Errata Sheet
for
FIELDVUE® DVC6000f Series Digital Valve Controllers Quick Start Guide, Form 5778
(Quick Start Guides dated December 2005 and April 2005)
and
FIELDVUE® DVC6000f Series Digital Valve Controllers Instruction Manual, Form 5774
(Instruction Manuals dated March 2006, March 2005, and December 2004)

NOTE: This errata sheet replaces all existing errata sheets for the DVC6000f Quick Start Guide and Instruction Manual.

The first two pages of this errata sheet cover all versions of the DVC6000f quick start guide and instruction manual listed above. Refer to the appropriate quick start guide or manual for all other information and instructions pertaining to the DVC6000f digital valve controller.

The NEPSI certification information found on page 3, 4, and 5 of this errata sheet is only applicable to the current DVC6000f quick start guide (December 2005) and instruction manual (March 2006).

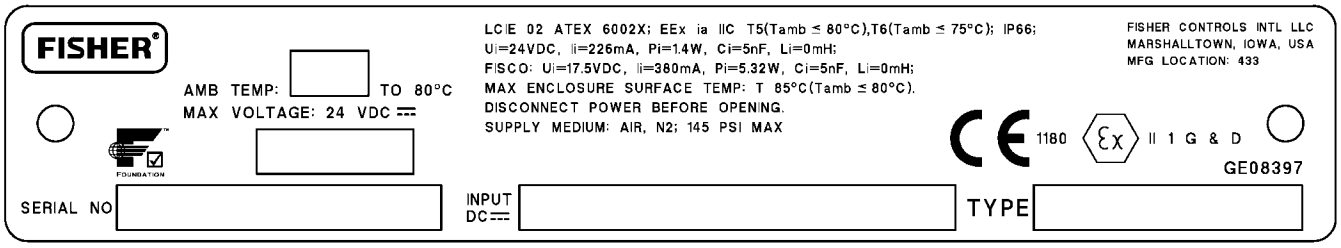
Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

DVC6000f Quick Start Guide Form – 5778

For Quick Start Guides dated December 2005 and April 2005

Replace *figure 5-5. ATEX Nameplate; Intrinsically Safe, Dust* with the updated figure below. The intrinsically safe maximum voltage entity parameter (U_i) has been corrected to read 24 VDC.



TYPE DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS

Figure 5–5. ATEX Nameplate; Intrinsic Safety, Dust

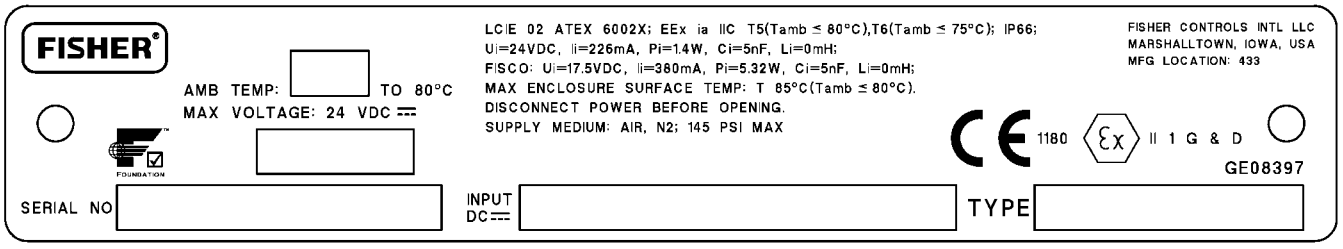
DVC6000f Instruction Manual – Form 5774

For Instruction Manuals dated March 2006 and March 2005

Replace the Intrinsic Safety, Dust-Tight nameplate for **Type DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS** in **figure D-7** with the updated nameplate below. The intrinsically safe maximum voltage entity parameter (U_i) has been corrected to read 24 VDC.

For Instruction Manuals dated December 2004

Replace the Intrinsic Safety, Dust-Tight nameplate for **Type DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS** in **figure D-3** with the updated nameplate below. The intrinsically safe maximum voltage entity parameter (U_i) has been corrected to read 24 VDC.



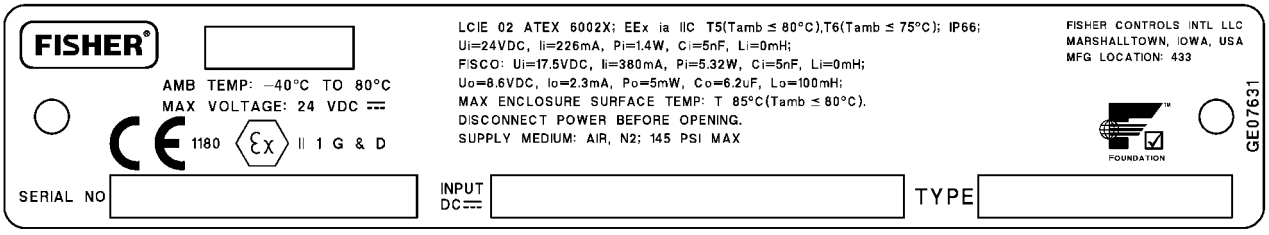
TYPE DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS

For Instruction Manuals dated March 2006 and March 2005

Replace the Intrinsic Safety, Dust-Tight nameplate for **Type DVC6005F** in **figure D-7** with the updated nameplate below. The intrinsically safe maximum voltage entity parameter (U_i) has been corrected to read 24 VDC.

For Instruction Manuals dated December 2004

Replace the Intrinsic Safety, Dust-Tight nameplate for **Type DVC6005F** in **figure D-3** with the updated nameplate below. The intrinsically safe maximum voltage entity parameter (U_i) has been corrected to read 24 VDC.



TYPE DVC6005F

NEPSI Approvals

Page 3, 4, and 5 of this errata sheet contain instructions for safe use in in hazardous locations and nameplates (see figure 1) for NEPSI approvals. Refer to the DVC6000f Series FIELDVUE® Digital Valve Controller Instruction Manual – Form 5774, dated March 2006 or the DVC6000f Series FIELDVUE® Digital Valve Controller Quick Start Guide – Form 5778, dated December 2005, for all other information and instructions pertaining to the DVC6000f digital valve controller.

Special Instructions for Safe Use and Installations in Hazardous Locations

Certain nameplates may carry more than one approval, and each approval may have unique installation requirements and/or conditions of safe use.

After reading and understanding these special special conditions of use, proceed with standard installation procedures as found in the quick start guide or instruction manual.

⚠ WARNING

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

NEPSI Intrinsic Safety

Notes for Safe Use of the Certified Product

DVC6000f series digital valve controllers (designated as controller hereafter) have been proved to be in conformity with the requirements specified in the national standards GB3836.1-2000 and GB3836.4-2000 through inspections conducted by National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (NEPSI). The Ex marking for the products is Ex ia II CT6/T5/T4, and their Ex certificate number is GYJ06280. When using the product, the user should pay attention to the items stated below:

1. The correlation of approved DVC6000f Series digital valve controllers in specific product type, Ex marking and operating ambient temperature this time is as follows:

Mounting Style		Product Type	Ex Marking	Ambient Temperature
Integral Mounting		DVC6010f DVC6020f DVC6030f	Ex ia II CT6	−40°C to +75°C
			Ex ia II CT5	−40°C to +80°C
Separate Mounting	Main Unit	DVC6005f	Ex ia II CT6	−40°C to +75°C
			Ex ia II CT5	−40°C to +80°C
	Feedback Unit	DVC6015	Ex ia II CT6	−60°C to +80°C
		DVC6025	Ex ia II CT5	−60°C to +95°C
		DVC6035	Ex ia II CT4	−60°C to +125°C

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

3. The values for intrinsically safe parameters and maximum internal equivalent parameters of the controller are as follow:

Max Input Voltage Ui (V)	Max Input Current Ii (mA)	Max Input Power Pi (W)	Max Internal Equivalent Parameter	
			Ci (nF)	Li (mH)
24	226	1.4	5	0
17.5	380	5.32	5	0

4. As a main unit of a separate design product, the values for intrinsically safe output parameters of DVC6005f are as follows:

Max Output Voltage Uo (V)	Max Output Current Io (mA)	Max Output Power Po (mW)	Max Equivalent Parameter allowed	
			Co (μF)	Lo (mH)
8.6	2.3	5	8.2	100

5. While the controller forms an intrinsically safe explosion protection system together with an associated equipment, the following requirements must be met: Uo ≤ Ui, Io ≤ Ii, Po ≤ Pi, Co ≥ Ci + Cc, Lo ≥ Li + Lc.

Note

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

6. The connection cable between the product and associated equipment should be a cable with

insulation screen and sheath. The screen should be connected to the ground.

7. An appropriate heat-resistant cable should be selected for use with the controller in an application where the ambient temperature exceeds 70°C.

8. When using and maintaining the product in the field, cleaning the plastic surface of the product with dry cloth is strictly prohibited to avoid the risk of producing electrical spark.

9. The user must not be allowed to replace at will the electric components of the product on his own to avoid damage to the intrinsically safe performance of explosion protection of the product.

10. The user must follow the relevant rules specified by the product instruction manual, the “13th Section of Electric Equipment Used in Explosive Gaseous Environment: Maintenance of Electric Equipment Used in Explosive Gaseous Environment” of GB3836.13-1997 standard, the “15th Section of Electric Equipment Used in Explosive Gaseous Environment: Electric Installation in Hazardous Locations (except for coal mine)” of GB3836.15-2000 standard and the “Electric installation construction and acceptance test code for electric equipment mounting engineering in an explosive and fire-hazardous environment” of GB50257:1996 standard while performing installation, operation, and maintenance for the product.

NEPSI Flameproof

DVC6000f Series digital valve controllers (designated as controller hereafter) have been proved to be in conformity with the requirements specified in the national standards GB3836.1-2000 and GB3836.2-2000 through inspections conducted by National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation (NEPSI). The Ex markings for the products are Ex d II B+H2T6/T5 (DVC6010f, DVC6020f, and DVC6030f only), Ex d II BT6/T5 (DVC6005f only), and Ex d II CT6/T5/T4 (DVC6015, DVC6025, and DVC6035 only) respectively and their Ex certificate number is GYJ06279. When using the product , the user should pay attention to the items stated below:

1. The correlation of this approved DVC6000f Series digital valve controllers in specific product type, Ex marking, and operating ambient temperature is as follows:

Product Type	Ex Marking	Ambient Temperature
DVC6010f, DVC6020f, DVC6030f (integral design)	Ex d II B+H_2T6	−40°C to +75°C
	Ex d II B+H_2T5	−40°C to +80°C
DVC6005f (main unit of separate design)	Ex d II BT6	−40°C to +75°C
	Ex d II BT5	−40°C to +80°C
DVC6015, DVC6025, DVC6035 (feedback units of separate design	Ex d II CT6	−60°C to +80°C
	Ex d II CT5	−60°C to +95°C
	Ex d II CT4	−60°C to +125°C

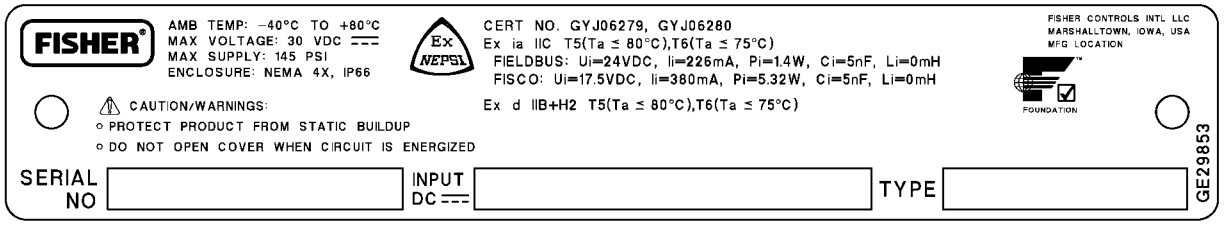
2. The enclosure of the controller provides a grounding terminal, and the user should install a reliable grounding wire connected to it when mounting and using the controller.

3. The controller’s cable entrance (1/2 NPT) must be fitted with a cable entry device which is Ex−approved through inspection of explosion protection, in conformity with relevant standards of GB3836.1-2000 and GB3836.2-2000 and has a corresponding rating of explosion protection.

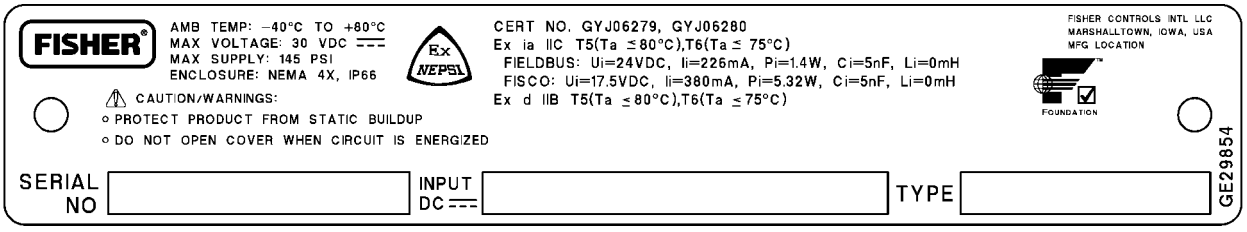
4. An appropriate heat−resistant cable should be selected for use with the controller in an application where the ambient temperature exceeds 70°C.

5. The principle of “Opening equipment’s cover is strictly prohibited while its is active” must be abided by when using and maintaining the controller in the field.

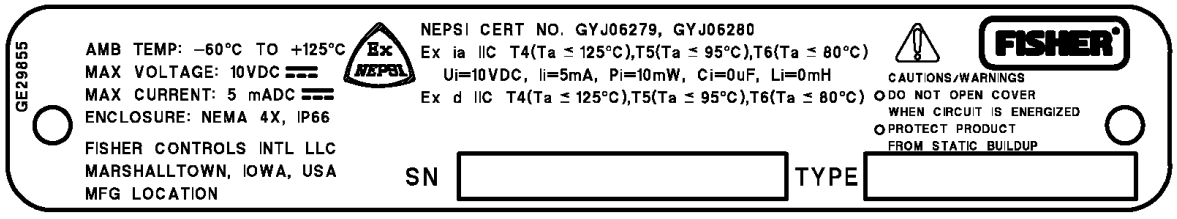
6. The user must follow the relevant rules specified by the product instruction manual, the “13th Section of Electric Equipment Used in Explosive Gaseous Environment: Maintenance of Electric Equipment Used in Explosive Gaseous Environment” of GB3836.13-1997 standard, the “15th Section of Electric Equipment Used in Explosive Gaseous Environment: Electric Installation in Hazardous Locations (except for coal mine)” of GB3836.15-2000 standard and the “Electric installation construction and acceptance test code for electric equipment mounting engineering in an explosive and fire-hazardous environment” of GB50257:1996 standard while performing installation, operation, and maintenance for the product.



TYPE DVC6010f, DVC6020f, DVC6030f



TYPE DVC6005f



TYPE DVC6015, DVC6025, DVC6035

Figure 1. NEPSI Intrinsic Safety and Flameproof Nameplates

DVC6000f Series

Errata Sheet
April 2007

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Instruction Manual
Form 5774
March 6, 2006

FIELDVUE® DVC6000f Series Digital Valve Controllers

This manual applies to:

Standard Control (SC)
Fieldbus Control (FC)
Fieldbus Logic (FL)

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Principle of Operation 8
PlantWeb® Alerts 9
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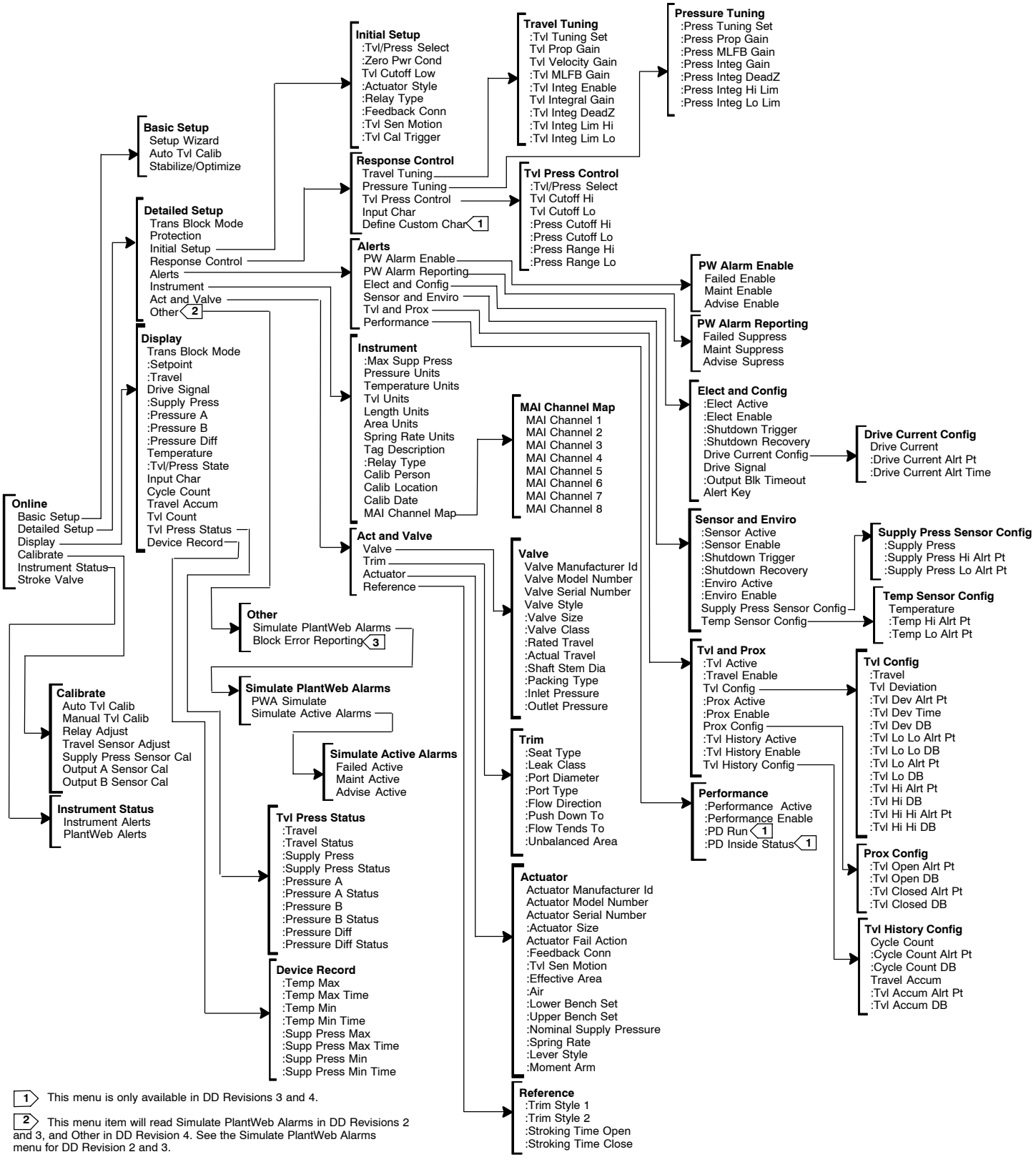
Model 375 Field Communicator Menu Tree for FIELDVUE® DVC6000f Digital Valve Controllers Transducer Block



1 This menu is only available in DD Revisions 3 and 4.

2 This menu item will read Simulate PlantWeb Alarms in DD Revisions 2 and 3, and Other in DD Revision 4. See the Simulate PlantWeb Alarms menu for DD Revision 2 and 3.

3 This menu item only available in DD Revision 4

Menu Tree for Model 375 Field Communicator
DVC6000f DD Revision 2, 3, and 4

375 Field Communicator Transducer Block Menu Structure

PARAMETER LABEL	PARAMETER NAME	MENU STRUCTURE
Actual Travel	ACTUAL_TRAVEL	TB > Detailed Setup > Act and Valve > Valve > Actual Travel
Actuator Fail Action	ACT_FAIL_ACTION	TB > Detailed Setup > Act and Valve > Actuator > Actuator Fail Action
Actuator Manufacturer Id	ACT_MAN_ID	TB > Detailed Setup > Act and Valve > Actuator >Actuator Manufacturer Id
Actuator Model Number	ACT_MODEL_NUM	TB > Detailed Setup > Act and Valve > Actuator > Actuator Model Number
Actuator Serial Number	ACT_SN	TB > Detailed Setup > Act and Valve > Actuator > Actuator Serial Number
Actuator Size	ACTUATOR_SIZE	TB > Detailed Setup > Act and Valve > Actuator > Actuator Size
Actuator Style	ACTUATOR_STYLE	TB > Detailed Setup > Initial Setup > Actuator Style
Advise Active	ADVISE_ACTIVE	TB > Instrument Status > PlantWeb Alerts > Advise Active
Advise Enable	ADVISE_ENABLE	TB > Detailed Setup > Alerts > PW Alarm Enable > Advise Enable
Advise Suppress	ADVISE_MASK	TB > Detailed Setup > Alerts > PW Alarm Reporting > Advise Suppress
Air	AIR	TB > Detailed Setup > Act and Valve > Actuator > Air
Alert Key	ALERT_KEY	TB > Detailed Setup > Alerts > Elect and Config > Alert Key
Area Units	AREA_UNITS	TB > Detailed Setup > Instrument > Area Units
Calib Date	XD_CAL_DATE	TB > Detailed Setup > Instrument > Calib Date
Calib Location	XD_CAL_LOC	TB > Detailed Setup > Instrument > Calib Location
Calib Person	XD_CAL_WHO	TB > Detailed Setup > Instrument > Calib Person
Cycle Count	CYCLE_COUNT	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Config > Cycle Count
Cycle Count Alrt Pt	CYCLE_COUNT_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Config > Cycle Count Alrt Pt
Cycle Count DB	CYCLE_COUNT_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Config > Cycle Count DB
Drive Current	DRIVE_CURRENT	TB > Detailed Setup > Alerts > Elect and Config > Drive Current
Drive Current Alrt Pt	DRIVE_CURRENT_ALRT_PT	TB > Detailed Setup > Alerts > Elect and Config > Drive Current Alrt Pt
Drive Current Alrt Time	DRIVE_CURRENT_TIME	TB > Detailed Setup > Alerts > Elect and Config > Drive Current Alrt Time
Drive Signal	DRIVE_SIGNAL	TB > Detailed Setup > Alerts > Elect and Config > Drive Signal
Effective Area	EFFECTIVE_AREA	TB > Detailed Setup > Act and Valve > Actuator > Effective Area
Elect Active	ELECT_ACTIVE	TB > Detailed Setup > Alerts > Elect and Config > Elect Active or TB > Instrument Status > Instrument Alerts
Elect Enable	ELECT_ENABLE	TB > Detailed Setup > Alerts > Elect and Config > Elect Enable
Enviro Active	ENVIRO_ACTIVE	TB > Detailed Setup > Alerts > Sensor and Enviro > Enviro Active or TB > Instrument Status > Instrument Alerts
Enviro Enable	ENVIRO_ENABLE	TB > Detailed Setup > Alerts > Sensor and Enviro > Enviro Enable
Failed Active	FAILED_ACTIVE	TB > Instrument Status > PlantWeb Alerts > Failed Active
Failed Enable	FAILED_ENABLE	TB > Detailed Setup > Alerts > PW Alarm Enable > Failed Enable
Failed Suppress	FAILED_MASK	TB > Detailed Setup > Alerts > PW Alarm Reporting > Failed Suppress
Feedback Conn	FEEDBACK_CONN	TB > Detailed Setup > Act and Valve > Actuator > Feedback Conn
Flow Direction	FLOW_DIRECTION	TB > Detailed Setup > Act and Valve > Trim > Flow Direction
Flow Tends To	FLOW_TENDS_TO	TB > Detailed Setup > Act and Valve > Trim > Flow Tends To
Inlet Pressure	INLET_PRESSURE	TB > Detailed Setup > Act and Valve > Valve > Inlet Pressure
Input Char	INPUT_CHAR	TB > Detailed Setup > Response Control > Input Char
Leak Class	LEAK_CLASS	TB > Detailed Setup > Act and Valve > Trim > Leak Class
Length Units	LENGTH_UNITS	TB > Detailed Setup > Instrument > Length Units
Lever Style	LEVER_STYLE	TB > Detailed Setup > Act and Valve > Actuator > Lever Style
Lower Bench Set	LOWER_BENCH_SET	TB > Detailed Setup > Act and Valve > Actuator > Lower Bench Set
MAI Channel 1	MAI_CHANNEL_1	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 1
MAI Channel 2	MAI_CHANNEL_2	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 2
MAI Channel 3	MAI_CHANNEL_3	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 3
MAI Channel 4	MAI_CHANNEL_4	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 4
MAI Channel 5	MAI_CHANNEL_5	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 5
MAI Channel 6	MAI_CHANNEL_6	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 6
MAI Channel 7	MAI_CHANNEL_7	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 7
MAI Channel 8	MAI_CHANNEL_8	TB > Detailed Setup > Instrument > MAI Channel Map > MAI Channel 8
Maint Active	MAINT_ACTIVE	TB > Instrument Status > PlantWeb Alerts > Maint Active
Maint Enable	MAINT_ENABLE	TB > Detailed Setup > Alerts > PW Alarm Enable > Maint Enable
Maint Suppress	MAINT_MASK	TB > Detailed Setup > Alerts > PW Alarm Reporting > Maint Suppress
Max Supp Press	MAX_SUPP_PRESS	TB > Detailed Setup > Instrument > Max Supp Press
Moment Arm	MOMENT_ARM	TB > Detailed Setup > Act and Valve > Actuator > Moment Arm
NominalSupplyPressure	NOMINAL_SUPPLY_PRESSURE	TB > Detailed Setup > Act and Valve > Actuator > Nominal Supply Pressure
Outlet Pressure	OUTLET_PRESSURE	TB > Detailed Setup > Act and Valve > Valve > Outlet Pressure
Output Blk Timeout	OUTPUT_BLK_TIMEOUT	TB > Detailed Setup > Alerts > Elect and Config > Output Blk Timeout

–Continued–

375 Field Communicator Transducer Block Menu Structure (Continued)

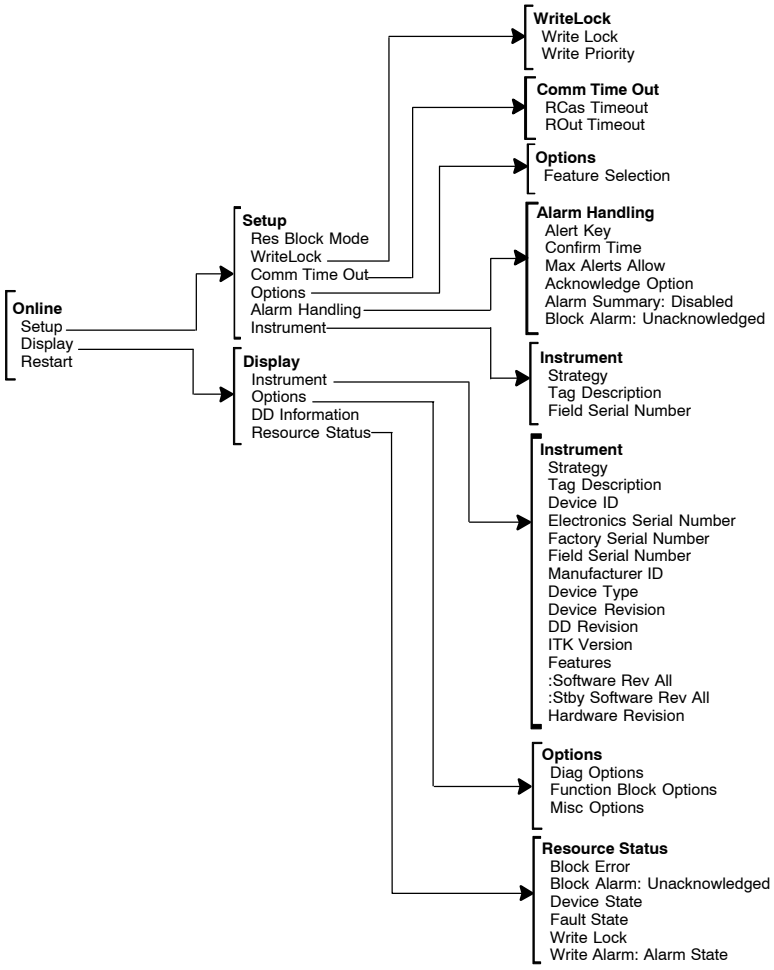
PARAMETER LABEL	PARAMETER NAME	MENU STRUCTURE
Packing Type	PACKING_TYPE	TB > Detailed Setup > Act and Valve > Valve > Packing Type
PD Inside Status	PD_STATUS	TB > Detailed Setup > Alerts > Performance > PD Status
PD Run	PD_RUN	TB > Detailed Setup > Alerts > Performance > PD Run
Performance Active	PERF_ACTIVE	TB > Detailed Setup > Alerts > Performance > Performance Active or TB > Instrument Status > Instrument Alerts
Performance Enable	PERF_ENABLE	TB > Detailed Setup > Alerts > Performance Enable
Port Diameter	PORT_DIAMETER	TB > Detailed Setup > Act and Valve > Trim > Port Diameter
Port Type	PORT_TYPE	TB > Detailed Setup > Act and Valve > Trim > Port Type
Press Cutoff Hi	PRESS_CUTOFF_HI	TB > Detailed Setup > Response Control > Tvl/Press Control > Press Cutoff Hi
Press Cutoff Lo	PRESS_CUTOFF_LO	TB > Detailed Setup > Response Control > Tvl/Press Control > Press Cutoff Lo
Press Integ DeadZ	PRESS_INTEG_DEADZ	TB > Detailed Setup > Response Control > Pressure Tuning > Press Integ DeadZ
Press Integ Gain	PRESS_INTEG_GAIN	TB > Detailed Setup > Response Control > Pressure Tuning > Press Integ Gain
Press MLFB Gain	PRESS_MLFB_GAIN	TB > Detailed Setup > Response Control > Pressure Tuning > Press MLFB Gain
Press Prop Gain	PRESS_PROP_GAIN	TB > Detailed Setup > Response Control > Pressure Tuning > Press Prop Gain
Press Range Hi	PRESS_RANGE_HI	TB > Detailed Setup > Response Control > Tvl/Press Control > Press Range Hi
Press Range Lo	PRESS_RANGE_LO	TB > Detailed Setup > Response Control > Tvl/Press Control > Press Range Lo
Press Tuning Set	PRESS_TUNING_SET	TB > Detailed Setup > Response Control > Pressure Tuning > Press Tuning Set
Pressure A	PRESSURE_A.VALUE	TB > Display > Tvl Press Status > Pressure A
Pressure A Status	PRESSURE_A.STATUS	TB > Display > Tvl Press Status > Pressure A Status
Pressure B	PRESSURE_B.VALUE	TB > Display > Tvl Press Status > Pressure B
Pressure B Status	PRESSURE_B.STATUS	TB > Display > Tvl Press Status > Pressure B Status
Pressure Diff	PRESSURE_DIFF.VALUE	TB > Display > Pressure Diff
Pressure Diff Status	PRESSURE_DIFF.STATUS	TB > Display > Tvl Press Status > Pressure Diff Status
Pressure Units	PRESSURE_UNITS	TB > Detailed Setup > Instrument > Pressure Units
Prox Active	PROX_ACTIVE	TB > Detailed Setup > Alerts > Tvl and Prox > Prox Active or TB > Instrument Status > Instrument Alerts
Prox Enable	PROX_ENABLE	TB > Detailed Setup > Alerts > Tvl and Prox > Prox Enable
Push Down To	PUSH_DOWN_TO	TB > Detailed Setup > Act and Valve > Trim > Push Down To
PWA Simulate	PWA_SIMULATE	TB > Detailed Setup > Simulate PlantWeb Alarms > PWA Simulate
Rated Travel	RATED_TRAVEL	TB > Detailed Setup > Act and Valve > Valve > Rated Travel
Relay Type	RELAY_TYPE	TB > Detailed Setup > Initial Setup > Relay Type
Seat Type	SEAT_TYPE	TB > Detailed Setup > Act and Valve > Trim > Seat Type
Setpoint	FINAL_VALUE.VALUE	TB > Display > Setpoint
Sensor Active	SENSOR_ACTIVE	TB > Detailed Setup > Alerts > Sensor and Enviro > Sensor Active or TB > Instrument Status > Instrument Alerts
Sensor Enable	SENSOR_ENABLE	TB > Detailed Setup > Alerts > Sensor and Enviro > Sensor Enable
Shaft Stem Dia	SHAFT_STEM_DIA	TB > Detailed Setup > Act and Valve > Valve > Shaft Stem Dia
Shutdown Recovery	SHUTDOWN_RECOVERY	TB > Detailed Setup > Alerts > Elect and Config > Shutdown Recovery
Shutdown Trigger	SHUTDOWN_TRIGGER	TB > Detailed Setup > Alerts > Elect and Config > Shutdown Trigger
Spring Rate	SPRING_RATE	TB > Detailed Setup > Act and Valve > Actuator > Spring Rate
Spring Rate Units	SPRING_RATE_UNITS	TB > Detailed Setup > Instrument > Spring Rate Units
Stroking Time Close	STROKING_TIME_CLOSE	TB > Detailed Setup > Act and Valve > Reference > Stroking Time Close
Stroking Time Open	STROKING_TIME_OPEN	TB > Detailed Setup > Act and Valve > Reference > Stroking Time Open
Supply Press	SUPPLY_PRESS.VALUE	TB > Detailed Setup > Alerts > Sensor and Enviro > Supply Press Sensor Config > Supply Press
Supply Press Hi Alrt Pt	SUP_PRES_HI_ALRT_PT	TB > Detailed Setup > Alerts > Sensor and Enviro > Supply Press Sensor Config > Supply Press Hi Alrt Pt
Supply Press Lo Alrt Pt	SUP_PRES_LO_ALRT_PT	TB > Detailed Setup > Alerts > Sensor and Enviro > Supply Press Sensor Config > Supply Press Lo Alrt Pt
Supp Press Max	SUPP_PRESS_MAX	TB > Display > Device Record > Supp Press Max
Supp Press Max Time	SUPP_PRESS_MAX_TIME	TB > Display > Device Record > Supp Press Max Time
Supp Press Min	SUPP_PRESS_MIN	TB > Display > Device Record > Supp Press Min
Supp Press Min Time	SUPP_PRESS_MIN_TIME	TB > Display > Device Record > Supp Press Min Time
Supply Press Status	SUPPLY_PRESSURE.STATUS	TB > Display > Tvl Press Status > Supply Press Status
Tag Description	TAG_DESC	TB > Detailed Setup > Instrument > Tag Description
Temperature	TEMPERATURE	TB > Detailed Setup > Alerts > Sensor and Enviro > Temp Sensor Config > Temperature
Temp Hi Alrt Pt	TEMP_HI_ALRT_PT	TB > Detailed Setup > Alerts > Sensor and Enviro > Temp Sensor Config > Temp Hi Alrt Pt
Temp Lo Alrt Pt	TEMP_LO_ALRT_PT	TB > Detailed Setup > Alerts > Sensor and Enviro > Temp Sensor Config > Temp Lo Alrt Pt
Temp Max	TEMP_MAX	TB > Display > Device Record > Temp Max
Temp Max Time	TEMP_MAX_TIME	TB > Display > Device Record > Temp Max Time
Temp Min	TEMP_MIN	TB > Display > Device Record > Temp Min

–Continued–

375 Field Communicator Transducer Block Menu Structure (Continued)

PARAMETER LABEL	PARAMETER NAME	MENU STRUCTURE
Temp Min Time	TEMP_MIN_TIME	TB > Display > Device Record > Temp Min Time
Temperature Units	TEMPERATURE_UNITS	TB > Detailed Setup > Instrument > Temperature Units
Travel	TRAVEL.VALUE	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Travel
Travel Accum	TRAVEL_ACCUM	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Config > Travel Accum
Travel Enable	TRAVEL_ENABLE	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Enable
Travel Status	TRAVEL.STATUS	TB > Display > Tvl Press Status > Travel Status
Trim Style 2	TRIM_STYLE_2	TB > Detailed Setup > Act and Valve > Reference > Trim Style 2
Trim Style 1	TRIM_STYLE_1	TB > Detailed Setup > Act and Valve > Reference > Trim Style 1
Tvl Accum Alrt Pt	TVL_ACCUM_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Config > Tvl Accum Alrt Pt
Tvl Accum DB	TVL_ACCUM_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Config > Tvl Accum DB
Tvl Active	TRAVEL_ACTIVE	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl Active or TB > Instrument Status > Instrument Alerts
Tvl Cal Trigger	TVL_CAL_TRIGGER	TB > Detailed Setup > Initial Setup > Tvl Cal Trigger
Tvl Closed Alrt Pt	TVL_CLOSED_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Prox Config > Tvl Closed Alrt Pt
Tvl Closed DB	TVL_CLOSED_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Prox Config > Tvl Closed DB
Tvl Count	TVL_COUNT	TB > Display >Tvl Count
Tvl Cutoff Hi	FINAL_VALUE_CUTOFF_HI	TB > Detailed Setup > Response Control > Tvl/Press Control > Tvl Cutoff Hi
Tvl Cutoff Lo	FINAL_VALUE_CUTOFF_LO	TB > Detailed Setup > Response Control > Tvl/Press Control > Tvl Cutoff Lo
Tvl Dev Alrt Pt	TVL_DEV_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Dev Alrt Pt
Tvl Deviation	TRAVEL_DEVIATION	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Deviation
Tvl Dev Time	TVL_DEV_TIME	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Dev Time
Tvl Dev DB	TVL_DEV_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Dev DB
Tvl Hi Alrt Pt	TVL_HI_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Hi Alrt Pt
Tvl Hi DB	TVL_HI_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Hi DB
Tvl Hi Hi Alrt Pt	TVL_HI_HI_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Hi Hi Alrt Pt
Tvl Hi Hi DB	TVL_HI_HI_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Hi Hi DB
Tvl History Active	TVL_HISTORY_ACTIVE	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Active or TB > Instrument Status > Instrument Alerts
Tvl History Enable	TVL_HISTORY_ENABLE	TB > Detailed Setup > Alerts > Tvl and Prox > Tvl History Enable
Tvl Integ DeadZ	TVL_INTEG_DEADZ	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Integ DeadZ
Tvl Integ Enable	TVL_INTEG_ENABLE	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Integ Enable
Tvl Integ Lim Hi	TVL_INTEG_LIM_HI	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Integ Lim Hi
Tvl Integ Lim Lo	TVL_INTEG_LIM_LO	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Integ Lim Lo
Tvl Integral Gain	SERVO_RESET	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Integral Gain
Tvl Lo Alrt Pt	TVL_LO_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Lo Alrt Pt
Tvl Lo DB	TVL_LO_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Lo DB
Tvl Lo Lo Alrt Pt	TVL_LO_LO_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Lo Lo Alrt Pt
Tvl Lo Lo DB	TVL_LO_LO_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Travel Config > Tvl Lo Lo DB
Tvl MLFB Gain	TVL_MLFB_GAIN	TB > Detailed Setup > Response Control > Travel Tuning > Tvl MLFB Gain
Tvl Open Alrt Pt	TVL_OPEN_ALRT_PT	TB > Detailed Setup > Alerts > Tvl and Prox > Prox Config > Tvl Open Alrt Pt
Tvl Open DB	TVL_OPEN_DB	TB > Detailed Setup > Alerts > Tvl and Prox > Prox Config > Tvl Open DB
Tvl/Press Select	TVL_PRESS_SELECT	TB > Detailed Setup > Response Control > Tvl/Press Control > Tvl/Press Select
Tvl/Press State	TVL_PRESS_STATE	TB > Display > Tvl/Press State
Tvl Prop Gain	SERVO_GAIN	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Prop Gain
Tvl Sen Motion	TRAVEL_SENSOR_MOTION	TB > Detailed Setup > Act and Valve > Actuator > Tvl Sen Motion
Tvl Sen Motion	TRAVEL_SENSOR_MOTION	TB > Detailed Setup > Initial Setup > Tvl Sen Motion
Tvl Tuning Set	TVL_TUNING_SET	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Tuning Set
Tvl Units	TVL_UNITS	TB > Detailed Setup > Instrument > Tvl Units
Tvl Velocity Gain	SERVO_RATE	TB > Detailed Setup > Response Control > Travel Tuning > Tvl Velocity Gain
Unbalanced Area	UNBALANCED_AREA	TB > Detailed Setup > Act and Valve > Trim > Unbalanced Area
Upper Bench Set	UPPER_BENCH_SET	TB > Detailed Setup > Act and Valve > Actuator > Upper Bench Set
Valve Class	VALVE_CLASS	TB > Detailed Setup > Act and Valve > Valve > Class
Valve Manufacturer Id	VALVE_MAN_ID	TB > Detailed Setup > Act and Valve > Valve > Valve Manufacturer Id
Valve Model Number	VALVE_MODEL_NUM	TB > Detailed Setup > Act and Valve > Valve > Valve Model Number
Valve Serial Number	VALVE_SN	TB > Detailed Setup > Act and Valve > Valve > Valve Serial Number
Valve Size	VALVE_SIZE	TB > Detailed Setup > Act and Valve > Valve > Valve Size
Valve Style	VALVE_TYPE	TB > Detailed Setup > Act and Valve > Valve > Valve Style
Zero Pwr Cond	ZERO_PWR_COND	TB > Detailed Setup > Initial Setup > Zero Pwr Cond

Model 375 Field Communicator Menu Tree for FIELDVUE® DVC6000f Digital Valve Controllers Resource Block



Menu Tree for Model 375 Field Communicator
DVC6000f DD Revision 2, 3, and 4

375 Field Communicator Resource Block Menu Structure

PARAMETER LABEL	PARAMETER NAME	MENU STRUCTURE
Acknowledge Option	ACK_OPTION	RB > Setup > Alarm Handling > Acknowledge Option
Alarm Summary: Disabled	ALARM_SUM.DISABLED	RB > Setup > Alarm Handling > Alarm Summary Disabled
Alert Key	ALERT_KEY	RB > Setup > Alarm Handling > Alert Key
Block Alarm: Unacknowledged	BLOCK_ALM.UNACKNOWLEDGED	RB > Setup > Alarm Handling > Block Alarm: Unacknowledged
Block Error	BLOCK_ERR	RB > Display > Resource Status > Block Error
Confirm Time	CONFIRM_TIME	RB > Setup > Alarm Handling > Confirm Time
Device ID	DEVICE_ID	RB > Display > Instrument > Device ID
Device Revision	DEV_REV	RB > Display > Instrument > Device Revision
Device State	RS_STATE	RB > Display > Resource Status > Device State
Device Type	DEV_TYPE	RB > Display > Instrument > Device Type
DD Revision	DD_REV	RB > Display > Instrument > DD Revision
Diag Options	DIAG_OPTIONS	RB > Display > Options > Diag Options
Electronics Serial Number	ELECTRONICS_SN	RB > Display > Instrument > Electronics Serial Number
Factory Serial Number	FACTORY_SN	RB > Display > Instrument > Factory Serial Number
Fault State	FAULT_STATE	RB > Display > Resource Status > Fault State
Features	FEATURES	RB > Display > Instrument > Features
Feature Selection	FEATURE_SEL	RB > Setup > Options > Feature Selection
Field Serial Number	FIELD_SN	RB > Setup > Instrument > Field Serial Number
Function Block Options	FB_OPTIONS	RB > Display > Options > Function Block Options
Hardware Revision	HARDWARE_REV	RB > Display > Instrument > Hardware Revision
ITK Version	ITK_VER	RB > Display > Instrument > ITK Version
Manufacturer ID	MANUFAC_ID	RB > Display > Instrument > Manufacturer ID
Max Alerts Allow	LIM_NOTIFY	RB > Setup > Alarm Handling > Max Alerts Allow
Misc Options	MISC_OPTIONS	RB > Display > Options > Misc Options
RCas Timeout	SHED_RCAS	RB > Setup> Comm Time Out > RCas Timeout
ROut Timeout	SHED_ROUT	RB > Setup > Comm Time Out > ROut Timeout
Software Rev All	SOFTWARE_REVISION.SOFTWARE_REV_ALL	RB > Display > Instrument > Software Rev All
Stby Software Rev All	STBY_SOFTWARE_REV.STBY_SOFTWARE_REV_ALL	RB > Display > Instrument > Stby Software Rev All
Strategy	STRATEGY	RB > Setup > Instrument > Strategy
Tag Description	TAG_DESC	RB > Setup > Instrument > Tag Description
Write Alarm: Alarm State	WRITE_ALM.ALARM_STATE	RB > Display > Resource Status > Write Alarm: Alarm State
Write Lock	WRITE_LOCK	RB > Setup > WriteLock> Write Lock
Write Priority	WRITE_PRI	RB > Setup > WriteLock> Write Priority

THE FIELDVUE® DVC6000f SERIES DIGITAL VALVE CONTROLLER IS A CORE COMPONENT OF THE PLANTWEB™ DIGITAL PLANT ARCHITECTURE. THE DIGITAL VALVE CONTROLLER POWERS PLANTWEB BY CAPTURING AND DELIVERING VALVE DIAGNOSTIC DATA. COUPLED WITH AMS VALVELINK® SOFTWARE, THE DVC6000f PROVIDES USERS WITH AN ACCURATE PICTURE OF VALVE PERFORMANCE, INCLUDING ACTUAL STEM POSITION, INSTRUMENT INPUT SIGNAL AND PNEUMATIC PRESSURE TO THE ACTUATOR. USING THIS INFORMATION, THE DIGITAL VALVE CONTROLLER DIAGNOSES NOT ONLY ITSELF, BUT ALSO THE VALVE AND ACTUATOR TO WHICH IT IS MOUNTED.

FIELDVUE® DVC6000f Series Digital Valve Controller

Section 1 Introduction

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Scope of Manual

This instruction manual includes specifications, installation, operating, and maintenance information for the DVC6000f Series digital valve controllers. The manual describes the functionality of the following FIELDVUE® fieldbus instruments:

Revision (Firmware)	Device Type	Device Revision	DD Compatibility(1)
1.3, 1.4	4601	1	2.0 or later; 4.0 or later recommended

1. Device descriptions can be downloaded from the internet at www.fieldvue.com.

This manual describes device setup using the Model 375 Field Communicator. For information on using AMS ValveLink® Software with the instrument, refer to the appropriate user guide or help.

No person may install, operate, or maintain a DVC6000f Series digital valve controller without first ● being fully trained and qualified in valve, actuator, and accessory installation, operation and maintenance, and ● carefully reading and understanding the contents of this manual. If you have any questions concerning these instructions, contact your Emerson Process Managment™ sales office before proceeding.

Note

Neither Emerson®, Emerson Process Management, Fisher®, nor any of their affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for the selection, use, or maintenance of any product remains with the purchaser and end-user.

Instrument Description

DVC6000f Series digital valve controllers for FOUNDATION™ fieldbus are interoperable, communicating, microprocessor-based, digital-to-pneumatic instruments. In addition to the primary function of converting a digital input signal to a pneumatic output, the DVC6000f Series digital valve controller, using FOUNDATION fieldbus communications protocol, gives easy access to information critical to process operation as well as process control. This can be done using a DeltaV™ console, another FOUNDATION fieldbus system console, or with AMS ValveLink Software.

W9132-1

Figure 1-1. Type DVC6010f Digital Valve Controller Mounted on Type 585C Piston Actuator

DVC6000f Series digital valve controllers can be mounted on single or double-acting sliding-stem actuators, as shown in figure 1-1, or on rotary actuators, as shown in figure 1-2. DVC6000f Series digital valve controllers mount on most Fisher and other manufacturers' rotary and sliding-stem actuators.

DVC6000f Series digital valve controllers are available with several selections of control and diagnostic capability. Control selections include:

- **Standard Control (SC)**— Digital valve controllers with Standard Control have the AO, PID, ISEL, OS, AI, MAI, DO, and four DI function blocks in addition to the resource and transducer blocks.

- **Fieldbus Control (FC)**—Digital valve controllers with Fieldbus Control have the AO function block in addition to the resource and transducer blocks.

- **Fieldbus Logic (FL)**—Digital valve controllers with Fieldbus Logic have the DO, and four DI function blocks, in addition to the resource and transducer block.

The diagnostic capabilities include:

- Performance Diagnostics (PD)
- Advanced Diagnostics (AD)
- Fieldbus Diagnostics (FD)

Figure 1-2. Rotary Control Valve with Type DVC6020f Digital Valve Controller

Performance and Advanced Diagnostics are available with AMS ValveLink Software. They provide visibility to instrument alerts. Fieldbus Diagnostics can be viewed with any host system.

Instrument Blocks

The digital valve controller is a block-based device. For detailed information on the blocks within the digital valve controller, see the Detailed Setup / Blocks section of this manual.

All DVC6000f Series digital valve controllers include the resource and transducer block:

- **Resource Block**—The resource block contains the hardware specific characteristics associated with a device; it has no input or output parameters. The resource block monitors and controls the general operation of other blocks within the device. For example, when the mode of the resource block is Out of Service, it impacts all function blocks.

- **Transducer Block**—The transducer block connects the analog output function block to the I/P converter, relay, and travel sensor hardware within the digital valve controller.

Function Blocks

In addition to the resource and transducer block, the digital valve controller may contain the following function blocks. For additional information on function blocks, refer to Appendix B, FOUNDATION fieldbus Communication.

- **Analog Output (AO) Function Block**—The analog output function block accepts the output from another function block (such as a PID block) and transfers it as an actuator control signal to the transducer block. If the DO block is selected, the AO block is not functional.

- **Proportional-Integral-Derivative (PID) Function Block**—The PID function block performs proportional-plus-integral-plus-derivative control.

