temperature
  - Input Current

Positioner Performance

- Mode and Protection
  - Instrument Mode
  - Change Instrument Mode
  - Protection
  - Change Protection
- Travel Control
  - Input Current
  - Relay Type
  - Zero Power Condition
  - Restart Latch Options
  - Restart Latch Status
- Cutoff/Limit High
  - Cutoff/Limit High Action
  - Cutoff High Trip Point
  - Cutoff Rate High
  - Travel Limit High Point
- Cutoff/Limit Low
  - Cutoff/Limit Low Action
  - Cutoff Low Trip Point
  - Cutoff Rate Low
  - Travel Limit Low Point
- Characterization
  - Input Characterization
  - Custom Characterization Table

Figure B-3.2. Device Settings

Input/Output

Inputs
- Input Current Range
  - Upper Range Value
  - Lower Range Value

Outputs

- Mode and Protection
  - Instrument Mode
  - Change Instrument Mode
  - Protection
  - Change Protection

- Mapped Variables
  - Primary Variable
  - Secondary Variable
  - Tertiary Variable
  - Quaternary Variable

- Positioner Transmitter
  - Function
  - Fail Signal

- Deadband
  - Travel Value Deadband

- Switch 1
  (Function -SW 1 = Disabled)
  - Function - SW 1

- Switch 1
  (Function -SW 1 = Limit)
  - Function - SW 1
  - Limit Action - SW 1
  - Trip Point - SW 1
  - Switch State
    - Status
    - State

- Switch 1
  (Function -SW 1 = Alert)
  - Function - SW 1
  - Limit Action - SW 1
  - Trip Point - SW 1
  - Switch 1 State
    - Status
    - State

Note: Switch menus change according to the value of the function (Disabled, Limit, or Alert)

Switch 1 Menus are shown; Menus are the same for Switch 2.

continued on next page

Figure B-3.3. Device Settings

Input/Output

Outputs (continued)

- Switch 1 Alert Configuration
  - Switch 1 Electronics
    - Non-Volatile Memory Defect
    - Drive Signal
    - Drive Current
    - Transmitter Open Circuit
    - Electronic Defect
  - Switch 1 Pressure
    - Supply Pressure Low
    - Supply Pressure High
    - Port A Overpressurized
  - Switch 1 Travel
    - Travel Feedback Error
    - Travel Deviation
    - Travel High
    - Travel Low
    - Travel Limit/Cutoff High
  - Switch 1 History
    - Cycle Count High
    - Travel Accumulator High
  - Switch 1 Information Status
    - Device Misconfigured
    - Instrument Time is Approximate
    - Calibration in Progress
    - Temperature High
    - Temperature Low
  - Switch 1 Miscellaneous
    - Instrument Mode
  - Switch 1 Simulation
    - Status Simulation Active

Note: Switch menus change according to the value of the function (Disabled, Limit, or Alert)

Switch 1 Menus are shown; Menus are the same for Switch 2.

Communication

Mode and Protection

- Instrument Mode
- Change Instrument Mode
- Protection
- Change Protection

Wired

- Polling Address

Display

Mode and Protection

- Instrument Mode
- Change Instrument Mode
- Protection
- Change Protection

Settings

- LUI Language Selection
- LUI Decimal Separator

Alerts

continued on next page

Figure B-3.4. Device Settings

Alerts

Electronics

Non-Volatile Memory Defect
- Non-Volatile Memory Defect
- Non-Volatile Memory Defect NE107 Category

Volatile Memory Defect
- Volatile Memory Defect
- Volatile Memory Defect Category

Drive Signal Alert
- Drive Signal
- Drive Signal Enable/Disable
- Drive Signal Alert NE107 Category

Drive Current
- Drive Current
- Drive Current Enable/Disable
- Drive Current Category

Transmitter Open Circuit
- Transmitter Open Circuit
- Transmitter Open Circuit Enable/ Disable
- Transmitter Open Circuit NE107 Category

Electronic Defect
- Electronic Defect
- Electronic Defect NE107 Category

Information Status

Device Misconfigured
- Device Misconfigured
- Device Misconfigured NE107 Category

