

Using the HART® Tri-Loop™ HART-to-Analog Signal Converter with Fisher™ FIELDVUE™ Digital Valve Controllers

Tri-Loop Signal Converter Operation with FIELDVUE Digital Valve Controllers

The Rosemount™ 333U (alarm high) and 333D (alarm low) HART Tri-Loop HART-to-Analog Signal Converter is used to read values from the digital valve controller and present them as 4 to 20 mA signals accessible to AI channels on traditional host systems. This device accepts a HART burst command 3 from a smart instrument and converts it into up to three 4 to 20 mA analog output signals. The output signals then can be read by a control system's analog input channels. Refer to the appropriate HART Field Device Specification instruction manual supplement for command 3 variables (see Related Fisher Documents on page 2).

Figure 1 shows a typical installation of the Tri-Loop signal converter with a digital valve controller.

The Tri-Loop signal converter may be used with the following FIELDVUE digital valve controllers:

- DVC6200 or DVC6000 HW2 digital valve controllers

Note

Burst mode communication is not supported with HART 7 in firmware revisions 2-6.

- DVC2000 digital valve controllers
- DVC6000 digital valve controllers

The Tri-Loop signal converter outputs will go to their fail state when any of the following occur:

- there is a loss of burst mode communication from the smart instrument
- there is a device malfunction reported by the smart instrument, or
- there is a loss of power to channel 1 of the signal converter.

Loss of power to channel 1 will cause all channels to go to their fail state. Loss of power to either channel 2 or 3 will not affect the remaining channels.

When in its fail state, a 333U signal converter generates a current of 21.75 mA or greater. A 333D generates a fail state current which is less than 3.75 mA.

The Tri-Loop signal converter is not recommended for FIELDVUE digital valve controller in split-range applications.

Installation Considerations

The Tri-Loop HART-to-analog signal converter design allows three different din-rail mounting options:

- Asymmetrical 32mm G rail
- Symmetrical 35 x 7.5 mm top hat rail
- Symmetrical 35 x 15 mm top hat rail

As shown in figure 1, the signal converter must be installed on the safe side of an Intrinsic Safety (IS) barrier. It is approved for FM and CSA ordinary location, and bears the CE marking to indicate compliance with applicable EC directives. It is not approved nor designed for nuclear-qualified applications.

Figure 1 also shows a HART filter as a convenient connection point for the two additional connections to the loop wires. The necessity of a HART filter depends upon the control system; the Tri-Loop signal converter does not add a requirement for a filter. If a filter is required, the HF340 din rail mount filter provides a convenient method for connecting field wiring between the control system, the signal converter and the digital valve controller. If no filter is required, the HF341 is available without filter action (straight-through).

Related Fisher Documents

DVC6200 and DVC6200 SIS

- DVC6200 Series Digital Valve Controller Quick Start Guide ([D103556X012](#))
- DVC6200 HW2 Digital Valve Controller Instruction Manual ([D103605X012](#))
- HART Field Device Specification for DVC6200 Digital Valve Controller ([D103639X012](#))
- DVC6200 HW1 Digital Valve Controller Instruction Manual ([D103409X012](#))
- HART Field Device Specification for DVC6000 and DVC6200 HW1 Digital Valve Controller ([D103649X012](#))
- DVC6200 SIS Digital Valve Controller Instruction Manual ([D103557X012](#))
- HART Field Device Specification for DVC6200 SIS Digital Valve Controller ([D103638X012](#))

DVC6000 HW2

- DVC6005 Series Remove Mount Digital Valve Controller Quick Start Guide ([D103784X012](#))
- DVC6200 HW2 Digital Valve Controller Instruction Manual ([D103785X012](#))
- HART Field Device Specification for DVC6000 HW2 Digital Valve Controller ([D103782X012](#))

DVC2000

- DVC2000 Digital Valve Controller Quick Start Guide ([D103203X012](#))
- DVC2000 Digital Valve Controller Instruction Manual ([D103176X012](#))
- HART Field Device Specification for DVC2000 Digital Valve Controller ([D103783X012](#))