- **Input Selector (ISEL) Function block**—The input selector function block selects from up to four inputs and may provide the selected signal as input to the PID block. The input selection can be configured to select the first good input signal; a maximum, minimum or average value; or a hot spare.

- **Output Splitter (OS) Function Block**—The output splitter function block accepts the output from another function block (such as a PID block) and creates two outputs that are scaled or split, according to the user configuration. This block is typically used for split ranging of two control valves.

- **Analog Input (AI) Function Block**—The analog input function block monitors the signal from a DVC6000f sensor or internal measurement and provides it to another block.

- **Multiple Analog Input (AI) Function Block**—The Multiple Analog Input (MAI) function block has the ability to process up to eight DVC6000f measurements and make them available to other function blocks.

- **Discrete Output (DO) Function Block**—The discrete output function block processes a discrete set point and sends it to a specified output channel, which can be transferred to the transducer block for actuator control. In the digital valve controller, the discrete output block provides both normal open/closed control and the ability to position the valve in 5% increments for course throttling applications. If the AO block is selected, the DO block is not functional.

- **Discrete Input (DI) Function Block**—The discrete input function block processes a single discrete input from a DVC6000f and makes it available to other function blocks. In the digital valve controller, the discrete input function block can provide limit switch functionality and valve position proximity detection.

Using This Manual

Procedures that require the use of the Model 375 Field Communicator have the Field Communicator symbol

in the heading.

Also included is the path required to accomplish various tasks; the sequence of steps through the Field Communicator menus. For example, the path to Resource Block Mode is RB > Setup > Res Block Mode.

An overview of the Model 375 Field Communicator resource block and transducer block menu structures are shown at the beginning of this manual. Menu structures for the function blocks are included with each function block section in Detailed Setup / Blocks.

Throughout this document, parameters are typically referred to by their common name or label, followed by the parameter name and index number; for example, Write Priority (WRITE_PRI [39]). However, not all interface systems support the use of the parameter label and instead use only the Parameter Name, followed by the index number, when referring to the block parameters.

Specifications

Specifications for the DVC6000f Series digital valve controllers are shown in table 1-1.

Related Information

Fieldbus Installation and Wiring Guidelines

This manual describes how to connect the fieldbus to the digital valve controller. For a technical description, planning, and installation information for a FOUNDATION fieldbus, refer to the FOUNDATION Fieldbus Technical Overview available from the Fieldbus FOUNDATION and Fieldbus Installations in a DeltaV System available from your Emerson Process Management sales office.

Related Documents

Other documents containing information related to the DVC6000f Series digital valve controllers include:

- FIELDVUE® DVC6000f Series Digital Valve Controller (Bulletin 62.1:DVC6000f)
- FIELDVUE® DVC6000f Series Digital Valve Controllers Quick Start Guide - Form 5778
- AMS ValveLink Help or Documentation
- DeltaV Online Help or documentation
- www.fieldvue.com

Educational Services

For information on available courses for DVC6000f Series digital valve controllers, as well as a variety of other products, contact:

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

Table 1-1. Specifications

Available Configurations

Type DVC6010f: Sliding stem applications
Type DVC6020f: Rotary and long-stroke sliding-stem applications [over 102 mm (4-inch) travel]
Type DVC6030f: Quarter-turn rotary applications

Remote-Mounted Instrument(1)

DVC6005f: Base unit for 2-inch pipestand or wall mounting
DVC6015: Feedback unit for sliding-stem applications
DVC6025: Feedback unit for rotary or long-stroke sliding-stem applications
DVC6035: Feedback unit for quarter-turn rotary applications

DVC6000f Series digital valve controllers can be mounted on Fisher and other manufacturers rotary and sliding-stem actuators.

Function Block Suites

■ Standard Control (throttling control)
Includes AO, PID, ISEL, OS, AI, MAI, DO, and four DI function blocks
■ Fieldbus Control (throttling control)
Contains the AO function block
■ Fieldbus Logic [discrete on/off]
Includes DO, and four DI function blocks

Block Execution Times

AO Block: 25 ms	*AI Block:* 25 ms
PID Block: 30 ms	*MAI BLock:* 40 ms
ISEL Block: 25 ms	*DO Block:* 25 ms
OS Block: 25 ms	*DI Block:* 20 ms

Electrical Input

Voltage Level: 9 to 32 volts
Maximum Current: 18 mA
Reverse Polarity Protection: Unit is not polarity sensitive
Termination: Bus must be properly terminated per ISA SP50 guidelines

Digital Communication Protocol

FOUNDATION fieldbus registered device

Physical Layer Type(s):

121—Low−power signaling, bus−powered, Entity Model I.S.

511—Low−power signaling, bus−powered, FISCO I.S.

Output Signal(2)

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

Supply Pressure(2,6)

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

Steady-State Air Consumption(2,3,4)

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

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

Maximum Output Capacity(3,4)

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

Independent Linearity(2,5)

±0.5% of output span

Electromagnetic Interference (EMI)

Tested per IEC 61326-1 (Edition 1.1). Meets emission levels for Class A equipment (industrial locations) and Class B equipment (domestic locations). Meets immunity requirements for industrial locations (Table A.1 in the IEC specification document). Immunity performance is shown in table 1-2.

−continued−

Table 1-1. Specifications (continued)

Operating Ambient Temperature Limits(6)

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

Electrical Classification

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

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

ATEX — Flameproof, Type n, Intrinsic Safety, and FISCO

IECEx — Flameproof, Type n, Intrinsic Safety, and FISCO

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

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

Connections

Supply Pressure: 1/4-inch NPT female and integral pad for mounting 67CFR regulator
Output Pressure: 1/4-inch NPT female
Tubing: 3/8-inch metal, recommended
Vent: 3/8-inch NPT female
Electrical: 1/2-inch NPT female, M20 adapter optional

Stem Travel

DVC6010f, DVC6015:
0 to 102 mm (4-inches) maximum
0 to 9.5 mm (0.375 inches) minimum
DVC6020f, DVC6025:
0 to 606 mm (23.875 inches) maximum

Shaft Rotation (DVC6020f, DVC6025, DVC6030f and DVC6035)

0 to 50 degrees minimum
0 to 90 degrees maximum

Mounting

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

Weight

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

Remote-Mounted Instruments
DVC6005f Base Unit: 4.1 Kg (9 lbs)
DVC6015 Feedback Unit: 1.3 Kg (2.9 lbs)
DVC6025 Feedback Unit: 1.4 Kg (3.1 lbs)
DVC6035 Feedback Unit: 0.9 Kg (2.0 lbs)

Options

■ Supply and output pressure gauges or ■ Tire valves, ■ Integral mounted filter regulator, ■ Stainless steel housing, module base and terminal box (valve-mounted instruments only)

Declaration of SEP

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

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

1. 3-conductor shielded cable, 22 AWG minimum wire size, is recommended for connection between base unit and feedback unit. Pneumatic tubing between base unit output connection and actuator has been tested to 15 meters (50 feet) maximum without performance degradation.
2. Defined in ISA Standard S51.1.
3. 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.
4. Values at 1.4 bar (20 psig) based on a single-acting direct relay; values at 5.5 bar (80 psig) based on double-acting relay.
5. Typical value. Not applicable for travels less than 19 mm (0.75 inch) or for shaft rotation less than 60 degrees. Also, not applicable to Type DVC6020f digital valve controllers in long-stroke applications.
6. The pressure/temperature limits in this manual and any applicable code or standard should not be exceeded.

Table 1-2. Immunity Performance

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

1. A = No degradation during testing. B = Temporary degradation during testing, but is self-recovering.

Table 1-3. Hazardous Area Classifications for Canada (CSA)

CERTIFICATION BODY	TYPE	CERTIFICATION OBTAINED	ENTITY RATING		TEMPERATURE CODE	ENCLOSURE RATING
CSA	DVC60x0F DVC60x0FS (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C, D,E,F,G per drawing GE04331 (including FISCO)	FIELDBUS		T5($T_{amb} \leq 80°C$)	4X
			V_{max} = 30 Vdc I_{max} = 226 mA C_i = 5 nF L_i = 0 mH			
			FISCO		T5($T_{amb} \leq 80°C$)	4X
			V_{max} = 17.5 Vdc I_{max} = 380 mA Ci = 5 nF Li = 0 mH P_i = 5.32 W			
		(Explosion Proof) Class/Division Class I Division 1 GP B,C,D	– – –		T6($T_{amb} \leq 80°C$)	4X
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	– – –			
	DVC6005F	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C, D,E,F,G per drawing GE07476 (including FISCO)	FIELDBUS		T6($T_{amb} \leq 60°C$)	4X
			V_{max} = 30 Vdc I_{max} = 226 mA C_i = 5 nF L_i = 0 mH	V_{oc} = 8.6 Vdc I_{sc} = 2.3 mA C_a = 6.2 µF L_a = 100 mH		
			FISCO			
			V_{max} = 17.5 Vdc I_{max} = 380 mA C_i = 5 nF L_i = 0 mH	V_{oc} = 8.6 Vdc I_{sc} = 2.3 mA C_a = 6.2 µF L_a = 100 mH		
		(Explosion Proof) Class/Division Class I Division 1 GP C,D	– – –		T6($T_{amb} \leq 60°C$)	
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	– – –		T6($T_{amb} \leq 60°C$)	
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C, D,E,F,G per drawing GE07476	V_{max} = 10 Vdc I_{max} = 4 mA C_i = 0 nF L_i = 0 mH		T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP B,C,D	– – –		T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	4X
		Class I Division 2 GP A,B,C,D Class II Division 1 GP E,F,G Class III Division 1	– – –		T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	4X

Table 1-4. Hazardous Area Classifications for United States (FM)

CERTIFICATION BODY	TYPE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
FM	DVC60x0F DVC60x0FS (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D,E,F,G per drawing GE04332 (including FISCO)	FIELDBUS V_{max} = 24 Vdc I_{max} = 226 mA C_i = 5 nF L_i = 0 mH P_i = 1.4 W FISCO V_{max} = 17.5 Vdc I_{max} = 380 mA C_i = 5 nF L_i = 0 mH P_i = 5.32 W	T5($T_{amb} \leq 80°C$)	4X
		(Explosion Proof) Class/Division Class I, Division 1 GP B,C,D	– – –	T6($T_{amb} \leq 80°C$)	4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	– – –	T6($T_{amb} \leq 80°C$)	4X
	DVC6005F	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C,D,E,F,G per drawing GE07475 (including FISCO)	FIELDBUS V_{max} = 24 Vdc, I_{max} = 226 mA, C_i = 5 nF, L_i = 0 mH, P_i = 1.4 W V_{oc} = 8.6 Vdc, I_{sc} = 2.3 mA, C_a = 6.2 µF, L_a = 100 mH, P_o = 5 mH FISCO V_{max} = 17.5 Vdc, I_{max} = 380 mA, C_i = 5 nF, L_i = 0 mH, P_i = 5.32 W V_{oc} = 8.6 Vdc, I_{sc} = 2.3 mA, C_a = 6.2 µF, L_a = 100 mH, P_o = 5 mW	T6($T_{amb} \leq 60°C$)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP C,D	– – –	T6($T_{amb} \leq 60°C$)	4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	– – –	T6($T_{amb} \leq 60°C$)	4X
	DVC60x5 (x = 1,2,3)	(Intrinsic Safety) Class/Division Class I,II,III Division 1 GP A,B,C, D,E,F,G per drawing GE07475	V_{max} = 10 Vdc I_{max} = 4 mA C_i = 0 nF L_i = 0 mH P_i = 10 mW	T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	4X
		(Explosion Proof) Class/Division Class I Division 1 GP A,B,C,D	– – –	T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	4X
		Class I Division 2 GP A,B,C,D Class II,III Division 1 GP E,F,G Class II,III Division 2 GP F,G	– – –	T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	4X

Table 1-5. Hazardous Area Classifications—ATEX

CERTIFICATE	TYPE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
ATEX	DVC60x0F DVC60x0FS (x = 1,2,3)	⟨Ex⟩ II 1 G D Gas EEx ia IIC T5/T6 - Intrinsic Safety Dust T85°C (Tamb ≤ 80°C)	FIELDBUS U_i = 24 Vdc I_i = 226 mA C_i = 5 nF L_i = 0 mH P_i = 1.4 W FISCO U_i = 17.5 Vdc I_i = 380 mA C_i = 5 nF L_i = 0 mH P_i = 5.32 W	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤75°C)	IP66
		⟨Ex⟩ II 2 G D Gas EEx d IIB+H2 T5/T6 - Flameproof Dust T90°C (Tamb ≤ 85°C)	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		⟨Ex⟩ II 3 G D Gas EEx nCL IIC T5/T6 - Type n Dust T85°C (Tamb ≤ 80°C)	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC6005F	⟨Ex⟩ II 1 G D Gas EEx ia IIC T5/T6 - Intrinsic Safety Dust T85°C (Tamb ≤ 80°C)	FIELDBUS U_i = 24 Vdc, I_i = 226 mA, C_i = 5 nF, L_i = 0 mH, P_i = 1.4 W U_o = 8.6 Vdc, I_o = 2.3 mA, C_a = 6.2 µF, L_a = 100 mH, P_o = 5 mW FISCO U_i = 17.5 Vdc, I_i = 380 mA, C_i = 5 nF, L_i = 0 mH, P_i = 5.32 W U_o = 8.6 Vdc, I_o = 2.3 mA, C_a = 6.2 µF, L_a = 100 mH, P_o = 5 mW	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		⟨Ex⟩ II 2 G D Gas EEx d IIB T5/T6 - Flameproof Dust •T90°C (Tamb ≤ 80°C)	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
		⟨Ex⟩ II 3 G D Gas EEx nL IIC T5/T6 - Type n Dust T85°C (Tamb ≤ 80°C)	– – –	T5(T_{amb} ≤ 80°C) T6 (T_{amb} ≤ 75°C)	IP66
	DVC60x5 (x = 1,2,3)	⟨Ex⟩ II 1 G D Gas EEx ia IIC T4/T5/T6 - Intrinsic Safety Dust •T130°C (Tamb ≤ 125°C)	U_i = 10 Vdc I_i = 4 mA C_i = 0 nF L_i = 0 mH P_i = 5 mW	T4(Tamb ≤ 125°C) T5(Tamb ≤ 95°C) T6(Tamb ≤ 80°C)	IP66
		⟨Ex⟩ II 2 G D Gas EEx d IIC T4/T5/T6 - Flameproof Dust T130°C (Tamb ≤ 125°C)	– – –	T4(Tamb ≤ 125°C) T5(Tamb ≤ 95°C) T6(Tamb ≤ 80°C)	IP66
		⟨Ex⟩ II 3 G D Gas EEx nA IIC T4/T5/T6 - Type n Dust T130°C (Tamb ≤ 125°C)	– – –	T4(Tamb ≤ 125°C) T5(Tamb ≤ 95°C) T6(Tamb ≤ 80°C)	IP66

Table 1-6. Hazardous Area Classifications—IECEx

CERTIFICATE	TYPE	CERTIFICATION OBTAINED	ENTITY RATING	TEMPERATURE CODE	ENCLOSURE RATING
IECEx	DVC60x0F DVC60x0FS (x = 1,2,3)	Gas Ex ia IIC T5/T6 - Intrinsic Safety	FIELDBUS V_{max} = 24 Vdc I_{max} = 226 mA C_i = 5 nF L_i = 0 mH P_i = 1.4 W FISCO V_{max} = 17.5 Vdc I_{max} = 380 mA C_i = 5 nF L_i = 0 mH P_i = 5.32 W	T5($T_{amb} \leq 80°C$) T6 ($T_{amb} \leq 75°C$)	IP66
		Gas Ex d IIB+H2 T5/T6 - Flameproof	– – –	T5($T_{amb} \leq 80°C$) T6 ($T_{amb} \leq 75°C$)	IP66
		Gas Ex nC IIC T5/T6 - Type n	– – –	T5($T_{amb} \leq 80°C$) T6 ($T_{amb} \leq 75°C$)	IP66
	DVC6005F	Gas Ex ia IIC T5/T6 - Intrinsic Safety	FIELDBUS V_{max} = 24 Vdc, I_{max} = 226 mA, C_i = 5 nF, L_i = 0 mH, P_i = 1.4 W; V_{oc} = 8.6 Vdc, I_{sc} = 2.3 mA, C_a = 6.2 µF, L_a = 100 mH, P_o = 5 mH FISCO V_{max} = 17.5 Vdc, I_{max} = 380 mA, C_i = 5 nF, L_i = 0 mH, P_i = 5.32 W; V_{oc} = 8.6 Vdc, I_{sc} = 2.3 mA, C_a = 6.2 µF, L_a = 100 mH, P_o = 5 mH	T5($T_{amb} \leq 80°C$) T6 ($T_{amb} \leq 75°C$)	IP66
		Gas Ex d IIB T5/T6 - Flameproof	– – –	T5($T_{amb} \leq 80°C$) T6 ($T_{amb} \leq 75°C$)	IP66
		Gas Ex nC IIC T5/T6 - Type n	– – –	T5($T_{amb} \leq 80°C$) T6 ($T_{amb} \leq 75°C$)	IP66
	DVC60x5 (x = 1,2,3)	Gas Ex ia IIC T4/T5/T6 - Intrinsic Safety	V_{max} = 10 Vdc I_{max} = 4 mA C_i = 0 nF L_i = 0 mH P_i = 10 mW	T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	IP66
		Gas Ex d IIC T4/T5/T6 - Flameproof	– – –	T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	IP66
		Gas Ex nA IIC T4/T5/T6 - Type n	– – –	T4(Tamb $\leq$ 125°C) T5(Tamb $\leq$ 95°C) T6(Tamb $\leq$ 80°C)	IP66

Section 2 Installation

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Installation

WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before mounting the DVC6000f Series digital valve controller:

- **Always wear protective clothing and eyewear when performing any installation procedures.**
- **Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.**
- **Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure from both sides of the valve.**
- **Vent the pneumatic actuator loading pressure and relieve any actuator spring precompression.**
- **Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

Special Instructions for Safe Use and Installation in Hazardous Locations

Certain nameplates may carry more than one approval, and each approval may have unique installation requirements and/or conditions of safe-use. Special instructions are listed by agency/approval below.

After reading and understanding these special conditions of use, proceed with standard installation procedures.

WARNING

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

CSA

Special Conditions of Safe Use

No special conditions for safe use.

Refer to table 1-3 for approval information, figures D-1 and D-2 for CSA loop schematics, and figure D-3 for the CSA nameplates.

FM

Special Conditions of Safe Use

No special conditions for safe use.

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

ATEX Intrinsic Safety, Dust

Special Conditions for Safe Use

•Type DVC6000f Series, and Type DVC6005f

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

2. The electrical parameters of this equipment must not exceed any following values:
$U_O \leq$ 17.5 V; $I_O \leq$ 380 mA; $P_O \leq$ 5.32 W

3. Operating ambient temperature: –52°C or –40°C to + 85°C

•Type DVC6015, DVC6025, and DVC6035

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

Refer to table 1-5 for additional approval information, and figure D-7 for the the ATEX Intrinsic Safety, Dust nameplates.

ATEX Flameproof, Dust

Special Conditions for Safe Use

•Type DVC6000f Series

Operating ambient temperature: −52°C or −40°C to + 85°C

•Type DVC6005f and Type DVC6015, DVC6025, and DVC6035

Operating ambient temperature as indicated on the nameplate.

Refer to table 1-5 for additional approval information, and figure D-8 for the ATEX Flameproof, Dust nameplates.

ATEX Type n, Dust

Special Conditions for Safe Use

•Type DVC6000f Series

Operating ambient temperature: −52°C or −40°C to + 80°C

•Type DVC6005f and Type DVC6015, DVC6025, and DVC6035

Operating ambient temperature as indicated on the nameplate.

Refer to table 1-5 for additional approval information, and figure D-9 for the ATEX Type n, Dust nameplates.

IECEx Intrinsic Safety, Type n, Flameproof

Conditions of Certification

•Type DVC6000f Series, and Type DVC6005f

Ex ia / Ex d / Ex n

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

•Type DVC6000f Series, Type DVC6005f, and Type DVC6005f and Type DVC6015, DVC6025, and DVC6035

EX d / Ex n

2. Do not open while energized.

Refer to table 1-6 for additional approval information, and figure D-10 for the IECEx nameplates.

Mounting

Type DVC6010f on Sliding-Stem Actuators Up to 102 mm (4 Inches) of Travel

WARNING

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

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

The Type DVC6010f digital valve controller mounts on sliding-stem actuators with up to 102 mm (4-inch) travel. Figure 2-1 shows a typical mounting on an actuator with up to 51 mm (2-inch) travel. Figure 2-2 shows a typical mounting on actuators with 51 to 102 mm (2- to 4-inch) travel. For actuators with greater than 102 mm (4-inch) travel, see the guidelines for mounting a Type DVC6020f digital valve controller.

Refer to the following guidelines when mounting on sliding-stem actuators with up to 4 inches of travel. Where a key number is referenced, refer to figure 11-2.

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

2. Attach the connector arm to the valve stem connector.

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

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

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

6. Set the position of the feedback arm (key 79) on the digital valve controller to the zero drive position

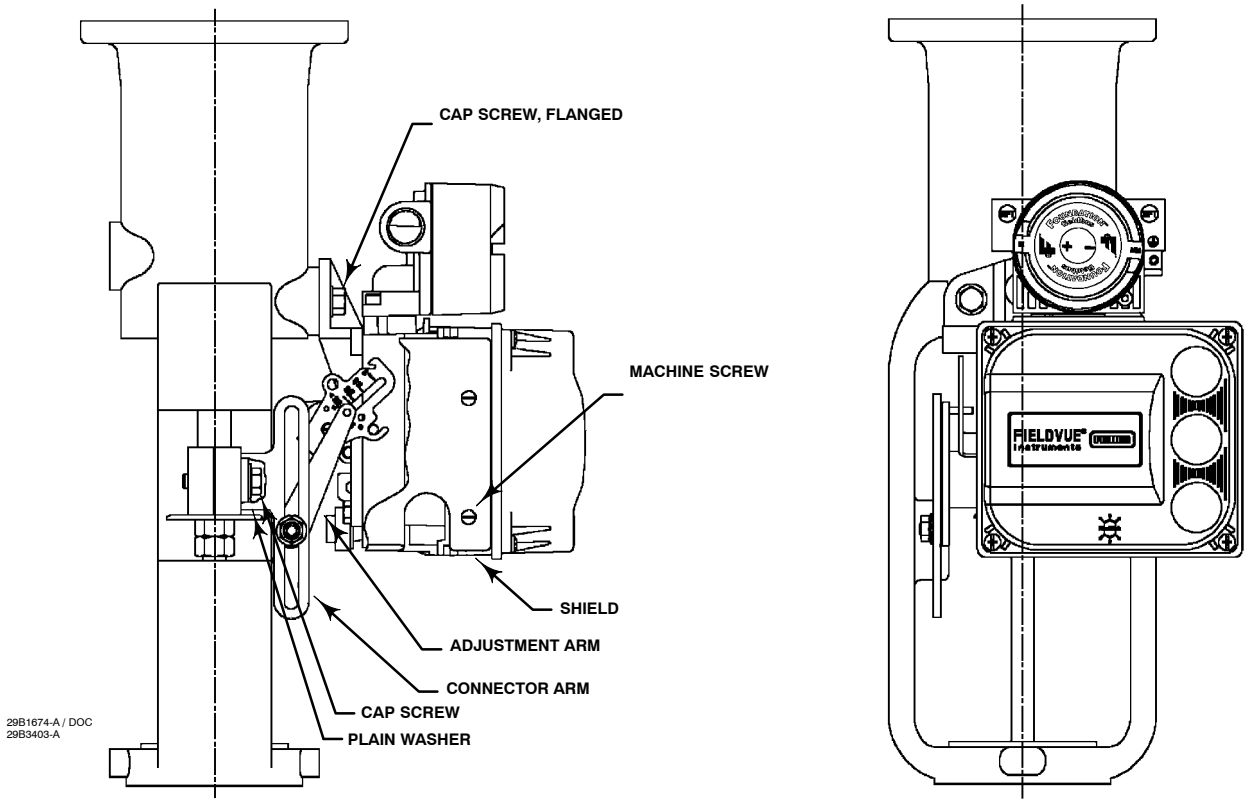


Figure 2-1. Type DVC6010f Digital Valve Controller Mounted on Sliding-Stem Actuators with up to 2 Inches Travel

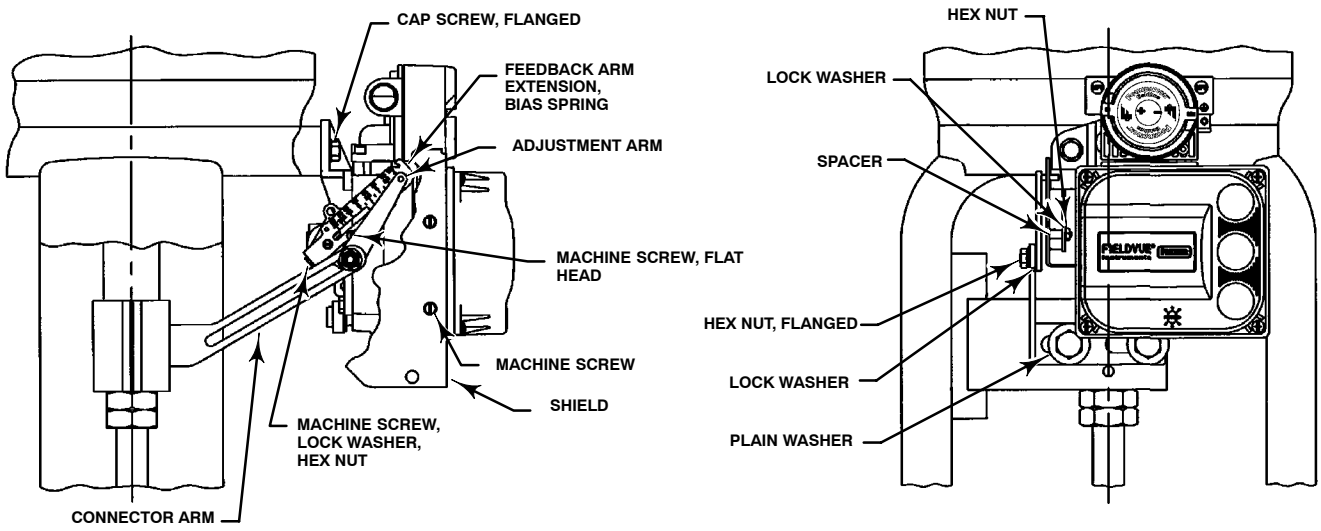


Figure 2-2. Type DVC6010f Digital Valve Controller Mounted on Sliding-Stem Actuators with 2 to 4 Inches Travel

(zero pressure from Port A with Relay Type A) by inserting the alignment pin (key 46) through the hole on the feedback arm as follows:

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

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

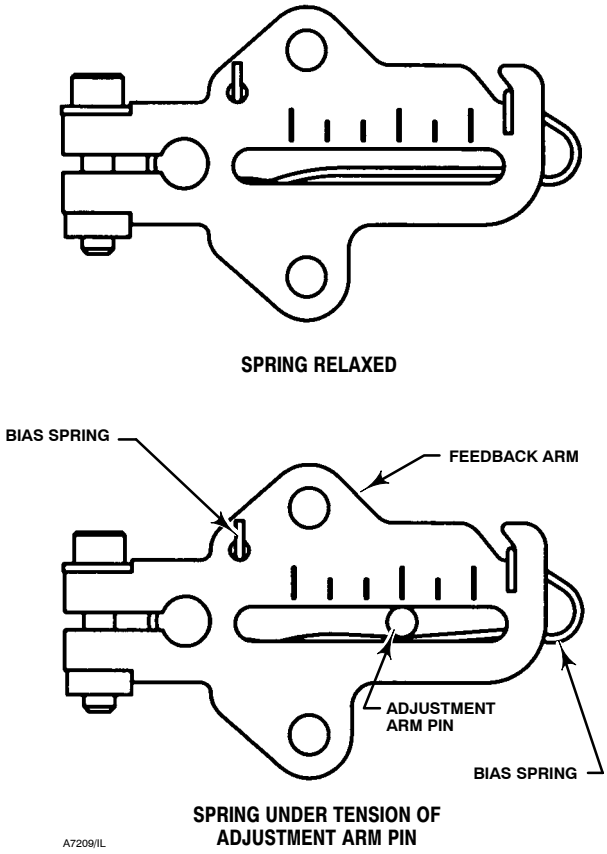


Figure 2-3. Locating Adjustment Arm Pin in Feedback Arm

Note

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

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

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

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

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

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

Type DVC6020f on Long-Stroke (4 to 24 Inch Travel) Sliding-Stem Actuators and Rotary Actuators

WARNING

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

If ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator, makes pneumatic connections to the actuator, sets up, and calibrates the instrument. If you purchased the digital valve controller separately, you will need a mounting kit to mount the digital valve

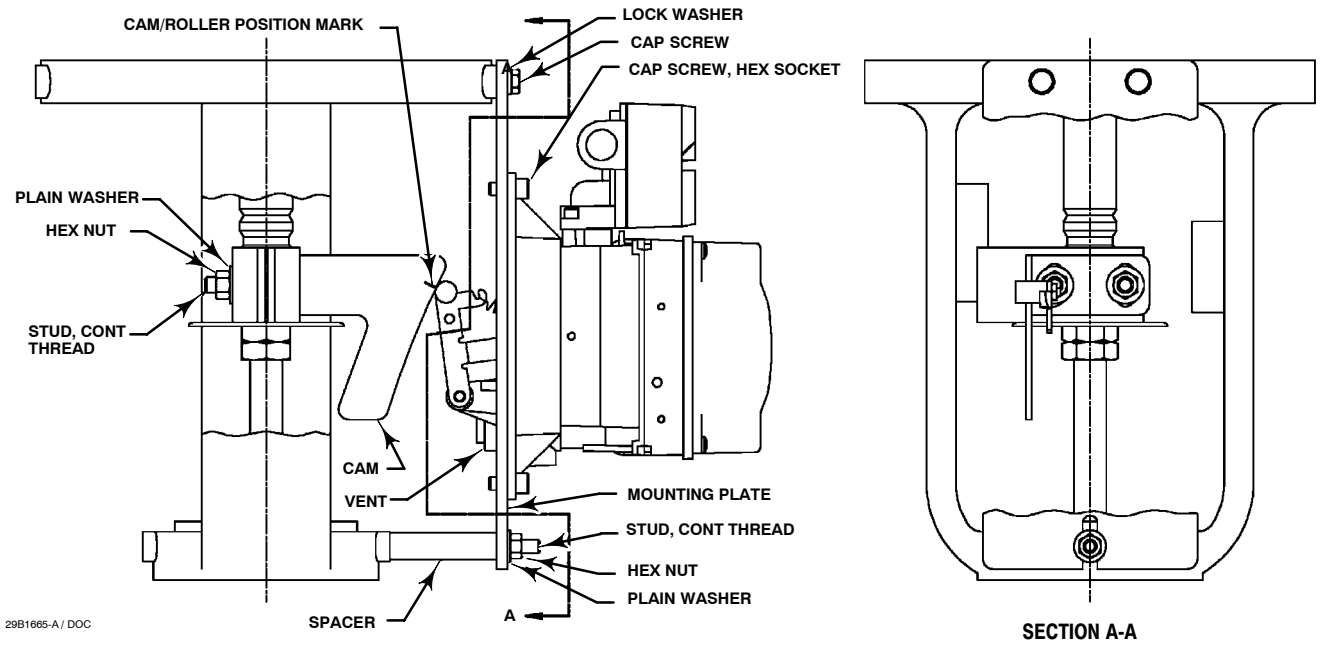


Figure 2-4. Type DVC6020f Digital Valve Controller Mounted on Long-Stroke Sliding-Stem Actuator.

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

Note

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

Type DVC6020f digital valve controllers use a cam (designed for linear response) and roller as the feedback mechanism. Figure 2-4 shows an example of mounting on sliding-stem actuators with travels from 4 inches to 24 inches. Some long-stroke applications will require an actuator with a tapped lower yoke boss. Figures 2-5 and 2-7 show the Type DVC6020f mounted on rotary actuators.

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

Refer to figures 2-4, 2-5, and 2-7 for parts locations. Refer to the following guidelines when mounting on sliding-stem actuators with 4 to 24 inches of travel or on rotary actuators:

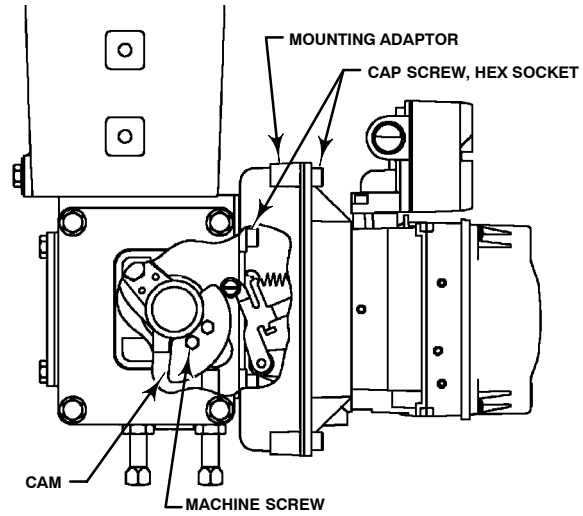
1. Isolate the control valve from the process line pressur and release pressure from both sides of the valve body. Shut off all pressure lines to the pneumatic actuator, releasing all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on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

2. If a cam is not already installed on the actuator, install the cam as described in the instructions included with the mounting kit. For sliding-stem actuators, the cam is installed on the stem connector.

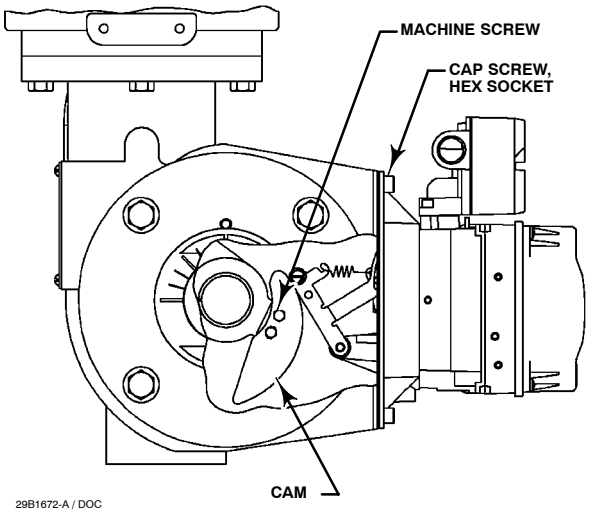
3. If a mounting plate is required, fasten the mounting plate to the actuator.

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

5. Larger size actuators may require a follower arm extension, as shown in figure 2-7. If required, the



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



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

Figure 2-5. Type DVC6020f Digital Valve Controller Mounted on Rotary Actuator

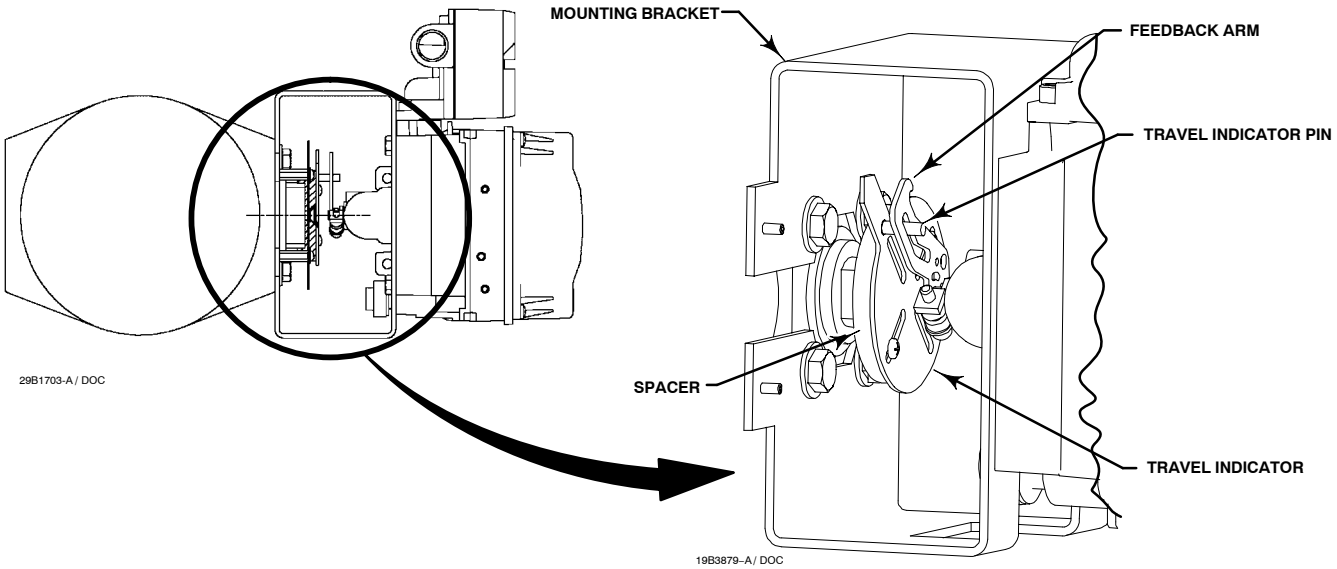


Figure 2-6. Mounting a Type DVC6030f Digital Valve Controller on a Rotary Actuator (Type 1032 Size 425A Shown)

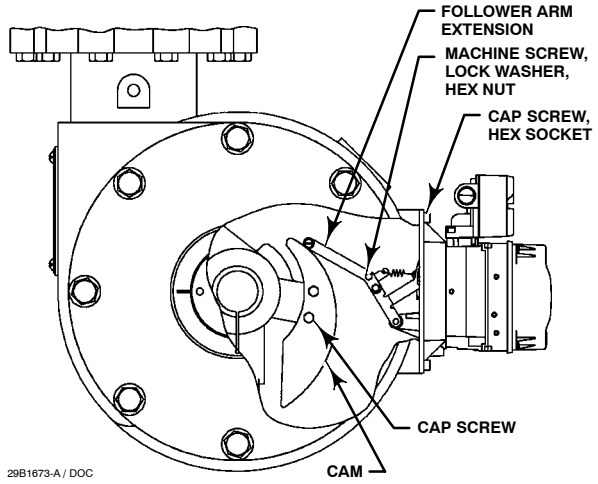


Figure 2-7. Type DVC6020f Digital Valve Controller with Long Feedback Arm and Follower Arm Extension Mounted on a Rotary Actuator

follower arm extension is included in the mounting kit. Follow the instructions included with the mounting kit to install the follower arm extension.

6. Mount the Type DVC6020f on the actuator as follows:

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

- If no mounting adaptor is required, attach the digital valve controller assembly to the actuator or mounting plate. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.

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

Type DVC6030f on Quarter-Turn Actuators

WARNING

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

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

Figure 2-6 shows the Type DVC6030f digital valve controller mounted on a quarter-turn actuator. Refer to figure 2-6 for parts locations. Refer to the following guidelines when mounting on quarter-turn actuators:

Note

Due to NAMUR mounting limitations, do not use the heavier stainless steel Type DVC6030f in vibration service.

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

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

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

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

Refer to figures 2-8 and 2-9. The travel indicator assembly can have a starting position of 7:30 or 10:30. Determine the desired starting position then proceed with the next step. Considering the top of the digital valve controller as the 12 o'clock position, in the next step attach the travel indicator, so that the pin is positioned as follows:

- **If increasing pressure from the digital valve controller output A rotates the potentiometer shaft clockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 10:30 position, as shown in figure 2-8.

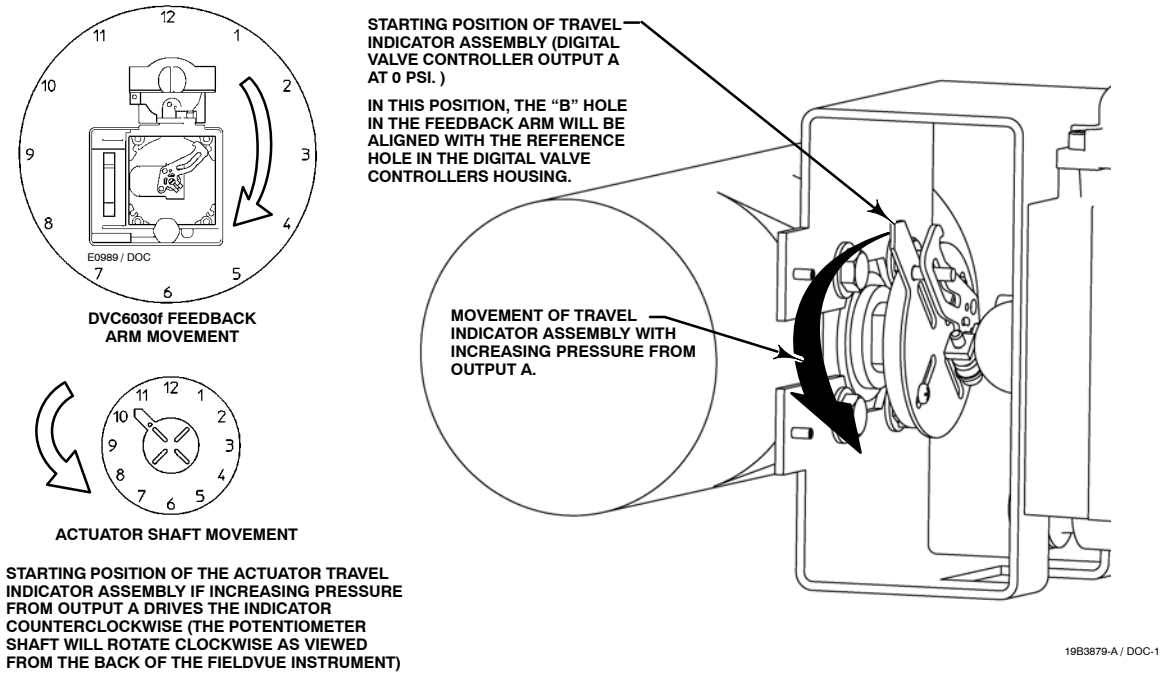


*Figure 2-8. Explanation of Travel Indicator Starting Position and Movement, if **Clockwise** Orientation is Selected for "Travel Sensor Motion" in AMS ValveLink® Software or the 375 Field Communicator*

- **If increasing pressure from the digital valve controller output A rotates the potentiometer shaft counterclockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 7:30 position, as shown in figure 2-9.

Note

AMS ValveLink Software and the 375 Field Communicator use the convention of clockwise (figure 2-8) and counterclockwise (figure 2-9) when viewing the potentiometer shaft from the back of the FIELDVUE instrument.

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

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

7. Position the digital valve controller so that the pin on the travel indicator engages the slot in the feedback arm and that the bias spring loads the pin as shown in figure 2-10. Attach the digital valve controller to the actuator or positioner plate.

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

Guidelines for Mounting the Type DVC6005f Base Unit

For remote-mounted digital valve controllers, the Type DVC6005f base unit ships separately from the control valve and does not include tubing, fittings or wiring. See the instructions that come with the mounting kit for detailed information on mounting the digital valve controller to a specific actuator model.

For remote-mounted instruments, mount the Type DVC6005f base unit on a 50.8 mm (2-inch) pipestand or wall. The included bracket is used for either mounting method.

Wall Mounting

Refer to figures 2-11 and 2-12. Drill two holes in the wall using the dimensions shown in figure 2-11. Attach the mounting bracket to the base unit using four spacers and 25.4 mm (1-inch) 1/4-20 hex head screws. Attach the base unit to the wall using suitable screws or bolts.

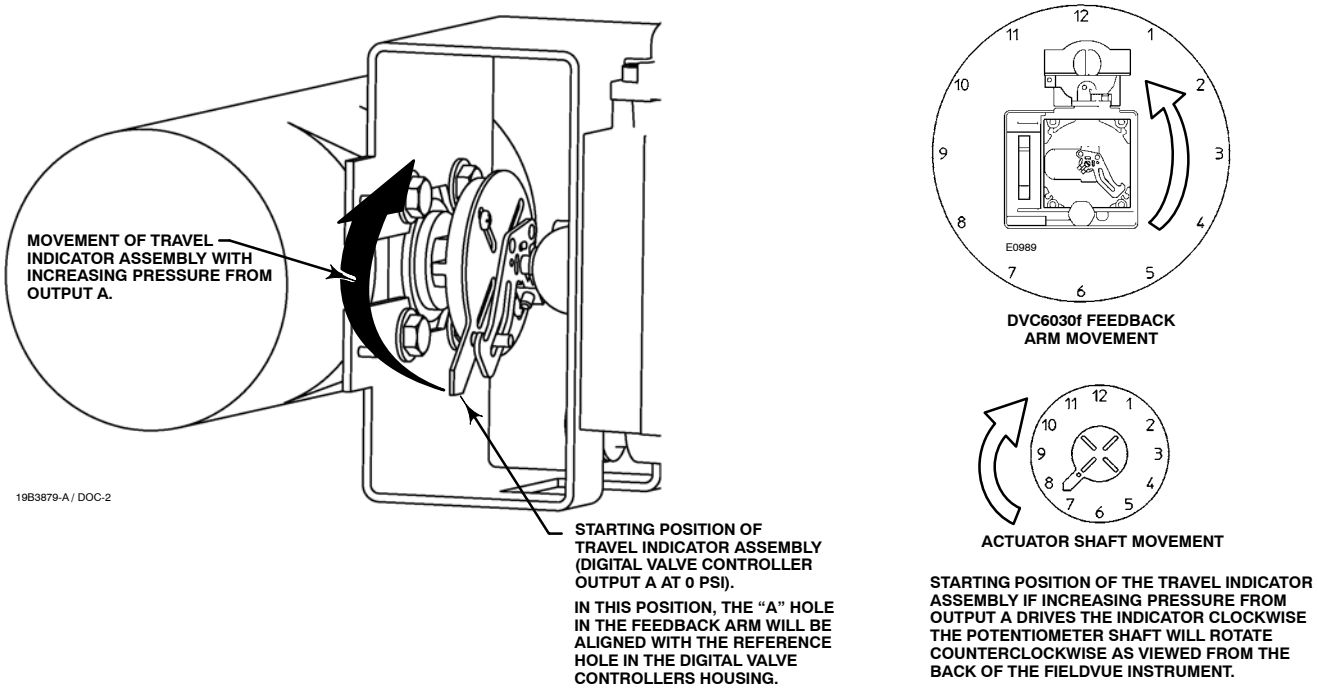


*Figure 2-9. Explanation of Travel Indicator Starting Position and Movement if **Counterclockwise** Orientation is Selected for "Travel Sensor Motion" in AMS ValveLink® Software or the 375 Field Communicator*

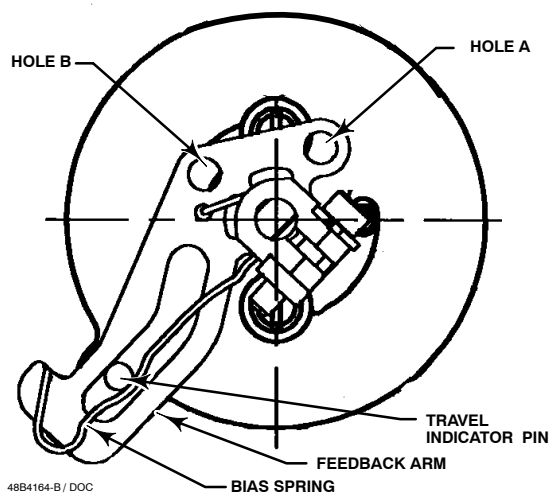


Figure 2-10. Positioning Travel Indicator Pin in the Feedback Arm (Viewed as if Looking from the Type DVC6030f toward the Actuator)

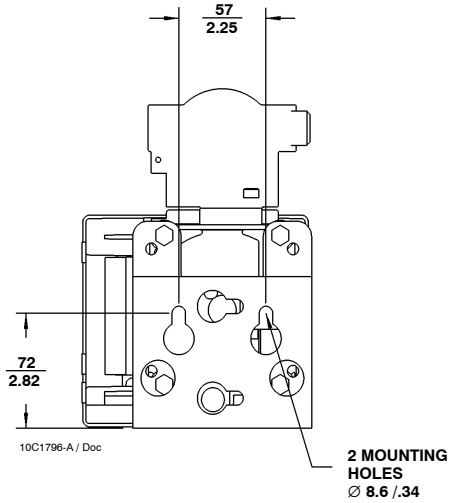
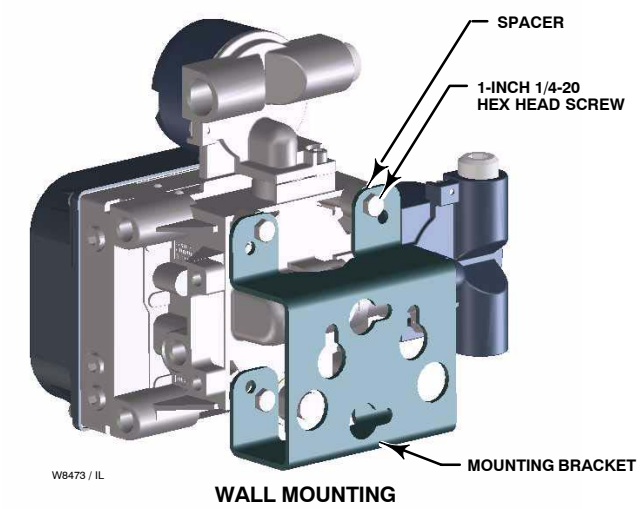


Figure 2-11. DVC6005f Series Digital Valve Controller with Mounting Bracket (Rear View)



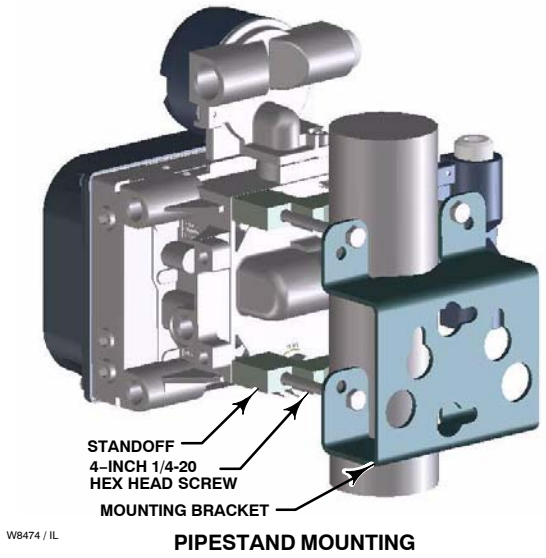


Figure 2-12. Type DVC6005f Base Unit Mounting

Pipestand Mounting

Refer to figure 2-12. Position a standoff on the back of the base unit. Using two 101.6 mm (4-inch) 1/4-20 hex head screws loosely attach the base unit to the pipestand with the mounting bracket. Position the second standoff, then using the remaining 101.6 mm (4-inch) hex head screws, securely fasten the base unit to the pipe stand.