Instrument Time is Approximate
- Instrument Time is Approximate
- Instrument Time is Approximate Enable/Disable
- Instrument Time is Approximate NE107 Category

Calibration In Progress
- Calibration In Progress
- Calibration In Progress Enable/Disable
- Calibration In Progress NE107 Category

Information Status (continued)

Diagnostic in Progress
- Diagnostic in Progress
- Diagnostic in Progress Enable/Disable
- Diagnostic in Progress NE107 Category

Temperature High
- Temperature High
- Temperature High Enable/Disable
- Temperature High NE107 Category
- Temperature High Alert Point

Temperature Low
- Temperature Low
- Temperature Low Enable/Disable
- Temperature Low NE107 Category
- Temperature Low Alert Point

Miscellaneous

Loop Current Fixed
- Loop Current Fixed
- Loop Current Fixed Alert NE107 Category

Loop Current Saturated
- Loop Current Saturated
- Loop Current Saturated Alert NE107 Category

Instrument Mode
- Instrument Mode Alert
- Instrument Mode Enable/Disable
- Instrument Mode NE107 Category

Travel

Current Values
- Setpoint
- Travel
- Travel Deadband Value

Travel Feedback Error
- Travel Feedback Error
- Travel Feedback Enable/Disable
- Travel Feedback Error Category

Travel Deviation
- Travel Deviation
- Travel Deviation Enable/Disable
- Travel Deviation NE107 Category
- Travel Deviation Alert Point
- Travel Deviation Time

continued on next page

Figure B-3.5. Device Settings

Alerts

Travel (continued)

- Travel High
  - Travel High
  - Travel High Enable/Disable
  - Travel High NE107 Category
  - Travel High Alert Point
- Travel Low
  - Travel Low
  - Travel Low Enable/Disable
  - Travel Low NE107 Category
  - Travel Low Alert Point
- Travel Limit/Cutoffs
  - Travel Limit/Cutoff High
    - Travel Limit/Cutoff High
    - Travel Limit/Cutoff High Enable/Disable
    - Travel Limit/Cutoff High NE107 Category
    - Cutoff/Limit High Action
    - Cutoff High Trip Point
    - Travel Limit High Point
  - Travel Limit/Cutoff Low
    - Travel Limit/Cutoff Low
    - Travel Limit/Cutoff Low Enable/Disable
    - Travel Limit/Cutoff Low NE107 Category
    - Cutoff/Limit Low Action
    - Cutoff Low Trip Point
    - Travel Limit Low Point

Travel History

- Cycle Count High
  - Cycle Count High
  - Cycle Count High Enable/Disable
  - Cycle Count High NE107 Category
  - Cycle Count High Alert Point
  - Cycle Count

Travel History (continued)

- Travel Accumulator High
  - Active/Not Active status
  - Travel Accumulator High Enable/Disable
  - Travel Accumulator High NE107 Category
  - Travel Accumulator High Alert Point
  - Travel Accumulator
  - Travel Deadband Value
- Stroke Open Time(5)
  - Stroke Open Time
  - Stroke Open Time Enable/Disable
  - Stroke Open Time NE107 Category
  - Stroke Open Time Fast Trip Point
  - Stroke Open Time Slow Trip Point
  - Open Threshold
  - Stroke Open Baseline
- Stroke Close Time(5)
  - Stroke Close Time
  - Stroke Close Time Enable/Disable
  - Stroke Close Time NE107 Category
  - Stroke Close Time Fast Trip Point
  - Stroke Close Time Slow Trip Point
  - Close Threshold
  - Stroke Close Baseline

Pressure

- Current Values
  - Output A(2)(6)
  - Supply Pressure
  - Output B(3)(7)
- Supply Pressure
  - Supply Pressure High
    - Supply Pressure High
    - Supply Pressure High Enable/Disable
    - Supply Pressure High NE107 Category
    - Supply Pressure High Alert Point
  - Supply Pressure Low
    - Supply Pressure Low
    - Supply Pressure Low Enable/Disable
    - Supply Pressure Low NE107 Category
    - Supply Pressure Low Alert Point
- Port A Overpressurized
  - Port A Overpressurized
  - Port A Overpressurized Enable/Disable
  - Port A Overpressurized NE107 Category
  - Port A Overpressurized Alert Point