Miscellaneous

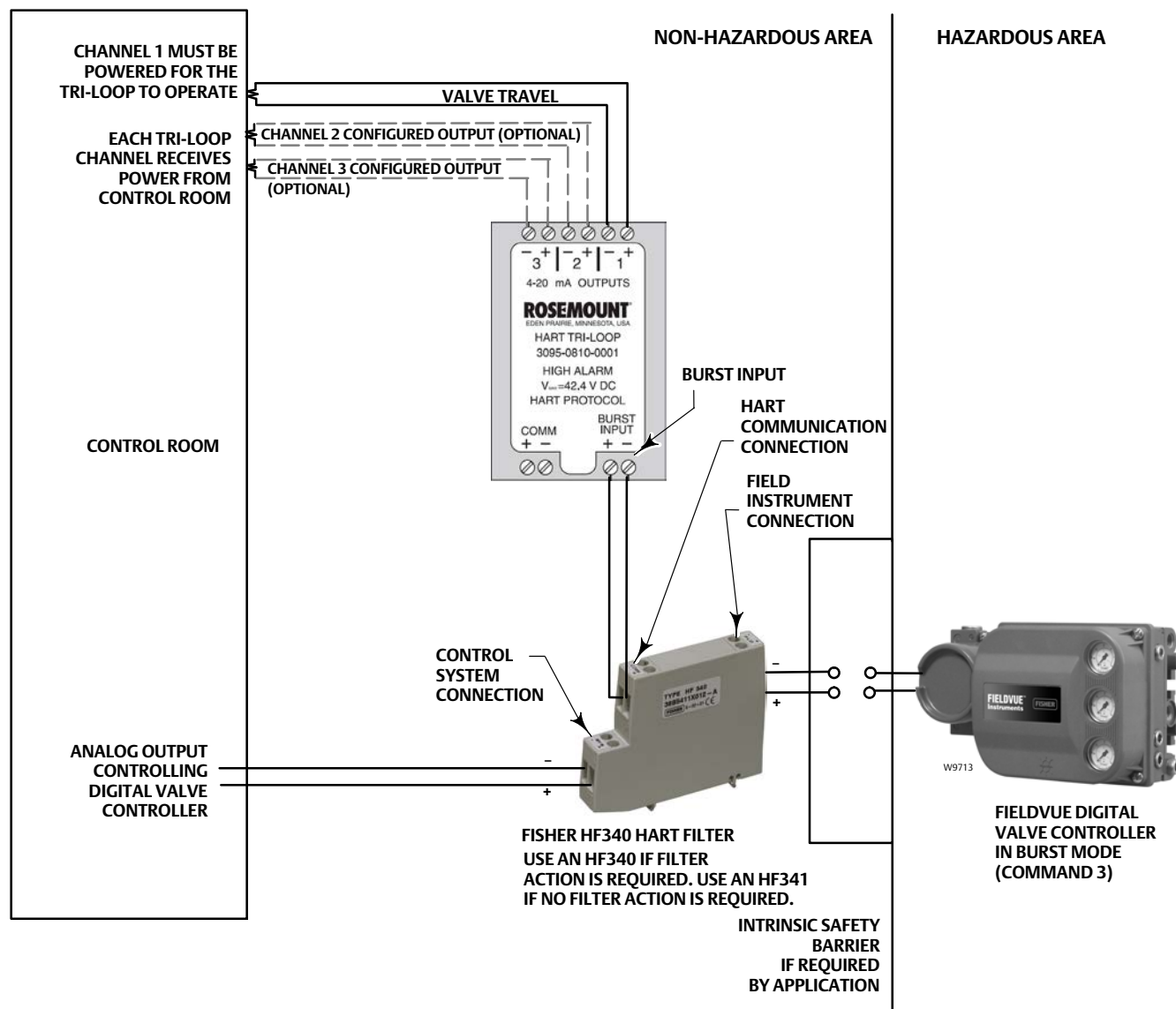
- HF340 Filter Instruction Manual ([D102796X012](#))

DVC6000 (Supported)

- DVC6000 Digital Valve Controllers Instruction Manual ([D102794X012](#))
- HART Field Device Specification for DVC6000 and DVC6200 HW1 Digital Valve Controller ([D103649X012](#))

Documents are available from your Emerson sales office, Local Business Partner, or at Fisher.com.