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

WARNING

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

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

Note

Refer to Type DVC6005f Base Unit Mounting on page 2-10 when installing a Type DVC6015 remote feedback unit.

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

Note

While the housing differs on the DVC6015 and the DVC6010f, feedback parts are the same.

Refer to the following guidelines when mounting on sliding-stem actuators with up to 4 inches of travel. Where a key number is referenced, refer to figure 11-3.

1. Isolate the control valve from the process line pressure and release pressure from both sides of the valve body. Shut off all pressure lines to the actuator, releasing all pressure from the actuator. Use lock-out

procedures to be sure that the above measures stay in effect while you work on the equipment.

2. Attach the connector arm to the valve stem connector.

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

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

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

6. Set the position of the feedback arm (key 79) on the digital valve controller to the zero drive position (zero pressure from Port A with Relay Type A) by inserting the alignment pin (key 46) through the hole on the feedback arm as follows:

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

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

Note

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

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

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

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

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

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

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

WARNING

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

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

Note

Refer to Type DVC6005f Base Unit Mounting on page 2-10 when installing a Type DVC6025 remote feedback unit.

Type DVC6025 remote feedback units use a cam and roller as the feedback mechanism. Figure 2-4 shows an example of mounting on sliding-stem actuators with travels from 4 inches to 24 inches. Some long-stroke applications will require an actuator with a tapped lower yoke boss. Figures 2-5 and 2-7 show an example of mounting on rotary actuators.

Note

While the housing differs on the DVC6025 and the DVC6020f, feedback parts are the same.

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

Refer to figures 2-4, 2-5, and 2-7 for parts locations. Also, where a key number is referenced, refer to figure 11-5. Refer to the following guidelines when mounting on sliding-stem actuators with 4 to 24 inches of travel or on rotary actuators:

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

2. If a cam is not already installed on the actuator, install the cam as described in the instructions included with the mounting kit. For sliding-stem actuators, the cam is installed on the stem connector.

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

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

5. Larger size actuators may require a follower arm extension, as shown in figure 2-7. If required, the follower arm extension is included in the mounting kit. Follow the instructions included with the mounting kit to install the follower arm extension.

6. Mount the Type DVC6025 on the actuator as follows:

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

- If no mounting adaptor is required, attach the digital valve controller assembly to the actuator or mounting plate. The roller on the digital valve controller feedback arm will contact the actuator cam as it is being attached.

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

Type Type DVC6035 on Quarter-Turn Actuators

WARNING

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

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

Note

Refer to Type DVC6005f Base Unit Mounting on page 2-10 when installing a Type DVC6035 remote feedback unit.

Figure 2-6 shows an example of mounting on on a quarter-turn actuator. Refer to figure 2-6 for parts locations. Also, where a key number is referenced, refer to figure 11-7. Refer to the following guidelines when mounting on quarter-turn actuators:

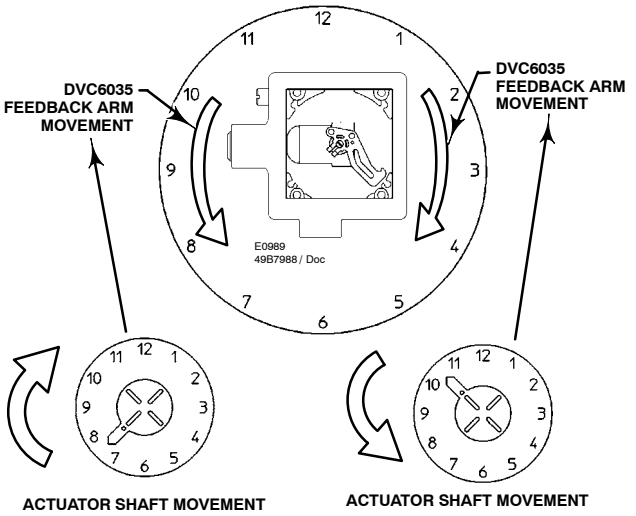


Figure 2-13. Type DVC6035 Travel Indicator Installation

Note

While the housing differs on the DVC6035 and the DVC6030f, feedback parts are the same.

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

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

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

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

Refer to figure 2-13. The travel indicator assembly can have a starting position of 7:30 or 10:30. Determine the desired starting position then proceed with the next step. Considering the top of the remote travel sensor as the 12 o'clock position, in the next step attach the travel indicator, so that the pin is positioned as follows:

Table 2-1. Feedback Arm Locking Requirements

Digital Valve Controller Type	Feedback Arm Alignment Hole
DVC6010f	B
DVC6020f	Not Applicable
DVC6030f	A

- **If increasing pressure from the digital valve controller output A rotates the digital valve controllers potentiometer shaft counterclockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 7:30 position, as shown in figures 2-9 and 2-13.

- **If increasing pressure from the digital valve controller output A rotates the digital valve controllers potentiometer shaft clockwise (as viewed from the back of the instrument)**, mount the travel indicator assembly such that the arrow is in the 10:30 position, as shown in figures 2-8 and 2-13.

Note

AMS ValveLink Software and the 375 Field Communicator use the convention of clockwise (figure 2-8) and counterclockwise (figure 2-9) when viewing the potentiometer shaft from the back of the FIELDVUE instrument.

Mounting for Pressure Control

Mounting the digital valve controller for pressure control does not require connecting the feedback linkage. However, if the feedback linkage is not connected, the feedback arm should be locked in place. Insert the special stainless steel alignment pin into either hole A or hole B of the feedback arm as shown in table 2-1. To lock the feedback arm, insert the alignment pin through hole A or B then screw the alignment pin into the threaded hole in the side of the housing.

The digital valve controller can be yoke-mounted or casing-mounted on an actuator. DVC6000f Series digital valve controllers setup for pressure control also can be wall or pipestand mounted.

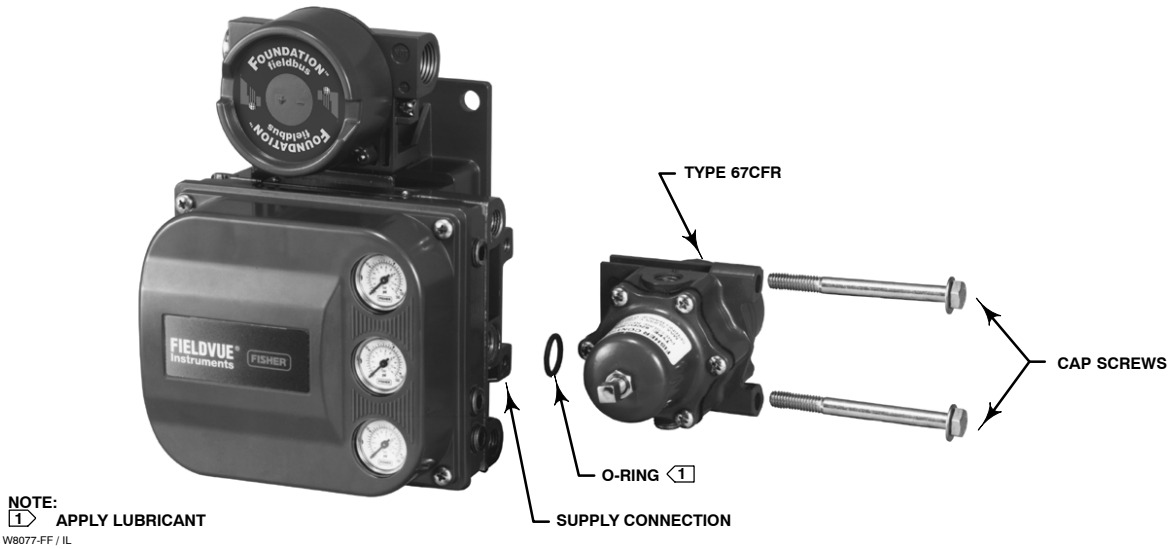


Figure 2-14. Mounting the Type 67CFR Regulator on a DVC6000f Series Digital Valve Controller

Pressure Connections

Actuator Mounting

WARNING

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

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

2. For yoke-mounting on rotary actuators only:

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

   b. If required, a mounting adaptor is included in the mounting kit. Attach the adaptor to the actuator as shown in figure 2-5.

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

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

Mounting the Type 67CFR Filter Regulator

A Type 67CFR filter regulator, when used with the DVC6000f Series digital valve controllers, can be mounted three ways.

Integral-Mounted Regulator

Refer to figure 2-14. Lubricate an O-ring and insert it in the recess around the SUPPLY connection on the digital valve controller. Attach the Type 67CFR filter regulator to the side of the digital valve controller. Thread a 1/4-inch socket-head pipe plug into the unused outlet on the filter regulator. This is the standard method of mounting the filter regulator.

Yoke-Mounted Regulator

Mount the filter regulator with 2 cap screws to the pre-drilled and tapped holes in the actuator yoke. Thread a 1/4-inch socket-head pipe plug into the unused outlet on the filter regulator. The O-ring is not required.

Casing-Mounted Regulator

Use the separate Type 67CFR filter regulator casing mounting bracket provided with the filter regulator. Attach the mounting bracket to the Type 67CFR and then attach this assembly to the actuator casing. Thread a 1/4-inch socket-head pipe plug into the unused outlet on the filter regulator. The O-ring is not required.

WARNING

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

Note

Make pressure connections to the digital valve controller using tubing with at least 10 mm (0.375-inch) diameter.

Pressure connections are shown in figure 2-15. All pressure connections on the digital valve controller are 1/4 inch NPT female connections. Use 10 mm (0.375 inch) tubing for all pneumatic connections. If remote venting is required, refer to the vent subsection.

Supply Connections

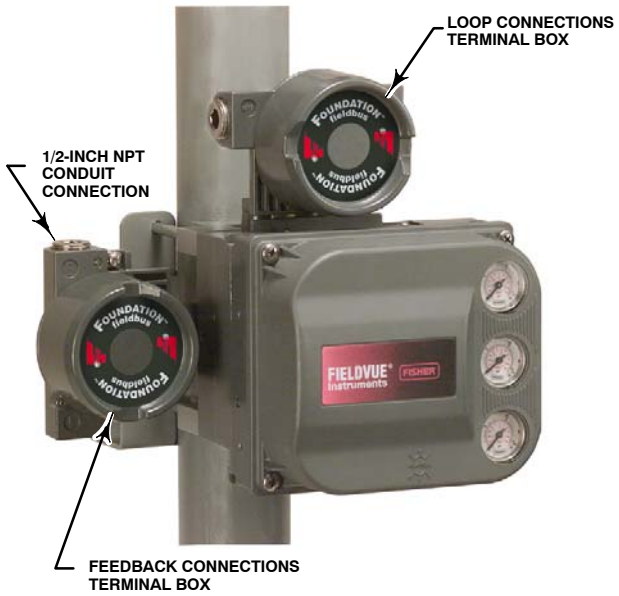
WARNING

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

WARNING

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

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



TYPE DVC6005f BASE UNIT

W8371-1-FF

W7963-1FF

NOTE:
PNEUMATIC CONNECTIONS APPLICABLE TO BOTH VALVE-MOUNTED INSTRUMENTS AND TYPE DVC6005f BASE UNIT.

Figure 2-15. DVC6000f Series Digital Valve Controller Connections

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

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

Output Connections

A factory mounted digital valve controller has its output piped to the pneumatic input connection on the actuator. If mounting the digital valve controller in the field, or installing the remote-mounted Type DVC6005f base unit, connect the 1/4-inch NPT digital valve controller output connections to the pneumatic actuator input connections.

Single-Acting Actuators

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

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

Double-Acting Actuators

DVC6000f Series digital valve controllers on double-acting actuators always use relay type A. With no instrument Fieldbus power (Zero Power Condition), OUTPUT A is at 0 pressure and OUTPUT B is at full supply pressure when the relay is properly adjusted.

To have the actuator stem retract into the cylinder with Zero Power Condition, connect OUTPUT A to the upper actuator cylinder connection. Connect OUTPUT B to the lower cylinder connection. Figure 2-16 shows the digital valve controller connected to a double-acting piston actuator.

To have the actuator stem extend from the cylinder with Zero Power Condition, connect OUTPUT A to the lower actuator cylinder connection. Connect OUTPUT B to the upper cylinder connection.

W9132-1

Figure 2-16. Type DVC6010f Digital Valve Controller Mounted on Type 585C Piston Actuator

Vent Connection

WARNING

Personal injury or property damage can occur from cover failure due to overpressure.

Ensure that the housing vent opening is open and free of debris to prevent pressure buildup under the cover.

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

To connect a remote vent to Type DVC6010f and DVC6030f digital valve controllers and Type DVC6015 and DVC6035 remote feedback units—sliding-stem remove the plastic vent (key 52, figures 11-1, 11-2 and 11-6). The vent connection is 3/8-inch NPT female. Typically, 12.7 mm (0.5 inch) tubing is used to provide a remote vent.

To connect a remote vent to a Type DVC6020f digital valve controller and a Type DVC6025 remote feedback unit—rotary replace the standard mounting bracket (key 74, figures 11-1 and 11-4) with the vent-away bracket (key 74). Install a pipe plug in

the vent-away mounting bracket (key 74). Mount the digital valve controller on the actuator as described in the Installation section of this manual. The vent connection is 3/8-inch NPT female. Typically, 12.7 mm (0.5 inch) tubing is used to provide a remote vent.

Use 10 mm (0.275 inch) outside diameter tubing to connect the 1/4-inch NPT digital valve controller output connection to the pneumatic actuator input connection.

If a volume tank is used to attenuate flow instabilities, the volume needs to be at least 1.64 liters (100 cubic inch) but not greater than 4.1 liters (250 cubic inch). To tune the digital valve controller for an assembly equipped with a volume tank, select a tuning set for an actuator with roughly the same volume. Do not use tuning set B when a volume tank is present.

Alternatively, flow fluctuations may be attenuated by placing a 0.9 mm (0.035 inch) fixed restriction between the regulator and the output. A list of fixed restriction orifice specifications is presented in table 2-2.

Table 2-2. Fixed Orifice Restrictions

Manufacturer	Part Number	Material	Description
Fisher	1D4835X0012	316 SST	No. 74 drilled orifice bleed adapter with 1/4-inch NPT connections. Enlarge orifice using No. 65 drill and cross out the “74” stamp.
O’Keefe Controls Co.	G-35-SS	303 SST	0.035 inch orifice bleed with 1/4-inch NPT connections

WARNING

Personal injury or property damage caused by fire or explosion may occur if this connection is attempted in a potentially explosive atmosphere or in an area that has been classified as hazardous. Confirm that area classification and atmosphere conditions permit the safe removal of the terminal box cover before proceeding

Electrical Connections

The following describes how to make fieldbus connections to the digital valve controller. For information on making other connections, such as connecting a personal computer with AMS ValveLink Software or connecting a simulate jumper, see the Installation section.

WARNING

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

WARNING

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

Fieldbus Connections

The digital valve controller is normally powered over the bus from a fieldbus 9 to 32 volt power supply and can be connected to the segment using a twisted shielded pair or with the quick connect cable entry option. Refer to the site preparation guide for proper wire types, termination, length, etc. for a fieldbus segment.

Note

As shipped from the factory, DVC6000f Series digital valve controllers will not move the valve when power is applied to the instrument. To avoid the valve going to an unknown position when power is applied, the unit is shipped from the factory with the transducer block mode Out of Service. See the Basic Setup section for information on setup and calibration and placing the instrument in service. The initial value for all blocks are shown in the parameter list for each block in the Detailed Setup / Block Section.

Making Fieldbus Connections with Twisted Shielded Pair

Refer to figures 11-1, 11-2, 11-4 and 11-6 for identification of parts.

WARNING

Personal injury or property damage, caused by fire or explosion, can result from the discharge of static electricity. Connect a 14 AWG (2.08 mm^2) ground strap between the digital valve controller and earth ground when flammable or hazardous gases are present. Refer to national and local codes and standards for grounding requirements.

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

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

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

3. The instrument is not polarity sensitive. Connect one wire from the control system output card to one of the LOOP screw terminals on the pwb/terminal strip assembly in the terminal box shown in figure 2-17. Connect the other wire from the control system output card to the other LOOP screw terminal in the terminal box.

4. As shown in figure 2-17, two ground terminals are available for connecting a safety ground, earth ground, or drain wire. The safety ground terminal is electrically identical to the earth ground. Make connections to these terminals following national and local codes and plant standards.

5. Replace and hand tighten the terminal box cap on the terminal box.

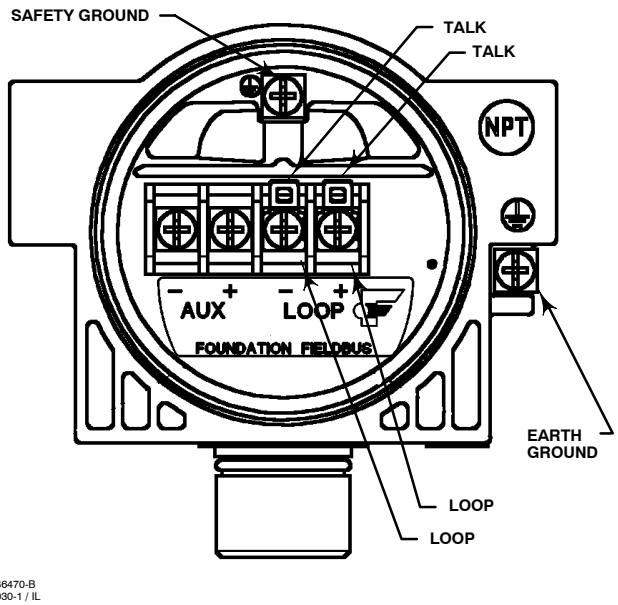


Figure 2-17. DVC6000f Series Digital Valve Controller Terminal Box

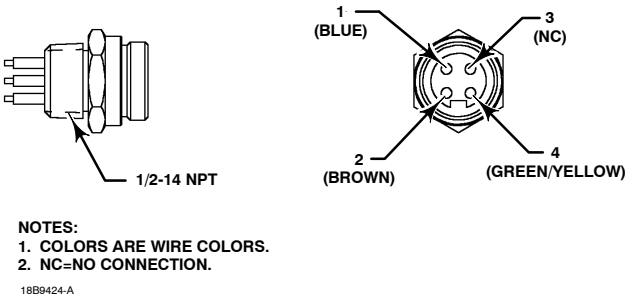


Figure 2-18. Quick Connect Connector

Making Fieldbus *Connections with the Quick Connect Cable Entry*

The DVC6000f is offered with a quick connect cable entry option, shown in figure 2-18, for the FOUNDATION fieldbus signal. The quick connect cable entry provides an easier and more reliable interface to fieldbus devices and support modules by providing a standard connection.

Refer to figures 11-1, 11-2, 11-4 and 11-6 for identification of parts.

WARNING

Personal injury or property damage, caused by fire or explosion, can result from the discharge of static electricity. Connect a 14 AWG (2.08 mm^2) ground strap between the digital valve controller and earth ground when flammable or hazardous gases are present. Refer to national and local codes and standards for grounding requirements.

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

To avoid personal injury or property damage, do not use the Quick Connect option on instruments in explosion-proof installations.

1. The quick connect cable entry should be installed on the digital valve controller at the factory. If it is, proceed to step 3. If not continue with step 2.

2. To install the Quick Connect:

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

   b. Apply sealant to the threads of the quick connector.

   c. Insert the wire pigtail into the desired conduit opening on the terminal box. Tighten the quick connector in the conduit opening.

   d. Cut and trim the ends of the wires.

   e. The instrument is not polarity sensitive. Refer to figure 2-17. Connect the blue wire to one of the LOOP terminals in the terminal box. Connect the brown wire to the other LOOP terminal. Connect the green/yellow wire to the Safety Ground terminal.

   f. Replace the terminal box cap on the terminal box.

3. Connect the field wiring connector to the installed quick connector.

Feedback Unit Connections for Remote Mounting

The DVC6005f base unit is designed to receive travel information via a remote sensor. The remote can be any of the following:

- Fisher supplied DVC6015, DVC6025 or DVC6035 feedback unit

- An under-traveled 10 kOhm potentiometer used in conjunction with onboard 30 kOhm resistor (potentiometer travel is greater than actuator travel)

- A potentiometer used in conjunction with two fixed resistors (potentiometer travel is the same as actuator travel)

WARNING

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

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

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

The feedback unit mounts on the actuator and is connected to the base unit, mounted on a pipestand or wall, with a 3-conductor shielded cable.

Connect the feedback unit to the base unit as follows, refer to figure 2-19:

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

2. On the base unit, remove the feedback connections terminal box cap (see figure 2-15).

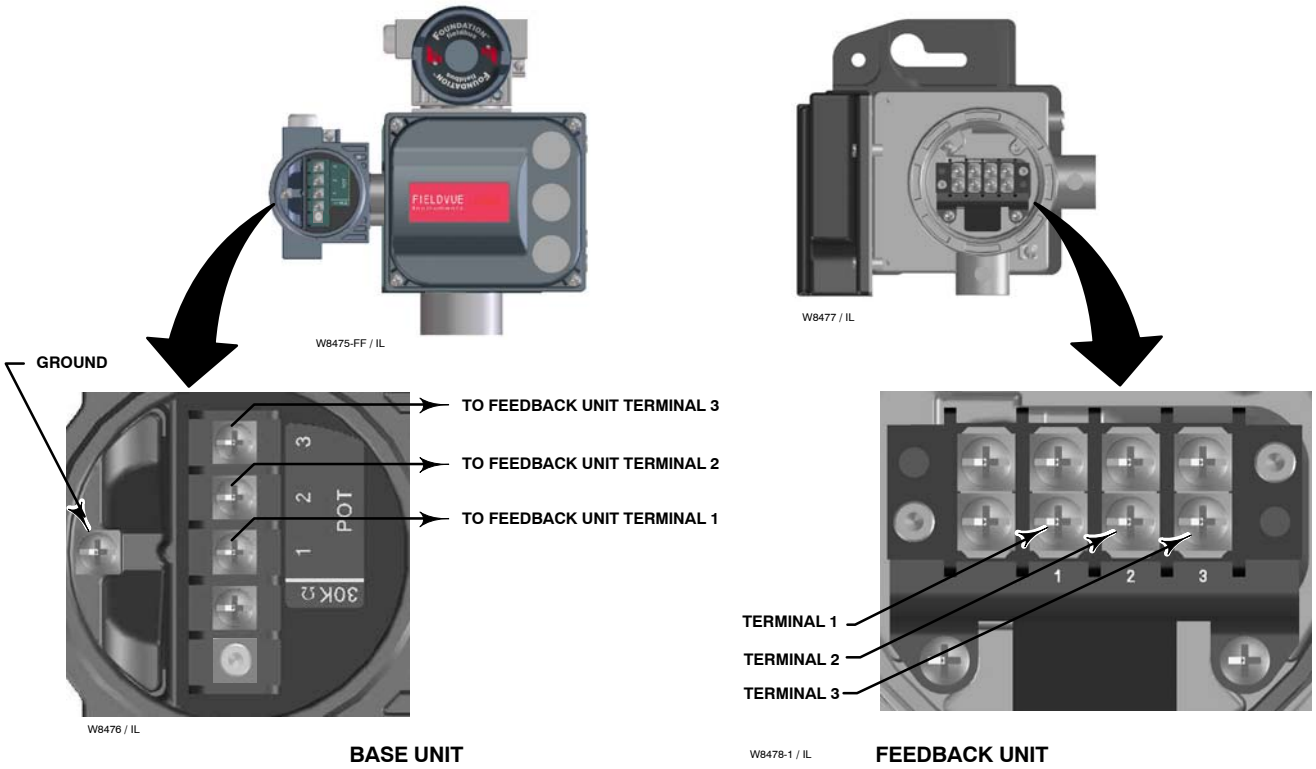


Figure 2-19. Terminal Details for Connecting Base Unit and Feedback Units of Remote-Mounted Digital Valve Controllers

3. If necessary, install conduit between the feedback unit and the base unit following applicable local and national electrical codes. Route the 3-conductor shielded cable between the two units.

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

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

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

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

8. Replace and hand tighten all covers.

Using an External 10 kOhm Potentiometer as a Remote Travel Sensor

Note

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

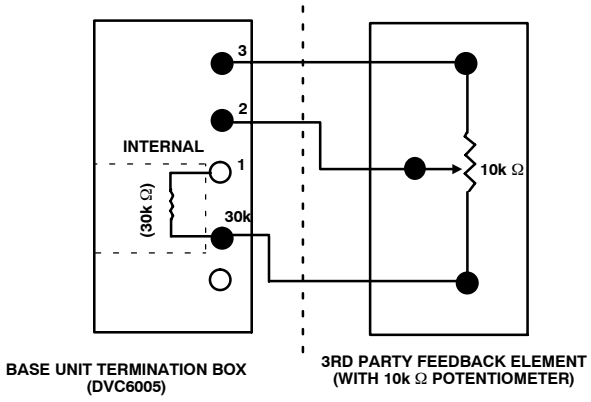


Figure 2-20. Terminal Details for Connecting a DVC6005f Base Unit and a 10 kOhm External Potentiometer

Note

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

The base unit (DVC6005f) was designed to work with a 40 kOhm potentiometer for travel feedback. However, there are linear potentiometers that are readily available with a rated resistance of 10 kOhm. Therefore, the feedback terminal box on the DVC6005f contains an additional 30 kOhm fixed resistor that may be added to the circuit. This brings the total resistance up to the required 40 kOhm.

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

2. On the base unit, remove the feedback connections terminal box cap (refer to figure 2-15).

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

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

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

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

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

8. Replace and tighten the base unit cover.

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

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

Note

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

CAUTION

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

Note

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

This procedure uses three resistors connected in series; two fixed resistors and one potentiometer. Three conditions must be met for the resistor combination to correctly operate the digital valve controller (refer to figure 2-21):

- The maximum resistance of the potentiometer ($R_{pot(max)}$) must be between 3.9 kOhm and 10 kOhm.

- The resistance of R_1 is 4.25 times greater than $R_{pot(max)}$.

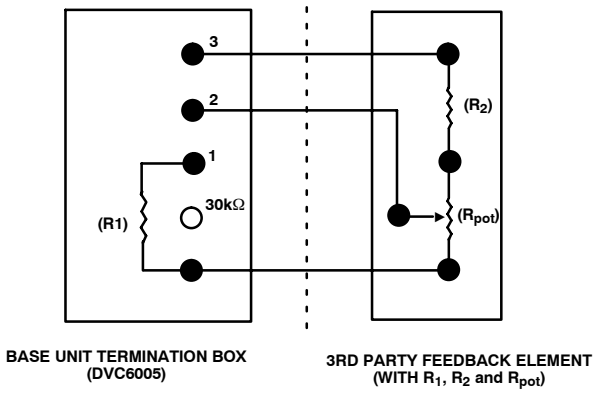


Figure 2-21. Terminal Details for Connecting a DVC6005f Base Unit and a Three-Resistor Series

- The resistance of R_2 is 4 times less than $R_{pot(max)}$.

WARNING

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

1. On the base unit, remove the feedback connections terminal box cap (see figure 2-15).

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

3. Install the fixed resistor (R1) across the unlabeled bottom Terminal and Terminal #1. The bottom terminal does not have a screw. The screw on the 30 kOhm terminal can be used. R1 must be properly insulated when installed in the terminal box to prevent personal injury or property damage.

4. Connect one wire of the 3-conductor shielded cable between the unlabeled bottom Terminal on the base unit and an end-lead on the external potentiometer (Rpot).

5. Connect the second wire of the 3-conductor shielded cable between the middle lead (wiper) of the external potentiometer (R_{pot}) and Terminal #2 on the base unit.

6. Connect the third wire of the 3-conductor shielded cable between a lead on (R_2) and Terminal #3 of the base unit.

7. Connect the available end-lead on the potentiometer (R_{pot}) with the available lead on fixed resistor (R_2).

8. Connect the cable shield or drain wire to the ground screw in the feedback connections terminal box of the base unit. Do not connect the shield or drain wire to any lead on the three-resistor series.

9. Replace and tighten the base unit cover.

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

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

Communication Connections

WARNING

Personal injury or property damage caused by fire or explosion may occur if this connection is attempted in a potentially explosive atmosphere or in an area that has been classified as hazardous. Confirm that area classification and atmosphere conditions permit the safe removal of the terminal box cap before proceeding.

A FOUNDATION fieldbus communicating device, such as a 375 Field Communicator or a personal computer running AMS ValveLink Software, interfaces with the DVC6000f Series digital valve controller from any wiring termination point in the segment. If you choose to connect the fieldbus communicating device directly to the instrument, attach the device to the LOCAL connections inside the terminal box to provide local communications with the instrument.

Simulate Enable Jumper

WARNING

Personal injury or property damage caused by fire or explosion may occur if this connection is attempted in a potentially explosive atmosphere or in an area that has been classified as hazardous. Confirm that area classification and atmosphere conditions permit the safe removal of the terminal box cap before proceeding.

Install a jumper across the SIMULATE ENABLE terminals to enable the instrument to accept a simulate command. (These terminals are marked AUX on the terminal board, see figure 2-17). With the jumper in place and the simulate parameter in the AO or DO block set to enabled, the transducer block ignores the output of the AO or DO block. The simulate value and status become the readback value and status to the AO or DO block and the transducer block is ignored. For more information on running simulations, see the Detailed Setup / Blocks section of this manual, the FOUNDATION fieldbus specifications, and the host documentation.

WARNING

Removing the jumper will disable the simulate, which may cause the valve to move. To avoid personal injury and property damage caused by the release of pressure or process fluid, provide some temporary means of control for the process.

Commissioning Tag

The DVC6000f Series digital valve controller is supplied with a removable paper commissioning tag, shown in figure 2-22. This tag contains both the device ID and a space to record the device's tag number. The device ID is a unique code that identifies a particular device in the absence of a device tag. The device tag is used as an operational identification for the device and is usually defined by the piping and instrumentation diagram (P&ID).

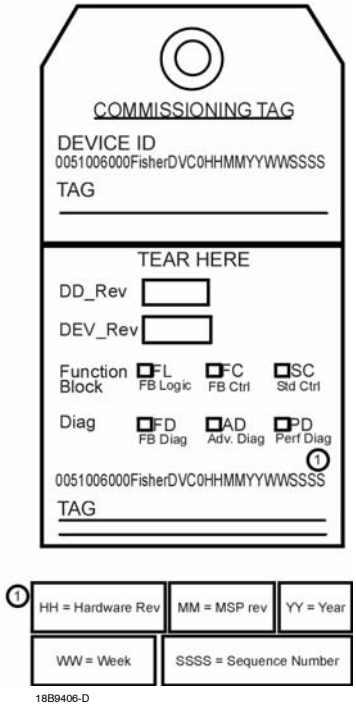


Figure 2-22. Paper Commissioning Tag

When commissioning more than one device on a fieldbus segment, identifying which device is at a particular location can be tedious without tags. The removable tag provided with the digital valve controller can be used to link the device ID and the physical installation location. The installer should note the physical location in both places on the removable commissioning tag and tear off the bottom portion. This should be done for each device on the segment. The bottom portion of the tags can be used for commissioning the segment in the control system.

Prior to commissioning, the device ID is displayed by the host system if no device tag is configured in the digital valve controller electronics. Typically the placeholder displays the device tag. The information on the paper tag enables the engineer to match the device ID to the correct placeholder.

As an ordering option, the factory can enter a device tag into the digital valve controller electronics during the manufacturing process. If this option is specified, the device tag is displayed at the host system prior to commissioning rather than the device ID. **This makes the job of commissioning the device easier**.

Section 3 Model 375 Field Communicator Basics

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Resource Block v

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Figure 3-1. Model 375 Field Communicator

Note

The Model 375 Field Communicator device description revision (DD) determines how the Field Communicator interfaces with the instrument. For information on displaying the device description revision, see page 3-7.

This section discusses the display, keypad, and menu structure for the Field Communicator, shown in figure 3-1. It includes information for displaying the Field Communicator device description revision number. For information on connecting the Field Communicator to the instrument, see the Installation section, Section 2. For more information on the Field Communicator, such as specifications and servicing, see the User's Manual for the Field Communicator 00375-0047-0001, included with the Field Communicator. This manual also is available from Rosemount Inc., Measurement Division.

Display

The Field Communicator communicates information to you through a 1/4 VGA (240 by 320 pixels) monochrome touch screen. It has a viewing area of approximately 9 cm by 12 cm.

Using the Keypad

On/Off Key

The on/off key is used to turn the Field Communicator on and off.

From the Main Menu, select FOUNDATION Fieldbus Application to run the fieldbus application. If a live fieldbus device is connected to the Field Communicator, the Fieldbus Application Menu will display briefly, followed by the Live Device List.

If insufficient voltage is detected, a warning will appear on the Field Communicator saying "no FF Segment Voltage Detected". Press OK to go to the FF Main Menu.

The on/off key is disabled while any applications are open, making it necessary for you to exit the 375 Main Menu before using the on/off key. This feature helps to avoid situations where the Field Communicator could be unintentionally turned off while a device's output is fixed or when configuration data has not been sent to a device.

Navigation Keys

Four arrow navigation keys allow you to move through the menu structure of the application. Press the right arrow (>) navigation key to navigate further into the menu.

Figure 3-2. Model 375 Field Communicator Alphanumeric and Shift Keys

Enter Key

The enter key allows you to perform the highlighted item, or to complete an editing action. For example, if you use the tab key to highlight the Cancel button, and then push the enter key, you will cancel out of that particular window. The enter key does not navigate you through the menu structure.

Tab Key

The tab key allows you to move between selectable controls.

Alphanumeric Keys

Figure 3-2 shows the alphanumeric keypad. Data entry, and other options, using letters, number and other characters can be performed using this keypad. The 375 Field Communicator will automatically determine the mode depending upon the input necessary for the particular field.

To enter text when in alphanumeric mode, press the desired keypad button in quick repetition to scroll through the options to attain the appropriate letter or number.

For example, to enter the letter “Z”, press the 9 key quickly four times.

Backlight Adjustment Key

The backlight adjustment key has four settings allowing you to adjust the intensity of the display. Higher intensities will shorten the battery life.

Function Key

The function key allows you to enable the alternate functionality of select keys. The grey characters on the keys indicate the alternate functionality. When enabled, the orange multifunction LED light will appear and an indication button can be found on the soft input panel (SIP). Press the key again to disable the function key.

Multifunction LED

The multifunction LED indicates when the 375 Field Communicator is in various states. Green signifies that the Field Communicator is on, while flashing green indicates that it is in power saving mode. Green and orange indicate that the function key is enabled, and a green and orange flash indicates that the on/off button has been pressed long enough for the Field Communicator to power up.

Using the Touch Screen

The touch screen display allows you to select and enter text by touching the window.

Tap the window once to select a menu item or to activate a control. Double-tap to access the various options associated with the menu item.

CAUTION

The touch screen should be contacted by blunt items only. The preferred item is the stylus that is included with the 375 Field Communicator. The use of a sharp instrument can cause damage to the touch screen interface.

Use the back arrow button([←]) to return to the previous menu. Use the terminate key ([×]) in the upper right corner of the touch screen to end the application.

Using the Soft Input Panel (SIP) Keyboard

As you move between menus, different dynamic buttons appear on the display. For example, in menus providing access to on-line help, the HELP button may appear on the display. In many cases the SEND label appears indicating that you must select the button on the display to send the information you have entered on the keypad to the FIELDVUE instrument's memory. Online menu options include:

3

- **SCRATCHPAD** is a text editor that allows you to create, open, edit and save simple text (.txt) documents.

- **HELP**—gives you information regarding the display selection.

- **SEND**—sends the information you have entered to the instrument.

- **EXIT**—takes you back to the menu from which you had requested the value of a variable that can only be read.

- **ABORT**—cancels your entry and takes you back to the menu from which you had selected the current variable or routine. Values are not changed.

- **OK**—takes you to the next menu or instruction screen.

- **ENTER**—sends the information you have selected to the instrument or flags the value that is to be sent to the instrument. If it is flagged to be sent, the SEND dynamic label appears as a function key selection.

- **ESC**—cancels your entry and takes you back to the menu from which you had selected the current variable or routine. Values are not changed.

- **SAVE**—saves information to the internal flash or the configuration expansion module.

- **START**—starts a Fieldbus Diagnostic

- **RETEST**—Repeats a Fieldbus Diagnostic

- **NEXT**—takes you to the next menu or instruction screen.

- **YES**

- **NO**

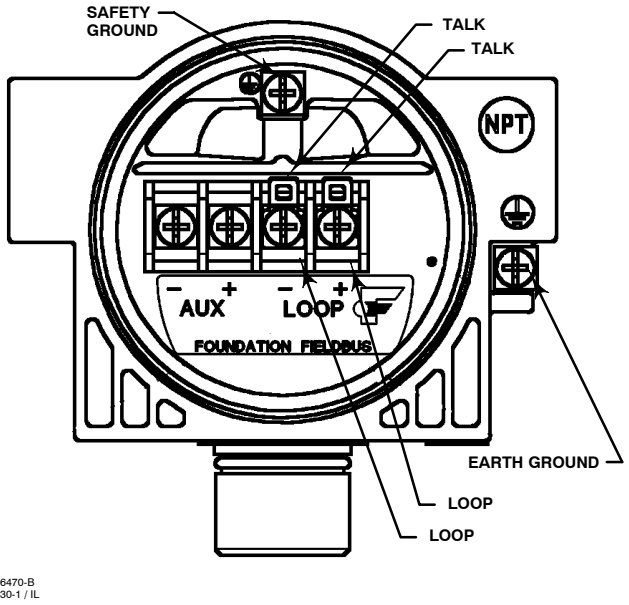

Figure 3-3. DVC6000f Series Digital Valve Controller Terminal Box

Online Operation

The Online menu displays data for the device to which you are connected, including critical, up-to-date process information, such as the segment live list, block lists and parameter functionality.

Connecting to a Fieldbus Loop

After ensuring that the device is connected to a Fieldbus power source, connect the 375 Field Communicator with the appropriate connectors in parallel with the DVC6000f. When connecting directly to the instrument, attach the Field Communicator to the TALK connections (refer to figure 3-3) inside the terminal box.

For information on Making Fieldbus Connections with the Quick Connect Cable Entry, refer to page 2-20 of the Installation section.

Note

The fieldbus connections are polarity sensitive. If connected incorrectly, an error message will display.

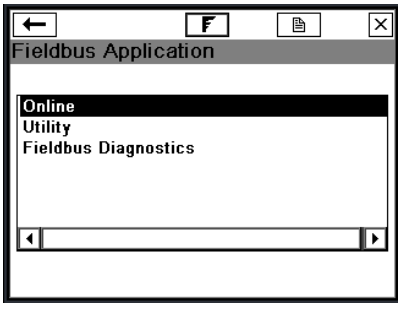

Figure 3-4. Fieldbus Application Menu

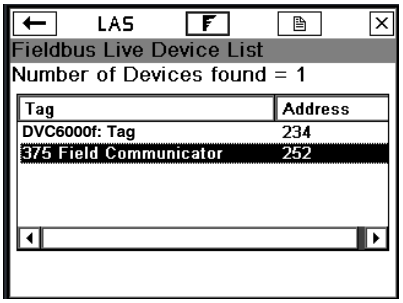

Figure 3-5. Fieldbus Live Device List

Displaying the Live Device List

The Live Device List contains all of the devices that need access to the bus.

To access the Live Device List from the *Fieldbus Application* menu select *Online* (refer to figures 3-4 and 3-5).

If an existing host control system or a device capable of being the LAS is not connected, the 375 Field Communicator will act as a temporary LAS on the segment and produce a warning.

Displaying the Block List

The Block List view lists the block tag, block type and actual mode of the device blocks, in addition to Schedule, Advanced and Detail information for a particular device. From the *Fieldbus Application* menu select *Online* (refer to figures 3-4 and 3-5). Select the device you want to work with from the Live Device List.

Working with Device Blocks

Displaying Block Parameters

To display the Block Menu select the desired block tag from the block list. From the Block Menu double tap the desired parameter group label category.

Note

Shaded areas indicate values that cannot be changed. At this time, only the resource, transducer and I/O blocks are editable.

Changing and Sending Parameter Data

From the *Fieldbus Application* menu select *Online* (refer to figures 3-4 and 3-5). Select the device you want to work with from the Live Device List to display the blocks in that device. Double tap the desired parameter. Change the parameter to the desired value (select HELP to see the parameter description). Tap OK to after making the change. Repeat these steps for other parameters as necessary. Once all of the desired changes have been made, tap SEND to save the changes to the device.

Note

An asterisk will appear next to a modified parameter which has not yet been sent to the device.

The Block mode must be in the appropriate state to accept parameter changes. This is typically MAN or OOS.

Displaying Device Status

From the *Fieldbus Application* menu, select *Online* to access the Live Device List (refer to figure 3-4 and 3-5). Select the desired device from the Live List.

To display the device status via the transducer block, select transducer block and double tap Instrument Status.

To display the device status via the resource block, select resource block, and double tap Resource Status.

To display the device status through any of the function block, select the desired function block and double tap Status.

Other Block List Selections

Detail Menu

Access the Live Device List from the *Fieldbus Application* menu be selecting *Online* (refer to figures 3-4 and 3-5). Select the desired device from the live list. Select Detail from the block list. Select one of the following options:

- **Physical Device Tag**—designates a field device's role in the system. The device tag should not be changed when the device is connected to a control segment.

WARNING

Changing the Physical Device Tag on a device which is on an active segment can cause process instability, resulting in personal injury or property damage.

- **Address**—the data link layer node address of the device. This is automatically assigned by the LAS when it is connected to a segment. This address should not be changed when the device is connected to a control system.

- **Device ID**—the unique number identifier for your device. This is assigned by the manufacturer and cannot be changed.

- **Device Revision**—the manufacturer revision number. This is used by an interface device to locate the DD file for the resource and cannot be changed.

Changing the I/O Block Schedule

From the *Fieldbus Application* menu, select *Online* to access the Live Device List (refer to figures 3-4 and 3-5). Select the desired device from the Live List. Select Schedule from the block list. The I/O Block Schedule window will appear. Select the appropriate MacroCycle (1, 2, 5, or 10 seconds) from the drop down menu. Select the I/O blocks that are to be scheduled and press OK. This will schedule the blocks and set the mode on these blocks to Auto. After reading the resulting note press OK to acknowledge that the I/O block(s) were successfully scheduled.

Displaying Advanced Features

From the *Fieldbus Application* menu, select *Online* to access the Live Device List (refer to figures 3-4 and 3-5). Select the desired device from the Live List. Select Advanced from the block list. Double tap the desired Label to view its values.

Polling

From the *Fieldbus Application* menu, select *Utility* and then Polling.

The V(FUN) is the first unpolled node address. V(NUN) is the number of node addresses not to poll. The addresses between V(FUN) and V(NUN) are polled. The DeltaV System checkbox instructs the 375 Field Communicator to use the same polling scheme as DeltaV.

Enter the desired polling addresses in the appropriate field. Narrowing the range of devices being polled provides a quicker live list refresh.

System Information

To access the Field Communicator system information, select *Settings* from the 375 Main Menu.

About 375 includes software information about your 375 Field Communicator.

Licensing can be viewed when you turn on the 375 Field Communicator and in the License settings menu. The license setting allows you to view the license on the System Card.

Memory settings consists of System Card, Internal Flash size, and Ram size, as well as the Expansion Module if installed. It allows you to view the total memory storage and available free space.

Displaying the Field Communicator Device Description Revision

Device Description (DD) Revision is the revision number of the Fisher Device Description that resides in the Field Communicator. It defines how the Field Communicator is to interact with the user and instrument.

To see the Field Communicator device description revision number, from the main menu, select *Utility, Device Descriptions List, Fisher Controls,* and *DVC6000f*.

Fieldbus Diagnostics

Fieldbus diagnostics are used for troubleshooting fieldbus networks. From the *Fieldbus Applications* menu, select *Fieldbus Diagnostics.* If a warning appears, select OK after reading it.

To perform a measurement, select the desired option by tapping the checkbox. Select START to view the diagnostic results.

If Auto-Re-test is selected, a single re-test will be performed. If this option is not selected, tap RETEST to perform a single re-test.

Disconnecting from a Fieldbus Device

Before disconnecting of turning of the Field Communicator confirm that all methods (such as calibration) are complete and resolve any un-sent data to the device.

Section 4 Basic Setup and Tuning

Basic Setup

Transducer Block Mode 4-2
Protection 4-2
Setup Wizard 4-2
Auto Travel Calibrate 4-6

Tuning

Stabilize/Optimize 4-7

Basic Setup

WARNING

Changes to the instrument setup may cause changes in the output pressure or valve travel. Depending on the application, these changes may upset process control, which may result in personal injury or propery damage.

When the DVC6000f Series digital valve controller is ordered as part of a control valve assembly, the factory mounts the digital valve controller and sets up the instrument as specified on the order. When mounting to a valve in the field, the instrument needs to be setup to match the instrument to the valve and actuator.

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

Basic Setup includes the following procedures:

- Setup Wizard
- Auto Travel Calibrate
- Stabilize / Optimize (optional)

Note

The DVC6000f may keep the Transducer Block Mode Out-of-Service if the instrument is not properly mounted.

To setup and calibrate the instrument, the Transducer Block Mode must be Manual, and the Protection must be None.

When using DD methods the method will request that you change the mode, but make changes in Protection automatically. Protection MUST NOT BE left as None, as downloading from a 375 Field Communicator, DeltaV or other host system will over write these parameters.

Table 4-1. DVC6000f Series Factory Default Settings

SETUP PARAMETER	DEFAULT SETTING
Tvl Cutoff Hi	99.5%
Tvl Cutoff Lo	0.5%
Tvl Integral Gain	9.4 repeats/min
Tvl Cal Trigger	No
Tvl Integ Enable	On
Tvl Integ Lim Hi	30%
Tvl Integ Lim Lo	–30%
Tvl Integ DeadZ	0.25%
Press Cutoff Hi	99.5%
Press Cutoff Lo	–0.5%
Press Integ DeadZ	0.25%
Press Integ Hi Lim	20.0%
Press Integ Lo Lim	–20.0%
Input Char	Linear
Shutdown Trigger	All Off
Shutdown Recovery	All Off
Output Blk Timeout	600 sec

Trans Block Mode

(TB > Detailed Setup > Trans Block Mode)

To setup and calibrate the instrument, the transducer block mode must be in Manual. For more information about transducer block mode, refer to page 5-23.

Protection

(TB > Detailed Setup > Protection)

To setup and calibrate the instrument, the protection must be set to *None* with the Field Communicator (for information on using the 375 Field Communicator, refer to 375 Field Communicator Basics, Section 3 of this manual). For more information about configuration protection refer to page 5-23.

Setup Wizard

(TB > Basic Setup > Setup Wizard)

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

Note

If a Type B, reverse acting relay is used, you must manually set the Relay Type (BASIC_SETUP.RELAY_TYPE [42.5]) to B. This will not be set during Setup Wizard.

1. Select whether Travel, Travel with Pressure fallback (auto recovery or manual recovery) or Pressure Control is desired. Refer to page 5-23 for additional information.

2. Enter the pressure units:kPa, bar, psi, inHg or in H_2O

3. Enter the maximum instrument supply pressure and output pressure range (if required).

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

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

6. Enter the actuator size.

7. Indicate whether a Volume Booster is being used.

8. Specify if factory defaults should be used for basic setup. If you select YES for factory default, the Field Communicator sets the setup parameters to the values listed in table 4-1. If you select NO for the factory defaults, the setup parameters listed in the table remain at their previous settings.

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

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

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

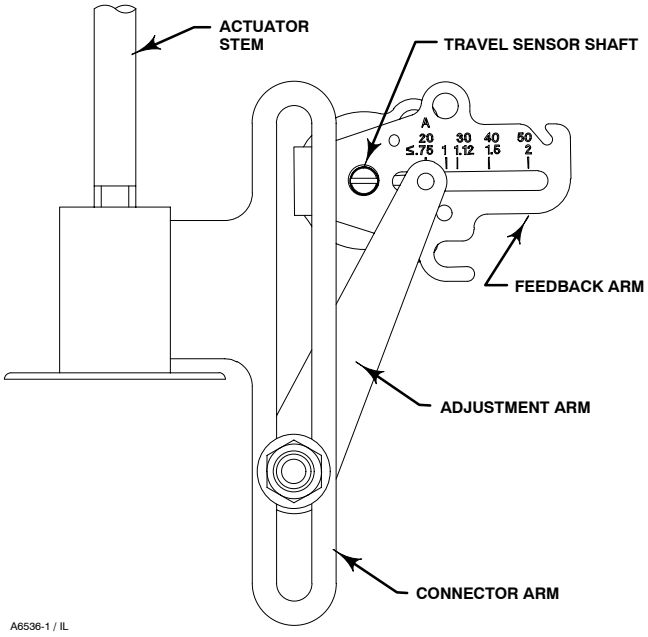

Figure 4-1. Feedback Connection for Typical Sliding-Stem Actuator (Up to 4-inch Travel)

- *Zero Power Condition*—Identifies whether the valve is fully open or fully closed when instrument power is lost. If you are unsure how to set this parameter, disconnect the segment loop power to the instrument. The resulting valve travel is the Zero Power Condition.