NOTES:
2 FOR DOUBLE-ACTING AND SINGLE-ACTING
3 FOR DOUBLE-ACTING AND REVERSE-ACTING
5 FOR ON/OFF TIER ONLY
6 OUTPUT B FOR REVERSE RELAY
7 OUTPUT B HERE FOR DOUBLE-ACTING ONLY

Figure B-3.6. Device Settings

Calibration

Travel

- Auto Calibration
- Auto Calibration Status
- Manual Calibration
- Manual Calibration Status
- Relay Adjust

Pressure Sensor

- Pressure Sensor Calibration

Input Current

- Input Current Calibration

Tuning

Mode and Protection

- Instrument Mode
- Change Instrument Mode
- Protection
- Change Protection

Travel Tuning(8)

- Travel Tuning Set
- Integrator Deadzone
- Travel Integral Gain
- MLFB Gain
- Travel Proportional Gain
- Travel Velocity Gain

Restore/Restart

Restore

- Restore User Configuration
- Restore Factory Configuration

Device Information

Identification

- Tag
- Long Tag
- Polling Address
- Manufacturer
- Device Type
- Application Mode
- Device Identifier

Serial Numbers

- Work Order Number
- Valve Serial Number
- Instrument Serial Number

Revisions

- HART Protocol Revision
- Device Revision
- Hardware Revision
- Main Firmware Revision

DD Information

- Device Type
- DD Rev 1
- Build Date
- Build Number
- Copyright

Blink Device

- Blink Device

NOTES:
8 FOR THROTTLING ONLY

Figure B-4.1 Diagnostics

Diagnostics

Alerts

Device Status:
[NE107 Category] or Good

Refresh Alerts

<Active Alert Name 1>[9]
- <Active Alert Name 1>
- NE107 Category
- Description
- Recommended Action

History
- Event Log
- Read Event Log Records
- Previous Records
- Next Records
- Clear Event Log

Proof Test

Valve Diagnostics[2]
- Stroke Valve

Variables

Mapped Variables
- Primary Variable
- Secondary Variable
- Tertiary Variable
- Quaternary Variable

Status
- Protection Status
- Device Status
- Run Time
- Power Ups
- Current Temperature

Travel/Pressure
- Travel
  - Input Current
  - Setpoint
  - Travel
  - Cycle Count
- Pressures
  - Supply Pressure
  - Output A[2]
  - Output B[3]
  - Differential Pressure[4]

Stroke Information[5]
- Stroke Open Baseline
- Stroke Open Time
- Stroke Close Baseline
- Stroke Close Time

Configuration
- Setpoint Source
- Application Mode
- Zero Power Condition
- Restart Latch Options
- Restart Latch Status
- Relay Type

Outputs
- Switch 1
  - Status
  - State
- Switch 2
  - Status
  - State

Trends

Setpoint/Travel

Travel/Pressure

Communication

Mode and Protection
- Instrument Mode
- Change Instrument Mode
- Protection
- Change Protection

Wired
- Polling Address

Simulation

Continued on next page

NOTES:
2 FOR DOUBLE-ACTING AND SINGLE-ACTING
3 FOR DOUBLE-ACTING AND REVERSE-ACTING
4 FOR DOUBLE-ACTING ONLY
5 FOR ON/OFF TIER ONLY
9 THERE CAN BE MORE THAN ONE ALERT LISTED

Figure B-4.2 Diagnostics

Simulation

Simulation Control
- Enable/Disable Simulation

Electronics
- Non-Volatile Memory Defect
- Drive Signal Alert
- Transmitter Open Circuit
- Reference Voltage Fail
- Drive Current Fail
- Electronic Defect

Information Status
- Instrument Misconfigured
- Instrument Time is Approximate
- Calibration In Progress
- Diagnostic in Progress
- Temperature High
- Temperature Low