Figure 1. Example HART Tri-Loop HART-to-Analog Signal Converter Installation with a FIELDVUE DVC6200 Digital Valve Controller



Tri-Loop Signal Converter Configuration From Fisher

The Tri-Loop HART-to-analog signal converter ships from Fisher pre-configured with one of the choices listed in table 1. As shown in the table the unit is available with either a high or low fail state. The channel 1 variable is always travel and the channel 2 variable is always travel target. Channel 3 is disabled, but can be configured by the user, using a Trex Device Communicator, a 475 Field Communicator, or AMS Suite: Intelligent Device Manager.

Table 1. Tri-Loop HART-to-Analog Signal Converter Configuration Choices

| TRI-LOOP MODEL | FAIL STATE | CHANNEL ⁽¹⁾ | | |
|--|------------|------------------------|----------------------|-----------------------|
| | | 1 (Travel) | 2 (Travel Target) | 3 (Not Configured) |
| 333D | Low | 0 to 100% | 0 to 100% | Disabled |
| 333U | High | | | |
| 1. Configurations of channels are preset, but can be changed with the HART or Field Communicator, or AMS Device Manager. | | | | |

The burst message from FIELDVUE digital valve controllers configured for fail-open actuators associates 0% travel with an open valve. Therefore, channel 1 of the Tri-Loop should be configured to provide a 20 mA output when the valve is open and a 4 mA output when the valve is closed (range is 100 to 0 rather than 0 to 100).

Power Source

Each output channel on the signal converter connects to a separate control system analog input channel. Each channel operates on a terminal voltage of 11 to 42.4 VDC. The signal converter is powered from the channel 1 power source. Lack of power on channel 1 will produce error states on channels 2 and 3.

Enabling Burst Mode

For a FIELDVUE digital valve controller to communicate with the Tri-Loop signal converter, the burst mode must be enabled. You can use a Field Communicator, ValveLink software, or AMS Device Manager to enable burst mode in the digital valve controller.

Note

The path to access Burst varies depending on the DD revision of the digital valve controller. Refer to the appropriate instruction manual to verify path.

Note

HART devices connected to an instrument which is actively using burst mode communication may experience some HART communication errors. You should not be concerned unless the errors do not clear after a few moments or if they disrupt ValveLink

software configuration, calibration, or diagnostic activities. If a disruption occurs, disable burst mode during these activities and turn it back on when completed.

Once burst mode is enabled, the digital valve controller will continue to burst HART command 3 until the burst mode is disabled. Even if instrument power is lost, the instrument will continue to burst command 3 when power is restored.

Troubleshooting

Refer to table 2 for Tri-Loop diagnostic status messages.

To reach the Diagnostic Status menu using the Trex communicator or the Field Communicator, select *Diagnostics/Service, Test Device, and Status* (fast key sequence 1-1-1).

Other Tri-Loop parameters can be access using the Trex communicator, Field Communicator or AMS Device Manager. Refer to figure 2 for the menu tree, and table 3 for the fast-key sequence.

Table 2. Tri-Loop Diagnostic Status Messages⁽¹⁾

| Error Message | Interpretation |
|--|---|
| CH1 Burst mode variable 'Not a Number' | Not applicable to the digital valve controller (always "off") |
| CH2 Burst mode variable 'Not a Number' | |
| CH3 Burst mode variable 'Not a Number' | |
| CH1 Burst mode variable at saturation | |
| CH2 Burst mode variable at saturation | |
| CH3 Burst mode variable at saturation | |
| Burst mode message is invalid | Parity or checksum error with burst message |
| Burst mode message timeout | Tri-Loop not receiving burst command "3" |
| Non-volatile memory checksum error | Internal problem with the Tri-Loop |
| Field device reporting failure | "Device Malfunction" status from the digital valve controller |
| CH1 Channel output is fixed | Channel commanded into "Output fixed" mode |
| CH2 Channel output is fixed | |
| CH3 Channel output is fixed | |
| CH1 Burst mode message units error | Channel's units do no match digital valve controllers units |
| CH2 Burst mode message units error | |
| CH3 Burst mode message units error | |
| 1. "ON" = error is in effect. "OFF" = error is not active. | |