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

- *Travel Sensor Motion*—Select Clockwise or Counterclockwise. Travel Sensor Motion establishes the proper valve travel sensor (feedback) rotation.

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

Table 4-2. Actuator Information for Basic Setup

Actuator Manufacturer	Actuator Model	Actuator Size	Actuator Style	Starting Tuning Set	Feedback Connection	Travel Sensor Motion (Relay A)(1)
Fisher	585C & 585CR	25 50, 60 60, 80 100, 130	Piston Dbl w/ or w/o Spring. See actuator instruction manual and nameplate.	F J L M	SStem-Standard for travels up to 4 inches. SStem-Roller for longer travels	Depends upon pneumatic connections. See description for Travel Sensor Motion
	657	30 34, 40 45, 50 46, 60, 70, 76, & 80-100	Spring & Diaphragm	H K L M	SStem-Standard	Clockwise
	667	30 34, 40 45, 50 46, 60, 70, 76, & 80-100	Spring & Diaphragm	H K L M	SStem-Standard	Counterclockwise
	1051 & 1052	20, 30 33 40 60, 70	Spring & Diaphragm	H I K M	Rotary	Clockwise
	1061	30 40 60 68, 80, 100 & 130	Piston Dbl w/o Spring	J K L M	Rotary	Depends upon pneumatic connections. See description for Travel Sensor Motion
	1066	20, 27, 75	Piston Dbl w/o Spring	Specify	Rotary	Depends upon pneumatic connections. See description for Travel Sensor Motion
	1066SR	20 27, 75	Piston Sgl w/Spring	G L	Rotary	**Mounting Style** / **Travel Sensor Motion** A – Clockwise B – Counterclockwise C – Counterclockwise D – Clockwise
	GX	225 750 1200	Spring & Diaphragm	X(2) K M	SStem-Standard	**Air to** **Open** – Counterclockwise **Close** – Clockwise
Baumann	Air to Extend	16 32 570	Spring & Diaphragm	C E K	SStem-Standard	Clockwise
	Air to Retract	16 32 570	Spring & Diaphragm	C E K	SStem-Standard	Counterclockwise
	Rotary	10 25 54		E H J	Rotary	Specify
Gulde	3024	GA 1.21 GA 1.31 GA 1.41	Spring & Diaphragm	E H K	SStem-Standard	For P_o operating mode (air opens), Counterclockwise For P_s operating mode (air closes), Clockwise
	3025	P460, P462, P900		M	Rotary	Specify

1. Values shown are for Relay Type A. Reverse for Relay Type B.
2. X = Expert tuning. Proportional Gain = 4.2; Velocity Gain = 3.0; Minor Loop Feedback Gain = 18.0

Table 4-3. Gain Values for Preselected Tuning Sets

TUNING SET	Travel			Pressure		
	Proportional Gain	Velocity Gain	Minor Loop Feedback Gain	Proportional Gain	Integrator Gain	Minor Loop Feedback Gain
B	2.0	3.0	35	0.5	0.3	35
C	4.4	3.0	35	2.2	0.1	35
D	4.8	3.0	35	2.4	0.1	35
E	5.5	3.0	35	2.8	0.1	35
F	6.2	3.1	35	3.1	0.1	35
G	7.2	3.6	34	3.6	0.1	34
H	8.4	4.2	31	4.2	0.1	31
I	9.7	4.8	27	4.8	0.1	27
J	11.3	5.6	23	5.6	0.1	23
K	13.1	6.0	18	6.6	0.1	18
L	15.5	6.0	12	7.8	0.1	12
M	18.0	6.0	12	9.0	0.1	12
X (Expert)	NA	NA	NA	NA	NA	NA

WARNING

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

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

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

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

- *Tuning Set*—There are twelve tuning sets to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings. Tuning set B provides the slowest response and M provides the fastest response. Table 4-3 lists the values for preselected tuning sets.

In addition, you can select Expert, which allows you to modify tuning of the digital valve controller by specifying the gain values.

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

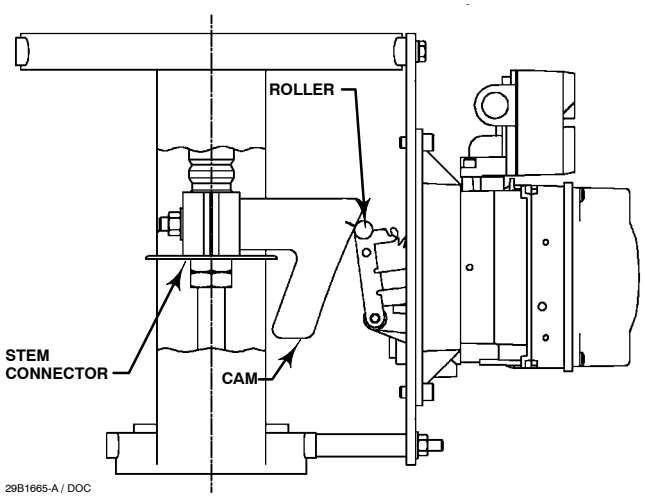

Figure 4-2. Feedback Connection for Typical Long-Stroke Sliding-Stem Actuator (4 to 24-Inches Travel)

Note

When selecting a tuning set for a DVC6015, DVC6025 or DVC6035 remote mount unit, it may be necessary to reduce the tuning set, due to the effects of the long tubing between the digital valve controller and the actuator.

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

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. To avoid personal injury and property damage caused by the release of pressure or process fluid, provide some temporary means of control for the process.

When the Setup Wizard is complete you are asked if you wish to run Auto Travel Calibration now. Select yes to automatically calibrate instrument travel at this time. Follow the prompts on the Field Communicator display. The calibration procedure uses the valve and actuator stops as the 0% and 100% calibration points. For additional information, refer to Auto Calibrate Travel in this section.

4

Note

Relay adjustment for single acting relays is not normally required. However, it is recommended that you check the relay adjustment for double acting relays in new installations before proceeding with travel calibration. Refer to page 6-5 for relay adjustment instructions.

If after completing auto setup and auto calibration the valve seems slightly unstable or unresponsive, you can improve operation by selecting *Stabilize/Optimize* from the *Basic Setup* menu. For additional information on stabilizing or optimizing valve response, refer to Stabilize/Optimize, also in this section.

Auto Tvl Calib

(TB > Basic Setup > Auto Tvl Calib)

WARNING

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

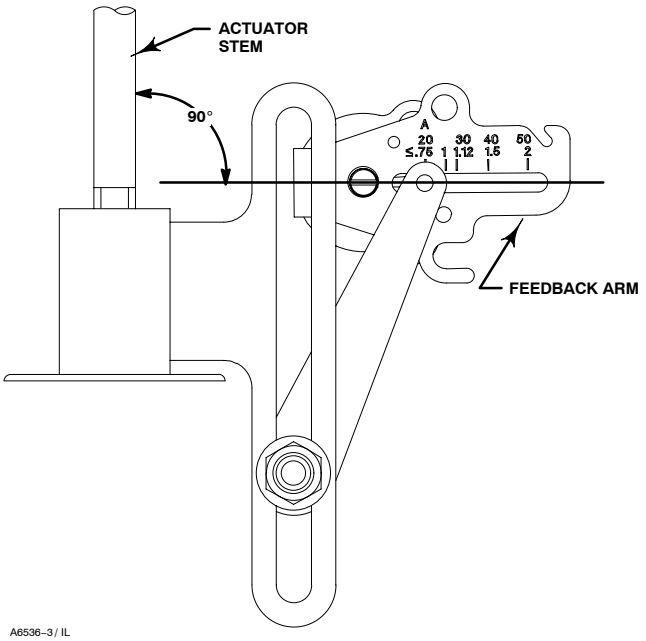

Figure 4-3. Crossover Point

There are two Auto Travel Calibration options available; autocalibrate-standard or autocalibrate–extended. Autocalibrate-extended is used for very large, slow moving actuators or actuators with accessories, and may also be needed for remote mount calibration.

Auto Travel Calibration requires user interaction only when the Feedback Connection is SStem - Standard. If the Feedback Connection is Rotary - All, SStem - Roller, no user interaction is required. For valves with the SStem - Standard Feedback Connection, interaction provides a more accurate crossover adjustment.

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

If you select Last Value, the crossover setting currently stored in the instrument is used and there are no further user interactions with the auto-calibration routine (go to step 3). If you select Default, an approximate value for the crossover is sent to the instrument and there are no further user interactions with the auto-calibration routine (go to step 3). If you select Manual, the Field Communicator prompts you to adjust the transducer block set point until the feedback arm is 90° to the actuator stem, as shown in figure 4-3. After you have made the adjustment, press OK and go to step 3.

2. The Field Communicator displays a menu to allow you to adjust the crossover.

Select the direction and size of change required to set the feedback arm so it is 90° to the actuator stem, as shown in figure 4-3.

If another adjustment is required, repeat step 2. Otherwise, select Done and then Next, and go to step 3.

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

4. When the calibration procedure has finished, you will be prompted to enter the name of the person performing the calibration procedure.

5. Enter the location of the calibration procedure.

6. Enter the date of the calibration procedure.

7. Place the Transducer Block Mode in Auto and verify that the travel properly tracks the setpoint changes.

Tuning

Stabilize/Optimize

(TB > Basic Setup > Stabilize/Optimize)

If after completing initial setup and calibration the valve cycles or overshoots, or is sluggish, you can improve operation running Stabilize/Optimize.

WARNING

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

Stabilize/Optimize is included with the device description (DD) software. Stabilize/Optimize is accessible from the transducer block and permits changing the transducer block set point a small amount to see if the valve is unstable or unresponsive. If valve response is unsatisfactory, the method permits adjusting the digital valve controller tuning to improve response.

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

If after selecting *Decrease Response* or *Increase Response* the valve travel overshoot is excessive, *Increase Damping* or *Decrease Damping* can be used to select a damping value not represented in a predefined tuning set. Select *Decrease Damping* to select a damping value that allows more overshoot. Select *Increase Damping* to select a damping value that will decrease the overshoot.

When valve operation is satisfactory, select Exit. Before exiting, you are asked if you want to return the transducer block mode to Auto. Select Yes to change the transducer block mode to Auto. Select No to leave the transducer block in its current mode.

Section 5 Detailed Setup / Blocks

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Resource Block Overview

The resource block contains the hardware specific characteristics associated with a device; it has no input or output parameters. The resource block monitors and controls the general operation of other blocks within the device. Most of the resource block parameters are operational parameters that provide information about the instrument such as identification, hardware information, available options, etc. and are read only. Configuration of the resource block involves selecting features from those that are available, setting the mode, setting write lock, and setting up alert reporting details.

The following procedures address only the key resource block parameters; however, all resource block parameters are listed in table 5-5.

Setup

Resource Block Mode

(RB > Setup > Res Block Mode)

Modes

The resource block can be in one of two modes (MODE_BLK [5]):

○ **Automatic (Auto)**—This is the operational mode for this block. When the resource block is in the Auto mode, all other function blocks are allowed to function normally.

○ **Out of Service (OOS)**—Placing the resource block in Out of Service mode stops all function block execution, by setting their modes to Out of Service as well. The actual mode of the function blocks is changed to Out of Service, but the function block target modes are retained . Placing the resource block in the Out of Service mode does not affect the mode of the transducer block.

Write Lock

(RB > Setup > WriteLock)

- **Write Lock**

Write Lock (WRITE_LOCK [34]) determines if writes are permissible to other device parameters. The Soft Write Lock feature must be selected to be able to use Write Lock (see Features). When Write Lock is set to Locked, no writes are permitted to any parameters within the device except to set Write Lock to Not Locked. When locked, the device functions normally, updating inputs and outputs and executing algorithms. When Write Lock is set to Not Locked, the Write Alarm (WRITE_ALM [40]) alert is active.

- **Write Priority**

Write Priority (WRITE_PRI [39]) sets the priority for Write Alarm. The lowest priority is 0. The highest is 15.

Comm Time Out

(RB > Setup > Comm Time Out)

- **RCas Timeout**

Note

Typically this parameter does not need to be changed. The unit will be operational using the default values assigned by the factory. Perform this procedure only if a remote computer is sending setpoints from your "advanced" control.

Default value for RCas Timeout is 20 seconds.

RCas Timeout (SHED_RCAS [26]) determines how long function blocks in the DVC6000f should wait before giving up on remote computer writes to RCas parameters. When the timeout is exceeded, the block sheds to the next mode as defined by the block shed options. If RCas Timeout is set to 0, the block will not shed from RCas. Enter a positive value in the RCas Timeout Timeout field. Time duration is in 1/32 milliseconds (640000 = 20 secs).

- **ROut Timeout**

Note

Typically this parameter does not need to be changed. The unit will be operational using the default values assigned by the factory. Perform this procedure only if a remote computer is sending setpoints from your "advanced" control.

Default value for ROut Timeout is 20 seconds.

ROut Timeout (SHED_ROUT [27]) determine how long function blocks in the DVC6000f should wait before giving up on computer writes to ROut parameters. When the timeout is exceeded, the block sheds to the next mode as defined by the block shed options. If ROut Timeout is set to 0, the block will not shed from ROut. Enter a positive value in the ROut Timeout field. Time duration is in 1/32 milliseconds (640000 = 20 secs).

Options

(RB > Setup > Options)

- **Feature Selection**

Note

Typically this parameter does not need to be changed. The unit will be operational using the default values assigned by the factory.

Fault State, Soft Write Lock, and Output Readback are set by default.

Feature Selection (FEATURE_SEL [18]) indicates which Resource Block Options features have been selected and is used to select the desired features.

○ **Reports**—Selecting reports enables alert and event reporting. Reporting of specific alerts may be suppressed. See Alerts on page 5-29.

○ **Fault State**—Selecting fault state enables the ability to manually set and clear the fault state. See parameter descriptions for Set Fault State (SET_FSTATE [29]) and Clear Fault State (CLR_FSTATE [30]) in table 5-5.

○ **Soft Write Lock**—When selected, permits using Write Lock (WRITE_LOCK [34]) to prevent any external change to parameter values. Block connections and calculation results will proceed normally, but the configuration is locked. Also see Write Lock, on page 5-4.

○ **Output Readback**—Output Readback is always enabled and is always from the actual valve position.

○ **Renunciation Supported**— When selected, the instrument will support Renunciation of alarms.

○ **PW Alarms set PV Status**— When selected, PlantWeb® alarms will set the PV status according to table 5-1.

○ **DO Control**— When selected, the transducer block accepts setpoint changes from the DO block. When not selected the transducer block accepts setpoint changes from the AO block. The resource block must be Out of Service to change this selection.

When DO Control is set, the AO block remains in IMAN and the DO block is fully functional. When not selected, the DO block remains in IMAN and the AO block is fully functional.

Alarm Handling

(RB > Setup > Alarm Handling)

- **Alert Key**

Alert Key (ALERT_KEY [4]) is a number that permits grouping alerts. This number may be used to indicate to the operator the source of the alert, such as the instrument, plant unit, etc. Enter a value between 1 and 255.

- **Confirm Time**

Confirm Time (CONFIRM_TIME [33]) determines the time, in 1/32 of a millisecond, the instrument waits for confirmation of receipt of a report before trying again. If Confirm Time is 0, the instrument does not retry to send the report. Enter 0 or a value between 320000 (10 secs) and 640000 (20 secs).

Table 5-1. Output Block PV Status

FEATURE_SEL PW Alarms Set PV Status	Transducer Mode, Actual	Active PlantWeb Alarms	AO / DO PV Status(2)	AO / DO PV Substatus	AO/DO PV Limit Substatus(1)
Enabled	OOS	X	Bad	Device Failure	Constant
	Man	X	Bad	Non-specific	Constant
	Auto	Fail	Uncertain	Subnormal	See table 5-2
	Auto	Maint, no Fail	Uncertain	Non-specific	See table 5-2
	Auto	Advisory, no Fail, no Maint	Good	Advisory	See table 5-2
	Auto	None	Good	Non-Specific	See table 5-2
Not Enabled	OOS	X	Bad	Device Failure	Constant
	Man	X	Bad	Non-Specific	Constant
	Auto	Fail	Good	Non-Specific	See table 5-2
	Auto	Maint, no Fail	Good	Non-Specific	See table 5-2
	Auto	Advisory, no Fail, no Maint	Good	Non-Specific	See table 5-2
	Auto	None	Good	Non-Specific	See table 5-2

NOTES:
X = No Effect
1. PV limit substatus reflects only READBACK limit substatus. SP limit substatus reflects only out block rate limits.
2. Firmware Revision 1.1 and earlier will set AO/DO PV Status to Bad if Feedback Sensor has failed, ie; Travel Sensor Fail. However, if the Travel Sensor fails, and the instrument falls back to pressure, PV Status will remain good.

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Table 5-2. Limit Sub Status

Out Block	Transducer Mode	In Cutoff Region	Rate Limited	Limit Sub-Status
AO, DO	OOS	X	X	Constant
AO, DO	MAN	X	X	Constant
AO	AUTO	High	X	High Limited
AO	AUTO	Low	X	Low Limited
AO	AUTO	X	High	High Limited
AO	AUTO	X	Low	Low Limited
AO	AUTO	None	None	Not Limited
DO	AUTO	X	High	High Limited
DO	AUTO	X	Low	Low Limited
DO	AUTO	X	None	Not Limited

NOTE: X = No Effect

- **Max Alerts Possible / Max Alerts Allow**

To have the instrument report alerts without having the host poll the alerts parameters, select the Reports feature (see Feature Select).

Maximum Alerts Possible (MAX_NOTIFY [31]) indicates the maximum number of alert reports that the device can send without getting a confirmation. This limit is determined by the amount of memory available for alert messages. The number can be set lower, to control alert flooding, by adjusting Maximum Alerts Allowed (LIM_NOTIFY [32]). If Max Alerts Allowed is set to zero, no alerts are reported. Enter a value between 0 and 3.

- **Acknowledge Option**

Acknowledge Option (ACK_OPTION [38]) determines if alarms associated with the block will be automatically acknowledged.

- **Alarm Summary: Disabled**

Alarm Summary (ALARM_SUM [37]) determines if the Write Alarm (WRITE_ALM [40]) and Block Alarm [BLOCK_ALM [36]) are disabled.

- **Block Alarm: Unacknowledged**

The Block Alarm (BLOCK_ALM [36]) is used for all configuration, hardware, connection failure or system problems in the block.

Instrument

(RB > Setup > Instrument)

- **Strategy**

Strategy (STRATEGY [3]) permits strategic grouping of blocks so the operator can identify where the block is located. The blocks may be grouped by plant area, plant equipment, etc. Enter a value between 0 and 65535 in the Strategy field.

- **Tag Description**

The Tag Description (TAG_DESC [2]) is used to assign a unique 32 character description to each block within the digital valve controller to describe the intended application for the block.

- **Field Serial Number**

The Field Serial Number (FIELD_SN [51]) is the serial number of instrument assigned in field.

Block Errors

Table 5-3 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the Resource block and are provided only for your reference.

Table 5-3. Resource Block BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	**Other** - Set if a device initialization error occured.
1	**Block Configuration Error** - Set if FEATURE_SEL, CYCLE_SEL, or CYCLE_TYPE is set incorrectly.
2	*Link Configuration Error - N/A*
3	**Simulate Active** - Indicates that the simulation jumper is in place on the aux terminals. This is not an indication that the I/O blocks are using simulation data. See AO block paramter SIMULATE [10] and DO block parameter SIMULATE_D [10].
4	*Local Override - N/A*
5	*Device Fault State - N/A*
6	**Device Needs Maintenance Soon** - Indicates a Maintenance PlantWeb Alert condition is active.
7	*Input failure/process variable had Bad status - N/A*
8	*Output failure - N/A*
9	**Memory failure** - Indicates a pending Flash or NVM failure.
10	**Lost Static Data** - Indicates failure of the memory containing static parameters.
11	**Lost NV Data** - Indicates failure of the memory containing non-volatile parameters.
12	*Readback Check Failed - NA*
13	**Device Needs Maintenance Now** - Indicates a Failed PlantWeb Alert condition is active.
14	**Power Up** - Indicates the device has been powered up and the Resource Block is not running normally.
15	**Out of Service (MSB)** - The resource block actual mode is Out of Service.

Master Reset

(RB > Master Reset)

You can restart the instrument to reset parameters, links, etc. within the instrument. However, due to the effect that a restart can have on the instrument, and therefore the control loop, restarting the instrument should be used cautiously and only as a last measure.

The following procedure describes how to use Master Reset to restart the instrument with a Field Communicator. You can also restart the instrument using AMS ValveLink Software or from a host system using the Restart method included with the device description (DD) software.

You can restart the instrument any time it is connected to an active segment.

⚠ WARNING

Restarting the instrument may cause loss of process control. To avoid personal injury and property damage caused by the release of pressure of process fluid, provide some temporary means of control for the process.

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To restart the instrument, select *Resource Block* and *Master Restart* on the Field Communicator.

1. Restart informs you about what can happen when an instrument restart is performed. Select *Yes* to continue, or *No* to abort without restarting.

2. Select the desired restart action or select *EXIT* to exit Restart. Select Help (not the Help button) to get information on restart actions.

There are two different restarts: Restart Processor, and Restart with Defaults:

When selecting either of these options, Restart informs you of the consequences of this action and asks if you want to continue. Select *Yes* to perform the restart action or select *No* to select another action or exit. Restart informs you when the restart is completed. You must acknowledge the message to continue.

Restart Processor—Performing a Restart Processor has the same effect as removing power from the instrument and re-applying power. Configuration and calibration do not change.

Restart with Defaults—Performing a Restart with Defaults should be done with care. This restart resets the static and non-volatile parameters for all of the blocks in the instrument to their initial value, as listed in table 5-4. After a Restart with Defaults, you should run the Setup Wizard and download the instrument configuration from the control system to properly setup the instrument. You also may need to re-establish communication links and trends.

Table 5-4. Parameters Affected by Restart with Defaults

Index Number	Parameter Name	Initial Value
	Resource Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Auto
	PERMITTED	Auto or Out of Service
	NORMAL	Auto
9	DD_RESOURCE	spaces
10	MANUFAC_ID	0x5100
11	DEV_TYPE	4601
12	DEV_REV	varies with release
13	DD_REV	varies with release
14	GRANT_DENY	All bits: 0
15	HARD_TYPES	All bits: 1 (active)
17	FEATURES	All bits: 1 (active)
18	FEATURE_SEL	Set by mfgr.
19	CYCLE_TYPE	0:1
20	CYCLE_SEL	0:0
21	MIN_CYCLE_T	3200
22	MEMORY_SIZE	0
23	NV_CYCLE_T	5760000
26	SHED_RCAS	640000
27	SHED_ROUT	640000
28	FAULT_STATE	1=Clear
31	MAX_NOTIFY	3
32	LIM_NOTIFY	MAX_NOTIFY
33	CONFIRM_TIME	640000
34	WRITE_LOCK	1=Unlocked
37	ALARM_SUM	
	DISABLED	All bits: 0
38	ACK_OPTION	Disabled
39	WRITE_PRI	0
41	ITK_VER	depends on device revision
42	DISTRIBUTOR	0x5100
43	DEV_STRING	read random number
44	FB_OPTIONS	All options enabled
45	DIAG_OPTIONS	depends on licensed options
46	MISC_OPTION	enabled
47	SOFTWARE_REVISION	depends on device revision
48	HARDWARE_REV	Factory set
49	ELECTRONICS_SN	Factory set
50	FACTORY_SN	spaces
51	FIELD_SN	spaces
52	DETAILED_STATUS	
54	DEVICE_ID	Device ID
55	STBY_SOFTWARE_REV	depends on software revision
	AO Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS+MAN+AUTO+CAS+ CAS
	NORMAL	Auto
8	SP	Dynamic
9	OUT	Dynamic
11	PV_SCALE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	AO Block (continued)	
12	XD_SCALE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
14	IO_OPTS	All off
15	STATUS_OPTS	All off
17	CAS_IN	BAD:
		NC:
		const
		0
18	SP_RATE_DN	+INF
19	SP_RATE_UP	+INF
20	SP_HI_LIM	100
21	SP_LO_LIM	0
22	CHANNEL	1=analog valve input
23	FSTATE_TIME	0
24	FSTATE_VAL	0
26	RCAS_IN	
	Status	BAD:
		NoComm:
		NoVal:
		const
	Value	0 Trk
27	SHED_OPT	All off
	PID Block Parameters	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS+MAN+AUTO+CAS+ RCAS+ROUT
	NORMAL	Auto
8	SP	Dynamic
9	OUT	Dynamic
10	PV_SCALE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
11	OUT_SCALE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
13	CONTROL_OPTS	0: Bypass enable
14	STATUS_OPTS	All off
15	IN	
	Status	BAD:
		NC:
		const
	Value	0
16	PV_FTIME	0
17	BYPASS	0
18	CAS_IN	
	Status	BAD:
		NC:
		const
	Value	0
19	SP_RATE_DN	+INF
20	SP_RATE_UP	+INF
21	SP_HI_LIM	100

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	PID Block (continued)	
22	SP_LO_LIM	0
23	GAIN	1
24	RESET	+INF
25	BAL_TIME	0
26	RATE	0
27	BKCAL_IN	
	Status	BAD: NC: const
	Value	0
28	OUT_HI_LIM	100
29	OUT_LO_LIM	0
30	BKCAL_HYS	0.5%
32	RCAS_IN	
	Status	BAD: NoCom: NoVal: const
	Value	0 Trk
33	ROUT_IN	
	Status	BAD: NoCom: NoVal: const
	Value	0 Trk
34	SHED_OPT	0
37	TRK_SCALE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal places	2
38	TRK_IN_D	
	Status	BAD: NC: const
	Value	0
39	TRK_VAL	
	Status	BAD: NC: const
	Value	0
40	FF_VAL	
	Status	BAD: NC: const
	Value	0
41	FF_SCALE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
42	FF_GAIN	0
45	ALARM_SUM	
	DISABLED	0
46	ACK_OPTION	Disabled
47	ALARM_HYS	0.5%
48	HI_HI_PRI	0
49	HI_HI_LIM	+INF
50	HI_PRI	0
51	HI_LIM	+INF
52	LO_PRI	0
53	LO_LIM	–INF
54	LO_LO_PRI	0
55	LO_LO_LIM	–INF

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	PID Block (continued)	
56	DV_HI_PRI	0
57	DV_HI_LIM	+INF
58	DV_LO_PRI	0
59	DV_LO_LIM	–INF
66	BIAS	
69	SP_FTIME	0
70	MATHFORM	0
71	STRUCTURECONFIG	0
72	GAMMA	
73	BETA	
74	IDEABAND	0
	ISEL Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS+MAN+AUTO
	NORMAL	Auto
7	OUT	
8	OUT_RANGE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
10	STATUS_OPTS	All off
11	IN_1	
	Status	BAD NC cons
	Value	0
12	IN_2	
	Status	BAD NC cons
	Value	0
13	IN_3	
	Status	BAD NC cons
	Value	0
14	IN_4	
	Status	BAD NC cons
	Value	0
15	DISABLE_1	
	Status	BAD NC cons
	Value	0
16	DISABLE_2	
	Status	BAD NC cons
	Value	0

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	ISEL Block (continued)	
17	DISABLE_3	
	Status	BAD NC cons
	Value	0
18	DISABLE_4	
	Status	BAD NC cons
	Value	0
19	SELECT_TYPE	All off
20	MIN_GOOD	0
22	OP_SELECT	
	Status	BAD NC constant
	Value	0
25	IN_5	
	Status	BAD NC cons
	Value	0
26	IN_6	
	Status	BAD NC cons
	Value	0
27	IN_7	
	Status	BAD NC cons
	Value	0
28	IN_8	
	Status	BAD NC cons
	Value	0
29	DISABLE_5	
	Status	BAD NC cons
	Value	0
30	DISABLE_6	
	Status	BAD NC cons
	Value	0
31	DISABLE_7	
	Status	BAD NC cons
	Value	0
32	DISABLE_8	
	Status	BAD NC cons
	Value	0
33	AVG_USE	0
34	ALARM_SUM	
	DISABLED	0
35	ACK_OPTION	0
36	ALARM_HYS	0.5%
37	HI_HI_PRI	0

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	ISEL Block (continued)	
38	HI_HI_LIM	0
39	HI_PRI	0
40	HI_LIM	0
41	LO_PRI	0
42	LO_LIM	0
43	LO_LO_PRI	0
44	LO_LO_LIM	0
49	OUT_D	
50	ALM_SEL	All bits: 0
	DI Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS+MAN+AUTO
	NORMAL	Auto
8	OUT_D	
10	XD_STATE	0
11	OUT_STATE	0
13	IO_OPTS	All off
14	STATUS_OPTS	All off
15	CHANNEL	0
16	PV_FTIME	0
20	ALARM_SUM	
	DISABLED	0
21	ACK_OPTION	All off
22	DISC_PRI	0
23	DISC_LIM	0
	OS Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS+MAN+AUTO
	NORMAL	AUTO+CAS
7	SP	
8	OUT_1	
9	OUT_2	
10	OUT_1_RANGE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
11	OUT_2_RANGE	
	EU 100%	100
	EU 0%	0
	Engineering Units	%
	Decimal Places	2
13	STATUS_OPTS	disabled
14	CAS_IN	
	Status	BAD NC const
	Value	0
19	BKCAL_1_IN	
	Status	BAD NC const
	Value	0

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	OS Block (continued)	
20	BKCAL_2_IN	
	Status	BAD
		NC
		const
	Value	0
21	BAL_TIME	0
	AI Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS, MAN, AUTO
	NORMAL	Auto
8	OUT	
10	XD_SCALE	
	EU at 100%	100
	EU 0%	0
	Units Index	%
	Decimal point	2
11	OUT_SCALE	
	EU 100%	100
	EU 0%	0
	Units Index	Trk s/b%
	Decimal point	2
13	I/O OPTS	disabled
14	STATUS OPTS	disabled
15	CHANNEL	0
16	L_TYPE	0
17	LOW_CUT	0
18	PV_FTIME	0
22	ALARM_SUM	
	DISABLED	0
23	ACK_OPTION	Disabled
24	ALARM_HYS	0.5%
25	HI_HI_PRI	0
26	HI_HI_LIM	0
27	HI_PRI	0
28	HI_LIM	0
29	LO_PRI	0
30	LO_LIM	0
31	LO_LO_PRI	0
32	LO_LO_LIM	0
37	OUT_D	
38	ALM_SEL	unselected
	MAI Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS, MAN, AUTO
	NORMAL	Auto
7	CHANNEL	
8	OUT_1	TB.FINAL_VALUE
9	OUT_2	TB.TRAVEL_TARGET
10	OUT_3	TB.FINAL_POSITION_VALUE
11	OUT_4	TB.TRAVEL
12	OUT_5	TB.SUPPLY_PRESS
13	OUT_6	TB.ACT_PRESS_A
14	OUT_7	TB.ACT_PRESS_B
15	OUT_8	TB.ACT_PRESS_DIFF

–Continued–

Table 5-4. Parameters Affected by Restart with Defaults (Continued)

Index Number	Parameter Name	Initial Value
	DO Block	
1	ST_REV	0
2	TAG_DESC	spaces
3	STRATEGY	0
4	ALERT_KEY	0
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	OOS+MAN+AUTO+CAS+ RCAS
	NORMAL	AUTO+CAS
8	SP_D	
9	OUT_D	
11	PV_STATE	0
12	XD_STATE	0
14	IO_OPTS	All off
15	STATUS_OPTS	All off
17	CAS_IN_D	
	Status	BAD
		NC
		const
	Value	0
18	CHANNEL	22
19	FSTATE_TIME	0
20	FSTATE_VAL_D	0
22	RCAS_IN_D	
	Status	BAD
		NoComm
		NoVal
		const
	Value	0
23	SHED_OPT	All off
27	SP_RATE_UP	0
28	SP_RATE_DN	0
	Transducer Block	
1	ST_REV	N/A
2	TAG_DESC	NULL
3	STRATEGY	0
4	ALERT_KEY	1
5	MODE_BLK	
	TARGET	Out of Service
	PERMITTED	AUTO, MAN, OOS
	NORMAL	Auto

Resource Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter.

Table 5-5. Resource Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	NA	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data. Increments by one each time a static parameter changes. The value is reset to 0 whenever a Restart with Defaults is performed. See Restarting the Instrument.
Tag Description TAG_DESC	2	RW	NA	7 bit ASCII	Spaces	Data Type: Octet String The user description of the intended application of the block. Null characters are not allowed in this data type.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned16 Used to identify groupings of blocks. The data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. Devices in a loop or plant section can be assigned with a common alert key to aid the operator in determining location of alerts.
Block Mode MODE_BLK	5					
TARGET_MODE	5.1	RW	ALL	3: Auto 7: OOS	3: Auto	Data Type: DS-69 The actual, target, permitted, and normal modes. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
ACTUAL_MODE	5.2	RO	NA	3: Auto 6: IMAN (only during initialization 7: OOS	N/A	
PERMITTED_MODE	5.3	RW	ALL	3: Auto 7: OOS	3: Auto 7: OOS	
NORMAL_MODE	5.4	RW	ALL	3: Auto	3: Auto	
Block Error BLOCK_ERR	6	RO	N/A	0: Other 1: Block Configuration Error 3: Simulate Active 6: Device needs Maintenance Soon 9: Memory Failure 10: Lost Static Data 11: Lost Non-Volatile Memory 13: Device needs Maintenance Now 14: Power-up 15: Out-of-Service (MSB)	Dynamic	Data Type: Bit String 0 = Inactive 1 = Active Error status associated with hardware or software for the resource block. When an error is shown it may be broadcast to the host through BLOCK_ALM.
Device State RS_STATE	7	RO	N/A	2: Initialization, Actual mode=IMAN 4: On-line, Actual Mode=Auto 5: Standby, Actual Mode=OOS 6: Failure, Actual Mode=OOS	5: Standby	Data Type: Unsigned8 State of the function block application state machine.
Test Read Write TEST_RW	8		ALL		0	This parameter may be used in interoperability testing to read and write all standard data types supported by the Fieldbus Foundation.
DD Resource DD_RESOURCE	9	RO	N/A		Spaces	Data Type: Visible String String identifying the VFD tag of the resource that contains the Device Description for this resource.

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Table 5-5. Resource Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Manufacturer Id MANUFAC_ID	10	RO	N/A		0x5100	Data Type: Unsigned32 Manufacturer identification number, used by an interface device or host to locate the DD file for the resource. All manufacturer identification numbers are maintained by the Fieldbus Foundation. A host usually will have a base directory for DD files. In this directory is a subdirectory for each manufacturer id. In each manufacturer id subdirectory is a directory for each device type made by that manufacturer. The device type directories contain files named by combining the device revision for the particular device type with the revision of the device description. The manufacturer id for Fisher is 0x005100.
Device Type DEV_TYPE	11	RO	N/A		4601	Data Type: Unsigned16 Manufacturer's model number associated with the resource, used by an interface device to locate the DD file for the resource.
Device Revision DEV_REV	12	RO	N/A		Varies with release	Data Type: Unsigned8 Manufacturer's revision number associated with the resource, used by an interface device to locate the DD file for the resource.
DD Revision DD_REV	13	RO	N/A		Varies with release	Data Type: Unsigned8 The minimum revision of the device description (DD) than can be used with the device revision of the instrument. Used by the interface device to prevent the use of DDs that are incompatible with the firmware in the instrument.
Grant Deny GRANT_DENY	14					
GRANT	14.1	RW	ALL	Valid Bits: 0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	Data Type: DS-70 Options for controlling access of a host computer and to block parameters. Parameter contains two attributes Grant and Deny each with program, tune, alarm and local permissions. Clearing a grant permission sets the corresponding deny permission, 0 = N/A, 1 = granted. Deny permissions may be cleared through the Deny attribute but not set, 0 = N/A, 1 = denied.
DENY	14.2	RW	ALL		All bits: 0	
Hard Types HARD_TYPES	15	RO	N/A	0: Scalar Input 1: Scalar output 2: Discrete input 3: Discrete output	0: 1 1: 1 2: 1 3: 1	Data Type: Bit String 0 = Inactive 1 = Active The types of hardware available as channel numbers in this resource.
Restart RESTART	16	RW	ALL	1=Run 2=Restart resource 3=Restart with defaults 4=Restart processor	1=Run	Data Type: Unsigned8 Allows a manual restart to be initiated. For details see Restarting the Instrument in this section.
Features FEATURES	17	RO	ALL	1: Reports supported 2: Fault State supported 3: Soft Write lock supported 10: Reannunciation supported 11: PW Alarms set PV Status 12: DO Control	1: 1 2: 1 3: 1 10: 1 11: 1 12: 1	Data Type: Bit String 0 = Inactive 1 = Active Shows the supported resource block options. Options are turned on and off via FEATURE_SELECT.

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Table 5-5. Resource Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Feature Selection FEATURE_SEL	18	RW	ALL	1: Reports Supported 2: Fault State supported 3: Soft Write lock supported 10:Reannunciation supported 11: PW Alarms set PV Status 12: DO Control	1:0 2:1 3:1 10:0 11:0 12:0	Data Type: Bit String 0 = Inactive 1 = Active Shows the selected resource block options. For details see Device Features in this section.
Cycle Type CYCLE_TYPE	19	RO	NA	0: Scheduled	0: 1	Data Type: Bit String 0 = Inactive 1 = Active Identifies the block execution methods available for this resource, may be scheduled, completion of block execution
Cycle Selection CYCLE_SEL	20		ALL	0: Scheduled	0: 0	Data Type: Bit String 0 = Inactive 1 = Active Identifies the block execution method selected for this resource.
Minimum Cycle Time MIN_CYCLE_T	21	RO	NA	3200	3200	Data Type: Unsigned32 Time duration of the shortest cycle interval (in 1/32 millisecond) of which the resource is capable. In the DVC this value is fixed at 3200 (100 milliseconds).
Memory Size MEMORY_SIZE	22	RO	NA	0	0	Date Type: Unsigned16 Memory, in kilobytes, available for additional function blocks. Because no additional function blocks may be added to DVC6000f Series instruments, this parameter value is fixed at 0.
Nonvolatile Cycle Time NV_CYCLE_T	23	RO	NA	Positive	576,000	Date Type: Unsigned32 This parameter identifies the minimum time interval (in 1/32 milliseconds) between copies of NV class data to NV memory. NV memory is updated only if there has been a change in the dynamic value. The last value saved in NV memory will be available for the restart procedure or a power cycle. A non-zero value regulates the frequency of writes, thus protecting the life span of the device. If the value is zero, data will never be automatically copied. Changes made by other than publishing to NV parameters will be copied to non-volatile memory immediately. For DVC6000f Series instruments, this parameter value is fixed at 576,000 (18 seconds).
Free Space FREE_SPACE	24	RO	NA	0 to 100%	0	Data Type: Float Percent of memory available for additional function blocks (see also MEMORY_SIZE). Because no additional function blocks may be added to DVC6000f Series instruments, this parameter value is fixed at 0.
Free Time FREE_TIME	25	RO	NA	0 to 100%	0	Data Type: Float Percent of block processing time that is free to process additional blocks. Because no additional function blocks may be added to DVC6000f Series instruments, this parameter value is fixed at 0.

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Table 5-5. Resource Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
RCAS Timeout SHED_RCAS	26	RW	ALL	Positive	640000	Date Type: Unsigned32 Time duration (in 1/32 millisecond) at which to give up on computer writes to function block RCAS parameters. If this time is exceeded then the function block will change to a mode other than RCAS based on the SHED_OPT parameter setting. Shed from RCAS mode never happens when SHED_RCAS is set to zero.
ROUT Timeout SHED_ROUT	27	RW	ALL	Positive	640000	Data Type: Unsigned32 Time duration (in 1/32 millisecond) at which to give up on computer writes to function block ROUT parameters. If this time is exceeded then the function block will change to a mode other than ROUT based on the SHED_OPT parameter setting. Shed from ROUT mode never happens when SHED_ROUT is set to zero.
Fault State FAULT_STATE	28	RO	N/A	1=Clear 2=Active	1=Clear	Data Type: Unsigned8 Forces output function blocks that are not Out of Service to the fault state condition. While this parameter is active the output function blocks will go to an actual mode of Local Override (LO) and will perform their fault state actions (see Action On Fault Detection for the output blocks on pages 5-70 and 5-149 of this section). This parameter is used to test the fault state behavior that normally occurs when there is a communication problem between devices. This parameter is changed by the SET_FSTATE and CLR_FSTATE parameters so long as the feature Fault State is selected (see Feature Selection [index number 18] in this table).
Set Fault State SET_FSTATE	29	RW	ALL	1=Off 2=Set	1=Off	Data Type: Unsigned8 Selecting Set changes the parameter FAULT_STATE to Active. This is essentially a “write only” parameter as it will always read OFF because it is defined as momentary. Writing a value of OFF has no affect. To use this parameter the feature Fault State must be selected (see Feature Selection on page 5-5).
Clear Fault State CLR_FSTATE	30	RW	ALL	1=Off 2= Clear	1=Off	Data Type: Unsigned8 Selecting Clear changes the parameter FAULT_STATE to Clear and clears the output function blocks of the FAULT_STATE if the field condition, if any, has cleared. This is essentially a “write only” parameter as it will always read OFF because it is defined as momentary. Writing a value of OFF has no affect. To use this parameter the feature Fault State must be selected (see Feature Selection on page 5-5).
Max Notify MAX_NOTIFY	31	RO	N/A	3	3	Data Type: Unsigned8 The maximum number of alert reports that this device can send without getting a confirmation. To control alert flooding, the number can be set lower by adjusting the LIM_NOTIFY parameter value. For DVC6000f Series instruments, this value is fixed at 3.
Max Alerts Allow LIM_NOTIFY	32	RW	ALL	0 to MAX_NOTIFY	MAX_NOTIFY	Data Type: Unsigned8 The number of alert reports that this device can send without getting a confirmation up to the maximum permitted in the parameter MAX_NOTIFY. If set to zero, then no alerts are reported.

–Continued–

Table 5-5. Resource Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Confirm Time CONFIRM_TIME	33	RW	ALL	> 0 Set by FCS	640000	Data Type: Unsigned32 The time (in 1/32 millisecond) the device waits for confirmation of receipt of an alert report before trying again.
Write Lock WRITE_LOCK	34	RW	ALL	0=Undefined 1=Unlocked 2=Locked	1=Unlocked	Data Type: Unsigned8 If set to Locked, no writes from anywhere are allowed except to clear WRITE_LOCK by entering Unlocked. Block inputs will continue to be updated if they are subscribers. The feature Soft Write Lock must be selected to enable writing to this parameter (see Device Features in this section).
Update Event UPDATE_EVT	35					
UNACKNOWLEDGED	35.1	RW	ALL	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	Data Type: DS-73 This alert is generated by any change to the static data. To support tracking changes in static parameter values, the blocks static revision parameter will be incremented each time a static parameter value is changed. Also, the blocks static revision parameter may be incremented if a static parameter is written but the value is not changed. If the Actual Mode is not Out of Service and Reports is selected in the Feature Select parameter, then this parameter will be sent to the host system providing the host has set up alert communications. Changes to static data while the block is Out of Service will be reported when the block transitions to another mode.
UPDATE_STATE	35.2	RO	NA	0=Undefined 1=Update reported 2=Update not reported	0=Undefined	
TIME_STAMP	35.3	RO	NA		0	
STATIC_REVISION	35.4	RO	NA		0	
RELATIVE_INDEX	35.5	RO	NA		0	
Block Alarm BLOCK_ALM	36					
UNACKNOWLEDGED	36.1	RW	ALL	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	Data Type: DS-72 This alarm is generated by a nonzero value in the Block Error. parameter. This alarm has a fixed priority of 2. For a BLOCK_ALM to be broadcast to the host the following conditions must be met: The feature Reports must be selected Alert communication with the host must be setup In the ALARM_SUM parameter, the disable bit for Block Alarm must be clear.
ALARM_STATE	36.2	RO	NA	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=Undefined	
TIME_STAMP	36.3	RO	NA		0	
SUBCODE	36.4	RO	NA		0	
VALUE	36.5	RO	NA		0	
Alarm Summary ALARM_SUM	37					
CURRENT	37.1	RO	NA	0: Discrete alarm 7: Block Alarm	All bits: 0	Data Type: DS-74 0=clear, acknowledged, reported, enabled Current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block. The Resource block only has two alarms: Write Alarm and Block Alarm.
UNACKNOWLEDGED	37.2	RO	NA	0: Discrete alarm 7: Block Alarm	All bits: 0	
UNREPORTED	37.3	RO	NA	0: Discrete alarm 7: Block Alarm	All bits: 0	
DISABLED	37.4	RW	ALL	0: Discrete alarm 7: Block Alarm	All bits: 0	
Acknowledge Option ACK_OPTION	38	RW	ALL	0: Discrete Alarm (Write Lock off) 7: Block Alarm	0: 0 7: 0	Data Type: Bit String 0=Disable 1=Enable Selection of whether alarms associated with the block will be automatically acknowledged.
Write Priority WRITE_PRI	39	RW	ALL	0 to 15	0	Data Type: Unsigned8 Priority of the alarm generated by setting WRITE_LOCK to Unlocked.

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Table 5-5. Resource Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Write Alarm WRITE_ALM	40					Data Type: DS-72 This alarm is generated when Unlocked in the WRITE_LOCK. parameter is set. This alarm has a priority of WRITE_PRI. For a WRITE_ALM to be broadcast to the host the following conditions must be met: The feature Reports must be selected Alert communication with the host must be setup In the ALARM_SUM parameter, the disable bit for Write Alarm must be clear. WRITE_PRI must be greater than 1.
UNACKNOWLEDGED	40.1	RW	ALL	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	
ALARM_STATE	40.2	RO	NA	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=Undefined	
TIME_STAMP	40.3	RO	NA		0	
SUBCODE	40.4	RO	NA		0	
VALUE	40.5	RO	NA		0	
ITK Version ITK_VER	41	RO	N/A		*	Data Type: Unsigned16 Major version of ITK test this device has been tested to. * Initial value depends on the revision of the DVC6000f.
Extended Parameters						
Private Label Distributor DISTRIBUTOR	42	RO	NA		0x5100	Data Type: Unsigned32 Private label distributor
Device String Array DEV_STRING	43					Unused extended parameter.
Function Block Options FB_OPTIONS	44	RO		Bits 0: AO 1: DO 2: AI 3: DI 4: PID 5: ISEL 6: OS 7: MAI	All options enabled	Data Type: Bit String 0=disabled 1=enabled Indicates which function block licensing options are enabled. One bit for each block type that is supported.
Diag Options DIAG_OPTIONS	45	RO	NA	1=FD Fieldbus Diagnostics 2=AD Advanced Diagnostics 3=PD Performance Diagnostics	*	Data Type: Enum Indicates which diagnostics licensing options are enabled. *Initial value depends on the licensed DVC6000f options.
Misc Options MISC_OPTIONS	46	RO	NA	0: Software Download 10: Travel Control Capable	0: 1 10: 1	Data Type: Bit String 0=Disable 1=Enable Indicates which miscellaneous licensing options are enabled.
Software Revision SOFTWARE_REVISION	47					Data Type: Uint8 Describes software revision information. This is the revision of the firmware that is currently in use. *Initial value depends on revision of DVC6000f.
SOFTWARE_REV_MAJOR	47.1	RO	NA	0–255	*	
SOFTWARE_REV_MINOR	47.2	RO	NA	0–255	*	
SOFTWARE_REV_BUILD	47.3	RO	NA	0–255	*	
IO_SOFTWARE_REV	47.4	RO	NA	0–255	*	
DIAG_CAL_REV	47.5	RO	NA	0–255	*	
SOFTWARE_REV_ALL	47.6	RO	NA	XX.XX.XX.XX.XX	*	Data Type: Visible String Describes software revision information. *Initial value depends on revision of DVC6000f. The range of this parameter consists of 47.1 through 47.5 values, converted to text, and linked together.
Hardware Revision HARDWARE_REV	48	RO	NA	Hardware revision number	Factory Set	Data Type: Uint8 Describe electronic hardware revision information.
Electronics Serial Number ELECTRONICS_SN	49	RO	NA	NA	Factory Set	Data Type: Visible String Electronics serial number set by manufacturing.

–Continued–

Table 5-5. Resource Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Factory Serial Number FACTORY_SN	50	RO	NA	NA	spaces	Data Type: Visible String Instrument serial number set by manufacturing.
Field Serial Number FIELD_SN	51	RW	NA	Any String	spaces	Data Type: Visible String Instrument serial number set in the field.
Detailed Status DETAILED_STATUS	52	RO	NA	NA		Data Type: Uint32 Not used by the DVC6000f.
Time Since Reset TIME_SINCE_RESET	53	RO	NA	NA	0	Number of seconds since the last time DVC6000f was restarted. Restart due to power up or restart command.
Device ID DEVICE ID	54	RO	NA	NA	Device ID	Data Type: Visible String Unique 32 character ID used to identify the device.
STBY_SOFTWARE_REV	55					
STBY_SOFTWARE_REV_MAJOR	55.1	RO	NA	0–255	*	Data Type: Uint8 Describes software revision information. This is the revision of the alternative firmware. *Initial value depends on revision of software in stby.
STBY_SOFTWARE_REV_MINOR	55.2	RO	NA	0–255	*	
STBY_SOFTWARE_REV_BUILD	55.3	RO	NA	0–255	*	
STBY_IO_SOFTWARE_REV	55.4	RO	NA	0–255	*	
STBY_DIAG_CAL_REV	55.5	RO	NA	0–255	*	
STBY_SOFTWARE_REV_ALL	55.6	RO	NA	XX.XX.XX.XX.XX	NA	Data Type: Visible String Describes software revision information. *Initial value depends on revision of software in stby. The range of this parameter consists of 55.1 through 55.5 values, converted to text, and linked together.