Miscellaneous
- Loop Current Fixed
- Loop Current Saturated
- Instrument Mode Alert

Sensor
- Minor Loop Sensor Failure Alert
- Travel Sensor Failure
- Pressure Sensor Failure
- Temperature Sensor Failure

Travel
- Travel Deviation
- Travel High
- Travel Low
- Travel Limit/Cutoff High
- Travel Limit/Cutoff Low

Travel History
- Cycle Count High
- Travel Accumulator
- Stroke Open Time[5]
- Stroke Close Time[5]

Pressure
- Supply Pressure High
- Supply Pressure Low
- Port A Overpressurized

Calibration

Travel
- Auto Calibration
- Auto Calibration Status
- Manual Calibration
- Manual Calibration Status
- Relay Adjust

Pressure Sensor
- Pressure Sensor Calibration

Input Current
- Input Current Calibration

Tuning

Mode and Protection
- Instrument Mode
- Change Instrument Mode
- Protection
- Change Protection

Travel Tuning[8]
- Travel Tuning Set
- Integrator Deadzone
- Travel Integral Gain
- Integral Gain
- MLFB Gain
- Travel Proportional Gain
- Travel Velocity Gain

Device Information

Identification
- Tag
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- Polling Address
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- Instrument Serial Number

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- HART Protocol Revision
- Device Revision
- Hardware Revision
- Main Firmware Revision

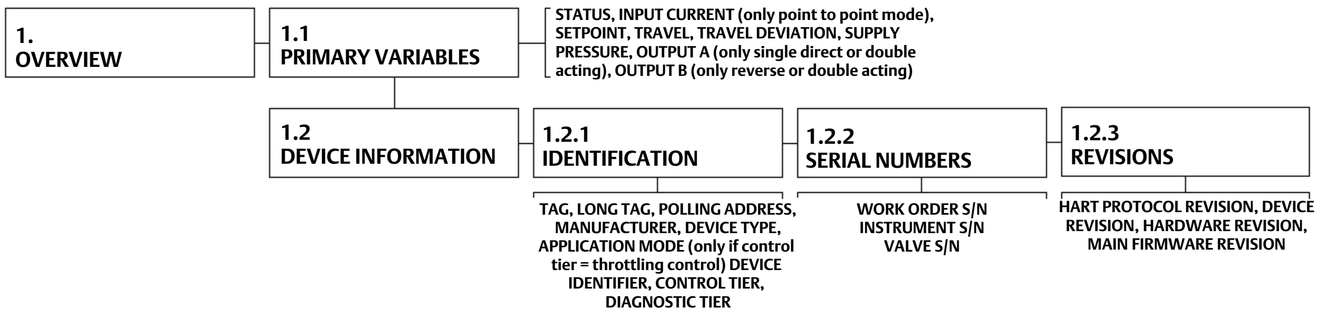
DD Information
- Device Type
- DD Rev 1
- Build Date
- Build Number
- Copyright