Figure 2. Menu Tree for the Tri-Loop Signal Converter

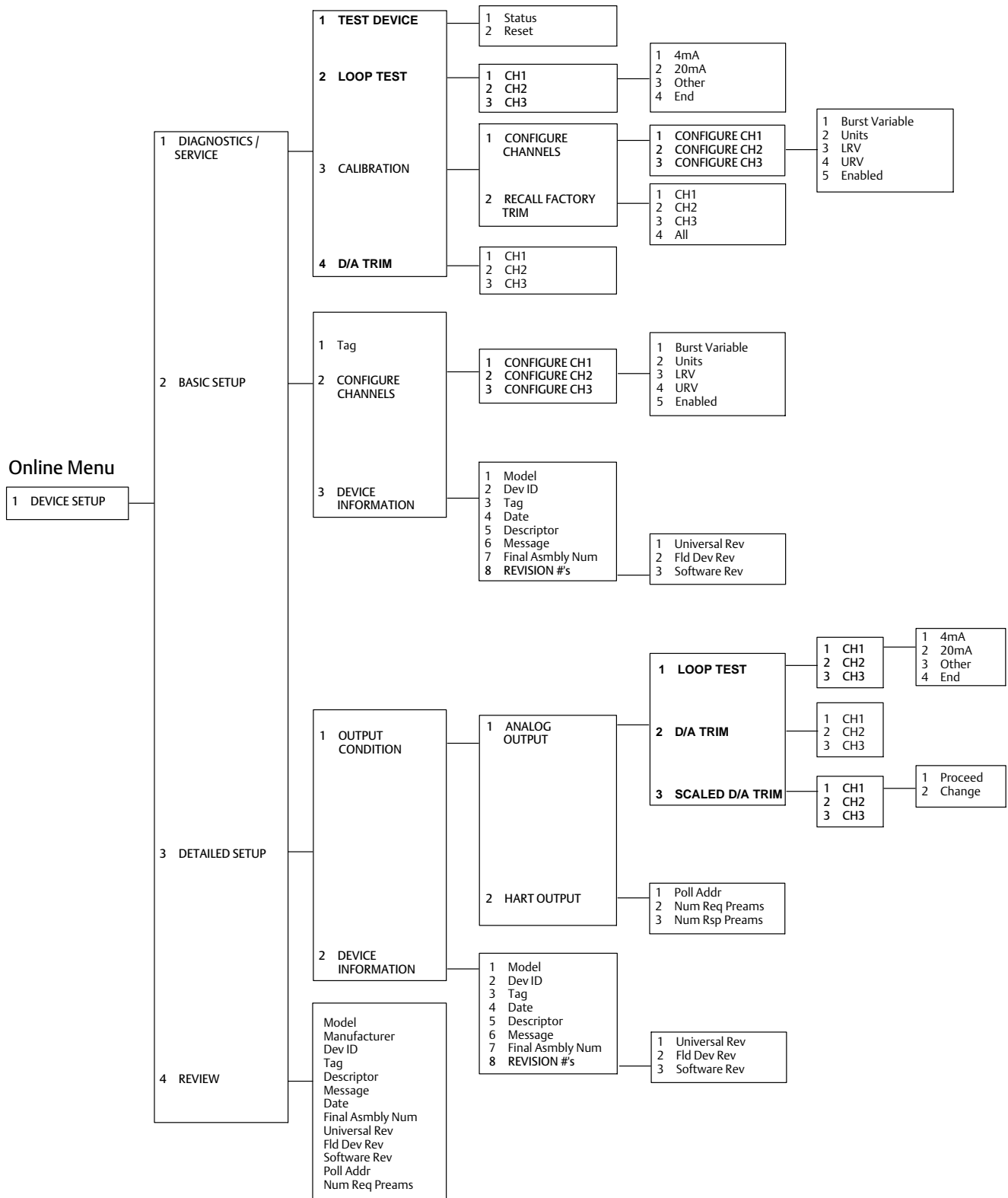


Table 3. Fast-Key Sequence for the Tri-Loop Signal Converter

| Function | Fast-Key Sequence | Function | Fast-Key Sequence |
|-------------------------------------|-------------------|-----------------------------------|-------------------|
| 20 mA (Loop Test) | 1-2-1-2 | Final Asmbly Num (Detailed Setup) | 3-2-7 |
| 20 mA (Output Condition) | 3-1-1-1-1-2 | Fld Dev Rev (Basic Setup) | 2-3-8-2 |
| 4 mA (Loop Test) | 1-2-1-1 | Fld Dev Rev (Detailed Setup) | 3-2-8-2 |
| 4 mA (Output Condition) | 3-1-1-1-1-1 | LRV (Calibration) | 1-3-1-1-3 |
| All (Calibration) | 1-3-2-4 | LRV (Configure Channels) | 2-2-1-3 |
| Burst Variable (Calibration) | 1-3-1-1-1 | Message (Basic Setup) | 2-3-6 |
| Burst Variable (Configure Channels) | 2-2-1-1 | Message (Detailed Setup) | 3-2-6 |
| CH1 (Calibration) | 1-3-2-1 | Model (Basic Setup) | 2-3-1 |
| CH1 (D/A TRIM) | 1-4-1 | Model (Detailed Setup) | 3-2-1 |
| CH1 (Output Condition) | 3-1-1-2-1 | Num Req Preams | 3-1-2-2 |
| CH2 (Calibration) | 1-3-2-2 | Num Rsp Preams | 3-1-2-3 |
| CH2 (D/A TRIM) | 1-4-2 | Other (Loop Test) | 1-2-1-3 |
| CH2 (Output Condition) | 3-1-1-2-2 | Other (Output Condition) | 3-1-1-1-1-3 |
| CH3 (Calibration) | 1-3-2-3 | Poll Addr | 3-1-2-1 |
| CH3 (D/A TRIM) | 1-4-3 | Proceed (Scaled D/A Trim) | 3-1-1-3-1-1 |
| CH3 (Output Condition) | 3-1-1-2-3 | Reset | 1-1-2 |