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-6. Resource Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	RS_STATE
25	FREE_TIME
28	FAULT_STATE
37.1	ALARM_SUM.CURRENT
37.2	ALARM_SUM.UNACKNOWLEDGED
37.3	ALARM_SUM.UNREPORTED
37.4	ALARM_SUM.DISABLED

Table 5-7. Resource Block, View 2

Index Number	Parameter
1	ST_REV
14.1	GRANT_DENY.GRANT
14.2	GRANT_DENY.DENY
18	FEATURE_SEL
20	CYCLE_SEL
23	NV_CYCLE_T
24	FREE_SPACE
26	SHED_RCAS
27	SHED_ROUT
32	LIM_NOTIFY
33	CONFIRM_TIME
34	WRITE_LOCK

Table 5-8. Resource Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	RS_STATE
25	FREE_TIME
28	FAULT_STATE
37.1	ALARM_SUM.CURRENT
37.2	ALARM_SUM.UNACKNOWLEDGED
37.3	ALARM_SUM.UNREPORTED
37.4	ALARM_SUM.DISABLED
44	FB_OPTIONS
52	DETAILED_STATUS
53	TIME_SINCE_RESET
54	DEVICE_ID

Table 5-9. Resource Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
10	MANUFAC_ID
11	DEV_TYPE
12	DEV_REV
13	DD_REV
15	HARD_TYPES
17	FEATURES
19	CYCLE_TYPE
21	MIN_CYCLE_T
22	MEMORY_SIZE
31	MAX_NOTIFY
38	ACK_OPTION
39	WRITE_PRI
41	ITK_VER
42	DISTRIBUTOR
43	DEV_STRING
45	DIAG_OPTIONS
46	MISC_OPTIONS
47.1	SOFTWARE_REVISION.SOFTWARE_REV_MAJOR
47.2	SOFTWARE_REVISION.SOFTWARE_REV_MINOR
47.3	SOFTWARE_REVISION.SOFTWARE_REV_BUILD
47.4	SOFTWARE_REVISION.IO_SOFTWARE_REV
47.5	SOFTWARE_REVISION.DIAG_CAL_REV
47.6	SOFTWARE_REVISION.SOFTWARE_REV_ALL
48	HARDWARE_REV
49	ELECTRONICS_SN
50	FACTORY_SN
51	FIELD_SN
55.1	STBY_SOFTWARE_REV.STBY_SOFTWARE_REV_MAJOR
55.2	STBY_SOFTWARE_REV.STBY_SOFTWARE_REV_MINOR
55.3	STBY_SOFTWARE_REV.STBY_SOFTWARE_REV_BUILD
55.4	STBY_SOFTWARE_REV.STBY_IO_SOFTWARE_REV
55.5	STBY_SOFTWARE_REV.STBY_DIAG_CAL_REV
55.6	STBY_SOFTWARE_REV.STBY_SOFTWARE_REV_ALL

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Transducer Block Overview

The transducer block accepts a signal from an output block as a set point to position a valve using a pneumatic actuator. Input to the transducer block is in percent. Closed is 0%, and open is 100%. The transducer block contains setup and calibration information and can be tuned to closely match the actuator. Input characterization permits modifying the overall characteristic of the instrument-actuator-valve combination in order to modify the installed gain characteristic of the loop. The transducer block can also be used to perform instrument and valve diagnostics and trigger performance alerts.

The following procedures address only the key transducer block parameters; however, all transducer block parameters are listed in table 5-13.

Detailed Setup

Note

To setup and calibrate the instrument, the transducer block Mode must be Manual and the Protection must be None.

Trans Block Mode

(TB > Detailed Setup > Transducer Block Mode)

Modes

The transducer block can be in one of three modes (MODE_BLK [5]):

○ **Automatic (Auto)**— This is the normal mode for this block. When the transducer block is in the auto mode, it accepts the output from the AO or DO block as a set point and outputs a drive signal to the I/O converter based upon this set point.

○ **Out of Service (OOS)**— Placing the transducer block in Out of Service mode changes the output to the zero power (no I/P drive) condition.

○ **Manual (MAN)**— Placing the transducer block in Manual will hold the value at the current setpoint (FINAL_VALUE [13]. The tranducer block will not accept changes from the AO or DO blocks. This mode is required to change some parameters and to run some diagnostics.

Protection

(TB > Detailed Setup > Protection)

To configure any parameters in the digital valve controller Write Lock (WRITE_LOCK [34]), in the resource block, must be set to Unlocked (refer to page 5-4). In addition, protection is provided for various transducer block parameters, as indicated in the Protect Category column of table 5-13, to prevent inadvertently overwriting key data by the host system or user.

○ **All**— will protect all transducer block Parameters.

○ **Setup and Calibration**— will protect only Setup and Calibration transducer block parameters.

○ **Calibration**— will protect only Calibration transducer block parameters.

○ **None**— will not protect any transducer block parameters.

Note

The Setup Wizard Auto Travel and Manual Travel methods automatically change transducer block protection for the user.

See table 5-13 for individual parameter details.

Initial Setup

(TB > Detailed Setup > Initial Setup)

- **Tvl/Press Select**

Travel/Pressure Select (TVL_PRESS_SELECT [41.1]) determines if the instrument is setup for travel or pressure control. Select Travel, Pressure, Travel with Pressure Fallback/Auto Recovery or Travel with Pressure Fallback/Manual Recovery. If the travel sensor fails, and Travel with Pressure Fallback/Auto Recovery is selected, it will return to travel control when the travel sensor starts working again. Travel with Pressure Fallback/Manual Recovery will stay in pressure control until Travel Pressure Select is

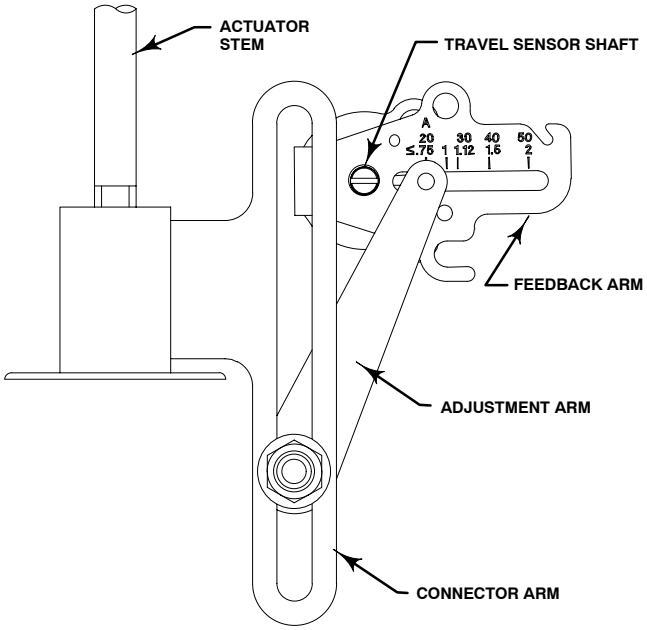

Figure 5-1. Feedback Connection for Typical Sliding-Stem Actuator (Up to 4-inch Travel)

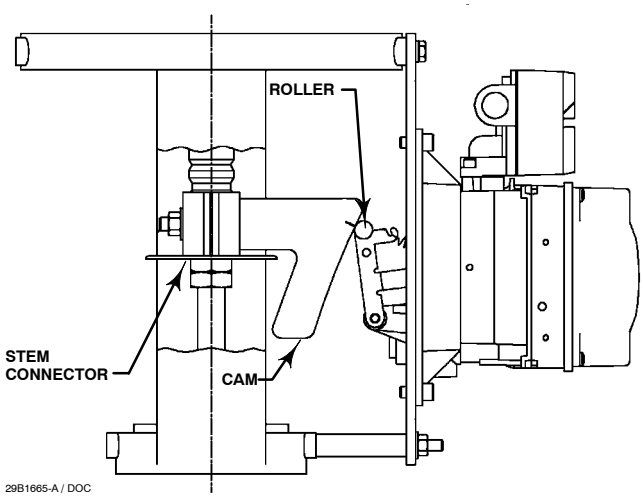

Figure 5-2. Feedback Connection for Typical Long-Stroke Sliding-Stem Actuator (4 to 24-Inches Travel)

changed to Travel with Pressure Fallback/Auto Recovery.

- **Zero Pwr Cond**

Zero Power Condition (ZERO_PWR_COND [42.2]) identifies whether the valve is open or closed when instrument power is lost. If you are unsure how to set this parameter, disconnect the segment loop power to the instrument. The resulting valve travel is the Zero Power Condition.

- **Tvl Cutoff Lo**

Travel Cutoff Lo (FINAL_VALUE_CUTOFF_LO [16]) defines the low cutoff point for travel, in percent. Below this cutoff, the travel target is set to −23%. A travel cutoff of 0.5% is recommended to help ensure maximum shutoff seat loading. Travel Cutoff Lo is effectively deactivated by setting it to −25%.

- **Actuator Style**

Select the Actuator Style (ACTUATOR_STYLE [42.1]), spring & diaphragm, piston double-acting without spring, piston single-acting with spring, or piston double-acting with spring.

- **Relay Type**

Enter the Relay Type (RELAY_TYPE [42.5]), A or B, installed in the digital valve controller. Relay A is for double-acting and single-acting direct-acting applications. Relay B is used for single-acting reverse-acting applications.

- **Feedback Conn**

Select the Feedback Connection(FEEDBACK_CONN [42.4]), Rot-All, SS-roller, or SStem-Standard. For rotary valves, enter Rot - All, SS-Roller. For sliding-stem valves, if the feedback linkage consists of a connector arm, adjustment arm, and feedback arm, similar to the linkage shown in figure 5-1, enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam, similar to the linkage shown in figure 5-2, enter Rotary All, SStem - Roller.

- **Tvl Sen Motion**

Note

The Travel Sensor Motion is set automatically by the Setup Wizard, or during the Auto Calibration procedure.

Select Clockwise or Counterclockwise. Travel Sensor Motion (TRAVEL_SEN_MOTION [42.3]) establishes the proper valve travel sensor (feedback) rotation.

WARNING

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

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

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

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

Response Control

Travel Tuning

(TB > Detailed Setup > Response Control > 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 the release of pressure or process fluid, provide some temporary means of control for the process.

- **Tvl Tuning Set**

There are twelve Travel Tuning Sets (TVL_TUNING_SET [42.10]) to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings.

Tuning set B provides the slowest response and M provides the fastest response. Table 5-10 lists the proportional gain, velocity gain and minor loop feedback gain values for preselected tuning sets.

Note

When selecting a tuning set for a DVC6015, DVC6025 or DVC6035 remote mount unit, it may be necessary to reduce the tuning set, due to the effects of the long tubing between the digital valve controller and the actuator.

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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 if standard tuning has not achieved the desired results.

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

Table 4-2 provides tuning set selection guidelines for Fisher, Baumann, and Gulde actuators. These tuning sets are 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.

For an actuator not listed in table 4-2, you can estimate a starting tuning set by calculating the casing or cylinder volume. Then, find an actuator in table 4-2 with the closest equivalent volume and use the tuning set suggested for that actuator.

- **Tvl Prop Gain**

Travel Proportional Gain (SERVO_GAIN [18]) is the proportional gain for the travel control tuning set. Changing this parameter will also change the tuning set to Expert.

- **Tvl Velocity Gain**

Travel Velocity Gain (SERVO_RATE [20]) is the velocity gain for the travel control tuning set. Changing this parameter will also change the tuning set to Expert.

- **Tvl MLFB Gain**

Travel MLFB Gain (TVL_MLFB_GAIN [44.5]) is the minor loop feedback gain for the travel control tuning set. Changing this parameter will also change the tuning set to Expert.

- **Tvl Integ Enable**

Select Yes or No. Travel Integral Enable (TVL_INTEG_ENABLE [44.1]) is used to enable the integral setting to improve static performance by correcting for error that exists between the travel target and actual travel.

- **Tvl Integral Gain**

Travel Integral Gain (SERVO_RESET [19]) (also called reset) is the ratio of the change in output to the change in input, based on the control action in which the output is proportional to the time integral of the input.

- **Tvl Integ DeadZ**

Travel Integral Dead Zone (TVL_INTEG_DEADZ [44.4]) is a window around the Primary Setpoint in which the integral action is disabled. The dead band is configurable from 0 to 2%.

- **Tvl Integ Lim Hi**

Travel Integral Limit Hi (TVL_INTEG_LIM_HI [44.2]) provides an upper limit to the integrator output. The high limit is configurable from 0 to 100% of the I/P drive signal.

- **Tvl Integ Lim Lo**

The Travel Integral Limit Lo (TVL_INTEG_LIM_LO [44.3]) provides a lower limit to the integrator output. The low limit is configurable from −100 to 0% of the I/P drive signal.

Table 5-10. Gain Values for Preselected Travel Tuning Sets

TUNING SET	TRAVEL PROPORTIONAL GAIN	TRAVEL VELOCITY GAIN	TRAVEL MINOR LOOP FEEDBACK GAIN
B	2.0	3.0	35
C	4.4	3.0	35
D	4.8	3.0	35
E	5.5	3.0	35
F	6.2	3.1	35
G	7.2	3.6	34
H	8.4	4.2	31
I	9.7	4.8	27
J	11.3	5.6	23
K	13.1	6.0	18
L	15.5	6.0	12
M	18.0	6.0	12
X (Expert)	User Adjusted	User Adjusted	User Adjusted

Pressure Tuning

(TB > Detailed Setup > Response Control > Pressure Tuning)

WARNING

Changes to the tuning set may cause the valve/actuator assembly to stroke. To avoid personal injury and property damage caused by the release of pressure or process fluid, provide some temporary means of control for the process.

- **Press Tuning Set**

There are twelve Pressure Tuning Sets (PRESS_TUNING_SET [42.11]) to choose from. Each tuning set provides a preselected value for the digital valve controller gain settings.

Tuning set B provides the slowest response and M provides the fastest response. Tuning set B is appropriate for controlling a pneumatic positioner. Table 5-11 lists the proportional gain, pressure integrator gain and minor loop feedback gain values for preselected tuning sets.

Table 5-11. Gain Values for Preselected Pressure Tuning Sets

TUNING SET	PRESSURE PROPORTIONAL GAIN	PRESSURE INTEGRATOR GAIN	PRESSURE MINOR LOOP FEEDBACK GAIN
B	0.5	0.3	35
C	2.2	0.1	35
D	2.4	0.1	35
E	2.8	0.1	35
F	3.1	0.1	35
G	3.6	0.1	34
H	4.2	0.1	31
I	4.8	0.1	27
J	5.6	0.1	23
K	6.6	0.1	18
L	7.8	0.1	12
M	9.0	0.1	12
X (Expert)	User Adjusted	User Adjusted	User Adjusted

Note

When selecting a tuning set for a DVC6015, DVC6025 or DVC6035 remote mount unit, it may be necessary to reduce the tuning set, due to the effects of the long tubing between the digital valve controller and the actuator.

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

Note

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

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

- **Press Prop Gain**

Pressure Proportional Gain (PRESS_PROP_GAIN [47.3]) is the proportional gain for the pressure control tuning set. Changing this parameter will also change the tuning set to Expert.

- **Press MLFB Gain**

Pressure MLFB Gain (PRESS_MLFB_GAIN [47.11]) is the minor loop feedback gain for the pressure control tuning set. Changing this parameter will also change the tuning set to Expert.

- **Press Integ Gain**

Pressure Integral Gain (PRESS_INTEG_GAIN [47.4]) (also called reset) is the ratio of the change in output to the change in input, based on the control action in which the output is proportional to the time integral of the input. Changing this parameter will also change the tuning set to Expert.

- **Press Integ DeadZ**

Pressure Integral Dead Zone (PRESS_INTEG_DEADZ [47.6]) is a window around the Primary Setpoint in which the integral action is disabled. The dead band is configurable from 0 to 2%.

- **Press Integ Hi Lim**

Pressure Integral Hi Limit (PRESS_INTEG_HI_LIM [47.7]) provides an upper limit to the integrator output. The high limit is configurable from 0 to 100% of the I/P drive signal.

- **Press Integ Lo Lim**

Pressure Integral Lo Limit (PRESS_INTEG_LO_LIM [47.8]) provides a lower limit to the integrator output. The low limit is configurable from −100 to 0% of the I/P drive signal.

Tvl Press Control

(TB > Detailed Setup > Response Control > Tvl Press Control)

- **Tvl/Press Select**

Note

Travel / Pressure Select must be set to Travel for double acting actuators.

5

Travel / Pressure Select (TVL_PRESS_SELECT [41.1]) determines if the instrument is setup for position or pressure control. Select Travel, Pressure, Travel with Pressure Fallback/Auto recovery or Travel with Pressure Fallback/Manual Recovery. If the travel sensor fails, and Travel with Pressure Fallback/Auto Recovery is selected, it will return to travel control when the travel sensor starts working again. Travel with Pressure Fallback/Manual recovery will stay in pressure control until Travel Pressure Select is changed to Travel or Travel with Pressure Fallback/Auto recovery. It is not necessary to enable the Travel Sensor Alert for Pressure Fallback to occur.

- **Tvl Cutoff Hi**

Travel Cutoff Hi (FINAL_VALUE_CUTOFF_HI [15]) defines the high cutoff point for the travel in percent (%) of pre-characterized setpoint. Above this cutoff, the travel target is set to 123.0% of the ranged travel. Travel Cutoff Hi is deactivated by setting it to 125.0%.

- **Tvl Cutoff Lo**

Travel Cutoff Lo (FINAL_VALUE_CUTOFF_LO [16]) defines the low cutoff point for the travel in percent (%) of pre-characterized setpoint. Below this cutoff, the travel target is set to −23%. A Travel Cutoff Lo of 0.5% is recommended to help ensure maximum shutoff seat loading. Travel Cutoff Lo is deactivated by setting it to −25.0%

- **Press Cutoff Hi**

Pressure Cutoff Hi (PRESS_CUTOFF_HI [47.1]) defines the high cutoff point for the pressure in percent (%) of pre-characterized setpoint. Above this cutoff, the pressure target is set to 123.0%. A Pressure Cutoff Hi of 99.5% is recommended to ensure valve goes fully open. Pressure Cutoff Hi is deactivated by setting it 125%.

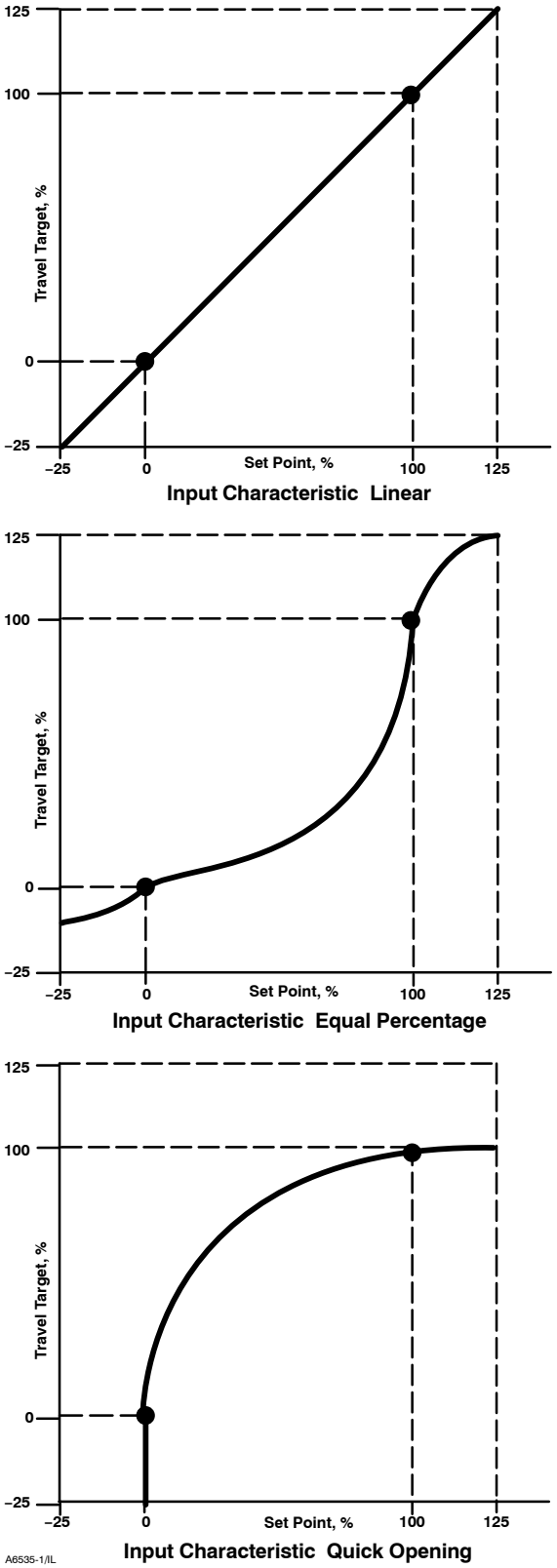

Figure 5-3. Travel Target Versus Ranged Set Point, for Various Input Characteristics (Zero Control Signal Closed)

- **Press Cutoff Lo**

Pressure Cutoff Lo (PRESS_CUTOFF_LO [47.2]) defines the low cutoff point for the pressure in percent (%) of pre-characterized setpoint. Below this cutoff, the pressure target is set to −23%. A Pressure Cutoff Lo of 0.5% is recommended to help ensure maximum shutoff seat loading. Pressure Cutoff Lo is deactivated by setting it to −25.0%

- **Press Range Hi**

Pressure Range Hi (PRESS_RANGE_HI [42.7]) is the high end of output pressure range. Enter the pressure that corresponds with 100% valve travel when Zero Power Condition is closed, or 0% valve travel when Zero Power Condition is open. This pressure *must be greater* than the Pressure Range Lo.

- **Press Range Lo**

Pressure Range Lo (PRESS_RANGE_LO [42.8]) is the low end of the output pressure range. Enter the pressure that corresponds to 0% valve travel when Zero Power Condition is closed, or 100% valve travel when Zero Power Condition is open. The pressure *must be less* than the Pressure Range Hi.

Input Char

(TB > Detailed Setup > Response Control > Input Char)

Input Characteristic (INPUT_CHAR [50]) defines the relationship between the travel target and travel set point. Travel set point is the input to the characterization function. Travel target is the output from the characterization function.

You can select from the three fixed input characteristics shown in figure 5-3 or you can select a custom characteristic. Figure 5-3 shows the relationship between the travel target and travel set point for the fixed input characteristics.

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

Note

Custom Characterization is not available in firmware revision 1.1 or earlier.

Alerts

The DVC6000f provides two levels of alerts; Instrument alerts and PlantWeb alerts.

Instrument Alert Conditions

Instrument Alert Conditions, when enabled, detect many operational and performance issues that may be of interest. To view these alerts, the user must open the appropriate status screen on a host such as DeltaV, AMS ValveLink Software or a 375 Field Communicator.

PlantWeb Alerts

Some instrument alert conditions can also be used to trigger PlantWeb alerts that will be reported in Failed, Maintenance or Advisory categories, as configured by the user. PlantWeb alerts, when enabled, can participate in the DeltaV alarm interface tools such as the alarm banner, alarm list and alarm summary.

When a PlantWeb alert occurs, the DVC6000f sends an event notification and waits a specified period of time for an acknowledgment to be received. This occurs even if the condition that caused the alert no longer exists. If the acknowledgment is not received within the pre-specified time-out period, the event notification is retransmitted. This reduces the possibility of alert messages getting lost.

Note

Additional details on setting up and using PlantWeb Alerts can be found in section 9 of this manual.

PW Alarm Enable

(TB > Detailed Setup > Alerts > PW Alarm Enable)

- **Failed Enable**

Failed Enable (FAILED_ENABLE [62]) enables or disables conditions that can cause a failed alert. A failed alert indicates a failure within the device that will make the device or some part of the device non-operational. Table 9-1 lists the available PlantWeb alerts.

- **Maint Enable**

Maintenance Enable (MAINT_ENABLE [63]) enables or disables conditions that can cause a maintenance alert. A maintenance alert indicates the device or some part of the device needs maintenance soon. Table 9-1 lists the available PlantWeb alerts.

- **Advise Enable**

Advise Enable (ADVISE_ENABLE [64]) enables or disables conditions that can cause an advisory alert. An advisory alert indicates informative conditions that do not have a direct impact on the device's primary functions. Table 9-1 lists the available PlantWeb alerts.

PW Alarm Reporting

(TB > Detailed Setup > Alerts > PW Alarm Reporting)

- **Failed Suppress**

Failed Suppress (FAILED_MASK [65]) determines which of the failed alert conditions are suppressed so that they are not reported. Even if reporting is suppressed, the bit in Failed Active (FAILED_ACTIVE [59]) is still set.

- **Maint Suppress**

Maintenance Suppress (MAINT_MASK [66]) determines which of the maintenance alert conditions are suppressed so that they are not reported. Even if reporting is suppressed, the bit in Maint Active (MAINT_ACTIVE [60]) is still set.

- **Advise Suppress**

Advise Suppress (ADVISE_MASK [67]) determines which of the advise alert conditions are suppressed so that they are not reported. Even if reporting is suppressed, the bit in Advise Active (ADVISE_ACTIVE [61]) is still set.

Elect and Config

(TB > Detailed Setup > Alerts > Elect and Config)

- **Elect Active**

Electronic Active (ELECT_ACTIVE [74.1]) displays which of the following Electronic alerts are active:

Drive Current—The Drive Current is active if the Drive Current Alert Point is exceeded for more than the Drive Current Alert Time.

Drive Signal—The Drive Signal is active if on of the following conditions exist:

Where Zero Power Condition is defined as closed:

Drive Signal < 10% and Calibrated Travel > 3%

Drive Signal > 90% and Calibrated Travel < 97%

Where Zero Power Condition is defined as open:

Drive Signal < 10% and Calibrated Travel < 97%

Drive Signal > 90% and Calibrated Travel > 3%

Program Memory—Active if a pending Flash or NVM failure is present.

Static Memory—Active if a failure occurs in the FRAM memory where the static parameters are stored.

Processor—Active if a failure occurs in the main processor.

I/O Processor—Active if a failure occurs in the I/O processor.

Outblock Timeout—Active if the maximum time of the output block timeout is exceeded.

Blocks Set to Default— Active if the resource block has undergone Restart with Defaults. This will stay active until the transducer block is changed from Out of Service.

- **Elect Enable**

Electronic Enable (ELECT_ENABLE [75.1]) permits enabling or disabling the Electronic Alerts shown above.

- **Shutdown Trigger**

The Shutdown Trigger (SHUTDOWN_TRIGGER [76.1]) permits enabling or disabling Self Test Shutdown for the Drive Current, Program Memory, Static Memory, Processor, I/O Processor and Outblock Timeout electronic alerts. When enabled, and the alert condition is present, the transducer Actual mode is placed Out of Service. The instrument will attempt to drive the valve to the Zero Power Condition and will no longer execute transducer control function.

- **Shutdown Recovery**

Shutdown Recovery (SHUTDOWN_RECOVERY [76.2]) permits enabling or disabling Automatic recovery from Self Test Shutdown. When enabled, the transducer block will return to Target mode when the condition that caused Shutdown clears. If not enabled, the transducer block will remain Out of Service until power is removed and restored or the user changes the transducer block target mode to Manual or Auto. In any case, the target mode will remain Out of Service, if the condition that caused the shutdown remains or while until the shutdown trigger is disabled.

Drive Current Config
(TB > Detailed Setup > Alerts > Elect and Config > Drive Current Config)

- **Drive Current**

Drive Current (DRIVE_CURRENT [54]) displays the measured Drive Current actually flowing through the I/P converter in percent of maximum drive.

- **Drive Current Alrt Pt**

The Drive Current Alert Point (DRIVE_CURRENT_ALRT_PT [76.4]) is when the absolute difference between the Drive Current and Drive Signal exceeds the set threshold for greater than the Drive Current Alert Time.

- **Drive Current Alrt Time**

The Drive Current Alert Time (DRIVE_CURRENT_TIME [76.5]) is the maximum time that the Drive Current Alert Point can be exceeded before the Drive Current Alert is active.

- **Drive Signal**

The Drive Signal (DRIVE_SIGNAL [53]) displays the commanded Drive Signal being sent to the I/P converter as a percentage of the maximum drive.

- **Output Blk Timeout**

The Output Block Timeout (OUTPUT_BLK_TIMEOUT [76.3]) is the maximum time between updates from the AO or DO block to the transducer block setpoint.

- **Alert Key**

The Alert Key (ALERT_KEY [4]) is the identification number of the plant unit. Devices in a loop or plant section can be assigned with a common alert key to aid the operator in determining location of alerts.

Sensor and Enviro

(TB > Detailed Setup > Alerts > Sensor and Enviro)

- **Sensor Active**

Sensor Active (SENSOR_ACTIVE [74.2]) displays which of the following sensor alerts are active:

Travel Sensor— Active if the Travel Sensor reading is outside the functional range.

Port A Pressure Sensor—Active if the Port A Pressure Sensor reading is outside the functional range.

Port B Pressure Sensor—Active if the Port B Pressure Sensor reading is outside the functional range.

Supply Pressure Sensor—Active if the Supply Pressure Sensor reading is outside the functional range.

Temperature Sensor—Active if the Temperature Sensor reading is outside the functional range.

- **Sensor Enable**

Sensor Enable (SENSOR_ENABLE [75.2]) permits enabling or disabling the Sensor Alerts shown above.

- **Shutdown Trigger**

The Shutdown Trigger (SHUTDOWN_TRIGGER [76.1]) permits enabling or disabling Self Test Shutdown for the Travel Sensor and Port A Pressure Sensor sensor alerts. When enabled, and the alert condition is present, the transducer Actual mode is placed Out of Service. The instrument will attempt to drive the valve to the Zero Power Condition and will no longer execute transducer control function.

- **Shutdown Recovery**

Shutdown Recovery (SHUTDOWN_RECOVERY [76.2]) permits enabling or disabling Manual recovery from Self Test Shutdown. When not enabled, the transducer block will return to Target mode when the condition that caused Shutdown clears. If enabled, the transducer block will remain Out of Service until power is removed and restored or the user changes the

transducer block target mode to Manual or Auto. In any case, the target mode will remain Out of Service, if the condition that caused the shutdown remains or while until the shutdown trigger is disabled.

- **Enviro Active**

Environment Active (ENVIRO_ACTIVE [74.3]) displays which of the following Environment Alerts are active:

Supply Pressure Hi—Active if the supply pressure is greater than the Supply Pressure Hi Alert Point

Supply Pressure Lo—Active if the supply pressure is lower than the Supply Pressure Lo Alert Point

Temperature Hi—Active if the temperature is greater than the Temperature Hi Alert Point

Temperature Lo—Active if the temperature is lower than the Temperature Lo Alert Point

- **Enviro Enable**

Environment Enable (ENVIRO_ENABLE [75.3]) permits enabling or disabling the Environment Alerts shown above.

Supply Press Sensor Config
(TB > Detailed Setup > Alerts > Sensor and Enviro > Supply Press Sensor Config)

- **Supply Press**

Supply Pressure (SUPPLY_PRESSURE.VALUE [35.2]) displays the instrument supply pressure in kPa, bar, or psi.

- **Supply Press Hi Alrt Pt**

When supply pressure exceeds the Supply Pressure Hi Alert Point (SUP_PRES_HI_ALRT_PT [76.8]) the Supply Pressure Hi Alert is active.

- **Supply Press Lo Alrt Pt**

When supply pressure is lower than the Supply Pressure Lo Alert Point (SUP_PRES_LO_ALRT_PT [76.9]) the Supply Pressure Lo Alert is active.

Temp Sensor Config
(TB > Detailed Setup > Alerts > Sensor and Enviro > Temp Sensor Config)

- **Temperature**

Degrees Fahrenheit or Celsius. The temperature (TEMPERATURE [48]) is measured from a sensor mounted on the digital valve controller's printed wiring board.

- **Temp Hi Alrt Pt**

When the instrument temperature exceeds the Temperature Hi Alert Point (TEMP_HI_ALRT_PT [76.6]) the Temperature Hi Alert is active.

- **Temp Lo Alrt Pt**

When the instrument temperature is lower than the Temperature Lo Alert Point (TEMP_LO_ALRT_PT [77.7]) the Temperature Lo Alert is active.

Tvl and Prox

(TB > Detailed Setup > Alerts > Tvl and Prox)

Note

The alerts contained in this section are valid for both travel and pressure control.

- **Tvl Active**

Travel Active (TRAVEL_ACTIVE [74.4]) displays which of the following Travel Alerts are active:

Travel Deviation—Active if the Travel deviation exceeds the Travel Deviation Alert Point by more than the Travel Deviation Time.

Travel Limit Hi Hi—Active if the Travel exceeds the Travel Limit Hi Hi Alert point.

Travel Limit Hi—Active if the Travel exceeds the Travel Limit Hi Alert point.

Travel Limit Lo—Active if the Travel is lower than the Travel Limit Lo Alert point.

Travel Limit Lo Lo—Active if the Travel is lower than the Travel Limit Lo Lo Alert point.

- **Travel Enable**

Travel Enable (TRAVEL_ENABLE [75.4]) permits enabling or disabling the Travel Alerts shown above.

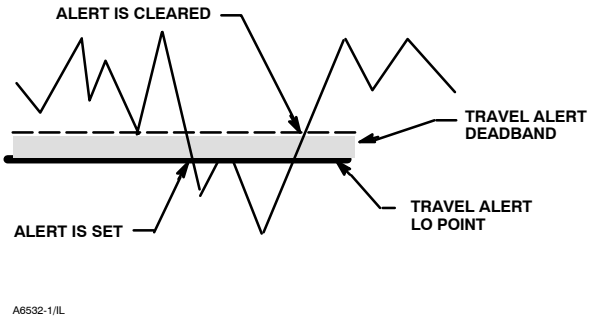

Figure 5-4. Travel Lo Alert Deadband

Tvl Config
(TB > Detailed Setup > Alerts >Tvl and Prox > Tvl Config)

- **Travel**

Travel (TRAVEL.VALUE [34.2]) displays the actual position of the valve in percent (%) of calibrated travel.

- **Tvl Deviation**

Travel Deviation (TRAVEL_DEVIATION [52]) displays the absolute difference in percent between Travel Target and Actual Travel.

- **Tvl Dev Alrt Pt**

The Travel Deviation Alert Point (TVL_DEV_ALRT_PT [77.1]) is the alert point for the difference, expressed in percent (%), between the travel target and the actual travel. When the difference exceeds the alert point for more than the Travel Deviation Time, the Travel Deviation Alert is set.

- **Tvl Dev Time**

Travel Deviation Time (TVL_DEV_TIME [77.2]) is the time, in seconds, that the travel deviation must exceed the Travel Deviation Alert Point before the alert is set.

- **Tvl Dev DB**

Travel Deviation Deadband (TVL_DEV_DB [77.3]) is the travel in percent threshold (%) of ranged travel required to clear a Travel Deviation alert, once it has been set. See figure 5-5.

- **Tvl Lo Lo Alrt Pt**

The Travel Lo Lo alert is set when the value of the travel, in percent (%) of ranged travel, goes below the Travel Lo Lo Alert Point (TVL_LO_LO_ALRT_PT [77.12]).

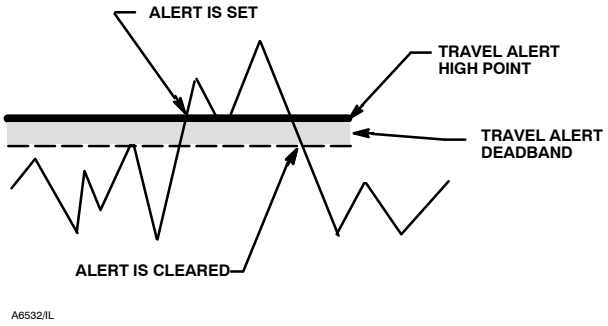

Figure 5-5. Travel Hi Alert Deadband

- **Tvl Lo Lo DB**

Travel Lo Lo Deadband (TVL_LO_LO_DB [77.13]) is the travel, in percent (%) of ranged travel, required to clear a Travel Lo Lo alert once it has been set. See figure 5-4.

- **Tvl Lo Alrt Pt**

The Travel Alert Lo alert is set when the value of the travel, in percent (%) of ranged travel, goes below the Travel Lo Alert Point (TVL_LO_ALRT_PT [77.14]).

- **Tvl Lo DB**

Travel Lo Deadband (TVL_LO_DB [77.15]) is the travel, in percent (%) of ranged travel, required to clear a travel lo alert, once it has been set. See figure 5-4.

- **Tvl Hi Alrt Pt**

Travel Hi Alert is set if the ranged travel rises above the Travel Hi Alert Point (TVL_HI_ALRT_PT [77.16]). Once the alert is set, the ranged travel must fall below the alert high point set by the Travel Hi Deadband before the alert is cleared. See figure 5-5.

- **Tvl Hi DB**

Travel Hi Deadband (TVL_HI_DB [77.17]) is the travel, in percent (%) of ranged travel, required to clear a Travel Hi Alert, once it has been set. See figure 5-5.

- **Tvl Hi Hi Alrt Pt**

Travel Hi Hi Alert Point (TVL_HI_HI_ALRT_PT [77.18]) is the value of the travel, in percent (%) of ranged travel, which, when exceeded, sets the Travel Alert Hi Hi alert.

- **Tvl Hi Hi DB**

Travel Hi Hi Deadband (TVL_HI_HI_DB [77.19]) is the travel, in percent (%) of ranged travel, required to clear a Travel Hi Hi alert, once it has been set. See figure 5-5.

- **Prox Active**

Proximity Active (PROX_ACTIVE [74.5]) displays which of the following Proximity Alerts are active:

Travel Open—Active if the Travel is greater than the Travel Open Alert Point.

Travel Closed—Active if the Travel is lower than the Travel Closed Alert Point.

Proximity Hi Hi—Active if the Travel is greater than the Proximity Hi Hi Alert Point.

Proximity Hi—Active if the Travel is greater than the Proximity Hi Alert Point.

Proximity Lo—Active if the Travel is lower than the Proximity Lo Alert Point.

Proximity Lo Lo—Active if the Travel is lower than the Proximity Lo Lo Alert Point.

- **Prox Enable**

Proximity Enable (PROX_ENABLE [75.5]) permits enabling or disabling the Proximity Alerts shown above.

Prox Config
(TB > Detailed Setup > Alerts >Tvl and Prox > Prox Config)

- **Tvl Open Alrt Pt**

Travel Open Alert Point (TVL_OPEN_ALRT_PT [77.8]) is the value of the travel in percent (%) or ranged travel, which, when exceeded, sets the Travel Open Alert.

- **Tvl Open DB**

Travel Open Deadband (TVL_OPEN_DB [77.9]) is the travel in percent (%) of ranged travel required to clear a Travel Open alert, once it has been set.

- **Tvl Closed Alrt Pt**

The Travel Closed Alert is set when the value of the travel, in percent (%) of ranged travel, goes below the Travel Closed Alert Point (TVL_CLOSED_ALRT_PT [77.10]).

- **Tvl Closed DB**

Travel Closed Deadband (TVL_CLOSED_DB [77.11]) is the travel in percent (%) of ranged travel required to clear a Travel Closed alert, once it has been set.

- **Tvl History Active**

Travel History Active (TVL_HISTORY_ACTIVE [74.6]) displays which of the following Travel History Alerts are active:

Cycle Count—Active when the Cycle Count exceeds the Cycle Count Alert Point.

Travel Accum—Active when the Travel Accum exceeds the Travel Accumulator Alert Point.

- **Tvl History Enable**

Travel History Enable (TVL_HISTORY_ENABLE [75.6]) permits enabling or disabling the Travel History Alerts shown above.

Tvl History Config
(TB > Detailed Setup > Alerts >Tvl and Prox > Tvl History Config)

- **Cycle Count**

The Cycle Counter (CYCLE_COUNT [73]) records the number of times the travel changes direction. The change in direction must occur after the deadband has been exceeded before it can be counted as a cycle. See figure 5-6. You can reset the Cycle Counter by configuring it as zero.

- **Cycle Count Alrt Pt**

Cycle Counter Alert Point (CYCLE_COUNT_ALRT_PT [77.6]) is the value of the Cycle Counter, in cycles, which, when exceeded, sets the Cycle Counter Alert.

- **Cycle Count DB**

Cycle Counter Deadband (CYCLE_COUNT_DB [77.7]) is the area around the travel reference point, in percent (%) of ranged travel, that was established at the last increment of the Cycle Counter. This area must be exceeded before a change in travel direction can be counted as a cycle. See figure 5-6.

- **Travel Accum**

Travel Accumulator (TRAVEL_ACCUM [72]) records the total change in travel, in percent (%) of ranged travel, since the accumulator was last cleared. The value of the Travel Accumulator increments when the magnitude of the change exceeds the Travel Accumulator Dead-band. See figure 5-7. You can reset the Travel Accumulator by configuring it to zero.

- **Tvl Accum Alrt Pt**

Travel Accumulator Alert Point (TVL_ACCUM_ALRT_PT [77.4]) is the value of the Travel Accumulator, in percent (%) of ranged travel,

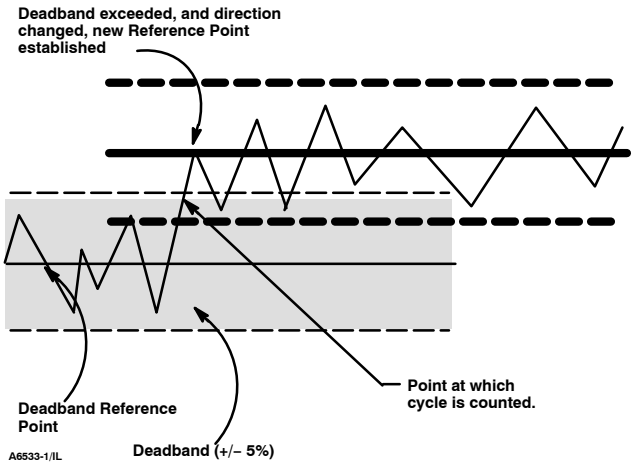

Figure 5-6. Cycle Counter Deadband (set at 10%)

which, when exceeded, sets the Travel Accumulator Alert.

- **Tvl Accum DB**

Travel Accumulator Deadband (TVL_ACCUM_DB [77.5]) is the area around the travel reference point, in percent (%) of ranged travel, that was established at the last increment of the accumulator. This area must be exceeded before a change in travel can be accumulated. See figure 5-7.

Performance

(TB > Detailed Setup > Alerts > Performance)

Note

Performance Alerts are only available with a PD tier instrument. Additionally, for the PD alerts to function properly:

- **The transducer block mode must not be out of service.**
- **The travel/pressure control state must be in travel control mode, and**
- **Bench Set Hi, Bench Set Lo, and Nominal Supply Pressure must be set in the Spec Sheets, then enable the Performance Information instrument alert (PERF_ENABLE [75.7]).**

- **Performance Active**

Performance Active (PERF_ACTIVE [74.7]) displays which of the following Performance Alerts are active:

Performance Critical—Active if the instrument is no longer able to control the valve or performance has been dramatically reduced.

Performance Reduced—Active if the instrument has detected a reduction in performance.

Performance Information—Active if the instrument has detected a condition that may pertain to control performance.

- **Performance Enable**

Performance Enable (PERF_ENABLE [75.7]) permits enabling or disabling the Performance Alerts above.

5

Instrument

(TB > Detailed Setup > Instrument)

- **Max Supp Press**

Enter the maximum supply pressure (MAX_SUPP_PRESS [42.6]) in psi, bar, or kPa, depending on what was selected for pressure units.

- **Pressure Units**

Define the output and supply pressure units (PRESSURE_UNITS [90]) in either psi, bar, or kPa.

- **Temp Units**

Enter the temperature units (TEMPERATURE_UNITS [89]) in degrees Fahrenheit or Celsius. The temperature is measured from a sensor mounted on the digital valve controller's printed wiring board.

- **Tvl Units**

Define the units for valve travel (TVL_UNITS [91]) in inches, centimeters, millimeters or degrees.

- **Length Units**

Define the units for valve dimensions (LENGTH_UNITS [92]) in inches, centimeters, or millimeters.

- **Area Units**

Define the units for actuator area (AREA_UNITS [93]) in inches^2, centimeter^2 or millimeter^2.

- **Spring Rate Units**

Define the units for actuator spring rate (SPRING_RATE_UNITS [94]) in lbs/in^2 or N/M.

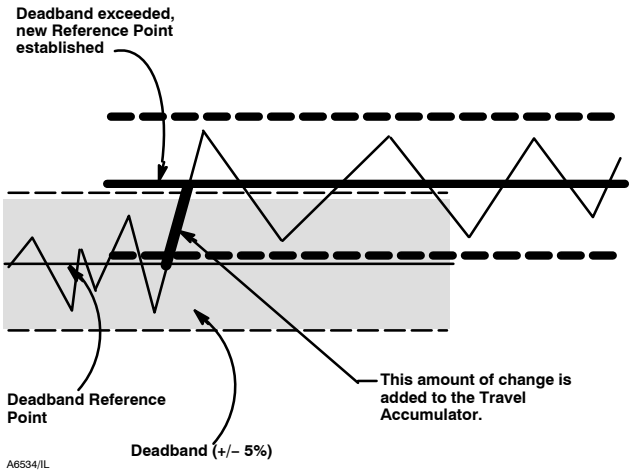

Figure 5-7. Travel Accumulator Deadband (set at 10%)

5

- **Tag Description**

The Tag Description (TAG_DESC [2]) is a 32 character description used to assign a unique description to each block within the digital valve controller to describe the intended application for the block.

- **Relay Type**

Enter the type of relay (RELAY_TYPE [42.5]), A or B, installed in the digital valve controller. Relay A is used for double-acting and single-acting direct applications. Relay B is used for single-acting reverse applications.

- **Calib Person**

Name of the person performing last calibration (XD_CAL_WHO [31]).

- **Calib Location**

Indicates the location of the last instrument calibration (XD_CAL_LOC [29]).

- **Calib Date**

Enter a date with the format MM/DD/YY. Date is a user-defined variable that provides a place to save the date of the last calibration (XD_CAL_DATE [30]).

MAI Channel Map
(TB > Detailed Setup > Instrument > MAI Channel Map)

- **MAI Channel 1 – 8**

Allows the user to specify which transducer block parameter is available through each of the MAI Block channels (MAI_CHANNEL_1 through MAI_CHANNEL_8 [95.1 through 95.8]). See table 5-13 for additional information.

Act and Valve

Valve

(TB > Detailed Setup > Act and Valve > Valve)

- **Valve Manufacturer ID**

Enter the ID of the manufacturer of the valve (VALVE_MAN_ID [25]) on which the instrument is mounted. Select from the drop-down list or enter the manufacturer's identification number as defined by the Fieldbus Foundation. For Fisher, the manufacturer ID hex value is 005100.

- **Valve Model Number**

Enter the valve model number (VALVE_MODEL_NUM [26]), (design letter or type number) for the valve on which the instrument is mounted.

- **Valve Serial Number**

Enter the serial number of the valve (VALVE_SN [27]) on which the instrument is mounted.

- **Valve Style**

Enter the type of valve (VALVE_TYPE [28]), sliding-stem or rotary, on which the instrument is mounted.

- **Class**

Enter the valve pressure class rating (VALVE_CLASS [83.2]).

- **Rated Travel**

Enter the valve rated travel (RATED_TRAVEL [83.3]) in inches or mm for sliding stem valves, or in degrees of rotation for rotary valves.

- **Actual Travel**

Enter the actual travel (ACTUAL_TRAVEL [83.4]) in inches or mm for sliding stem valves, or in degrees of rotation for rotary valves.

- **Stem Diameter**

Enter the valve stem diameter (SHAFT_STEM_DIA [83.5]) in inches or millimeters.

- **Packing Type**

Enter the valve packing construction (PACKING_TYPE [83.6]).

- **Inlet Pressure**

Enter the valve inlet pressure (INLET_PRESSURE [83.7]).

- **Outlet Pressure**

Enter the valve outlet pressure (OUTLET_PRESSURE [83.8]) in psig, kPa, Bar, in Hg or in H_2O.

Trim

(TB > Detailed Setup > Act and Valve > Trim)

- **Seat Type**

Enter the valve seat type (SEAT_TYPE [84.1]).

- **Leak Class**

Enter the valve leak class (LEAK_CLASS [84.2]).

- **Port Diameter**

Enter the valve port diameter (PORT_DIAMETER [84.3]) in inches or mm.

- **Port Type**

Enter the valve port type (PORT_TYPE [84.4]).

- **Flow Direction**

Enter the flow direction (FLOW_DIRECTION [84.5]) through the valve.

- **Push Down To**

Enter the effect on valve movement when the stem is moved down (PUSH_DOWN_TO [84.6]).

- **Flow Tends To**

Enter the effect on valve travel with increasing flow (FLOW_TENDS_TO [84.7]).

- **Unbalanced Area**

Enter the valve unbalanced area (UNBALANCED_AREA [84.8]) in in^2 or mm^2.