Blink Device
- Blink Device

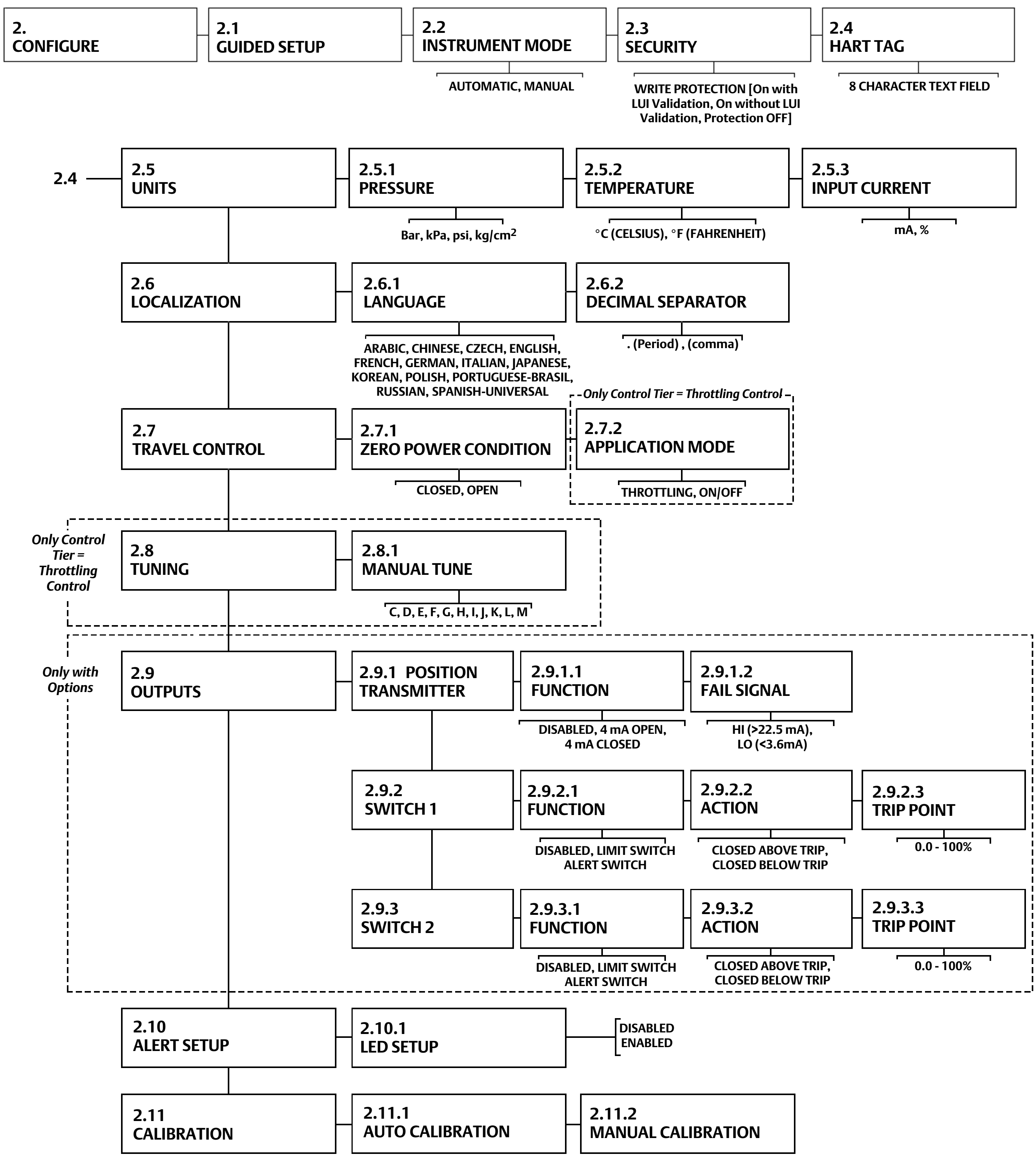
NOTE:
5 FOR ON/OFF TIER ONLY

Appendix C Local User Interface (LUI) Flow Chart

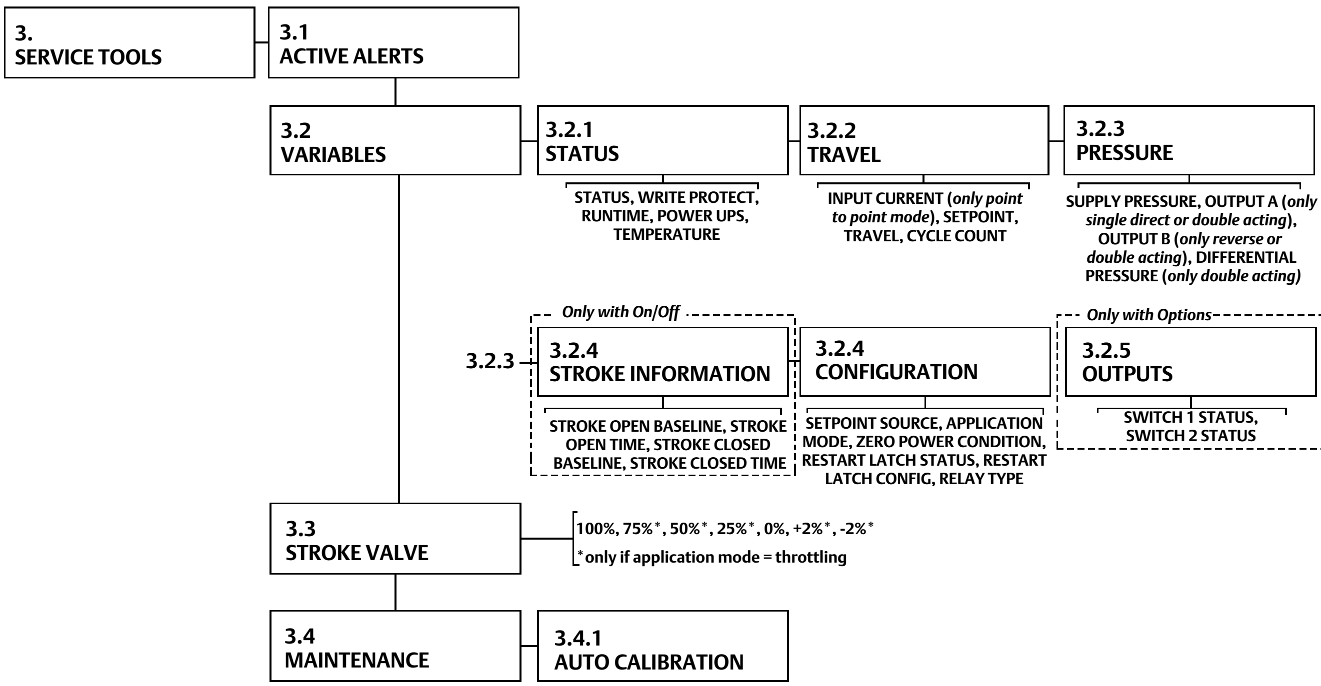
Overview



Configure


2. CONFIGURE
2.1 GUIDED SETUP
2.2 INSTRUMENT MODE
AUTOMATIC, MANUAL
2.3 SECURITY
WRITE PROTECTION [On with LUI Validation, On without LUI Validation, Protection OFF]
2.4 HART TAG
8 CHARACTER TEXT FIELD
2.4
2.5 UNITS
2.5.1 PRESSURE
Bar, kPa, psi, kg/cm2
2.5.2 TEMPERATURE
°C (CELSIUS), °F (FAHRENHEIT)
2.5.3 INPUT CURRENT
mA, %
2.6 LOCALIZATION
2.6.1 LANGUAGE
ARABIC, CHINESE, CZECH, ENGLISH, FRENCH, GERMAN, ITALIAN, JAPANESE, KOREAN, POLISH, PORTUGUESE-BRASIL, RUSSIAN, SPANISH-UNIVERSAL
2.6.2 DECIMAL SEPARATOR
. (Period) , (comma)
Only Control Tier = Throttling Control
2.7 TRAVEL CONTROL