| Change (Scaled D/A Trim) | 3-1-1-3-1-2 | Software Rev (Basic Setup) | 2-3-8-3 |
| Date (Basic Setup) | 2-3-4 | Software Rev (Detailed Setup) | 3-2-8-3 |
| Date (Detailed Setup) | 3-2-4 | Status | 1-1-1 |
| Descriptor (Basic Setup) | 2-3-5 | Tag | 2-1 |
| Descriptor (Detailed Setup) | 3-2-5 | Tag (Basic Setup) | 2-3-3 |
| Dev ID (Basic Setup) | 2-3-2 | Tag (Detailed Setup) | 3-2-3 |
| Dev ID (Detailed Setup) | 3-2-2 | Units (Calibration) | 1-3-1-1-2 |
| Enabled (Calibration) | 1-3-1-1-5 | Units (Configure Channels) | 2-2-1-2 |
| Enabled (Configure Channels) | 2-2-1-5 | Universal Rev (Basic Setup) | 2-3-8-1 |
| End (Loop Test) | 1-2-1-4 | Universal Rev (Detailed Setup) | 3-2-8-1 |
| End (Output Condition) | 3-1-1-1-1-4 | URV (Calibration) | 1-3-1-1-4 |
| Final Asmbly Num (Basic Setup) | 2-3-7 | URV (Configure Channels) | 2-2-1-4 |

Related Rosemount Documents

For more information on the Tri-Loop HART-to-analog signal converter, refer to the following Rosemount documents, available from the Rosemount Measurement division:

- Model 333 HART Tri-Loop HART-to-Analog Signal Converter product manual ([00809-0100-4754](#))
- Model 333 HART Tri-Loop HART-to-Analog Signal Converter product data sheet ([00813-0100-4754](#))
- AMS Trex Device Communicator [User Guide](#)
- 475 Field Communicator [User's Manual](#)

Documents are available from your Emerson sales office or at [Emerson.com](#).

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