Actuator

(TB > Detailed Setup > Act and Valve > Actuator)

- **Actuator Manufacturer Id**

Enter the manufacturer's identification number (ACT_MAN_ID [22]) of the actuator on which the instrument is mounted. Select from the drop-down list or enter the manufacturer's identification number as defined by the Fieldbus Foundation. For Fisher, the manufacturer ID hex value is 005100.

- **Actuator Model Number**

Enter the type number for the actuator (ACT_MODEL_NUM [23]) on which the instrument is mounted.

- **Actuator Serial Number**

Enter the serial number (ACT_SN [24]) for the actuator on which the instrument is mounted.

- **Act Size**

Enter the size of the actuator (ACTUATOR_SIZE [85.1]) on which the instrument is mounted.

- **Actuator Fail Action**

Sets actuator action to be performed upon loss of actuator air pressure (ACT_FAIL_ACTION [21]).

- **Feedback Conn**

Select the feedback connection (FEEDBACK_CONN [42.4]), Rotary All, SStem - Roller or SStem - Standard. For rotary valves, enter Rotary - All, SStem - Roller. For sliding-stem valves, if the feedback linkage consists of a connector arm, adjustment arm, and feedback arm (similar to figure 5-1), enter SStem - Standard. If the feedback linkage consists of a roller that follows a cam (similar to figure 5-2), enter Rotary All, SStem - Roller.

- **Tvl Sen Motion**

Note

The Travel Sensor Motion is set automatically by the Setup Wizard, or during the Auto Calibration procedure.

Select Clockwise or Counterclockwise. Travel Sensor Motion (TRAVEL_SEN_MOTION [42.3]) establishes the proper valve travel sensor (feedback) rotation.

WARNING

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

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

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

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

- **Lever Style**

Enter the lever style (LEVER_STYLE [85.10]) for rotary actuators as either Pivot Point or Rack and Pinion.

- **Moment Arm**

Defines the moment arm (MOMENT_ARM [85.11]) for rotary actuators.

- **Effective Area**

Enter the actuator effective area (EFFECTIVE_AREA [85.2]) in in^2, cm^2, or mm^2.

- **Air**

Select Opens or Closes, indicating the effect of increasing air pressure (AIR [85.3]) on the valve travel.

- **Lower Bench Set**

Enter the lower actuator operating pressure (LOWER_BENCH SET [85.4]).

- **Upper Bench Set**

Enter the upper actuator operating pressure (UPPER_BENCH_SET [85.5]).

- **Nominal Supply Pressure**

Enter the nominal instrument supply pressure (NOMINAL_SUPPLY PRESSURE [85.6]).

- **Spring Rate**

Enter the actuator spring rate (SPRING_RATE [85.7]) in lbs•in or N•m.

Reference

(TB > Detailed Setup > Act and Valve > Reference)

- **Trim Style 1**

Enter the valve trim style (TRIM_STYLE_1 [84.9]).

- **Trim Style 2**

Enter the valve trim style (TRIM_STYLE_2 [84.10]).

- **Stroking Time Open**

Enter the time required to stroke the valve from closed to open (STROKING_TIME_OPEN [85.8]).

- **Stroking Time Close**

Enter the time required to stroke the valve from open to close (STROKING_TIME_CLOSE [85.9]).

Simulate PlantWeb® Alarms

PWA Simulate

(TB > Detailed Setup > Other > PWA Simulate)

When enabled, PWA Simulate (PWA_SIMULATE [39]) allows the user to write to the following PlantWeb and Instrument alert parameters; Failed Active, Maint Active, Advise Active, Enviro Active, Travel Active, Prox Active, Tvl History Active, Performance Active, PD Event Active, PD Detail 1 Active, PD Detail 2 Active, PD Detail 3 Active, PD Detail 4 Active, PD Detail 5 Active, PD Detail 6 Active. This provides a way to simulate these alerts for testing. In order to enable PWA Simulate, the Aux Terminal must be jumpered.

PWA Simulate is cleared on a power cycle. It can also be cleared manually, or by removing the Aux terminal jumper.

Simulate Active Alarms

(TB > Detailed Setup > Simulate Active Alarms)

- **Failed Active**

Permits simulating an active Failed alarm (FAILED_ACTIVE [59]).

- **Maint Active**

Permits simulating an active Maintenance alarm (MAINT_ACTIVE [60]).

- **Advise Active**

Permits simulating an active Advisory alarm (ADVISE_ACTIVE -[61]).

Block Error Reporting

(TB > Detailed Setup > Other > Block Error Reporting)

When enabled, the AO or DO BLOCK_ERR [6] parameter will report PlantWeb Alerts. the same as Block Error in the resource block.

Block Error bit 6 (Device Needs Maintenance Soon) will report any active PlantWeb Maintenance Alert.

Block Error bit 13 (Device Needs Maintenance Now) will report any active PlantWeb Failed Alert.

Stroking the Digital Valve Controller Output

(TB > Stroke Valve)

Stroke Valve is used to confirm proper valve operation. From the *Transducer Block* menu, select *Stroke Valve*. Follow the prompts on the Field Communicator display to select from the following: *Done, Ramp Open, Ramp Closed, Ramp to Target, Step to Target,* and *Stop*.

- *Done*—Select this if you are done. All ramping is stopped when DONE is selected.

- *Ramp Open*—ramps the travel toward open at the rate of 1.0% per second of the ranged travel.

- *Ramp Closed*—ramps the travel toward closed at the rate of 1.0% per second of the ranged travel.

- *Ramp to Target*—ramps the travel to the specified target at the rate of 1.0% per second of the ranged travel.

- *Step to Target*—steps the travel to the specified target.

- *Stop*—stops the command.

Block Errors

Table 5-12 lists conditions reported in the BLOCK_ERR [6] and XD_ERR [11] parameters. Conditions in *italics* are not applicable for the transducer block and are provided only for your reference.

Table 5-12. Transducer Block BLOCK_ERR and XD_ERROR Conditions

Condition Number	Condition Name and Description
0	*Other - (N/A)*
1	**Block Configuration Error** - Indicates that one of the following parameters have been configured out of the proper range: 15, 16, 47.1, 47.2, 46.3, 46.5, 42.7, 42.8.
2	*Link Configuration Error - (N/A)*
3	**Simulate Active** - Indicates that the simulation jumper is in place on the aux terminals. This is not an indication that the I/O blocks are using simulation data. See AO block paramter SIMULATE [10] and DO block parameter SIMULATE_D [10].
4	*Local Override - (N/A)*
5	*Device Fault State – (NA)*
6	*Maintenance Needed Soon - (N/A)*
7	*Input failure/process variable has Bad status - (N/A)*
8	*Output failure - (N/A)*
9	*Memory failure - (N/A)*
10	**Lost Static Data** - Indicates that manufacturing functional or thermal tests were incomplete
11	*Lost NV Data - (N/A)*
12	*Readback Check Failed - (N/A)*
13	**Device Needs Maintenance Now** - Indicates that manufacturing functional or thermal tests were incomplete
14	*Power Up - (N/A)*
15	**Out of Service** - Indicates Out of Service Mode.

Transducer Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Protection Category: Indicates if protected when Write Lock is selected, and the category of protection
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-13. Transducer Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	N/A	NONE	Data Type: Unit16 The revision level of the static data. Increments by one each time a static parameter is written. The value is reset to 0 whenever a Restart with Defaults is performed. See Restarting the Instrument.
Tag Description TAG_DESC	2	RW	ALL		NULL	SETUP	Data Type: String The description of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	SETUP	Data Type: Uint16 Used to help group blocks.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	1	SETUP	Data Type: Uint8 The identification number of the plant unit. Devices in a loop or plant section can be assigned with a common alert key to aid the operator in determining location of alerts.
Block Mode MODE_BLK	5						Data Type: DS-69 The actual, target, permitted, and normal modes. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	3: AUTO 4: MANUAL 7: OOS	7: OOS	NONE	
ACTUAL	5.2	RO	N/A		N/A	N/A	
PERMITTED	5.3	RW	ALL		3:AUTO 4:MANUAL 7: OOS	NONE	
NORMAL	5.4	RW	ALL		3:AUTO	NONE	
Block Error BLOCK_ERR	6	RO	N/A	3: Simulate Jumper Active 10: Static Memory Failed (Functional or thermal data missing) 13: Maintenance Needed Now (Functional or thermal data missing) 15: Out-of-Service	N/A	N/A	Data Type: Bit String Error status associated with hardware or software for the transducer block.
Update Event UPDATE_EVT	7						
UNACKNOWLEDGED	7.1	RW	ALL	0=Undefined 1=Acknowledged 2=Unacknowledged	0	NONE	Data Type: DS-73 Alert generated by change to static data.
UPDATE_STATE	7.2	RO	N/A	0=Undefined 1=Updated reported 2=Update Not reported	0	N/A	
TIME_STAMP	7.3	RO	N/A		0	N/A	
STATIC_REVISION	7.4	RO	N/A		0	N/A	
RELATIVE_INDEX	7.5	RO	N/A		0	N/A	

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Block Alarm BLOCK_ALM	8						
UNACKNOWLEDGED	8.1	RW	ALL	0=Undefined 1=Acknowledged 2=Unacknowledged	0	NONE	Data Type: DS-72 Used to report the BLOCK_ERR alarm to the host system
ALARM_STATE	8.2	RO	N/A	0=Undefined 1=Clear−reported 2=Clear−not reported 3=Active−reported 4=Active−not reported	0	N/A	
TIME_STAMP	8.3	RO	N/A		0	N/A	
SUBCODE	8.4	RO	N/A	Subcode: Bit Number in BLOCK_ERR	0	N/A	
VALUE	8.5	RO	N/A	Value of parameter at alarm time for a single alarm, 0 for multiple alarms	0	N/A	
Transducer Directory TRANSDUCER_DIRECTORY	9	RO	N/A	1,1	1,1	N/A	Data Type: Array [2] of UINT16 Not used
Transducer Type TRANSDUCER_TYPE	10	RO		106	106	N/A	Data Type: Uint16 Identifies the type of the transducer.
Transducer Error XD_ERROR or TDC_ERROR	11	RO		Valid Numbers: 0 = No Error	0	N/A	Data Type: Uint8 Error code for the transducer block.
Collection Directory COLLECTION_DIRECTORY	12	RO		1,1,1,1,1	1,1,1,1,1	N/A	Data Type: Array [5] of UINT32 Not used
FINAL_VALUE	13						
Setpoint Status STATUS	13.1	RW	MAN OOS		N/A	NONE	Data Type: DS-65 In Travel Control: Setpoint for valve travel in %, prior to characterization. In Pressure Control: Setpoint for implied valve travel as % or pressure range, prior to characterization. FINAL_VALUE is not updated unless the AO block is selected in FEATURE_SELECT. For example, FINAL_VALUE still has last value written by AO channel 1 when DO is in control.
Setpoint VALUE	13.2	RW	MAN OOS	−25 to 125	N/A	NONE	
Setpoint Range FINAL_VALUE_RANGE	14						Data Type: DS-68 High and Low range limit values, engineering units code, and number of digits to the right of the decimal place to be used to display the Final Value.
EU_100	14.1	RO	N/A	100	100	N/A	
EU_0	14.2	RO	N/A	0	0	N/A	
UNITS_INDEX	14.3	RO	N/A	PERCENT	1342	N/A	
DECIMAL	14.4	RO	N/A	2	2	N/A	
Tvl Cutoff Hi FINAL_VALUE_CUTOFF_HI	15	RW	MAN OOS	−25 to 125	99.5	SETUP	Data Type: Float When the servo goes above this % of span, the stem position goes to the upper limit. Cutoffs are OFF when Low is at −25% and high is at +125%. Must be > low cutoff + .625%.
Tvl Cutoff Lo FINAL_VALUE_CUTOFF_LO	16	RW	MAN OOS	−25 to 125	0.5	SETUP	Data Type: Float When the servo goes below this % of span, the stem position goes to the lower limit. Cutoffs are OFF when Low is at −25% and high is at +125%. Must be < hi cutoff − .625%.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
FINAL_POSITION_VALUE	17						Data Type: DS-65 In Travel Control: Valve travel in %, decharacterized to correlate with Setpoint (FINAL_VALUE [13]). In Pressure Control: Implied valve travel as a % of pressure range, decharacterized to correlate with Setpoint (FINAL_VALUE [13]). Controls AI channel 3.
Travel Status (DeChar) STATUS	17.1	RO	N/A		N/A	N/A	
Travel (DeChar) VALUE	17.2	RO	N/A	–25 to 125%		N/A	
Tvl Prop Gain SERVO_GAIN	18	RW	MAN OOS	> = 0	4.4	SETUP	Data Type: Float Travel Control Only. Gain of servo.
Tvl Integral Gain SERVO_RESET	19	RW	MAN OOS	> = 0 , = 0 causes wind down	9.4	SETUP	Data Type: Float Travel Control Only. If set to 0, will cause integrator to wind down.
Tvl Velocity Gain SERVO_RATE	20	RW	MAN OOS	> = 0	3.0	SETUP	Data Type: Float Travel Control Only. Rate of servo.
Actuator Fail Action ACT_FAIL_ACTION	21	RW	MAN OOS	0=Uninitialized 1=Self Closing 2=Self Opening	1= Self Closing	SETUP	Data Type: Enum Action performed by actuator in the event of air pressure.
Actuator Manufacturer Id ACT_MAN_ID	22	RW	ALL		0x5100	SETUP	Data Type: Uint32 The actuator manufacturer identification number.
Actuator Model Number ACT_MODEL_NUM	23	RW	ALL		Null	SETUP	Data Type: Visible String Model number of actuator.
Actuator Serial Number ACT_SN	24	RW	ALL		Null	SETUP	Data Type: Visible String Serial number of actuator.
Valve Manufacturer Id VALVE_MAN_ID	25	RW	ALL		0x5100	SETUP	Data Type: Uint32 The valve manufacturer identification number.
Valve Model Number VALVE_MODEL_NUM	26	RW	ALL		Null	SETUP	Data Type: Visible String The valve model number.
Valve Serial Number VALVE_SN	27	RW	ALL		Null	SETUP	Data Type: Visible String The valve serial number.
Valve Style VALVE_TYPE	28	RW	ALL	1=Sliding Stem 2=Rotary	1=Sliding Stem	SETUP	Data Type: Enum Selects Rotary or Sliding Stem. For informational purposes only.
Calib Location XD_CAL_LOC	29	RW	ALL		Null	CAL	Data Type: Visible String Where device was last calibrated.
Calib Date XD_CAL_DATE	30	RW	ALL		Uninitialized	CAL	Data Type: Date Date of last calibration.
Calib Person XD_CAL_WHO	31	RW	ALL		Null	CAL	Data Type: Visible String Name of person performing last calibration.
SETPOINT_D	32						Data Type: DS_66 SETPOINT_D is not updated unless the DO block is selected in FEATURE_SEL. STATUS indicates the validity of value, set by the DO block OUT.STATUS VALUE is the discrete value of setpoint. Only values of 0, 1, or increments of 5 up to 95 are allowed. Written by DO channel 22.
Setpoint(D) Status STATUS	32.1	RW	MAN OOS			NONE	
Setpoint(D) VALUE	32.2	RW	MAN OOS	0 = closed 1 = open 5,10,15.. = %		NONE	
TRAVEL_D	33						Data Type: DS_66 STATUS indicates the validity of VALUE. VALUE: 0=closed , 1=open 5,10,15.. = %. Controls DI Channel 23
Travel(D) Status STATUS	33.1	RO	N/A			N/A	
Travel (D) VALUE	33.2	RO	N/A	0 = closed 1 = open 5,10,15.. = %		N/A	

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
TRAVEL	34						Data Type: DS-65 In Travel Control: Actual valve travel in % of calibrated travel range. In Pressure Control: Implied valve travel in % of pressure range. Controls AI channel 4.
Travel Status STATUS	34.1	RO	N/A			N/A	
Travel VALUE	34.2	RO	N/A			N/A	
SUPPLY_PRESSURE	35						Data Type: DS-65 STATUS indicates the validity of VALUE. VALUE is pressure of air supply, controls AI channel 5.
Supply Press Status STATUS	35.1	RO	N/A			N/A	
Supply Press VALUE	35.2	RO	N/A			N/A	
PRESSURE_A	36						Data Type: DS-65 STATUS Indicates the validity of VALUE. Pressure of primary air output, controls AI channel 6.
Pressure A Status STATUS	36.1	RO	N/A			N/A	
Pressure A VALUE	36.2	RO	N/A			N/A	
PRESSURE_B	37						Data Type: DS-65 STATUS indicates the validity of VALUE. VALUE is the Pressure on secondary output, controls AI channel 7.
Pressure B Status STATUS	37.1	RO	N/A			N/A	
Pressure B VALUE	37.2	RO	N/A			N/A	
PRESSURE_DIFF	38						Data Type: DS-65 STATUS indicates the validity of VALUE. VALUE is the difference between PRESSURE_A and PRESSURE_B, controls AI channel 8.
Pressure Diff Status STATUS	38.1	RO	N/A			N/A	
Pressure Diff VALUE	38.2	RO	N/A			N/A	
PWA Simulate PWA_SIMULATE	39	RO or RW*	ALL	1=Simulate Off 2=Simulate Enabled	1=Simulate Off	ALL	Data Type: Enum When this is set to 2 all the alert ACTIVE parameters can be written, except for INST_ALERTS_ACTIVE. SHUTDOWN_ALERT_ACTIVE. This allows alerts to be simulated for testing with hosts. NOTE: only ACTIVE parameters are affected by this. * PWA Simulate is RW only if a jumper is installed across the Aux Terminal. If no jumpered is installed across the Aux Terminal, PWA Simulate is RO.
Grant Deny GRANT_DENY	40						
GRANT	40.1	RW	ALL	0: Program 1: Tune 2: Alarm 3: Local	all bits cleared	NONE	Data Type: Bit String Options for controlling access of host computer and local control panels to operating, tuning, and alarm parameters of the block. Has no effect on the DVC6000f. GRANT: 0=N/A, 1= granted DENY: 0=N/A, 1= denied
DENY	40.2	RW	ALL		all bits cleared	NONE	
Tvl Press Control TVL_PRESS_CONTROL	41						
Tvl/Press Select TVL_PRESS_SELECT	41.1	RW	ALL	1=Travel 2=Pressure 3=TVL/PRESS Auto Recv 4=TVL/PRESS Man Recv	1=Travel	SETUP	Data Type: Enum Selects whether travel sensor or port A pressure is used for feedback.
Tvl/Press State TVL_PRESS_STATE	41.2	RO	N/A	1=Travel 2=Pressure		N/A	Data Type: Enum Indicates which sensor is used for feedback

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Basic Setup BASIC_SETUP	42						
Actuator Style ACTUATOR_STYLE	42.1	RW	MAN OOS	1=Spring & Diaphragm 2=Piston-Dbl w/o Spring 3=Piston-Dbl w/Spring 4=Piston Sgl w/Spring	1=Spring & Diaphragm	SETUP	Data Type: Enum
Zero Pwr Cond ZERO_PWR_COND	42.2	RW	MAN OOS	1=Valve Closed 2=Valve Open	1=Valve Closed	SETUP	Data Type: Enum Identifies whether the valve is open or closed when instrument power is lost.
Tvl Sen Motion TRAVEL_SEN_MOTION	42.3	RW	MAN OOS	1=Counter Clockwise 2=Clockwise	1=Counter Clockwise	SETUP	Data Type: Enum
Feedback Conn FEEDBACK_CONN	42.4	RW	MAN OOS	1=Rotary All 2=Sstem Roller 3=Sstem Standard	3=Sstem Standard	SETUP	Data Type: Enum
Relay Type RELAY_TYPE	42.5	RW	MAN OOS	1=Type A 2=Type B	1=Type A	SETUP	Data Type: Enum
Max Supp Press MAX_SUPP_PRESS	42.6	RW	MAN OOS	> 0, < = 150	35 psig	SETUP	Data Type: Float
Press Range Hi PRESS_RANGE_HI	42.7	RW	MAN OOS	> 0, < = 150	15.0 psig	SETUP	Data Type: Float Defines pressure corresponding to max pressure in pressure control mode.
Press Range Lo PRESS_RANGE_LO	42.8	RW	MAN OOS	> = 0, < = 150	3.0 psig	SETUP	Data Type: Float Defines pressure corresponding to minimum pressure in pressure control mode.
Tvl Cal Trigger TVL_CAL_TRIGGER	42.9	RW	MAN OOS	1 = Aux Term ignored	1	SETUP	Not available in the DVC6000f
Tvl Tuning Set TVL_TUNING_SET	42.10	RW	MAN OOS	1=B, 2= C, ...12=M 23=X	2=C	SETUP	Data Type: Enum Letter (B through M or X)
Press Tuning Set PRESS_TUNING_SET	42.11	RW	MAN OOS	1=B, 2=C, ...12= M 23=X	2=C	SETUP	Data Type: Enum Letter (B through M or X)
TRAVEL_CAL	43						
Tvl Count TVL_COUNT	43.1	RO	N/A				Data Type: Uint16 Raw feedback from Travel Sensor
Tvl Hi Cal TVL_HI_CAL	43.2	RW	MAN OOS	<TVL_FAC_HI >TVL_LO_CAL		CAL	Data Type: Uint16 Max drive calibration point
Tvl Lo Cal TVL_LO_CAL	43.3	RW	MAN OOS	>TVL_FAC_LO <TVL_HI_CAL		CAL	Data Type: Uint16 Min drive calibration point
Tvl Crossover TVL_CROSSOVER	43.4	RW	MAN OOS	>0% < = 100%	50%	CAL	Data Type: Float
Tvl Fac Hi TVL_FAC_HI	43.5	RO	N/A		Set by Factory	N/A	Data Type: Uint16 Maximum value of travel sensor counts. Set at factory.
Tvl Fac Lo TVL_FAC_LO	43.6	RO	N/A		Set by Factory	N/A	Data Type: Uint16 Minimum value of travel sensor counts. Set at factory.
Tvl IP Bias TVL_IP_BIAS	43.7	RW	MAN OOS	0% – 100%	70%	CAL	Data Type: Float
Tvl MLFB Bias TVL_MLFB_BIAS	43.8	RW	MAN OOS	0 – 100%	50%	CAL	Data Type: Float

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
TRAVEL_TUNE	44						
Tvl Integ Enable TVL_INTEG_ENABLE	44.1	RW	MAN OOS	1=Off 2=On	2=On	SETUP	Data Type: Enum
Tvl Integ Lim Hi TVL_INTEG_LIM_HI	44.2	RW	MAN OOS	0% – 100%	30%	SETUP	Data Type: Float
Tvl Integ Lim Lo TVL_INTEG_LIM_LO	44.3	RW	MAN OOS	–100% – 0%	–30%	SETUP	Data Type: Float
Tvl Integ DeadZ TVL_INTEG_DEADZ	44.4	RW	MAN OOS	0% – 2%	0.25%	SETUP	Data Type: Float
Tvl MLFB Gain TVL_MLFB_GAIN	44.5	RW	MAN OOS	>= 0	35	SETUP	Data Type: Float
TRAVEL_CAL_RUN	45						
Tvl Cal Cmd TVL_CAL_CMD	45.1	RW	MAN	1=Operating 2=Autocalibrate 3=Mark Crossover 4=Mark Full Open 5=Mark Full Closed 6=Manual Calibrate Final 7=Abort 8=Clear Cal Status 9=Manual Calibrate Init 10=Manual Calibrate Restore 11=Reset Travel Sensor Error 12=Reserved 13=Execute Performance Tuner 14=Execute Performance Tuner Extended 15=Autocalibrate Extended	1=Operating	CAL	Data Type: Enum Resets to 1 after a write
Tvl Cal Prog TVL_CAL_PROG	45.2	RO	N/A		0%	N/A	Data Type: Uint8
Tvl Cal Status TVL_CAL_STATUS	45.3	RO	N/A	0: auto cal complete 1: calibration complete 2: auto cal in progress 3: manual cal in progress 4: crossover marked 5: upper position marked 6: lower position marked 7: calibration error 8: performance tuner active	no bits set	N/A	Data Type: Bit String All bits set to 0 when mode changes from O/S. 0 = FALSE, 1 = TRUE
Reserved TVL_CAL_RESERVED	45.4						Reserved

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
PRESS_CAL	46						
Supp Press Scale SUPP_PRESS_SCALE	46.1	RW	MAN OOS	> = 0	1	CAL	Data Type: Float
Supp Press Offset SUPP_PRESS_OFFSET	46.2	RW	MAN OOS	0 to 16383	0	CAL	Data Type: Uint16
Press A Scale PRESS_A_SCALE	46.3	RW	MAN OOS	> = 0	1	CAL	Data Type: Float
Press A Offset PRESS_A_OFFSET	46.4	RW	MAN OOS	0 to 16383	0	CAL	Data Type: Uint16
Press B Scale PRESS_B_SCALE	46.5	RW	MAN OOS	> = 0	1	CAL	Data Type: Float
Press B Offset PRESS_B_OFFSET	46.6	RW	MAN OOS	0 to 16383	0	CAL	Data Type: Uint16
Press IP Bias PRESS_IP_BIAS	46.7	RW	MAN OOS	0–100%	70%	CAL	Data Type: Float
Press MLFB Bias PRESS_MLFB_BIAS	46.8	RW	MAN OOS	0–100%	50%	CAL	Data Type: Float
PRESS_TUNE	47						
Press Cutoff Hi PRESS_CUTOFF_HI	47.1	RW	MAN OOS	–25 –125%, > CUTOFF_LO	99.50%	SETUP	Data Type: Float
Press Cutoff Lo PRESS_CUTOFF_LO	47.2	RW	MAN OOS	–25 –125% < CUTOFF_HI	0.50%	SETUP	Data Type: Float
Press Prop Gain PRESS_PROP_GAIN	47.3	RW	MAN OOS	> = 0, < 32	2.2	SETUP	Data Type: Float Proportional gain
Press Integ Gain PRESS_INTEG_GAIN	47.4	RW	MAN OOS	> = 0, < 32	0.1	SETUP	Data Type: Float Integral resets per second
Press Rate Gain PRESS_RATE_GAIN	47.5	RW	MAN OOS	> = 0, < = 512	0	SETUP	Data Type: Float Derivative gain
Press Integ DeadZ PRESS_INTEG_DEADZ	47.6	RW	MAN OOS	= 0%, < = 2.0%	0.25%	SETUP	Data Type: Float Integrator Deadzone, 1/2 width
Press Integ Hi Lim PRESS_INTEG_HI_LIM	47.7	RW	MAN OOS	> = 0%, < = 100%, >INTEG_LO	20%	SETUP	Data Type: Float Integrator limits
Press Integ Lo Lim PRESS_INTEG_LO_LIM	47.8	RW	MAN OOS	< = 0%, > = –100%, <INTEG_HI	–20%	SETUP	Data Type: Float Integrator limits
Press Integ IC Hi PRESS_INTEG_IC_HI	47.9	RW	MAN OOS	>= –100%, < = 100%	12%		Not used by the DVC6000f
Press Integ IC Lo PRESS_INTEG_IC_LO	47.10	RW	MAN OOS	>= –100%, < = 100%	–12%		Not used by the DVC6000f
Press MLFB Gain PRESS_MLFB_GAIN	47.11	RW	MAN OOS	> 0, < = 100	35	SETUP	Data Type: Float
Temperature TEMPERATURE	48	RO	N/A		N/A	N/A	Data Type: Float Electronics temperature – Controls AI channel 11
Target Travel TRAVEL_TARGET	49	RO					
Status STATUS	49.1	RO	MAN OOS			N/A	Data Type: DS-65 In Travel Control: Setpoint for valve travel in %, post characterization. In Pressure Control: Setpoint for implied valve travel as a % or pressure range, post characterization.
Value VALUE	49.2	RO	MAN OOS			N/A	
Input Char INPUT_CHAR	50	RW	MAN OOS	1=Linear 2=Equal % 3=Quick Opening 4=Reserved 5=Custom	1=Linear	SETUP	Data Type: Enum

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Custom Points CUSTOM_POINTS	51	RW	MAN OOS		Linear, Y=X	SETUP	Data Type: UINT16 Array[43] Each item – 2500 to 12500 First integrator is number of valid points. Followed by 21 X values and then 21 Y values. X values must be increasing. Y values must be increasing or same.
Tvl Deviation TRAVEL_DEVIATION	52	RO	N/A	0 to 100%		N/A	Data Type: Float Absolute value of (TRAVEL_TARGET [34] – TRAVEL), Controls AI channel 10
Drive Signal DRIVE_SIGNAL	53	RO	N/A	0 to 100%		N/A	Data Type: Float Controls AI channel 9
Drive Current DRIVE_CURRENT	54	RO	N/A	0 to 100%		N/A	Data Type: Float
MLFB MLFB	55	RO	N/A	–100% to 100%		N/A	Data Type: Float
Failed Alarm FAILED_ALM	56						Data Type: DS-71 Used to report alerts to host system.
UNACKNOWLEDGED	56.1	RW	ALL	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	NONE	
ALARM_STATE	56.2	RO	N/A	0=Undefined 1=Clear–reported 2=Clear–not reported 3=Active–reported 4=Active–not reported	0=Undefined	N/A	
TIME_STAMP	56.3	RO	N/A		0	N/A	
SUBCODE	56.4	RO	N/A		0	N/A	
VALUE	56.5	RO	N/A		0	N/A	Data Type: Float Value of parameter at alarm time for single alarm, 0 for multiple alarms
Maint Alarm MAINT_ALM	57						Data Type: DS-71 Used to report alerts to host system
UNACKNOWLEDGED	57.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	NONE	
ALARM_STATE	57.2	RO	N/A	0=Undefined 1=Clear–reported 2=Clear–not reported 3=Active–reported 4=Active–not reported	0=Undefined	N/A	
TIME_STAMP	57.3	RO	N/A		0	N/A	
SUBCODE	57.4	RO	N/A		0	N/A	
VALUE	57.5	RO	N/A		0	N/A	Data Type: Float Value of parameter at alarm time for single alarm, 0 for multiple alarms

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Advise Alarm ADVISE_ALM	58						Data Type: DS-71 Used to report alerts to host system
UNACKNOWLEDGED	58.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	NONE	
ALARM_STATE	58.2	RO	N/A	0: Undefined 1: Clear−reported 2: Clear−not reported 3: Active−reported 4: Active−not reported	0=Undefined	N/A	
TIME_STAMP	58.3	RO	N/A		0	N/A	
SUBCODE	58.4	RO	N/A		0	N/A	
VALUE	58.5	RO	N/A		0	N/A	Data Type: Float Value of parameter at alarm time for single alarm, 0 for multiple alarms
Failed Active FAILED_ACTIVE	59	RO(1)	N/A	0: Drive Current 1: Drive Signal 2: Processor Impaired 3: Output Block Timeout 4: Blocks Set to Defaults 5: Travel Sensor 6: Outlet Pressure Sensor 7: Supply Pressure Sensor 8: Temperature Sensor 9: Supply Pressure 10: Temperature Limit 11: Travel Deviation 12: Travel Limit 13: Travel Accumulator 14: Cycle Counter 15: Performance Critical 16: Performance Reduced 17: Performance Information 18: Shutdown Alert	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Failed Alert Status
Maint Active MAINT_ACTIVE	60	RO(1)	N/A	0: Drive Current 1: Drive Signal 2: Processor Impaired 3: Output Block Timeout 4: Blocks Set to Defaults 5: Travel Sensor 6: Outlet Pressure Sensor 7: Supply Pressure Sensor 8: Temperature Sensor 9: Supply Pressure 10: Temperature Limit 11: Travel Deviation 12: Travel Limit 13: Travel Accumulator 14: Cycle Counter 15: Performance Critical 16: Performance Reduced 17: Performance Information 18: Shutdown Alert	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Maintenance Alert Status

1. These parameters can be written when PWA_SIMULATE is active and Protect Category is not ALL.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Advise Active ADVISE_ACTIVE	61	RO(1)	N/A	0: Drive Current 1: Drive Signal 2: Processor Impaired 3: Output Block Timeout 4: Blocks Set to Defaults 5: Travel Sensor 6: Outlet Pressure Sensor 7: Supply Pressure Sensor 8: Temperature Sensor 9: Supply Pressure 10: Temperature Limit 11: Travel Deviation 12: Travel Limit 13: Travel Accumulator 14: Cycle Counter 15: Performance Critical 16: Performance Reduced 17: Performance Information 18: Shutdown Alert	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Advise Alert Status
Failed Enable FAILED_ENABLE	62	RW	ALL	Same as for FAILED_ACTIVE above	Enabled Bits: 0: Drive Current 2: Processor Impaired 4: Blocks Set to Default 5: Travel Sensor 15: Performance Critical 18: Shutdown Alert	ALL	Data Type: Bit String 0=disable 1=enable Failed alert enable. Enable allows detection of alert. All alerts can be disabled.
Maint Enable MAINT_ENABLE	63	RW	ALL	Same as for MAINT_ACTIVE above	Enabled Bits: 1: Drive Signal 3: Output Block Timeout 6: Outlet Pressure Sensor 9: Supply Pressure 11: Travel Deviation 13: Travel Accumulator 14: Cycle Counter 16: Performance Reduced	ALL	Data Type: Bit String 0=disable 1=enable Maint alert enable. Enable allows detection of alert. All alerts can be disabled.
Advise Enable ADVISE_ENABLE	64	RW	ALL	Same as for ADVISE_ENABLE above	Enabled Bits: 8: Temperature Sensor 9: Supply Pressure Sensor 10: Temperature Limit 12: Travel Limit	ALL	Data Type: Bit String 0=disable 1=enable Advise alert enable. Enable allows detection of alert. All alerts can be disabled.
Failed Suppress FAILED_MASK	65	RW	ALL	Same as for FAILED_ACTIVE above	All bits: 0	ALL	Data Type: Bit String 0=disable 1=enable Failed alert mask. MASK controls whether an alert is reported. If alert is enabled the alert condition is evaluated and the ACTIVE parameter is updated to reflect if alert is active or not. If the bit is set reporting is suppressed. Default is all bits cleared.

1. These parameters can be written when PWA_SIMULATE is active and Protect Category is not ALL.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Maint Suppress MAINT_MASK	66	RW	ALL	Same as for MAINT_ACTIVE above	All bits: 0	ALL	Data Type: Bit String 0=disable 1=enable Maintenance alert mask. MASK controls whether an alert is reported. If alert is enabled the alert condition is evaluated and the ACTIVE parameter is updated to reflect if alert is active or not. If the bit is set reporting is suppressed. Default is all bits cleared.
Advise Suppress ADVISE_MASK	67	RW	ALL	Same as for ADVISE_ENABLE above	All bits: 0	ALL	Data Type: Bit String 0=disable 1=enable Advise alert mask. MASK controls whether an alert is reported. If alert is enabled the alert condition is evaluated and the ACTIVE parameter is updated to reflect if alert is active or not. If the bit is set reporting is suppressed. Default is all bits cleared.
Failed Pri FAILED_PRI	68	RW	ALL	0 to 15	2	SETUP	Data Type: Uint8 Failed alert priority
Maint Pri MAINT_PRI	69	RW	ALL	0 to 15	2	SETUP	Data Type: Uint8 Maintenance alert priority
Advise Pri ADVISE_PRI	70	RW	ALL	0 to 15	2	SETUP	Data Type: Uint8 Advise alert priority
Recommended Action RECOMMENDED_ACTION	71	RO	N/A	0 to 65535	0	N/A	Data Type: Uint16 Fix for most serious condition
Travel Accum TRAVEL_ACCUM	72	RW	ALL	Write: Anything Read: Actual		CAL	Data Type: Uint32 Total travel expressed in integer % terms. Controls AI channel 13.
Cycle Count CYCLE_COUNT	73	RW	ALL	Write: Anything Read: Actual		CAL	Data Type: Uint32 Number of cycle transitions above a certain threshold of movement. Controls AI channel 12.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
INST_ALERTS_ACTIVE	74						
Elect Active ELECT_ACTIVE	74.1	RO(1)	ALL	0: Drive Current 1: Drive Signal 2: Memory Failure – Pending 3: Static Memory 4: Processor 5: I/O Processor 6: Output Block Timeout 7: Block Set to Defaults	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Electronics Alert status
Sensor Active SENSOR_ACTIVE	74.2	RO(1)	ALL	0: Travel Sensor 1: Port A Pressure Sensor 2: Port B Pressure Sensor 3: Supply Pressure Sensor 4: Temperature Sensor	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Sensor Alert status
Enviro Active ENVIRO_ACTIVE	74.3	RO(1)	ALL	0: Supply Pressure High 1: Supply Pressure Low 2: Temperature High 3: Temperature Low	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Enviro Alert status
Tvl Active TRAVEL_ACTIVE	74.4	RO(1)	ALL	0: Travel Deviation 1: Travel Limit High High 2: Travel Limit Low Low 3: Travel Limit High 4: Travel Limit Low	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Travel Alert status
Prox Active PROX_ACTIVE	74.5	RO(1)	N/A	0: Travel Open 1: Travel Closed 2: Proximity High High 3: Proximity High 4: Proximity Low 5: Proximity Low Low	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Proximity Alert status.
Tvl History Active TVL_HISTORY_ACTIVE	74.6	RO(1)	ALL	0: Cycle Counter 1: Travel Accumulator	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Travel History Alert status
Performance Active PERF_ACTIVE	74.7	RO(1)	ALL	0: Performance Critical 1: Performance Reduced 2: Performance Information	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Alert status
PD Event Active PD_EVENT_ACTIVE	74.8	RO(1)	ALL	0: High I/P Drive Signal 1: Low I/P Drive Signal 2: High Air Mass Flow 3: Large Travel Deviation 4: Low Supply Pressure 5: High Supply Pressure 6: High Crossover Pressure 7: Low Crossover Pressure 8: High I/P Drive Signal 9: Low I/P Drive Signal 10: High Air Mass Flow 11: Large Travel Deviation 12: Low Supply Pressure 13: High Supply Pressure 14: High Crossover Pressure 15: Low Crossover Pressure 16: No Air Mass Flow Estimate	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic event status.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
PD Detail 1 Active PD_DETAIL1_ACTIVE	74.9	RO(1)	ALL	0: I/P Primary Plugged 1: I/P Nozzle Plugged 2: I/P Latched 3: Reserved 4: Relay Jammed 5: Relay Cross Misadj 6: Relay Bias Diaph Leak 7: Relay Port A Diaph Leak 8: Relay Port B Diaph Leak 9: Reserved 10: Valve Stuck Low or Sensor Arm Damage 11: Valve Stuck High or Sensor Arm Damage 12: Piston Ring Leak 13: Reserved 14: Low Supply Pressure 15: External Leak 16: SOV Trip 17: Air Line Blocked 18: Reserved 19: Reserved 20: Unknown	All bits:0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Critical possible cause.
PD Detail 2 Active PD_DETAIL2_ACTIVE	74.10	RO(1)	ALL	Reserved	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Detail status.
PD Detail 3 Active PD_DETAIL3_ACTIVE	74.11	RO(1)	ALL	0: I/P Primary Plugging 1: I/P Nozzle Plugging 2: I/P Calibration Shift 3: Reserved 4: Relay Cross Misadj 5: Relay Port A Diaph Leak 6: Relay Port B Diaph Leak 7: Reserved 8: Piston Ring Leak 9: Reserved 10: Reserved 11: Low Supply Pressure 12: Reserved 13: External Leak 14: Reserved 15: Travel Calibration Shift 16: Unknown 17: Reserved 18: Reserved	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Reduce possible cause.
PD Detail 4 Active PD_DETAIL4_ACTIVE	74.12	RO(1)	ALL	Reserved	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Detail status

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
PD Detail 5 Active PD_DETAIL5_ACTIVE	74.13	RO(1)	ALL	0: Relay Disengaged 1: Insufficient Pressure Differential 2: Travel Calibration Error 3: Reserved 4: High Supply Pressure* 5: Reserved 6: Near a Travel Cutoff Or Stop 7:Reserved 8: Spec Sheet Fields Incomplete* 9: Sensor Failure* 10: Pressure Control Active 11: Tranducer Block Mode OOS 12: Not Authorized for PD 13: PD Run Disabled* 14: Trigger Data Available*	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Detail status *Bits which, when set, will trigger PERF_ACTIVE bit 2.
PD Detail 6 Active PD_DETAIL6_ACTIVE	74.14	RO(1)	ALL	Reserved	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Performance Diagnostic Detail status
Shutdown Alerts SHUTDOWN_ALERTS_ACTIVE	74.15	RO	N/A	0: Drive Current 1: Program Memory 2: Static Memory 3: Processor or I/O Processor 4: Travel Sensor 5: Port A Pressure Sensor 6: Output Block Timeout 7–31: (Reserved)	All bits: 0	N/A	Data Type: Bit String 0=inactive 1=active Indicates what caused an Instrument Shutdown. Bit remains set even if condition has passed if Shutdown Recovery is Manual. All bits are cleared when MODE_BLK.TARGET is written. Always enabled whenever the corresponding SHUTDOWN_TRIGGER is enabled.

1. These parameters can be written when PWA_SIMULATE is active and Protect Category is not ALL.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
INST_ALERTS_ENABLE	75						
Elect Enable ELECT_ENABLE	75.1	RW	ALL	0: Drive Current 1: Drive Signal 2: Program Memory 3: Static Memory 4: Processor 5: I/O Processor 6: Output Block Timeout 7: Blocks Set to Defaults	Enabled Bits: 0: Drive Current 1: Drive Signal 2: Program Memory 3: Static Memory 4: Processor 5: I/O Processor 7: Block Set to Default	SETUP	Data Type: Bit String 0=disable 1=enable Electronic Alerts Enable
Sensor Enable SENSOR_ENABLE	75.2	RW	ALL	0: Travel Sensor 1: Port A Pressure Sensor 2: Port B Pressure Sensor 3: Supply Pressure Sensor 4: Temperature Sensor	Enabled Bits: 0: Travel Sensor 1: Port A Pressure Sensor 2: Port B Pressure Sensor 3: Supply Pressure Sensor 4: Temperature Sensor	SETUP	Data Type: Bit String 0=disable 1=enable Sensor Alerts Enable
Enviro Enable ENVIRO_ENABLE	75.3	RW	ALL	0: Supply Pressure High 1: Supply Pressure Low 2: Temperature High 3: Temperature Low	Enabled Bits: 0: Supply Pressure High 2: Temperature High 3: Temperature Low	SETUP	Data Type: Bit String 0=disable 1=enable Enviro Alerts Enable
Travel Enable TRAVEL_ENABLE	75.4	RW	ALL	0: Travel Deviation 1: Travel Limit High High 2: Travel Limit Low Low 3: Travel Limit High 4: Travel Limit Low	Enabled Bits: 0: Travel Deviation	SETUP	Data Type: Bit String 0=disable 1=enable Travel Alerts Enable
Prox Enable PROX_ENABLE	75.5	RW	ALL	0: Travel Open 1: Travel Closed 2: Proximity High High 3: Proximity High 4: Proximity Low 5: Proximity Low Low	All bits: 0	SETUP	Data Type: Bit String 0=disable 1=enable Proximity Alerts Enable
Tvl History Enable TVL_HISTORY_ENABLE	75.6	RW	ALL	0: Cycle Counter 1: Travel Accumulator	All bits: 0	SETUP	Data Type: Bit String 0=disable 1=enable Travel History Alerts Enable
Performance Enable PERF_ENABLE	75.7	RW	ALL	0: Performance Critical 1: Performance Reduced 2: Performance Information	Enabled Bits: 0: Performance Critical 1: Performance Reduced	SETUP	Data Type: Bit String 0=disable 1=enable Performance Alerts Enable

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
INST_ALERTS_CONFIG	76						
Shutdown Trigger SHUTDOWN_TRIGGER	76.1	RW	ALL	0: Drive Current 1: Program Memory 2: Static Memory 3: Processor or I/O Processor 4: Travel Sensor 5: Port A Pressure Sensor 6: Output Block Timeout 7–31: (Reserved)	All bits: 0	SETUP	Data Type: Bit String 0=attempt control, 1=fail to zero drive e.g. OOS mode Action on specific instrument alerts:
Shutdown Recovery SHUTDOWN_RECOVERY	76.2	RW	ALL	0: (reserved) 1: Program Memory 2: Static Memory 3: Processor or I/O Processor 4: Travel Sensor 5: Port A Pressure Sensor 6: Output Block Timeout 7–31: (Reserved)	All bits: 0	SETUP	Data Type: Bit String 0=Auto 1=Manual Recovery action after a shutdown trigger “fail to zero drive” above,
Output Blk Timeout OUTPUT_BLK_TIMEOUT	76.3	RW	ALL	Time > = 0, < = 800 seconds	600 sec	SETUP	Data Type: Float The maximum time between updates from the AO or DO block to the transducer block setpoint.
Drive Current Alrt Pt DRIVE_CURRENT_ALRT_PT	76.4	RW	ALL	> = 5, < = 100	50%	SETUP	Data Type: Float (percent different) drive signal not reaching I/P accurately.
Drive Current Alrt Time DRIVE_CURRENT_TIME	76.5	RW	ALL	= 0.25, < = 120 seconds	5 sec	SETUP	Data Type: Float (percent different) drive signal not reaching I/P accurately.
Temp Hi Alrt Pt TEMP_HI_ALRT_PT	76.6	RW	ALL	> −76 F, < 257 F	186 deg F	SETUP	Data Type: Float Temperature HI Limits
Temp Lo Alrt Pt TEMP_LO_ALRT_PT	76.7	RW	ALL	> −76 F, < 257 F	−63 deg F	SETUP	Data Type: Float Temperature LO Limits
Supply Press Hi Alrt Pt SUP_PRES_HI_ALRT_PT	76.8	RW	ALL	> = 0, < = 150	145 psig	SETUP	Data Type: Float Maximum supply pressure
Supply Press Lo Alrt Pt SUP_PRES_LO_ALRT_PT	76.9	RW	ALL	> = 0, < = 150	19 psig	SETUP	Data Type: Float Minimum supply pressure

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
INST_ALERTS_CONFIG2	77						
Tvl Dev Alrt Pt TVL_DEV_ALRT_PT	77.1	RW	ALL	> 0%, <= 125%	5%	SETUP	Data Type: Float Alerts when difference between sp and pv is too large for too long.
Tvl Dev Time TVL_DEV_TIME	77.2	RW	ALL	> = 0, < = 120 seconds	10 sec	SETUP	Data Type: Float
Tvl Dev DB TVL_DEV_DB	77.3	RW	ALL	> = 0%, < = 100%	2%	SETUP	Data Type: Float
Tvl Accum Alrt Pt TVL_ACCUM_ALRT_PT	77.4	RW	ALL	> = 0	1,000,000	SETUP	Data Type: Uint32 Alerts when accumulated travel is too much
Tvl Accum DB TVL_ACCUM_DB	77.5	RW	ALL	0 – 100%	1%	SETUP	Data Type: Float Deadband
Cycle Count Alrt Pt CYCLE_COUNT_ALRT_PT	77.6	RW	ALL	> = 0	1,000,000	SETUP	Alerts when number of cycles is too large.
Cycle Count DB CYCLE_COUNT_DB	77.7	RW	ALL	0 – 100%	1%	SETUP	Data Type: Float Deadband
Tvl Open Alrt Pt TVL_OPEN_ALRT_PT	77.8	RW	ALL	–25% to 125%	99.5%	SETUP	Data Type: Float Alert when valve is open. Control DI channel 24 regardless of alert enable state.
Tvl Open DB TVL_OPEN_DB	77.9	RW	ALL	> = 0%, < =100%	5%	SETUP	Data Type: Float Deadband
Tvl Closed Alrt Pt TVL_CLOSED_ALRT_PT	77.10	RW	ALL	–25% to 125%	0.5%	SETUP	Data Type: Float Alerts when valve closed. Controls DI channel 25 regardless of alert enable state.
Tvl Closed DB TVL_CLOSED_DB	77.11	RW	ALL	> = 0%, < = 100%	5%	SETUP	Data Type: Float Deadband
Tvl Lo Lo Alrt Pt TVL_LO_LO_ALRT_PT	77.12	RW	ALL	–25% to 125%	–25%	SETUP	Data Type: Float Alert when valve position is less than alert point. Controls DI channels 26 & 30 regardless of alert enable state.
Tvl Lo Lo DB TVL_LO_LO_DB	77.13	RW	ALL	> = 0%, < = 100%	5%	SETUP	Data Type: Float Deadband
Tvl Lo Alrt Pt TVL_LO_ALRT_PT	77.14	RW	ALL	–25% to 125%	–25%	SETUP	Data Type: Float Alert when valve position is less than alert point. Controls DI channels 27 & 31 regardless of alert enable state.
Tvl Lo DB TVL_LO_DB	77.15	RW	ALL	> = 0%, < = 100%	5%	SETUP	Data Type: Float Deadband
Tvl Hi Alrt Pt TVL_HI_ALRT_PT	77.16	RW	ALL	–25% to 125%	125%	SETUP	Data Type: Float Alert when valve position is less than alert point. Controls DI channels 28 & 32 regardless of alert enable state.
Tvl Hi DB TVL_HI_DB	77.17	RW	ALL	> = 0%, < = 100%	5%	SETUP	Data Type: Float Deadband
Tvl Hi Hi Alrt Pt TVL_HI_HI_ALRT_PT	77.18	RW	ALL	–25% to 125%	125%	SETUP	Data Type: Float Alert when valve position is less than alert point. Controls DI channels 29 & 33 regardless of alert enable state.
Tvl Hi Hi DB TVL_HI_HI_DB	77.19	RW	ALL	> = 0%, < = 100%	5%	SETUP	Data Type: Float Deadband