2.7.1 ZERO POWER CONDITION
CLOSED, OPEN
2.7.2 APPLICATION MODE
THROTTLING, ON/OFF
Only Control Tier = Throttling Control
2.8 TUNING
2.8.1 MANUAL TUNE
C, D, E, F, G, H, I, J, K, L, M
Only with Options
2.9 OUTPUTS
2.9.1 POSITION TRANSMITTER
2.9.1.1 FUNCTION
DISABLED, 4 mA OPEN, 4 mA CLOSED
2.9.1.2 FAIL SIGNAL
HI (>22.5 mA), LO (<3.6mA)
2.9.2 SWITCH 1
2.9.2.1 FUNCTION
DISABLED, LIMIT SWITCH ALERT SWITCH
2.9.2.2 ACTION
CLOSED ABOVE TRIP, CLOSED BELOW TRIP
2.9.2.3 TRIP POINT
0.0 - 100%
2.9.3 SWITCH 2
2.9.3.1 FUNCTION
DISABLED, LIMIT SWITCH ALERT SWITCH
2.9.3.2 ACTION
CLOSED ABOVE TRIP, CLOSED BELOW TRIP
2.9.3.3 TRIP POINT
0.0 - 100%
2.10 ALERT SETUP
2.10.1 LED SETUP
DISABLED
ENABLED
2.11 CALIBRATION
2.11.1 AUTO CALIBRATION
2.11.2 MANUAL CALIBRATION

Service Tools



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.

ANSI (acronym)
The acronym ANSI stands for the American National Standards Institute

ANSI Class
Valve pressure/temperature rating.

Application Mode
Determines the control available for the instrument.

If the Control Tier is Throttling Control (TC) the user may select between the following two options. However, if the Control Tier is Discrete Control (DC) the Application Mode will always be On/Off. See also Control Tier.

- **Throttling:** Travel Output of 0% through 100%
- **On/Off:** Travel Output of 0% or 100%

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.

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 Tier
Determines the control available for the instrument. See also Application Mode.

- **Throttling Control (TC):** Supports Throttling and On/Off Application Modes
- **Discrete Control (DC):** Supports On/Off Application Mode

Controller
A device that operates automatically to regulate a controlled variable.

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 High Alert Point
An adjustable value which, when exceeded, activates the Cycle Counter Alert. Valid entries are 0 to 4 billion cycles.

Deviation
Usually, the difference between setpoint 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 handheld communicator and the instrument.

Drive Signal
The signal to the I/P converter from the printed circuit board in the Front Cover Assembly. 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 the user configured Drive Signal Deviation Time, the Drive Signal Alert is active. If none of the conditions exist, the alert is cleared.

If Zero Power Condition = Closed

The alert is active when:

drive signal <10% and calibrated travel >3%

drive signal >90% and calibrated travel <97%

If Zero Power Condition = Open

The alert is active when:

drive signal <10% and calibrated travel <97%

drive signal >90% and calibrated travel >3%

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 Signal
Indicates to the instrument the actual position of the valve. The travel sensor provides the feedback signal to the instrument's printed circuit board in the Front Cover Assembly.

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.

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 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 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 Current Units
Units in which the input current is displayed and maintained in the instrument.

Input Range
The input range that corresponds to the travel range.

Instrument Mode

Determines if the instrument responds to its analog input signal. There are two instrument modes:

- Automatic (AUTO): 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 Automatic
- Manual (MAN): The instrument output does not change in response to analog input changes when the instrument mode is in Manual.
- Local Override (LO): Local Override is when the device is latched to a Zero Power Condition. It occurs when the device is reset in Automatic mode which is caused by loss of power. Local Override is not a user configurable instrument mode.

Some setup parameters can be changed only when the instrument mode is in Manual.

Instrument Serial Number

The serial number assigned to the instrument 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.

Local User Interface

The screen and navigation buttons located physically on the instrument.

LUI (acronym)

The acronym LUI stands for Local User Interface.

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.

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.

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 63.

Pressure Sensor

A FIELDVUE instrument internal device that senses pneumatic pressure. The DVC7K has 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 is the primary master.

In contrast, a secondary master is not often permanently wired to a field instrument. The handheld communicator or a computer running Device Description (DD) software communicating through a HART modem could be considered a secondary master.

Note: If one type of master changes the instrument mode to Manual, the same type must change it back to Automatic. For example, if a device set up as a primary master changes the instrument mode to Manual, a device set up as a primary master must be used to to change the instrument mode back to Automatic.

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.

Setpoint Source

Defines where the instrument reads its set point. The following setpoint sources are available for a FIELDVUE Instrument:

- Input Current: 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.

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.

Stroke Close Time Fast Trip Point

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 greater than 0 seconds.

Stroke Close Time Slow Trip Point

Maximum time, in seconds, for the travel to decrease through the entire ranged travel. This rate is applied to any travel decrease. Valid entries are greater than 0 seconds.

Stroke Open Time Fast Trip Point

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 greater than 0 seconds.

Stroke Open Time Slow Trip Point

Maximum 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 greater than 0 seconds.