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Self Test Status SELFTEST_STATUS	78	RO	N/A	0: 1: Integrator frozen 2: Integrator Limited Low 3: Integrator Limited High 4: Tvl Sensor Span Error 5: MILFB Error 7: Tvl Sensor High Error 8: Tvl Sensor Low Error 9: Pressure Sensor B 10: Pressure Sensor A 11: Supply Pressure Sensor 13: IOP Failure 15: Simulate Jumper ON	All bits: 0		Data Type: Bit String 0=inactive 1=active Indicates the status of the instrument self test. **Integrator Frozen**: The integrator function is temporarily suspended. The integrator is suspended if any of the following conditions are met: •The setpoint and actual travel are greater than 98% or less than 2%. •The set point is in cutoff •The Transducer block is Out of Service (OOS) **Integrator Limited Low**: Indicates the integrator reached its limit and cannot move the valve any further. High valve friction may cause this situation. **Integrator Limited High**: Indicates the integrator reached its limit and cannot move the valve any further. High valve friction may cause this situation. **Travel Sensor Span Error**: Indicates that span between the endpoints of travel are not far enough apart. This error is reported during automatic calibration. **MLFB Error**: Indicates that the Minor Loop Feedback sensor gave a non-valid value during automatic calibration. **Travel Sensor High Error**: Indicates the travel sensor has reported a travel position that is significantly above the normal operating range, and has failed. **Travel Sensor Low Error**: Indicates the travel sensor has reported a travel position that is significantly below the normal operating range, and has failed. **Pressure B Sensor Failure**: Indicates the pressure sensor is reporting a pressure that is significantly outside of the normal operating pressure, and has failed. **Pressure A Sensor Failure**: Indicates the pressure sensor is reporting a pressure that is significantly outside of the normal operating pressure, and has failed. **Supply Sensor Failure**: Indicates the pressure sensor is reporting a pressure that is significantly outside of the normal operating pressure, and has failed. **IOP Failure**: Indicates the I/O processor has failed. **Simulate Jumper ON**: Indicates the simulate jumper is connected to the DVC6000f between the two AUX terminals.
Health Index HEALTH_INDEX	79	RO	N/A	0 – 100	100	N/A	Data Type: Uint8 Represents overall health of device. 100 is perfect, 0 is completely bad. Settings for DVC6000f will range from 10 to 100.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Reserved A RESERVED_A	80	RW	ALL		N/A	SETUP	Data Type: Array, 118 x UINT8 Reserved
Reserved AI RESERVED_AI	81	RW	ALL		0	SETUP	Data Type: Uint16 Reserved
Upgrade Progress UPGRADE_PROGRESS	82	RO	N/A		1	N/A	Data Type: Enum Not used by the DVC6000f
SPEC_SHEET_VALVE	83						
Valve Size VALVE_SIZE	83.1	RW	ALL		NULL	ALL	Data Type: Visible String
Valve Class VALVE_CLASS	83.2	RW	ALL		NULL	ALL	Data Type: Visible String
Rated Travel RATED_TRAVEL	83.3	RW	ALL		0.00	ALL	Data Type: Float
Actual Travel ACTUAL_TRAVEL	83.4	RW	ALL		0.00	ALL	Data Type: Float
Shaft Stem Dia SHAFT_STEM_DIA	83.5	RW	ALL		0.00	ALL	Data Type: Float
Packing Type PACKING_TYPE	83.6	RW	ALL		NULL	ALL	Data Type: Visible String
Inlet Pressure INLET_PRESSURE	83.7	RW	ALL		0.00	ALL	Data Type: Float
Outlet Pressure OUTLET_PRESSURE	83.8	RW	ALL		0.00	ALL	Data Type: Float
SPEC_SHEET_TRIM	84						
Seat Type SEAT_TYPE	84.1	RW	ALL		NULL	ALL	Data Type: Visible String
Leak Class LEAK_CLASS	84.2	RW	ALL	ANSI Seat Leakage Classification 1=I 2=II 3=III 4=IV 5=V 6=VI 7=BFW 8=STD AIR	1= I	ALL	Data Type: Enum
Port Diameter PORT_DIAMETER	84.3	RW	ALL		0.00	ALL	Data Type: Float
Port Type PORT_TYPE	84.4	RW	ALL	1=balanced 2=unbalanced	1=balanced	ALL	Data Type: Enum
Flow Direction FLOW_DIRECTION	84.5	RW	ALL	1=up 2=down	1=up	ALL	Data Type: Enum
Push Down To PUSH_DOWN_TO	84.6	RW	ALL	1=open 2=close	2=close	ALL	Data Type: Enum
Flow Tends To FLOW_TENDS_TO	84.7	RW	ALL	1=open 2=close	1=open	ALL	Data Type: Enum
Unbalanced Area UNBALANCED_AREA	84.8	RW	ALL		0.00	ALL	Data Type: Float
Trim Style 1 TRIM_STYLE_1	84.9	RW	ALL		NULL	ALL	Data Type: Visible String
Trim Style 2 TRIM_STYLE_2	84.10	RW	ALL		NULL	ALL	Data Type: Visible String

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
SPEC_SHEET_ACT	85						
Actuator Size ACTUATOR SIZE	85.1	RW	ALL		NULL	ALL	Data Type: Visible String
Effective Area EFFECTIVE AREA	85.2	RW	ALL		0.00	ALL	Data Type: Float
Air AIR	85.3	RW	ALL	1=open 2=close	1=open	ALL	Data Type: Enum
Lower Bench Set LOWER_BENCH_SET	85.4	RW	ALL		0.00	ALL	Data Type: Float
Upper Bench Set UPPER_BENCH_SET	85.5	RW	ALL		0.00	ALL	Data Type: Float
Nominal Supply Pressure NOMINAL_SUPPLY_PRESSURE	85.6	RW	ALL		0.00	ALL	Data Type: Float
Spring Rate SPRING_RATE	85.7	RW	ALL		0.00	ALL	Data Type: Float
Stroking Time Open STROKING_TIME_OPEN	85.8	RW	ALL		0.00	ALL	Data Type: Float Seconds
Stroking Time Close STROKING_TIME_CLOSE	85.9	RW	ALL		0.00	ALL	Data Type: Float Seconds
Lever Style LEVER_STYLE	85.10	RW	ALL	1=Pivot Point 2=Rack & Pinion	1=Pivot Point	ALL	Data Type: Enum
Moment Arm MOMENT_ARM	85.11	RW	ALL		0.00	ALL	Data Type: Float
DEVICE_RECORD	86						These parameters can only set by a new reserved AI command.
Temp Max TEMP_MAX	86.1	RO	N/A		–9999.99	N/A	Data Type: Float Highest temperature recorded
Temp Max Time TEMP_MAX_TIME	86.2	RO	N/A		Zero time	N/A	Data Type: Time Value
Temp Min TEMP_MIN	86.3	RO	N/A		9999.99	N/A	Data Type: Float Lowest temperature recorded
Temp Min Time TEMP_MIN_TIME	86.4	RO	N/A		Zero time	N/A	Data Type: Time Value
Supp Press Max SUPP_PRESS_MAX	86.5	RO	N/A		0.0	N/A	Data Type: Float Highest supply pressure recorded
Supp Press Max Time SUPP_PRESS_MAX_TIME	86.6	RO	N/A		Zero time	N/A	Data Type: Time Value
Supp Press Min SUPP_PRESS_MIN	86.7	RO	N/A		9999.99	N/A	Data Type: Float Lowest supply pressure recorded
Supp Press Min Time SUPP_PRESS_MIN_TIME	86.8	RO	N/A		Zero time	N/A	Data Type: Time Value
Comm Error Count COMM_ERROR_COUNT	86.9	RW	N/A		0	SETUP	Not used by the DVC6000f
Protection PROTECTION	87	RW	ALL	1=None 2=Calibration 3=Setup & Calibration 4=All	2=Calibration	NONE	Data Type: Enum Write lock enable/disable. If setting is at or above a parameters protection level then that parameter is read-only.
PERF_DIAG	88						
PD Run PD_COMMAND	88.1	RW	AUTO MAN	1=PD On 2=PD Off	1=PD On	NONE	Data Type: Enum Controls whether PD will run or not.
PD Status PD_STATUS	88.2	RO	ALL	1=Not Running 2=Running		NONE	Data Type: Enum Status of performance diagnostics.
PD Config PD_CONFIG	88.3	RW	ALL	0		NONE	Data Type: Bit String Bit string for configuring PD setup and options.
PD Extra PD_EXTRA	88.4	RW	ALL		0	NONE	Data Type: Uint32 Extra 32 bit integer for sending values to PD.

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Table 5-13. Transducer Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Protect Category	Description
Temperature Units TEMPERATURE_UNITS	89	RW	ALL	C=1001 F=1002	F	SETUP	Data Type: Enum
Pressure Units PRESSURE_UNITS	90	RW	ALL	kPa=1133 bar=1137 psig=1143 inHg=1155 inH2O=1146	psig	SETUP	Data Type: Enum
Tvl Units TVL_UNITS	91	RW	ALL	cm=1012 mm=1013 in=1019 deg=1005	in	SETUP	Data Type: Enum Travel units for spec sheet ACTUAL-TRAVEL and RATED_TRAVEL only.
Length Units LENGTH_UNITS	92	RW	ALL	cm=1012 mm=1013 in=1019	in	SETUP	Data Type: Enum Not used for spec sheet ACTUAL-TRAVEL OR RATED_TRAVEL
Area Units AREA_UNITS	93	RW	ALL	cm^2=1025 mm^2=1027 in^2=1030	in^2	SETUP	Data Type: Enum
Spring Rate Units SPRING_RATE_UNITS	94	RW	ALL	N/m=1165 lb/in=1596	lb/in.	SETUP	Data Type: Enum
MAI_CHANNEL_MAP	95						Data Type:Uint16 This defines which transducer block channels will be sent to each of the 8 MAI channels. No scaling or other conversion will be done. Values will be sent in the currently defined units. If set to 0, then no output to MAI (status will be set to BAD). 1=FINAL_VALUE 2=TRAVEL_TARGET 3=FINAL_POSITION_VALUE 4=TRAVEL 5=SUPPLY_PRESS 6=ACT_PRESS_A 7=ACT_PRESS_B 8=ACT_PRESS_DIFF 9=DRIVE_SIGNAL 10=TRAVEL_DEVIATION 11=TEMPERATURE 12=CYCLE_COUNT 13=TRAVEL_ACCUM
MAI Channel 1 MAI_CHANNEL_1	95.1	RW	MAN	1 through 13	1	SETUP	
MAI Channel 2 MAI_CHANNEL_2	95.2	RW	MAN	1 through 13	2	SETUP	
MAI Channel 3 MAI_CHANNEL_3	95.3	RW	MAN	1 through 13	3	SETUP	
MAI Channel 4 MAI_CHANNEL_4	95.4	RW	MAN	1 through 13	4	SETUP	
MAI Channel 5 MAI_CHANNEL_5	95.5	RW	MAN	1 through 13	5	SETUP	
MAI Channel 6 MAI_CHANNEL_6	95.6	RW	MAN	1 through 13	6	SETUP	
MAI Channel 7 MAI_CHANNEL_7	95.7	RW	MAN	1 through 13	7	SETUP	
MAI Channel 8 MAI_CHANNEL_8	95.8	RW	MAN	1 through 13	8	SETUP	

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-14. Transducer Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET
5.2	MODE_BLK.ACTUAL
5.3	MODE_BLK.PERMITTED
5.4	MODE_BLK.NORMAL
6	BLOCK_ERR
10	TRANSDUCER_TYPE
11	XD_ERROR
13.1	FINAL_VALUE.STATUS
13.2	FINAL_VALUE.VALUE
17.1	FINAL_POSITION_VALUE.STATUS
17.2	FINAL_POSITION_VALUE.VALUE
32.1	SETPOINT_D.STATUS
32.2	SETPOINT_D.VALUE

Table 5-15. Transducer Block, View 2

Index Number	Parameter
1	ST_REV
10	TRANSDUCER_TYPE
14.1	FINAL_VALUE_RANGE.EU_100
14.2	FINAL_VALUE_RANGE.EU_0
14.3	FINAL_VALUE_RANGE.UNITS_INDEX
14.4	FINAL_VALUE_RANGE.DECIMAL
15	FINAL_VALUE_CUTOFF_HI
16	FINAL_VALUE_CUTOFF_LO
18	SERVO_GAIN
19	SERVO_RESET
20	SERVO_RATE
21	ACT_FAIL_ACTION
40.1	GRANT_DENY.GRANT
40.2	GRANT_DENY.DENY
50	INPUT_CHAR

Note

Because individual views are limited in size, View Lists 3 and 4 have multiple parts.

Table 5-16. Transducer Block, View 3.1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLOCK.TARGET
5.2	MODE_BLOCK.ACTUAL
5.3	MODE_BLOCK.PERMITTED
5.4	MODE_BLOCK.NORMAL
6	BLOCK_ERR
10	TRANSDUCER_TYPE
11	XD_ERROR
13.1	FINAL_VALUE.STATUS
13.2	FINAL_VALUE.VALUE
17.1	FINAL_POSITION_VALUE.STATUS
17.2	FINAL_POSITION_VALUE.VALUE
32.1	SETPOINT_D.STATUS
32.2	SETPOINT_D.VALUE
35.1	SUPPLY_PRESSURE.STATUS
35.2	SUPPLY_PRESSURE.VALUE
36.1	PRESSURE_A.STATUS
36.2	PRESSURE_A.VALUE
37.1	PRESSURE_B.STATUS
37.2	PRESSURE_B.VALUE
38.1	PRESSURE_DIFF.STATUS
38.2	PRESSURE_DIFF.VALUE
48	TEMPERATURE
49	TRAVEL_TARGET
52	TRAVEL_DEVIATION
53	DRIVE_SIGNAL
54	DRIVE_CURRENT
55	MLFB
59	FAILED_ACTIVE
60	MAINT_ACTIVE
61	ADVISE_ACTIVE
71	RECOMMEND_ACTION
72	TRAVEL_ACCUM
73	CYCLE_COUNT
75.1	INST_ALERTS_ENABLE.ELECT_ENABLE
75.2	INST_ALERTS_ENABLE.SENSOR_ENABLE
75.3	INST_ALERTS_ENABLE.ENVIRO_ENABLE
75.4	INST_ALERTS_ENABLE.TRAVEL_ENABLE
75.5	INST_ALERTS_ENABLE.PROX_ENABLE
75.6	INST_ALERTS_ENABLE.TVL_HISTORY_ENABLE
75.7	INST_ALERTS_ENABLE.PERF_ENABLE

Table 5-17. Transducer Block, View 3.2

Index Number	Parameter
1	ST_REV
74.1	INST_ALERTS_ACTIVE.ELECT_ACTIVE
74.2	INST_ALERTS_ACTIVE.SENSOR_ACTIVE
74.3	INST_ALERTS_ACTIVE.ENVIRO_ACTIVE
74.4	INST_ALERTS_ACTIVE.TRAVEL_ACTIVE
74.5	INST_ALERTS_ACTIVE.PROX_ACTIVE
74.6	INST_ALERTS_ACTIVE.TVL_HISTORY_ACTIVE
74.7	INST_ALERTS_ACTIVE.PERF_ACTIVE
74.8	INST_ALERTS_ACTIVE.PD_EVENT_ACTIVE
74.9	INST_ALERTS_ACTIVE.PD_DETAIL1_ACTIVE
74.10	INST_ALERTS_ACTIVE.PD_DETAIL2_ACTIVE
74.11	INST_ALERTS_ACTIVE.PD_DETAIL3_ACTIVE
74.12	INST_ALERTS_ACTIVE.PD_DETAIL4_ACTIVE
74.13	INST_ALERTS_ACTIVE.PD_DETAIL5_ACTIVE
78	SELFTEST_STATUS
79	HEALTH_INDEX
86.1	DEVICE_RECORD.TEMP_MAX
86.2	DEVICE_RECORD.TEMP_MAX_TIME
86.3	DEVICE_RECORD.TEMP_MIN
86.4	DEVICE_RECORD.TEMP_MIN_TIME
86.5	DEVICE_RECORD.SUPP_PRESS_MAX
86.6	DEVICE_RECORD.SUPP_PRESS_MAX_TIME
86.7	DEVICE_RECORD.SUPP_PRESS_MIN
86.8	DEVICE_RECORD.SUPP_PRESS_MIN_TIME

Table 5-18. Transducer Block, View 4.1

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
10	TRANSDUCER_TYPE
22	ACT_MAN_ID
23	ACT_MODEL_NUM
24	ACT_SN
25	VALVE_MAN_ID
26	VALVE_MODEL_NUM

Table 5-19. Transducer Block, View 4.2

Index Number	Parameter
1	ST_REV
27	VALVE_SN
28	VALVE_TYPE
29	XD_CAL_LOC
30	XD_CAL_DATE
31	XD_CAL_WHO
89	TEMPERATURE_UNITS
90	PRESSURE_UNITS
91	TVL_UNITS
92	LENGTH_UNITS
93	AREA_UNITS
94	SPRING_RATE_UNITS

Table 5-20. Transducer Block, View 4.3

Index Number	Parameter
1	ST_REV
39	PWA_SIMULATE
41.1	TVL_PRESS_CONTROL.TVL_PRESS_SELECT
41.2	TVL_PRESS_CONTROL.TVL_PRESS_STATE
42.1	BASIC_SETUP.ACTUATOR_STYLE
42.2	BASIC_SETUP.ZERO_PWR_COND
42.3	BASIC_SETUP.TRAVEL_SEN_MOTION
42.4	BASIC_SETUP.FEEDBACK_CONN
42.5	BASIC_SETUP.RELAY_TYPE
42.6	BASIC_SETUP.MAX_SUPP_PRESS
42.7	BASIC_SETUP.PRESS_RANGE_HI
42.8	BASIC_SETUP.PRESS_RANGE_LO
42.9	BASIC_SETUP.TVL_CAL_TRIGGER
42.10	BASIC_SETUP.TVL_TUNING_SET
42.11	BASIC_SETUP.PRESS_TUNING_SET
44.1	TRAVEL_TUNE.TVL_INTEG_ENABLE
44.2	TRAVEL_TUNE.TVL_INTEG_LIM_HI
44.3	TRAVEL_TUNE.TVL_INTEG_LIM_LO
44.4	TRAVEL_TUNE.TVL_INTEG_DEADZ
44.5	TRAVEL_TUNE.TVL_MLFB_GAIN
47.1	PRESS_TUNE.PRESS_CUTOFF_HI
47.2	PRESS_TUNE.PRESS_CUTOFF_LO
47.3	PRESS_TUNE.PRESS_PROP_GAIN
47.4	PRESS_TUNE.PRESS_INTEG_GAIN
47.5	PRESS_TUNE.PRESS_RATE_GAIN
47.6	PRESS_TUNE.PRESS_INTEG_DEADZ
47.7	PRESS_TUNE.PRESS_INTEG_HI_LIM
47.8	PRESS_TUNE.PRESS_INTEG_LO_LIM
47.9	PRESS_TUNE.PRESS_INTEG_IC_HI
47.10	PRESS_TUNE.PRESS_INTEG_IC_LO
47.11	PRESS_TUNE.PRESS_MLFB_GAIN
62	FAILED_ENABLE
63	MAINT_ENABLE
64	ADVISE_ENABLE
65	FAILED_MASK
66	MAINT_MASK
67	ADVISE_MASK
68	FAILED_PRI
69	MAINT_PRI
70	ADVISE_PRI

Table 5-21. Transducer Block, View 4.4

Index Number	Parameter
1	ST_REV
76.1	INST_ALERTS_CONFIG.SHUTDOWN_TRIGGER
76.2	INST_ALERTS_CONFIG.SHUTDOWN_RECOVERY
76.3	INST_ALERTS_CONFIG.OUTPUT_BLK_TIMEOUT
76.4	INST_ALERTS_CONFIG.DRIVE_CURRENT_ALRT_PT
76.5	INST_ALERTS_CONFIG.DRIVE_CURRENT_TIME
76.6	INST_ALERTS_CONFIG.TEMP_HI_ALRT_PT
76.7	INST_ALERTS_CONFIG.TEMP_LO_ALRT_PT
76.8	INST_ALERTS_CONFIG.SUP_PRES_HI_ALRT_PT
76.9	INST_ALERTS_CONFIG.SUP_PRES_LO_ALRT_PT
77.1	INST_ALERTS_CONFIG2.TVL_DEV_ALRT_PT
77.2	INST_ALERTS_CONFIG2.TVL_DEV_TIME
77.3	INST_ALERTS_CONFIG2.TVL_DEV_DB
77.4	INST_ALERTS_CONFIG2.TVL_ACCUM_ALRT_PT
77.5	INST_ALERTS_CONFIG2.TVL_ACCUM_DB
77.6	INST_ALERTS_CONFIG2.CYCLE_COUNT_ALRT_PT
77.7	INST_ALERTS_CONFIG2.CYCLE_COUNT_DB
77.8	INST_ALERTS_CONFIG2.TVL_OPEN_ALRT_PT
77.9	INST_ALERTS_CONFIG2.TVL_OPEN_DB
77.10	INST_ALERTS_CONFIG2.TVL_CLOSED_ALRT_PT
77.11	INST_ALERTS_CONFIG2.TVL_CLOSED_DB
77.12	INST_ALERTS_CONFIG2.TVL_LO_LO_ALRT_PT
77.13	INST_ALERTS_CONFIG2.TVL_LO_LO_DB
77.14	INST_ALERTS_CONFIG2.TVL_LO_ALRT_PT
77.15	INST_ALERTS_CONFIG2.TVL_LO_DB
77.16	INST_ALERTS_CONFIG2.TVL_HI_ALRT_PT
77.17	INST_ALERTS_CONFIG2.TVL_HI_DB
77.18	INST_ALERTS_CONFIG2.TVL_HI_HI_ALRT_PT
77.19	INST_ALERTS_CONFIG2.TVL_HI_HI_DB
82	UPGRADE_PROGRESS
87	PROTECTION

Table 5-22. Transducer Block View, 4.5

Index Number	Parameter
1	ST_REV
95.1	MAI_CHANNEL_1
95.2	MAI_CHANNEL_2
95.3	MAI_CHANNEL_3
95.4	MAI_CHANNEL_4
95.5	MAI_CHANNEL_5
95.6	MAI_CHANNEL_6
95.7	MAI_CHANNEL_7
95.8	MAI_CHANNEL_8

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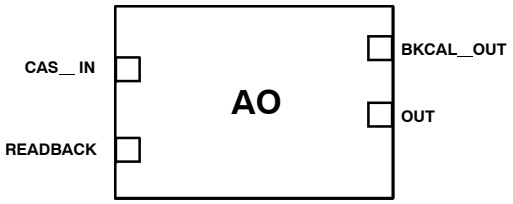

CAS_IN = The remote setpoint value from another function block.
BKCAL_OUT = The value and status required by the BKCAL_IN input of another block to prevent reset windup and to provide bumpless transfer to closed loop control.
OUT = The block output and status.
READBACK = Actual valve position.

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Figure 5-8. Analog Output (AO) Function Block

5

Analog Output (AO) Function Block Overview

The Analog Output (AO) function block assigns an output value to a field device through a specified I/O channel. The block supports mode control, signal status calculation, and simulation. Figure 5-9 illustrates the internal components of the AO function block, and table 5-24 lists the definitions of the block parameters. The digital valve controller measures and uses actual valve position for READBACK [16].

Note

The AO block actual mode will not move to Auto unless:

- **Resource Block actual mode is Auto,**
- **AO CHANNEL [22] is set to 1,**
- **AO SHED_OPT [27] is set to a non-zero value, and**
- **AO MODE_BLK.PERMITTED [5.3] Auto is enabled.**

Note

Feature Select in the resource block must have the DO Control option disabled for the AO block to be fully functional.

Modes

The Analog Output function block supports the following modes:

- **Manual (Man)**—You can manually set the output to the I/O channel through the OUT [9] attribute. This mode is used primarily for maintenance, calibration and diagnostics.

- **Automatic (Auto)**—The block output (OUT [9]) reflects the target operating point specified by the setpoint (SP [8]) attribute. Typically the setpoint is set by the user.

- **Cascade (Cas)**—The SP [8] attribute is set by another function block through a connection to CAS_IN [17]. The SP [8] value is used to set the OUT [9] attribute automatically. This is the most frequently used mode in the digital valve controller.

Note

The transducer block must be in Auto for the mode to go to AUTO, CAS or MAN.

- **RemoteCascade (RCas)**—The SP [8] is set by a host computer by writing to the RCAS_IN [28] parameter. The SP [8] value is used to set the OUT [9] attribute automatically.

- **Out of Service (OOS)**—The block is not processed. The output channel is maintained at the last value and the status of OUT [9] is set to Bad: Out of Service. The BLOCK_ERR [6] attribute shows Out of Service.

- **Initialization Manual (Iman)**—The path to the output hardware is broken and the AO block output will remain at the last position. This means the transducer block mode is Out of Service or Manual.

- **Local Override (LO)**—The output of the block is not responding to inputs because the fault state action is active. OUT [9] freezes or goes to value per IO_OPTS [14].

The target mode of the block may be restricted to one or more of the following modes: Man, Auto, Cas, RCas, or OOS.

Mode Handling

Shed Options—RCAS Mode Only

Automatically changing through the permitted modes when starting from a remote mode, fall from (or shed) or climb to a remote mode is determined by the parameter SHED_OPT [27]. A block climbs and sheds through the same path. For example, if SHED_OPT [27] specifies that a block should shed to Auto, then, if the block target mode is set to RCas, the block goes through Auto on the way to RCas.

When the block is in Cas mode and the CAS_IN [17] input goes bad, the block sheds mode to the next lower permitted mode.

You can configure the shed option as follows:

Shed With Return Options

Remote cascade connection failure shifts actual mode but keeps trying to restore remote cascade (in other words, the remote cascade target mode stays in effect).

Note

During Shed with Return Options, the actual mode is changed, while the target mode stays the same.

Normal—On failure of a remote cascade connection the block attempts to attain the highest permitted non-remote mode until remote cascade is restored. Cas is the highest permitted non-remote mode and Auto is is the next permitted non-remote mode. If Cas or Auto are not available, the block will shed by default to Man.

Retained Target—The retained target mode is the previous target mode before it was changed to RCAS or ROUT. On failure of a remote cascade connection the block attempts to attain the retained target mode.

Auto—On failure of a remote cascade connection the block attempts to attain Auto, if permitted, until remote cascade is restored.

Man—On failure of a remote cascade connection the block sheds to Man until a remote cascade connection is restored.

Shed With No Return Options

Note

During Shed with No Return Options, the target mode is changed, while the actual mode stays the same.

For any shed with no return option, the target mode changes as determined by the option. Therefore, there is no attempt to restore the connection following failure. The behavior on change to the remote cascade target mode is identical to that for Shed With Return Options.

Normal—On failure of a remote cascade connection the block sets the target mode to the highest permitted non-remote mode. Cas is the highest permitted non-remote mode and Auto is is the next highest permitted non-remote mode. If Cas or Auto are not available, the block will shed by default to Man.

Retained Target—The retained target mode is the previous target mode before it was changed to RCAS or ROUT. On failure of a remote cascade connection the block sets the target mode to the retained target mode.

Auto—On failure of a remote cascade connection, the block sets the target mode to Auto, if permitted.

Man—On failure of remote cascade connection, the block sets the target mode to Man, if permitted.

The user may configure SHED_OPT [27] so that it calls for a target mode that is not permitted. When doing this, the mode logic uses the following rules as applied by the remote logic:

- Shed logic never results in a non-permitted target mode.

- Shed logic never attempts to attain an actual mode of Auto or Cas if that mode is not permitted.

Status Handling

Output or readback fault detection is reflected in the status of PV [7], OUT [9], and BKCAL_OUT [25]. A

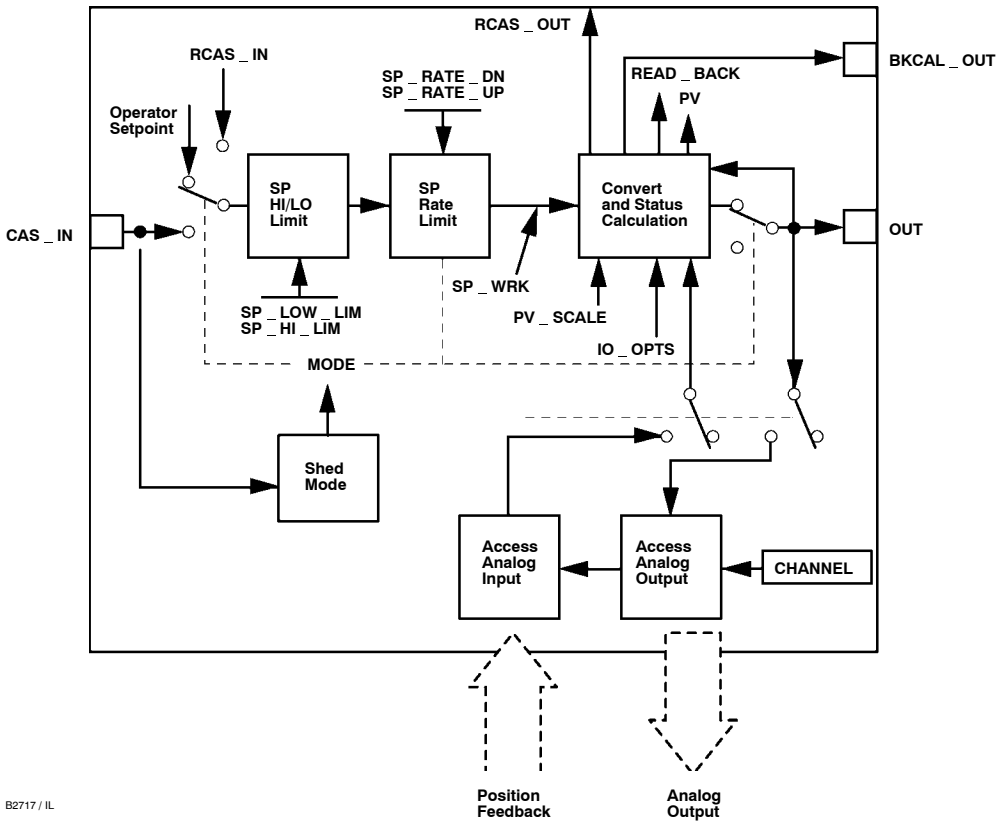

Figure 5-9. Analog Output Function Block Schematic

limited SP [8] condition is reflected in the BKCAL_OUT [25] status. When simulation is enabled through the SIMULATE [10] attribute, you can set the value and status for PV [7] and READBACK [16].

When the block is in Cas mode and the CAS_IN [17] input goes bad, the block sheds mode to the next permitted mode.

Setting the Output

To set the output for the AO block, you must first set the mode to define the manner in which the block determines its setpoint. In Manual mode the value of the output attribute (OUT [9]) must be set manually by the user, and is independent of the setpoint. In Automatic mode, OUT [9] is set automatically based on the value specified by the set point (SP [8]) in engineering units and the I/O Options attribute. In addition, you can limit the SP [8] value and the rate at which a change in the SP [8] is passed to OUT [9].

In Cascade mode, the cascade input connection (CAS_IN [17]) is used to update the SP [8]. The back calculation output (BKCAL_OUT [25]) is wired to the back calculation input (BKCAL_IN [27]) of the upstream block that provides CAS_IN [17]. This provides bumpless transfer on mode changes and windup protection in the upstream block.

Note

You must wire BKCAL_OUT [25] to BKCAL_IN [27] of the upstream block that provides CAS_IN [17]. Otherwise, the AO the upstream block will not initialize properly, and the setpoint at CAS_IN [17] will not be passed to OUT [9].

The OUT [9] attribute or an analog readback value, such as valve position, is shown by the process value (PV [7]) attribute in engineering units.

To support testing, you can enable simulation, which allows you to manually set the channel feedback. There is no alarm detection in the AO function block.

To select the manner of processing the SP and the channel output value configure the setpoint limiting

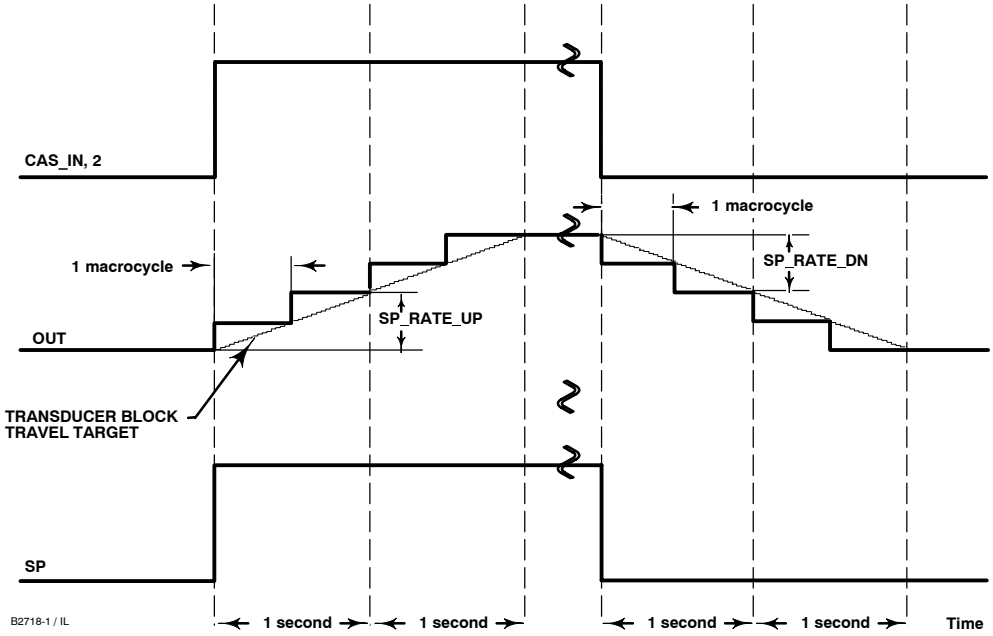

Figure 5-10. Analog Output Function Block Timing Diagram

options, the tracking options, and the conversion and status calculations.

Output Block PV Status

The Output Block PV Status is determined by the enabled status of the Resource Block parameter FEATURE_SEL [18], the Transducer Block mode, and enabled Active PlantWeb alarms. Refer to table 5-1.

Set Point Selection and Limiting

To select the source of the SP [8] value use the MODE [5] attribute. In Automatic (Auto) mode, the local, manually-entered SP [8] is used. In Cascade (Cas) mode, the SP [8] comes from another block through the CAS_IN [17] input connector. In RemoteCascade (RCas) mode, the SP [8] comes from a host computer that writes to RCAS_IN [28]. The range and units of the SP [8] are defined by the PV_SCALE [11] attribute.

In Manual (Man) mode the SP [8] automatically tracks the PV [7] value when you select the SP-PV Track in Man I/O option. The SP [8] value is set equal to the PV value when the block is in manual mode, and is enabled in IO_OPTS [14]. You can disable this option in Man or OOS mode only.

The SP [8] value is limited to the range defined by the setpoint high limit attribute (SP_HI_LIM [20]) and the setpoint low limit attribute (SP_LO_LIM [21]).

In Auto mode, the rate at which a change in the SP [8] is passed to OUT [9] is limited by the values of the setpoint upward rate limit attribute (SP_RATE_UP [19]) and the setpoint downward rate limit attribute (SP_RATE_DN [18]). A limit of zero disables rate limiting, even in Auto mode.

As shown in figure 5-10, the block executes a percentage of the set point change each macrocycle. For example, if the set point rate is set at 10% per second and the macrocycle is 500 milliseconds (0.5 seconds or 50% of 1 second), then during the first macrocycle the set point will change 5% (50% of the 10% per second rate). If the macrocycle is 750 milliseconds (0.75 seconds or 75% of 1 second), then during the first macrocycle the setpoint will change 7.5% (75% of 10).

When the transducer block receives the setpoint change from an AO block with rate limits, it will smoothly move the valve to the requested setpoint at the rate limit configured in the AO block.

In Auto mode, the converted SP [8] value is stored in the OUT [9] attribute. In Man mode, the OUT [9] attribute is set manually, and is used to set the analog output defined by the CHANNEL [22] parameter.

You can access the actuator position associated with the output channel through the READBACK [16] parameter (in OUT units) and in the PV [7] attribute (in

engineering units). The digital valve controller supports position feedback and therefore provides the actual valve position in PV [7] and READBACK [16] directly.

Action On Fault Detection

To define the state to which you wish the valve to enter when the block is in CAS mode, and the CAS_IN [17] input detects a communication failure, configure the following parameters:

IO_OPTS [14]: Determines the action OUT [9] will take upon a fault state. If the IO_OPTS [14] "Fault State to Value" is not selected, then OUT [9] holds its last position when Fault State is set. If "Fault State to Value" is selected, OUT [9] goes to the FSTATE_VAL [24] value when Fault State is set.

FSTATE_TIME [23]: The length of time, in seconds, that the AO block will wait to set Fault State. When Fault State is set, the OUT [9] value goes to either the FSTATE_VAL [24] value or holds its last position, depending on I/O_OPTS [14]. When the block has a target mode of CAS, a fault condition will be detected if the CAS_IN [17] has a BAD status or an Initiate Fault State substatus is received from the upstream block.

FSTATE_VAL [24]: Determines the OUT [9] value if IO_OPTS "Fault State to Value" is selected. The OUT [9] value transitions to FSTATE_VAL [24] after FSTATE_TIME [23] elapses and the fault condition has not cleared.

I/O Options

The I/O options parameter (IO_OPTS [14]) allows you to select how the I/O signals are processed. You can set I/O options in Manual or Out of Service mode only. The following I/O options are available in the AO block:

Use PV for BKCAL_OUT—Changes the BKCAL_OUT [25] value to the PV [7] value. When the Use PV for BKCAL_OUT option is not enabled (False), the BKCAL_OUT [25] value is the working setpoint value.

Target to Man if Fault State Activated—Set the target mode to Man, thus losing the original target, if Fault State is activated. This latches an output block into the manual mode.

Use Fault State value on Restart—Use the value of FSTATE_VAL [24] for SP [8] when power is restored or if the device is restarted, otherwise use the last value saved in non-volatile memory. This does not act like Fault State, it only uses the value of FSTATE_VAL [24].

Fault State to Value—The output action to take when a fault occurs (if not selected, use hold last value; if selected, use FSTATE_VAL [24]).

Increase to Close—If the Increase to Close bit is set the value to the transducer is inverted, e.g. 20% becomes 80%. This I/O option is available only for a SC device.

SP–PV Track in Man—Permits the setpoint to track the process variable when the target mode of the block is MAN.

SP–PV Track in LO—Permits the setpoint to track the process variable when the target mode of the block is LO.

SP Track retained Target—Permits the setpoint to track the RCas or Cas parameter based on the retained target mode when the actual mode of the block is LO or Man. When SP-PV track options are enabled, the SP Track retained target will have precedence in the selection of the value to track when the actual mode is Man and LO.

Simulation

When simulate is active, the transducer sub-parameters show the actual transducer block status and value as normally passed back to the AO block. The Simulate sub-parameters are writable and replace actual transducer values.

Note

When simulate is active, the output block no longer writes values to the transducer block. If the Output Blk Timeout period is exceeded, the transducer block will move the valve to the Zero Power Condition. The AO block will also cause an Output Timeout in the transducer block if simulate is active.

Application Information

The configuration of an AO function block and its associated output channels depends on the specific application. A typical configuration for the Analog Output involves the following attributes:

PV_SCALE Set the range and engineering units to values that correspond to the operation range. For the digital valve controller, PV_SCALE [11] is typically set between 0 and 100%.

BKCAL_OUT If you are using the CAS_IN [17] connector wired from another block, wire the BKCAL_OUT [25] attribute to the other block's BKCAL_IN [27] attribute.

IO_OPTS Set the type of tracking and action upon fault state.

SHED_OPT Set the action to be taken when the set point or output are not updated in a remote mode.

Block Errors

Table 5-23 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the AO block and are provided only for your reference.

Table 5-23. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other (N/A)*
1	**Block Configuration Error** - CHANNEL and SHED_OPT set to 0
2	*Link Configuration Error (N/A)*
3	**Simulate active** - Simulation is enabled and the block is using a simulated value in its execution.
4	**Local Override** - Device in fault state. Actual mode LO.
5	**Device Fault State Set** - AO block in fault state after FSTATE_TIME because of Bad status or IFS substatus on CAS_IN or Resource block commanded fault state.
6	**Device Needs Maintenance Soon** - Indicates a Maintenance PlantWeb Alert condition is active if Block Error Reporting is enabled. See page 5-39.
7	**Input failure/process variable has Bad status** - PV has bad status and Feature Select in the Resource block has the Out Readback bit set.
8	**Output failure** - PV has bad status.
9	*Memory Failure (N/A)*
10	*Lost Static Data (N/A)*
11	*Lost NV Data (N/A)*
12	*Readback Check Failed (N/A)*
13	**Device Needs Maintenance Now** - Indicates Failed PlantWeb Alert condition is active if Block Error Reporting is enabled. See page 5-39.
14	**Power Up** - This condition exists after power up until actual mode is not Out of Service.
15	**Out of Service** - The block is in Out of Service (OOS) mode.

AO Block Parameter List

- Read/Write Capability: RO − Read Only, RW − Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-24. Analog Output Function Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
Tag Description TAG_DESC	2	RW	ALL	7 bit ASCII	Spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 Valid Bits: 7: OOS, 6: IMAN, 5: LO, 4: MAN, 3: AUTO, 2: CAS, 1: RCAS The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block (Note: Bit 6 (IMAN) is valid for ACTUAL only) Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS MAN AUTO AUTO-CAS AUTO-RCAS	OOS until block is configured, then last valid target	
ACTUAL	5.2	RO	ALL		OOS	
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO+ CAS+RCAS	OOS+MAN+ AUTO+ CAS+RCAS	
NORMAL	5.4	RW	ALL		AUTO	
Block Error BLOCK_ERR	6	RO	N/A	1: Block Configuration Error 3: Simulate Active 4: Local Override 5: Device Fault State Set 7: Input Failure/Bad PV status 8: Output Failure 14: Power-up 15: Out-of-Service	Dynamic	Data Type: Bit String 0=inactive 1=active This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown. See table 5-23.
Process Variable PV	7	RO	N/A	PV Status set equal to READBACK status	Dynamic	Data Type: DS-65 The process variable used in block execution. This value is converted from READBACK to show the actuator position in the same units as the setpoint value.
Set Point SP	8		OOS MAN AUTO	PV_SCALE +/− 10%	Dynamic	Data Type: DS-65 The SP of the analog block. Can be derived from CAS_IN, RCAS_IN in normal modes, or can track PV in MAN or LO modes. IO_OPTS is used to determine value of SP in MAN or LO. If no IO_OPTS for SP tracking are set, SP will freeze when mode changes from CAS or RCAS.
Output OUT	9		MAN IMAN OOS	OUT_SCALE +/− 10%	Dynamic	Data Type: DS-65 The primary value and status calculated by the block in Auto mode. OUT may be set manually in Man mode.

−Continued−

Table 5-24. Analog Output Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Simulate SIMULATE	10					Data Type: DS-82 Allows the analog input to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track actual value & status.
SIMULATE_STATUS	10.1	RW	ALL		0	
SIMULATE_VALUE	10.2	RW	ALL		0	
TRANSDUCER_STATUS	10.3	RO	ALL		0	
TRANSDUCER_VALUE	10.4	RO	ALL		0	
ENABLE/DISABLE	10.5	RW	ALL	0: Not Initialized 1: Simulation Disable 2: Simulation Active	1: Simulation Disabled	
Process Value Scale PV_SCALE	11	RW	OOS	EU at 100% EU at 0% Units index Decimal Point	100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of decimal places to be used in displaying the PV parameter and parameters which have the same scaling as PV.
Transducer Scale XD_SCALE	12	RO	OOS	EU at 100% EU at 0% Units index Decimal Point	100 only 0 only % only 2	Data Type: DS-68 The high and low scale values and engineering units code are read only. This parameter determines the number of digits to the right of the decimal point used with the value obtained from the transducer for a specified channel.
Grant Deny GRANT_DENY	13					Data Type: DS-70 Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. GRANT: 1 = granted, 0= N/A DENY: 1 = denied, 0 = N/A
GRANT	13.1	RW	ALL	0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
DENY	13.2	RW	ALL		All bits: 0	
I/O Options IO_OPTS	14		OOS	1: SP tracks PV in Man 3: SP tracks PV in LO 4: SP Track retained target in Man or LO 5: Increase to Close 6: Fault State to value 0=freeze 1=go to Fault State value 7: Use Fault State value on restart 8: Target to Man if Fault State activated 9: Use PV for BKCAL_OUT 0=SP 1=PV	All bits: 0	Data Type: Bit String 0=disable 1=enable Allows you to select the type of tracking and the output value when a fault condition occurs.
Status Options STATUS_OPTS	15		OOS	4: Propagate Failure Backward	All bits: 0	Data Type: Bit String 0=disable 1=enable Options the user may select for the block processing of status.
Readback READBACK	16	RO	N/A	Status		Data Type: DS-65 Readback is the de-characterized valve position as reported by the transducer block parameter FINAL_POSITION_VALUE [17]. This correlates with the AO block parameter OUT [9], which is the setpoint to the transducer. READBACK is the simulated input if SIMULATE is enabled or the transducer block feedback if SIMULATE is disabled.
				Value	Dynamic	
Cascade Input CAS_IN	17		ALL	Status	BAD: NC: const	Data Type: DS-65 The setpoint value from another function block.
				Value	0	

–Continued–

Table 5-24. Analog Output Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Setpoint Rate Down SP_RATE_DN	18		ALL	Positive, 0 disables rate limiting PV units	+INF	Data Type: Float Ramp rate for downward set point changes. When the ramp rate is set to zero, the set point is used immediately.
Setpoint Rate Up SP_RATE_UP	19		ALL	Positive, 0 disables rate limiting PV units	+INF	Data Type: Float Ramp rate for upward set point changes. When the ramp rate is set to zero, the setpoint is used immediately.
Setpoint High Limit SP_HI_LIM	20		ALL	PV Scale +/– 10%	100	Data Type: Float The highest set point value allowed. SP_HI_LIM must be greater than SP_LO_LIM.
Setpoint Low Limit SP_LO_LIM	21		ALL	PV Scale +/– 10%	0	Data Type: Float The lowest set point value allowed. SP_LO_LIM must be less than SP_HI_LIM.
AO Channel CHANNEL	22		OOS	0=undefined 1=Setpoint	1=Setpoint	Data Type: Unsigned16 Defines which transducer parameter receives the AO output. Select Setpoint to control valve position.
Fault State Time FSTATE_TIME	23		ALL	Positive, seconds	0	Data Type: Float Time from failure detection to reaction if failure still exists.
Fault State Value FSTATE_VAL	24		ALL	PV Scale +/– 10%	0	Data Type: Float Preset value to use if I/O_OPTS Fault State to Value or Use Fault State Value on Restart is set.
Back Calculation Output BKCAL_OUT	25	RO	N/A	Status Limits Value	Dynamic	Data Type: DS-65 The value and status required by the BKCAL_IN input of another block to prevent reset windup and to provide bumpless transfer to closed loop control.
Remote Cascade Input RCAS_IN	26		ALL	Status Value	BAD: NoCom: NoVal: const 0 Trk	Data Type: DS-65 Target SP and status by supervisory host
Shed Options SHED_OPT	27		ALL	Defined by FF spec 0=Invalid 1=Normal Shed, Normal Return 2=Normal Shed, No Return 3=Shed to Auto, normal return 4=Shed to Auto, no return. Target mode changes to Auto on detection of a shed condition 5=Shed to Manual, normal return 6=Shed to Manual, No return. Target mode changes to MAN on detection of a shed condition. 7=Shed to retained target, normal return 8=Shed to retained target, no return. (Change target to retained target)	0	Data Type: Unsigned8 Defines the action to be taken when the set point or output are not updated in a remote mode.
Remote Cascade Output RCAS_OUT	28	RO	N/A	Status Value	Dynamic	Data Type: DS-65 Block set point and status after ramping

–Continued–

Table 5-24. Analog Output Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Update Event UPDATE_EVT	29					Data Type: DS-73 This alert is generated by any changes to static data.
UNACKNOWLEDGED	29.1	RW	N/A	0:Undefined 1:Acknowledged 2:Unacknowledged	0: Undefined	
UPDATE_STATUS	29.2	RO	N/A	0:Undefined 1:Update reported 2:Update not reported	0: Undefined	
TIME_STAMP	29.3	RO	N/A		0	
STATIC_REVISION	29.4	RO	N/A		0	
RELATIVE_INDEX	29.5	RO	N/A		0	
Block Alarm BLOCK_ALM	30					Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure, or system problems in the block.
UNACKNOWLEDGED	30.1	RW	N/A	0:Undefined 1:Acknowledged 2:Unacknowledged	0: Undefined	
ALARM_STATE	30.2	RO	N/A	0:Undefined 1:Clear reported 2:Clear not reported 3:Active reported 4:Active not reported	0: Undefined	
TIME_STAMP	30.3	RO	N/A		0	
SUBCODE	30.4	RO	N/A		0	
VALUE	30.5	RO	N/A		0	
Extended Parameters						
StdDev STDDEV	31	RO	N/A	positive float	Dynamic	Data Type: Float Standard Deviation. To support DeltaV Variability measurement.
Cap StdDev CAP_STDDEV	32	RO	N/A	positive float	Dynamic	Data Type: Float Capability Standard Deviation. To support DeltaV Variability measurement.