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 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 Deadband

The percent (%) of ranged travel around the travel reference point where no change in alert status will occur. This prevents the alert from toggling on and off when operating near the alert point. Valid entries are 0% to 100%. Typical value is between 2% and 5%. See also, Travel Deviation Alert, Travel High Alert, Travel Low Alert, Cycle Count High Alert, and Travel Accumulator Alert.

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 between the Travel Target and the Travel is less than the Travel Deviation Alert Point minus the Travel Deadband.

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 360 seconds.

Travel High Alert

The Travel High Alert is active if the travel exceeds the travel high alert point. Once the alert is active, the alert will clear when the travel falls below the travel high alert point minus the Travel Deadband.

Travel High Alert Point

Value of the travel, in percent of ranged travel, which, when exceeded, activates the Travel High Alert. Valid entries are -25% to 125%.

Travel Limit High Point

Defines the cutoff point for the travel, in percent of ranged travel. Once travel exceeds the cutoff, the drive signal is set to either maximum or minimum, depending on the Zero Power Condition. 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 Limit Low Point

Defines the cutoff point for the travel, in percent of ranged travel. Once travel exceeds the cutoff, the drive signal is set to either maximum or minimum, depending on the Zero Power Condition. 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 Limit/Cutoff High Alert

The Travel Limit/Cutoff High Alert is active if either the Travel Threshold High Action is Cutoff and Travel exceeds the Travel Cutoff High Point or Travel Threshold High Action is Limit and Travel exceeds the Travel Limit High Point.

Travel Limit/Cutoff Low Alert

The Travel Limit/Cutoff Low Alert is active if either the Travel Threshold Low Action is Cutoff and Travel is below the Travel Cutoff Low Point or Travel Threshold Low Action is Limit and Travel falls below the Travel Limit Low Point.

Travel Low Alert

The Travel Low Alert is active if the travel is below the travel low alert points. Once the alert is active, the alert will clear when the travel exceeds the travel low alert point plus the Travel Deadband.

Travel Low Alert Point

Value of the travel, in percent of ranged travel, which, when exceeded, activates the Travel Alert Low Alert. Valid entries are -25% to 125%.

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 in the DVC7K is the Hall Effect sensor that measures the position of the magnetic assembly.

Travel Sensor Motion

Increasing or decreasing air pressure causes the magnet assembly to move up or down or the rotary shaft to turn clockwise or counterclockwise. Guided Setup asks if it can move the valve to determine travel.

Travel Threshold High Action

Allows the user to control the behavior when the setpoint is high. The user can select from the following options:

- **Disabled:** no action occurs when the setpoint is high
- **Cutoff:** Travel Limit/Cutoff High will activate if the Travel exceeds the Travel Limit High Point.
- **Limit:** Travel Limit/Cutoff High will activate if the Travel exceeds the Travel Cutoff High Point.

Travel Threshold Low Action

Allows the user to control the behavior when the setpoint is low. The user can select from the following options:

- **Disabled:** no action occurs when the setpoint is low.
- **Cutoff:** Travel Limit/Cutoff Low will activate if the Travel is below the Travel Limit Low Point.
- **Limit:** Travel Limit/Cutoff Low will activate if the Travel is below the Travel Cutoff Low Point.

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.

Write Protection

Determines if commands from a HART device can calibrate and/or configure certain parameters in the instrument. There are three types of write protection:

- On with LUI Validation: Prohibits changing protected setup parameters and calibration. The instrument is Protected until write protection is disabled from the Local User Interface (LUI).
- On without LUI Validation: Prohibits changing protected setup parameters and calibration. The instrument is Protected until write protection is write protection to be disabled from the software (example: device description).
- Off: Permits both configuration and calibration. The instrument is ”unprotected.”

Zero Power Condition

The position of the valve (open or closed) when the electrical power to the instrument is removed. Zero Power Condition (ZPC) is determined by relay and actuator action as follows:

Single Acting Direct (Relay C) Upon loss of electrical power instrument goes to zero air output at port A.

Double Acting (Relay A) Upon loss of electrical power instrument goes to full supply air output at port B. A goes to zero air output.

Single Acting Reverse (Relay B) Upon loss of electrical power instrument goes to full supply air output at Port B.

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Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

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