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-25. AO Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV
8	SP
9	OUT
16	READBACK
17	CAS_IN

Table 5-26. AO Function Block, View 2

Index Number	Parameter
1	ST_REV
11	PV_SCALE
12	XD_SCALE
13.1	GRANT_DENY.GRANT
13.2	GRANT_DENY.DENY
20	SP_HI_LIM
21	SP_LO_LIM

Table 5-27. AO Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV
8	SP
9	OUT
16	READBACK
17	CAS_IN
25	BKCAL_OUT
26	RCAS_IN
28	RCAS_OUT
31	STDDEV
32	CAP_STDDEV

Table 5-28. AO Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
14	IO_OPTS
15	STATUS_OPTS
18	SP_RATE_DN
19	SP_RATE_UP
22	CHANNEL
23	FSTATE_TIME
24	FSTATE_VAL
27	SHED_OPT

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ANALOG OUTPUT FUNCTION BLOCK

Quick Config
- Alert Key
- Process Value Scale: EU at 100%
- Process Value Scale: EU at 0%
- Process Value Scale: Units Index
- Process Value Scale: Decimal
- Simulate: Simulate Status
- Simulate: Simulate Value
- Simulate: Transducer Status
- Simulate: Transducer Value
- Simulate: Simulate En/Disable
- Setpoint: Status
- Setpoint: Value
- Setpoint High Limit
- Setpoint Low Limit

Common Config
- Alert Key
- I/O Options
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Process Value Scale: EU at 100%
- Process Value Scale: EU at 0%
- Process Value Scale: Units Index
- Process Value Scale: Decimal
- Setpoint: Status
- Setpoint: Value
- Setpoint High Limit
- Setpoint Low Limit

Advanced Config
- Fault State Time
- Fault State Value
- Shed Options
- Simulate: Simulate Status
- Simulate: Simulate Value
- Simulate: Transducer Status
- Simulate: Transducer Value
- Simulate: Simulate En/Disable
- Setpoint Rate Down
- Setpoint Rate Up
- Static Revision
- Status Options
- Strategy
- Transducer Scale: EU at 100%
- Transducer Scale: EU at 0%
- Transducer Scale: Units Index
- Transducer Scale: Decimal

I/O Reference
- AO Channel

Connectors
- Back Calculation Output: Status
- Back Calculation Output: Value
- Cascade Input: Status
- Cascade Input: Value
- Output: Status
- Output: Value

Online
- Back Calculation Output: Status
- Back Calculation Output: Value
- Block Error
- Cascade Input: Status
- Cascade Input: Value
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output: Status
- Output: Value
- Process Value: Status
- Process Value: Value
- Remote Cascade Input: Status
- Remote Cascade Input: Value
- Remote Cascade Output: Status
- Remote Cascade Output: Value
- Readback: Status
- Readback: Value
- Setpoint: Status
- Setpoint: Value

Status
- Block Error

Other
- Tag Description
- Grant Deny: Grant
- Grant Deny: Deny
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- StdDev
- Cap StdDev

All
- Characteristics
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- Process Value: Status
- Process Value: Value
- Setpoint: Status
- Setpoint: Value
- Output: Status
- Output: Value
- Simulate: Simulate Status
- Simulate: Simulate Value
- Simulate: Transducer Status
- Simulate: Transducer Value
- Simulate: Simulate En/Disable
- Process Value Scale: EU at 100%
- Process Value Scale: EU at 0%
- Process Value Scale: Units Index
- Process Value Scale: Decimal
- Transducer Scale: EU at 100%
- Transducer Scale: EU at 0%
- Transducer Scale: Units Index
- Transducer Scale: Decimal
- Grant Deny: Grant
- Grant Deny: Deny
- I/O Options
- Status Options
- Readback: Status
- Readback: Value
- Cascade Input: Status
- Cascade Input: Value
- Setpoint Rate Down
- Setpoint Rate Up
- Setpoint High Limit
- Setpoint Low Limit
- AO Channel
- Fault State Time
- Fault State Value
- Back Calculation Output: Status
- Back Calculation Output: Value
- Remote Cascade Input: Status
- Remote Cascade Input: Value
- Shed Options
- Remote Cascade Output: Status
- Remote Cascade Output: Value
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- StdDev
- Cap StdDev

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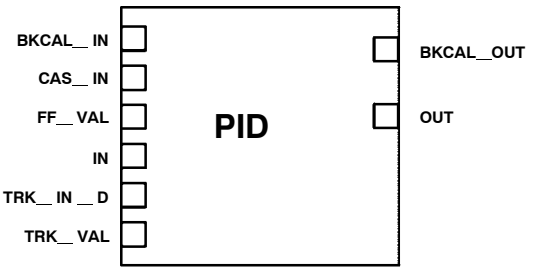

BKCAL_IN = THE ANALOG INPUT VALUE AND STATUS FROM ANOTHER BLOCK'S BKCAL _OUT OUTPUT THAT IS USED FOR BACKWARD OUTPUT TRACKING FOR BUMPLESS TRANSFER AND TO PASS LIMIT STATUS.

CAS_IN = THE REMOTE SETPOINT VALUE FROM ANOTHER FUNCTION BLOCK.

FF_VAL = THE FEEDFORWARD CONTROL INPUT VALUE AND STATUS.

IN = THE CONNECTION FOR THE PROCESS VARIABLEFROM ANOTHER FUNCTION BLOCK.

TRK_IN_D = INITIATES THE EXTERNAL TRACKING FUNCTION.

TRK_VAL = THE VALUE AFTER SCALING APPLIED TO OUT IN LOCAL OVERRIDE MODE.

BKCAL_OUT = THE VALUE AND STATUS REQUIRED BY THE BKCAL_IN INPUT OF ANOTHER FUNCTION BLOCK TO PREVENT RESET WINDUP AND TO PROVIDE BUMPLESS TRANSFER TO CLOSED LOOP CONTROL.

OUT = THE BLOCK OUTPUT AND STATUS.

B2720 / IL

Figure 5-11. Proportional+Integral+Derivative (PID) Function Block

PID Function Block Overview

The PID function block combines all of the necessary logic to perform proportional/integral/derivative (PID) control. The block supports mode control, signal scaling and limiting, feedforward control, override tracking, alarm limit detection, and signal status propagation.

The block supports two forms of the PID equation: Standard and Series. You can choose the appropriate equation using the MATHFORM [70] parameter. The Standard ISA PID equation is the default selection.

$$\text{Standard Out} = \text{GAIN} \times \text{ex} \times \left(1 + \frac{1}{\tau_r s + 1} + \frac{\tau_d s}{\propto \times \tau_d s + 1}\right) + \text{F}$$

$$\text{Series Out} = \text{GAIN} \times \text{ex} \times \left[\left(1 + \frac{1}{\tau_r s}\right) + \left(\frac{\tau_d s + 1}{\propto \times \tau_d s + 1}\right)\right] + \text{F}$$

where

GAIN: proportional gain value

τ_r: integral action time constant (RESET parameter) in seconds

s: laplace operator

τ_d: derivative action time constant (RATE parameter)

α: fixed smoothing factor of 0.1 applied to RATE

F: feedforward control contribution from the feedforward input (FF_VAL)

E: error between setpoint and process variable

To further customize the block for use in your application, you can configure filtering, feedforward inputs, tracking inputs, setpoint and output limiting, PID equation structures, and block output action. Table 5-31 lists the PID block parameters and their descriptions, units of measure, and index numbers, and figure 5-12 illustrates the internal components of the PID function block.

Modes

The PID function block supports the following modes:

- **Manual (Man)**—The block output (OUT [9]) may be set manually.

- **Automatic (Auto)**—The SP [8] may be set manually and the block algorithm calculates OUT [9].

- **Cascade (Cas)**—The SP [8] is calculated in another block and is provided to the PID block through the CAS_IN [18] connection.

- **RemoteCascade (RCas)**—The SP [8] is provided by a host computer that writes to the RCAS_IN [32] parameter.

- **RemoteOutput (ROut)**—The OUT [9] is provided by a host computer that writes to the ROUT_IN [33] parameter.

- **Local Override (LO)**—The track function is active. OUT [9] is set by TRK_VAL [39]. The BLOCK_ERR [6] parameter shows Local override.

- **Initialization Manual (IMan)**—The output path is not complete (for example, the cascade–to–slave path might not be open). In IMan mode, OUT [9] tracks BKCAL_IN [27].

- **Out of Service (OOS)**—The block is not processed. The OUT [9] status is set to Bad: Out of

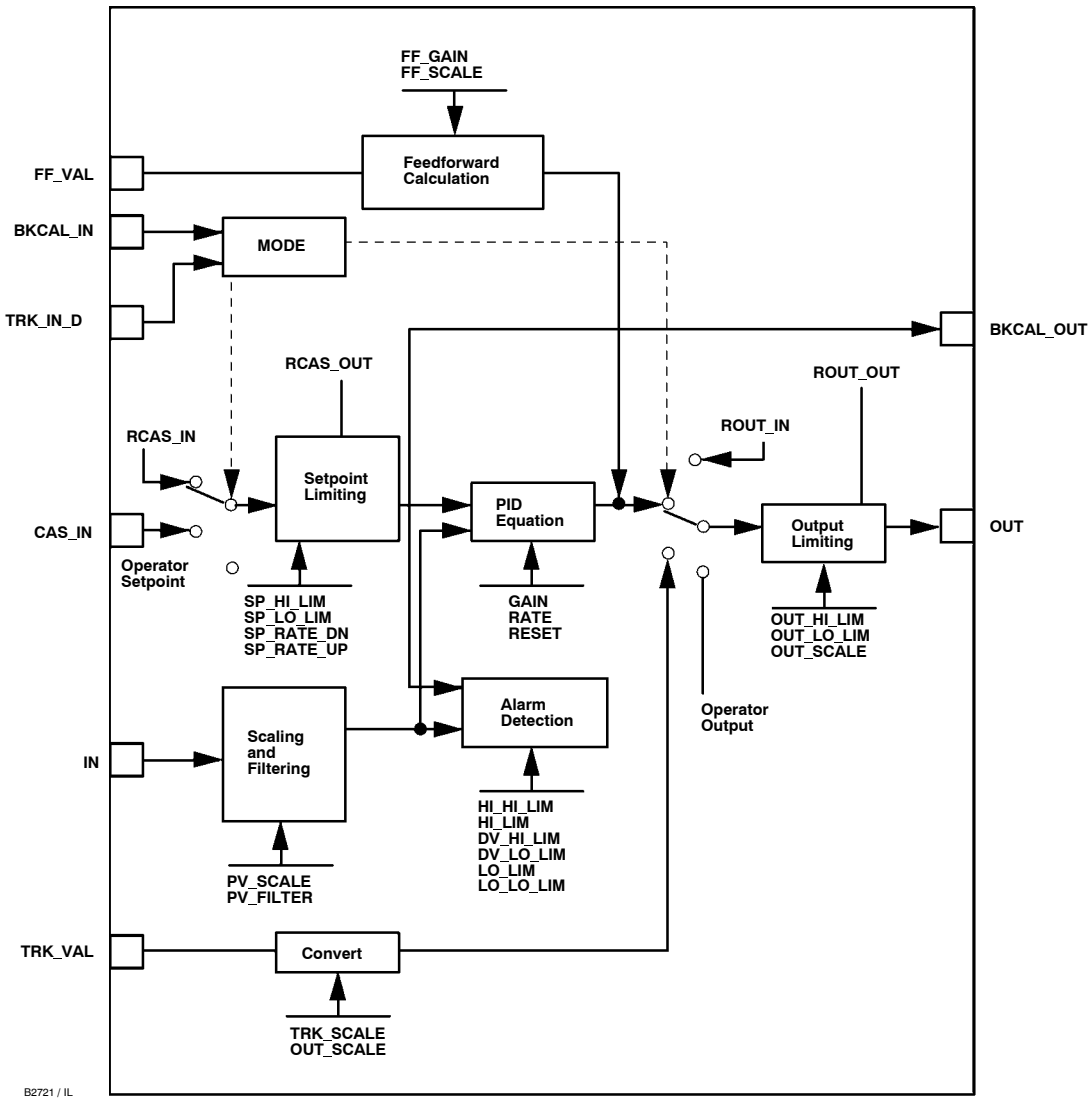

Figure 5-12. PID Function Block Schematic

Service. The BLOCK_ERR [6] parameter shows Out of service.

You can configure the Man, Auto, Cas, and OOS modes as permitted modes for operator entry.

Mode Handling

Shed Options—RCAS Mode Only

Shed from or climb to a remote mode is determined by the parameter SHED_OPT [34]. A block climbs and sheds through the same path. For example, if SHED_OPT [34] specifies that a block should shed to Auto, then, if the block target mode is set to RCas, the block goes through Auto on the way to RCas. You can configure the shed option as follows:

Shed With Return Options

Remote cascade or remote output connection failure shifts actual mode but keeps trying to restore remote cascade or remote output (in other words, the remote cascade or remote output target mode stays in effect).

Normal—On failure of a remote connection, the block attempts to attain the highest permitted non-remote mode until the remote connection is restored. Cas is the highest permitted non-remote mode and Auto is is

the next highest permitted non-remote mode. If Cas or Auto are not available, the block will shed by default to Man.

Retained Target—The retained target mode is the mode the block was in before changing to one of the remote target modes. On failure of a remote connection, the block attempts to attain the retained target mode.

Auto—On failure of a remote connection, the block attempts to attain Auto, if permitted, until the remote connection is restored.

Man—On failure of a remote connection, the block sheds to Man until a remote connection is restored.

Shed With No Return Options

For any shed with no return option, the target mode changes as determined by the option. Therefore, there is no attempt to restore the connection following failure. The behavior on change to a remote target mode is identical to that for Shed With Return Options.

Normal—On failure of a remote connection, the block sets the target mode to the highest permitted non-remote mode. Cas is the highest permitted non-remote mode and Auto is is the next permitted non-remote mode. If Cas or Auto are not available, the block will shed by default to Man.

Retained Target—The retained target mode is the mode the block was in before changing to one of the remote target modes. On failure of a remote connection, the block sets the target mode to the retained target mode.

Auto—On failure of a remote connection, the block sets the target mode to Auto, if permitted.

Man—On failure of a remote connection, the block sets the target mode to Man, if permitted.

The user may configure SHED_OPTS [34] so that it calls for a target mode that is not permitted. When doing this, the mode logic uses the following rules as applied by the remote logic:

- Shed logic never results in a non-permitted target mode.

- Shed logic never attempts to attain an actual mode of Auto or Cas if that mode is not permitted.

Status Handling

If the input status on the PID block is Bad, the mode of the block reverts to Manual. In addition, you can select the Target to Manual if Bad IN status option to direct the target mode to revert to manual. You can set the status option in Manual or Out of Service mode only.

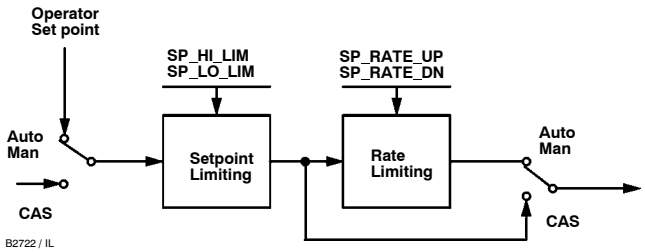

Figure 5-13. PID Function Block Set Point Selection

Set Point Selection and Limiting

The set point of the PID block is only valid when the block is in Auto, Cas, or RCas. Figure 5-13 illustrates the method for set point selection. You can configure the SP_HI_LIM [21] and SP_LO_LIM [22] parameters to limit the set point. In Cascade or Remote Cascade mode, the set point is adjusted by another function block or by a host computer, and the output is computed based on the set point.

In Automatic mode, the set point is entered manually by the operator, and the output is computed based on the set point. In Auto mode, you can also adjust the set point limit and the set point rate of change using the SP_RATE_UP [20] and SP_RATE_DN [19] parameters.

In Manual mode the output is entered manually by the operator. In Remote Output mode, the output is entered by a host computer.

Output Selection and Limiting

Output selection is determined by the mode and the set point. In Automatic, Cascade, or Remote Cascade mode, the output is computed by the PID control equation. In Manual and Remote Output mode, the output may be entered manually (see also Set Point Selection and Limiting). You can limit the output by configuring the OUT_HI_LIM [28] and OUT_LO_LIM [29] parameters.

Filtering

The filtering feature changes the response time of the device to smooth variations in output readings caused by rapid changes in input. You can adjust the filter time constant (in seconds) using the PV_FTIME [16] or SP_FTIME [69] parameters. Set the filter time constant to zero to disable the filter feature.

Feedforward Calculation

The feedforward value (FF_VAL [40]) is scaled (FF_SCALE [41]) to a common range for compatibility with the output scale (OUT_SCALE [11]). A gain value (FF_GAIN [42]) is applied to achieve the total feedforward contribution.

Output Tracking

Output tracking is enabled through the control options. You can set control options in Manual or Out of Service mode only.

The Track Enable control option must be set to True for the track function to operate. When the Track in Manual control option is set to True, the operator cannot override the tracking function in Manual mode. When Track in Manual is False, the operator can override the tracking function when the block is in Manual mode. Activating the track function causes the block's actual mode to revert to Local Override.

The TRK_VAL [38] parameter specifies the value to be converted and tracked into the output when the track function is operating. The TRK_SCALE [37] parameter specifies the range of TRK_VAL [38].

When the TRK_IN_D [38] parameter is True and the Track Enable control option is True, the TRK_VAL [38] input is converted to the appropriate value and output in units of OUT_SCALE [11].

Set Point Tracking

You can configure the method for tracking the set point by configuring the following control options (CONTROL_OPTS [12]):

- **SP–PV Track in Man**—Permits the SP [8] to track the PV [7] when the actual mode of the block is Man.

- **SP–PV Track in LO or IMan**—Permits the SP [8] to track the PV [7] when the actual mode of the block is Local Override (LO) or Initialization Manual (IMan).

- **SP–PV Track in ROUT**—Permits the SP [8] to track the PV [7] when the actual mode of the block is RemoteOut (ROUT).

- **SP Track retained Target**—Causes the set point to track the RCAS or CAS parameter based on the retained target mode when the actual mode is MAN or LO.

- **Act On IR**—If this option is true, then when IR (Initialization Requested) is received on BKCAL_IN [27], the SP [8] will be adjusted within setpoint limits to provide bumpless transfer when the cascade is closed. If the setpoint required to provide bumpless transfer is outside the setpoint limits, then any difference added to provide bumpless transfer will be removed in the BAL_TIME [25].

When one of these options is set, the SP[8] value is set to the PV [7] value while in the specified mode.

You can select the value that a master controller uses for tracking by configuring the Use PV for BKCAL_OUT control option. The BKCAL_OUT [31] value tracks the PV value. BKCAL_IN [27] on a master controller connected to BKCAL_OUT [31] on the PID block in an open cascade strategy forces its OUT [9] to match BKCAL_IN [27], thus tracking the PV from the slave PID block into its cascade input connection (CAS_IN [18]). If the Use PV for BKCAL_OUT option is not selected, the working set point (SP_WRK [68]) is used for BKCAL_OUT [31].

You can set control options in Manual or Out of Service mode only. When the mode is set to Auto, the SP [8] will remain at the last value (it will no longer follow the PV [7].

PID Equation Structures for Enhanced PID Block

Note

Extended parameters are not available at this time for all host systems. Refer to your host system documentation, or contact your Emerson Process Management sales office for additional information.

Configure the STRUCTURECONFIG [71] parameter to select the PID equation structure. You can select one of the following choices:

- Proportional, integral, and derivative on error (PID)

- Proportional and integral on error, derivative on PV (PI_D)

- Integral on error, proportional and derivative on PV (I_PD)

- Proportional on error, derivative on error (PD)

- Integral on error, derivative on error (ID)

- Integral on error, derivative on PV (I_D)

- Two degrees of Freedom (2DOF)

5

Reverse and Direct Action

To configure the block output action, set the Direct Acting control option. This option defines the relationship between a change in PV [7] and the corresponding change in output. With Direct Acting enabled (True), an increase in PV results in an increase in the output.

You can set control options in Manual or Out of Service mode only.

Alarm Detection

A block alarm will be generated whenever the BLOCK_ERR [6] has an error bit set. The types of block error for the PID block are defined above.

Process alarm detection is based on the PV [7] value. You can configure the alarm limits of the following standard alarms:

- High (HI_LIM [51])

- High high (HI_HI_LIM [49])

- Low (LO_LIM [53])

- Low low (LO_LO_LIM [55])

Additional process alarm detection is based on the difference between SP [8] and PV [7] values and can be configured via the following parameters:

- Deviation high (DV_HI_LIM [57])

- Deviation low (DV_LO_LIM [59])

Table 5-29. PID Function Block Alarm Priorities

Priority Number	Priority Description(1)
0	The alarm is disabled
1	An alarm condition with a priority of 1 can be recognized by the system. The device monitors the alarm but does not report it until requested by the host system.
2	An alarm condition with a priority of 2 is reported to the operator, but generally does not require operator attention (such as diagnostics and system alerts).
3–7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8–15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.

1. The priority classes “advise” and critical” have no relationship to Plant Web Alerts.

In order to avoid alarm chattering when the variable is oscillating around the alarm limit, an alarm hysteresis in percent of the PV span can be set using the ALARM_HYS [47] parameter. The priority of each alarm is set in the following parameters:

- HI_PRI [50]

- HI_HI_PRI [48]

- LO_PRI [52]

- LO_LO_PRI [54]

- DV_HI_PRI [56]

- DV_LO_PRI [58]

Alarms are grouped into five levels of priority, as shown in table 5-29.

Application Information

The PID function block is a powerful, flexible control algorithm that is designed to work in a variety of control strategies. The PID block is configured differently for different applications. The following examples describe the use of the PID block for closed−loop control (basic PID loop), feedforward control, cascade control with master and slave, and complex cascade control with override.

DeltaV™ Tune

DeltaV Tune quickly and automatically determines optimal tuning parameters for PID control loops. For more information on DeltaV Tune, refer to DeltaV Books Online or DeltaV documentation.

Block Errors

Table 5-30 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the PID block and are provided only for your reference.

Table 5-30. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other (N/A)*
1	**Block Configuration Error**—SHED_OPT or BYPASS set to 0
2	*Link Configuration Error (N/A)*
3	*Simulate Active (N/A)*
4	**Local Override**—The actual mode is LO and Track Enable is set.
5	*Device Fault State Set (N/A)*
6	*Device Needs Maintenance Soon (N/A)*
7	**Input failure/process variable has Bad status**—The parameter linked to IN is indicating a Bad status.
8	*Output Failure (N/A)*
9	*Memory Failure (N/A)*
10	*Lost Static Data (N/A)*
11	*Lost NV Data (N/A)*
12	*Readback Check Failed (N/A)*
13	*Device Needs Maintenance Now (N/A)*
14	**Power Up**—Set if devices was powered up with this block in Out of Service (OOS) mode. Cleared on first change of mode to other than OOS.
15	**Out of Service**—The actual mode is Out of Service (OOS).

PID Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-31. PID Function Block System Parameters Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static pa rameter value in the block is changed.
Tag Description TAG_DESC	2	RW	ALL	7 bit ASCII	Spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	0 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 Valid Bits: 7: OOS, 6: IMAN, 5: LO, 4: MAN, 3: AUTO, 2: CAS, 1: RCAS, 0: ROUT The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS, MAN, AUTO CAS, RCAS, ROUT	OOS until block is configured, then last valid target	
ACTUAL	5.2	RO	ALL		OOS	
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO+ CAS+RCAS+ROUT	OOS MAN, AUTO CAS, RCAS ROUT	
NORMAL	5.4	RW	ALL		AUTO	
Block Error BLOCK_ERR	6	RO	N/A	Defined Bits 1: Block Configuration Error 4: Local Override 7: Input Failure/ Bad PV status 14: Power-up 15: Out-of-Service	Dynamic	Data Type: Bit String 0 = inactive 1 = active This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string so that multiple errors may be shown.
Process Value PV	7	RO	N/A		Dynamic	Data Type: DS-65 The process variable used in block execution.
Setpoint SP	8		OOS MAN AUTO	PV_SCALE +/– 10%	Dynamic	Data Type: DS-65 The target block setpoint value. It is the result of setpoint limiting and setpoint rate of change limiting.
Output OUT	9		MAN OOS	Status OUT_SCALE +/– 10%	Dynamic	DS-65 The block output value and status.
				Value		
Process Value Scale PV_SCALE	10		OOS	EU at 100% EU at 0% Units index Decimal Point	100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with PV.

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Output Scale OUT_SCALE	11		OOS	EU at 100% EU at 0%t Units index Decimal Point	100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with OUT.
Grant Deny GRANT_DENY	12					Data Type: DS-70 Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. Not used by the device. GRANT: 0=N/A, 1=granted DENY: 0 = N/A, 1= denied
GRANT	12.1		ALL	0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
DENY	12.2		ALL	0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
Control Options CONTROL_OPTS	13		OOS	0: Bypass Enable 1: SP tracks PV in MAN 2: SP tracks PV in ROUT 3: SP tracks PV in LO or MAN 4: SP tracks RCAS or CAS in IMAN, LO, MAN or ROUT 5: Direct Acting 7: Track Enable 8: Track in Manual 9: Use PV for BKCAL_OUT 10: Act on IR 12: Restrict SP to limits in Cas and RCas 13: No output limits in MAN	All bits: 0	Data Type: Bit String 0=disable 1=enable Allows you to specify control strategy options.
Status Options STATUS_OPTS	14		OOS	0: IFS (Initiate Fault State) if BAD IN 1: IFS if BAD CAS_IN 2: Use Uncertain as Good 5: Target to MAN if BAD IN	All bits: 0	Data Type: Bit String 0=disable 1=enable Allows you to select options for status handling and processing.
Input IN	15		ALL	Status	BAD: NC: const	Data Type: DS-65 The primary input value of the block.
				Value	0	
Process Value Filter Time PV_FTIME	16		ALL	Positive	0	Data Type: Float The time constant of the first−order PV filter. It is the time, in seconds, required for a 63 percent change in the IN value.
Bypass BYPASS	17		MAN OOS	1=Off 2=On	0=undefined	Data Type: Enum Used to override the calculation of the block. When enabled, the SP is sent directly to the output.
Cascade Input CAS_IN	18		ALL	Status	BAD NC: const	Data Type: DS-65 The setpoint value from another block.
				Value	0	
Setpoint Rate Down SP_RATE_DN	19		ALL	Positive	+ INF	Data Type: Float Ramp rate for downward SP changes. When the ramp rate is set to zero, the SP is used immediately. PV per second
Setpoint Rate UP SP_RATE_UP	20		ALL	Positive	+ INF	Data Type: Float Ramp rate for upward SP changes. When the ramp rate is set to zero, the SP is used immediately. PV per second
Setpoint High Limit SP_HI_LIM	21		ALL	PV Scale +/− 10%, must be greater than SP_LO_LIM	100	Data Type: Float The highest SP value allowed.
Setpoint Low Limit SP_LO_LIM	22		ALL	PV Scale +/− 10%, must be less than SP_HI_LIM	0	Data Type: Float The lowest SP value allowed.

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Gain GAIN	23		ALL	greater than 0	1	Data Type: Float The proportional gain value.
Reset RESET	24		ALL	Positive	+ INF	Data Type: Float The integral action time constant. Seconds per repeat
Balance Time BAL_TIME	25		ALL	Positive	0	Data Type: Float The specified time, in seconds, for the internal working value of bias to return to the operator set bias. Also used to specify the time constant at which the integral term will move to obtain balance when the output is limited and the mode is AUTO, CAS, or RCAS.
Rate RATE	26		ALL	Positive	0	Data Type: Float The derivative action time constant, in seconds.
Back Calculation Input BKCAL_IN	27		ALL	Status	BAD: NC: const	Data Type: DS-65 The analog input value and status from another block's BKCAL_OUT output that is used for backward output tracking for bumpless transfer and to pass limit status.
				Value	0	
Output High Limit OUT_HI_LIM	28		ALL	OUT_SCALE +/– 10%	100	Data Type: Float Limits the maximum output value for modes other than manual.
Output Low Limit OUT_LO_LIM	29		ALL	OUT_SCALE +/– 10%	0	Data Type: Float Limits the minimum output value for modes other than manual.
Back Calculation Hysteresis BKCAL_HYS	30		ALL	0 to 50%	0.50%	Data Type: Float The amount the output value must change away from the its output limit before limit status is turned off.
Back Calculation Output BKCAL_OUT	31	RO	N/A		Dynamic	Data Type: DS-65 The value and status required by the BKCAL_IN input of another block to prevent reset windup and to provide bumpless transfer of closed loop control.
Remote Cascade Input RCAS_IN	32		ALL	Status	BAD: NoCom: NoVal: const	Data Type: DS-65 Target setpoint and status that is provided by a supervisory host. Used when mode is RCAS.
				Value	0 Trk	
Remote Out Input ROUT_IN	33		ALL	Status	BAD: NoCom: NoVal: const	Data Type: DS-65 Target output and status that is provided by a supervisory host. Used when mode is ROUT.
				Value	0 Trk	

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Shed Options SHED_OPT	34		ALL	0=Invalid 1=Normal Shed, Normal Return 2=Normal Shed, No Return 3=Shed to Auto, normal return 4=Shed to Auto, no return. Target mode changes to Auto on detection of a shed condition 5=Shed to Manual, normal return 6=Shed to Manual, No return. Target mode changes to MAN on detection of a shed condition. 7=Shed to retained target, normal return 8=Shed to retained target, no return. (Change target to retained target)	0=Invalid	Data Type: Uint8 Defines action to be taken on remote control device timeout. Normal Return – actual mode changes to the next lowest priority non–remote mode permitted but returns to the target remote mode when the remote computer completes the initialization handshake. No Return – Target mode changes to the next lowest priority non–remote mode permitted. The target remote mode is lost, so no return occurs.
Remote Cascade Output RCAS_OUT	35	RO	N/A		Dynamic	Data Type: DS-65 Block setpoint and status after ramping, filtering, and limiting that is provided to a supervisory host for back calculation to allow action to be taken under limiting conditions or mode change. Used when mode is RCAS.
Remote Out Output ROUT_OUT	36	RO	N/A		Dynamic	Data Type: DS-65 Block output that is provided to a supervisory host for a back calculation to allow action to be taken under limiting conditions or mode change. Used when mode is RCAS.
Tracking Scale TRK_SCALE	37		MAN OOS		100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with the external tracking value (TRK_VAL).
Tracking Input Discrete TRK_IN_D	38		ALL	Status	BAD: NC: const	Data Type: DS-66 Discrete input that initiates external tracking of the block output to the value specified by TRK_VAL.
				Value	0	
Tracking Value TRK_VAL	39		ALL	Status	BAD: NC: const	Data Type: DS-65 The value (after scaling from TRK_SCALE to OUT_SCALE) applied to OUT in LO mode when external tracking is enabled by TRK_IN_D.
				Value	0	
Feed Forward Value FF_VAL	40		ALL	Status	BAD: NC: const	Data Type: DS-65 The feedforward control input value and status.
				Value	0	
Feed Forward Scale FF_SCALE	41		MAN OOS		100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with the feedforward value (FF_VAL).
Feed Forward Gain FF_GAIN	42		MAN OOS		0	Data Type: Float The feedforward gain value. FF_VAL is multiplied by FF_GAIN before it is added to the calculated control output. A value of 0 disables feedforward.

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Update Event UPDATE_EVT	43					Data Type: DS-73 This alert is generated by any changes to the static data.
UNACKNOWLEDGED	43.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
UPDATE_STATE	43.2	RO	N/A	0=Undefined 1=Update reported 2=Update not reported	0	
TIME_STAMP	43.3	RO	N/A		0	
STATIC_REVISION	43.4	RO	N/A		0	
RELATIVE_INDEX	43.5	RO	N/A		0	
Block Alarm BLOCK_ALM	44					Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure, or system problems in the block. The cause of the alarm will be set in the subcode. VALUE Data Type: Unsigned8
UNACKNOWLEDGED	44.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	44.2	RO	N/A	0=Undefined 1=Clear-reported 2=Clear-not reported 3=Active reported 4=Active not reported	0	
TIME_STAMP	44.3	RO	N/A		0	
SUBCODE	44.4	RO	N/A		0	
VALUE	44.5	RO	N/A		0	
Alarm Summary ALARM_SUM	45					Data Type: DS-74 Current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
CURRENT	45.1	RO	ALL	1: High High Alarm 2: High Alarm 3: Low Low Alarm 4: Low Alarm 5: Deviation High Alarm 6: Deviation Low Alarm 7: Block Alarm	Dynamic	
UNACKNOWLEDGED	45.2	RO	ALL			
UNREPORTED	45.3	RO	ALL			
DISABLED	45.4	RW	ALL			
Acknowledge Option ACK_OPTION	46		N/A	1: High High Alarm 2: High Alarm 3: Low Low Alarm 4: Low Alarm 5: Deviation High Alarm 6: Deviation Low Alarm 7: Block Alarm	All bits: 0	Data Type: Bit String 0=Disable 1=Enable Used to set auto acknowledgment of alarms.
Alarm Hysteresis ALARM_HYS	47		ALL	0 to 50%	0.50%	Data Type: Float The amount the alarm value must return to within the alarm limit before the associated active alarm condition clears.
High High Priority HI_HI_PRI	48		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the HI HI Alarm.
High High Limit HI_HI_LIM	49		ALL	PV_SCALE, or +INF	+INF	Data Type: Float The setting for the alarm limit used to detect the HI HI alarm condition.
High Priority HI_PRI	50		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the HI alarm.
High Limit HI_LIM	51		ALL	PV_SCALE, or +INF	+INF	Data Type: Float The setting for the alarm limit used to detect the HI alarm condition.
Low Priority LO_PRI	52		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the LO alarm.
Low Limit LO_LIM	53		ALL	PV_SCALE, or –INF	–INF	Data Type: Float The setting for the alarm limit used to detect the LO alarm condition.
Low Low Priority LO_LO_PRI	54		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the LO LO alarm.
Low Low Limit LO_LO_LIM	55		ALL	PV_SCALE, or –INF	–INF	Data Type: Float The setting for the alarm limit used to detect the LO LO alarm condition.

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Deviation High Priority DV_HI_PRI	56		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the deviation high alarm.
Deviation High Limit DV_HI_LIM	57		ALL	PV_SCALE, or +INF	+INF	Data Type: Float The setting for the alarm limit used to detect the deviation high alarm condition.
Deviation Low Priority DV_LO_PRI	58		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the deviation low alarm.
Deviation Low Limit DV_LO_LIM	59		ALL	−INF, or −PV span to 0	−INF	Data Type: Float The setting for the alarm limit use to detect the deviation low alarm condition.
High High Alarm HI_HI_ALM	60					Data Type: DS-71 The HI HI alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm. VALUE Data Type: Float
UNACKNOWLEDGED	60.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=undefined	
ALARM_STATE	60.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=undefined	
TIME_STAMP	60.3	RO	N/A		0	
SUBCODE	60.4	RO	N/A		0	
VALUE	60.5	RO	N/A		0	
High Alarm HI_ALM	61					Data Type: DS-71 The HI alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm. VALUE Data Type: Float
UNACKNOWLEDGED	61.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=undefined	
ALARM_STATE	61.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=undefined	
TIME_STAMP	61.3	RO	N/A		0	
SUBCODE	61.4	RO	N/A		0	
VALUE	61.5	RO	N/A		0	
Low Alarm LO_ALM	62					Data Type: DS-71 The LO alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm. VALUE Data Type: Float
UNACKNOWLEDGED	62.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=undefined	
ALARM_STATE	62.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=undefined	
TIME_STAMP	62.3	RO	N/A		0	
SUBCODE	62.4	RO	N/A		0	
VALUE	62.5	RO	N/A		0	
Low Low Alarm LO_LO_ALM	63					Data Type: DS-71 The LO LO alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm. VALUE Data Type: Float
UNACKNOWLEDGED	63.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=undefined	
ALARM_STATE	63.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=undefined	
TIME_STAMP	63.3	RO	N/A		0	
SUBCODE	63.4	RO	N/A		0	
VALUE	63.5	RO	N/A		0	

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Deviation High Alarm DV_HI_ALM	64					Data Type: DS-71 The DV HI alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm. VALUE Data Type: Float
UNACKNOWLEDGED	64.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=undefined	
ALARM_STATE	64.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=undefined	
TIME_STAMP	64.3	RO	N/A		0	
SUBCODE	64.4	RO	N/A		0	
VALUE	64.5	RO	N/A		0	
Deviation Low Alarm DV_LO_ALM	65					Data Type: DS-71 The DV LO alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm. VALUE Data Type: Float
UNACKNOWLEDGED	65.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=undefined	
ALARM_STATE	65.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0=undefined	
TIME_STAMP	65.3	RO	N/A		0	
SUBCODE	65.4	RO	N/A		0	
VALUE	65.5	RO	N/A		0	
Extended Parameters						
Bias BIAS	66		ALL	OUT_SCALE +/− 10%	0	Data Type: Float The bias value used to calculate output for a PD structure.
Error ERROR	67	RO	N/A		Dynamic	Data Type: Float The error (SP−PV) used to determine the control action.
SP Work SP_WRK	68	RO	N/A		Dynamic	Data Type: Float The working set point of the block after limiting and filtering is applied. EU of PV_SCALE
SP FTime SP_FTIME	69		ALL	Positive	0	Data Type: Float The time constant of the first-order SP filter. It is the time, in seconds, required for a 63 percent change in the IN value. Applied after SP rate limiting.
Math Form MATHFORM	70		OOS	0=Standard 1=Series	0=Standard	Data Type: Unsigned8 Selects equation form (series or standard)
Structureconfig STRUCTURECONFIG	71		OOS	0=PID terms on error 1=PI terms on error, D term on PV 2=I terms on error, PD term on PV 3=PD terms on error 4= P term on error, D term on PV 5=ID terms on error 6=I term on error, D term on PV 7=2 Deg. of Freedom PID	0=PID terms on error	Data Type: Unsigned8 Defines PID equation structure to apply controller action.
UGamma GAMMA (ugamma)	72		OOS	> = 0, < = 1	1.0	Data Type: Float Fraction of derivative action taken on error versus PV. For a value of 0.6, then 60% of the derivative action will be based on error and 40% on PV. The value of GAMMA may be changed over a range of 0−1 if STRUCTURE is set to Two Degrees of Freedom Control. Otherwise, it is automatically set to a value of 1 or 0 based on the Structure selection.

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
UBeta BETA (ubeta)	73		OOS	> = 0, < = 1	1.0	Data Type: Float Fraction of proportional action taken on error versus PV. For a value of 0.6, then 60% of the proportional action will be based on error and 40% on PV. The value of BETA may be changed over a range of 0–1 if STRUCTURE is set to Two Degrees of Freedom Control. Otherwise, it is automatically set to a value of 1 or 0 based on the Structure selection.
IDeadBand IDEADBAND	74		OOS	Positive	0	Data Type: Float Integral action stops when ERROR is within IDEADBAND, proportional and derivative action continue. EU of PV_SCALE
StdDev STDDEV	75	RO	N/A		Dynamic	Data Type: Float Standard deviation of PV.
Cap StdDev CAP_STDDEV	76	RO	N/A		Dynamic	Data Type: Float Standard deviation of PV changes.
T Request T_REQUEST	77	RO	ALL	0=Request Tuning 1=Force Tuning 2=Reset Tuner	0	Data Type: Bit String Operator request to initiate/control autotuning.
T State T_STATE	78	RO	NONE		0	Data Type: Unsigned8 Current autotuner state.
T Status T_STATUS	79	RO	N/A	0=Scan Rate Too Low Warning 1=Insufficient Process Response (obsolete) 2=Scan Rate Too High Warning 3=Inverse Direct Acting Error 4=PV Deviation Too Large 5=Initial PV Deviation Too Large 6=PV Limited or Constant 7=PV Bad 8=Invalid Mode for Tuning 9=BKCAL_IN Non Good or Limited 10=Out Limited 11=Bypass Active 12=Mode Changed 13=Tracking Active 14=Disconnected 15=SP Changed	0	Data Type: Bit String Autotuner status.
T Ipgain T_IPGAIN	80	RO	N/A		0.0	Data Type: Float Integrated process gain.
T Ugain T_UGAIN	81	RO	N/A		0.0	Data Type: Float Ultimate gain.
T Uperiod T_UPERIOD	82	RO	N/A		0.0	Data Type: Float Ultimate period.
T Psgain T_PSGAIN	83	RO	N/A		0.0	Data Type: Float Process static gain.
T Ptimec T_PTIMEC	84	RO	N/A		0.0	Data Type: Float Process time constant.
T Pdtime T_PDTIME	85	RO	N/A		0.0	Data Type: Float Process dead time.
T Targetop T_TARGETOP	86		ALL		2	Data Type: Unsigned8 Target oscillation periods.
T Hyster T_HYSTER	87		ALL	> = 0.0	0.0	Data Type: Float Hysteresis
T Relayss T_RELAYSS	88		ALL	> = 0.0	3.0	Data Type: Float Relay step size.
T Gain Magnifier T_GAIN_MAGNIFIER	89		ALL	> 0.1, < 100	1.0	Data Type: Float Scales amount of gain.

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Table 5-31. PID Function Block System Parameters Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
T Auto Extra DT T_AUTO_EXTRA_DT	90		ALL		0	Data Type: Unsigned8 Allow additional cycle with extra deadtime.
T Auto Hysteresis T_AUTO_HYSTERESIS	91		ALL		0	Data Type: Unsigned8 Allows calculation of hysteresis based on CAP_STDDEV
T Aoperiods T_AOPERIODS	92	RO	N/A		0	Data Type: Unsigned8 Actual oscillation periods.

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-32. PID Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV
8	SP
9	OUT
18	CAS_IN
38	TRK_IN_D
39	TRK_VAL
45.1	ALARM_SUM.CURRENT
45.2	ALARM_SUM.UNACKNOWLEDGED
45.3	ALARM_SUM.UNREPORTED
45.4	ALARM_SUM.DISABLED

Table 5-33. PID Function Block, View 2

Index Number	Parameter
1	ST_REV
10	PV_SCALE
11	OUT_SCALE
12.1	GRANT_DENY.GRANT
12.2	GRANT_DENY.DENY
17	BYPASS
21	SP_HI_LIM
22	SP_LO_LIM
28	OUT_HI_LIM
29	OUT_LO_LIM

Table 5-34. PID Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV
8	SP
9	OUT
15	IN
18	CAS_IN
27	BKCAL_IN
31	BKCAL_OUT
32	RCAS_IN
33	ROUT_IN
35	RCAS_OUT
36	ROUT_OUT
38	TRK_IN_D
39	TRK_VAL
40	FF_VAL
45.1	ALARM_SUM.CURRENT
45.2	ALARM_SUM.UNACKNOWLEDGED
45.3	ALARM_SUM.UNREPORTED
45.4	ALARM_SUM.DISABLED
67	ERROR
68	SP_WORK
71	STRUCTURECONFIG
75	STDDEV
76	CAP_STDDEV

Note

Because individual views are limited in size, View List 4 has two parts.

Table 5-35. PID Function Block, View 4.1

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
13	CONTROL_OPTS
14	STATUS_OPTS
16	PV_FTIME
19	SP_RATE_DN
20	SP_RATE_UP
23	GAIN
24	RESET
25	BAL_TIME
26	RATE
30	BKCAL_HYS
34	SHED_OPT
37	TRK_SCALE
41	FF_SCALE
42	FF_GAIN
46	ACK_OPTION
47	ALARM_HYS
48	HI_HI_PRI
49	HI_HI_LIM
50	HI_PRI
51	HI_LIM
52	LO_PRI
53	LO_LIM
54	LO_LO_PRI
55	LO_LO_LIM
56	DV_HI_PRI
57	DV_HI_LIM
58	DV_LO_PRI
59	DV_LO_LIM

Table 5-36. PID Function Block, View 4.2

Index Number	Parameter
1	ST_REV
66	BIAS
69	SP_FTIME
70	MATHFORM
71	STRUCTURECONFIG
72	GAMMA (ugamma)
73	BETA
74	IDEADBAND

375 Field Communicator Menu Structure

PID FUNCTION BLOCK

Quick Config
- Alert Key
- Control Options
- Deviation High Limit
- Deviation Low Limit
- Gain
- High High Limit
- High Limit
- Low Limit
- Low Low Limit
- Output Scale: EU at 100%
- Output Scale: EU at 0%
- Output Scale: Units Index
- Output Scale: Decimal
- Process Value Scale: EU at 100%
- Process Value Scale: EU at 0%
- Process Value Scale: Units Index
- Process Value Scale: Decimal
- Reset
- Setpoint: Status
- Setpoint: Value
- Setpoint High Limit
- Setpoint Low Limit

Common Config
- Alarm Hysteresis
- Alert Key
- Control Options
- Deviation High Limit
- Deviation Low Limit
- Gain
- High High Limit
- High Limit
- Low Limit
- Low Low Limit
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output High Limit
- Output Low Limit
- Output Scale: EU at 100%
- Output Scale: EU at 0%
- Output Scale: Units Index
- Output Scale: Decimal
- Process Value Filter Time
- Process Value Scale: EU at 100%
- Process Value Scale: EU at 0%
- Process Value Scale: Units Index
- Process Value Scale: Decimal
- Rate
- Reset
- Setpoint: Status
- Setpoint: Value
- Setpoint High Limit
- Setpoint Low Limit

Advanced Config
- Back Calculation Hysteresis
- Feed Forward Gain
- Feed Forward Scale: EU at 100%
- Feed Forward Scale: EU at 0%
- Feed Forward Scale: Units Index
- Feed Forward Scale: Decimal
- Shed Options
- Setpoint Rate Down
- Setpoint Rate Up
- Static Revision
- Status Options
- Strategy
- Tracking Scale: EU at 100%
- Tracking Scale: EU at 0%
- Tracking Scale: Units Index
- Tracking Scale: Decimal
- Tracking Value: Status
- Tracking Value: Value

Connectors
- Back Calculation Input: Status
- Back Calculation Intput: Value
- Back Calculation Output: Status
- Back Calculation Output: Value
- Cascade Input: Status
- Cascade Input: Value
- Feed Forward Value: Status
- Feed Forward Value: Value
- Input: Status
- Input: Value
- Output: Status
- Ouput: Value
- Tracking Input Discrete: Status
- Tracking Input Descrete: Value
- Tracking Value: Status
- Tracking Value: Value

Online
- Back Calculation Input: Status
- Back Calculation Intput: Value
- Back Calculation Output: Status
- Back Calculation Output: Value
- Block Error
- Bypass
- Cascade Input: Status
- Cascade Input: Value
- Feed Forward Value: Status
- Feed Forward Value: Value
- Gain
- Input: Status
- Input: Value
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output: Status
- Output: Value
- Process Value: Status
- Process Value: Value
- Remote Cascade Input: Status
- Remote Cascade Input: Value
- Remote Cascade Output: Status
- Remote Cascade Output: Value
- Remote Out Input: Status
- Remote Out Input: Value
- Remote Out Output: Status
- Remote Out Output: Value
- Setpoint: Status
- Setpoint: Value
- Tracking Input Discrete: Status
- Tracking Input Descrete: Value
- Tracking Value: Status
- Tracking Value: Value

Status
- Block Error

(menu continued on next page)

PID FUNCTION BLOCK cont.

Other
- Tag Description
- Grant Deny: Grant
- Grant Deny: Deny
- Balance Time
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- Acknowledge Option
- High High Alarm: Unacknowledged
- High High Alarm: Alarm State
- High High Alarm: Time Stamp
- High High Alarm: Subcode
- High High Alarm: Float Value
- High Alarm: Unacknowledged
- High Alarm: Alarm State
- High Alarm: Time Stamp
- High Alarm: Subcode
- High Alarm: Float Value
- Low Alarm: Unacknowledged
- Low Alarm: Alarm State
- Low Alarm: Time Stamp
- Low Alarm: Subcode
- Low Alarm: Float Value
- Low Low Alarm: Unacknowledged
- Low Low Alarm: Alarm State
- Low Low Alarm: Time Stamp
- Low Low Alarm: Subcode
- Low Low Alarm: Float Value
- Deviation High Alarm: Unacknowledged
- Deviation High Alarm: Alarm State
- Deviation High Alarm: Time Stamp
- Deviation High Alarm: Subcode
- Deviation High Alarm: Float Value
- Deviation Low Alarm: Unacknowledged
- Deviation Low Alarm: Alarm State
- Deviation Low Alarm: Time Stamp
- Deviation Low Alarm: Subcode
- Deviation Low Alarm: Float Value
- Bias

Other (continued)
- Error
- SP Work
- SP FTime
- mathform
- structureconfig
- Ugamma
- UBeta
- IDeadBand
- StdDv
- Cap StdDev
- T Request
- T State
- T Status
- T Ipgain
- T Ugain
- T Uperiod
- T Psgain
- T Ptimec
- T Pdtime
- T Targetop
- T Hyster
- T Relayss
- T Gain Magnifier
- T Auto Extra DT
- T Auto Hysteresis
- T Aoperiods

All
- Characteristics: Block Tag
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- Process Value: Status
- Process Value: Value
- Setpoint: Status
- Setpoint: Value
- Output: Status
- Output: Value
- Process Value Scale: EU at 100%
- Process Value Scale: EU at 0%
- Process Value Scale: Units Index
- Process Value Scale: Decimal
- Output Scale: EU at 100%
- Output Scale: EU at 0%
- Output Scale: Units Index
- Output Scale: Decimal
- Grant Deny: Grant
- Grant Deny: Deny
- Control Options
- Status Options
- Input: Status
- Input: Value
- Process Value Filter Time
- Bypass
- Cascade Input: Status
- Cascade Input: Value
- Setpoint Rate Down
- Setpoint Rate Up
- Setpoint High Limit
- Setpoint Low Limit
- Gain
- Reset
- Balance Time
- Rate
- Back Calculation Input: Status
- Back Calculation Input: Value
- Output High Limit
- Output Low Limit
- Back Calculation Hysteresis
- Back Calculation Output: Status
- Back Calculation Output: Value
- Remote Cascade Input: Status
- Remote Cascade Input: Value
- Remote Out Input: Status
- Remote Out Input: Value
- Shed Options
- Remote Cascade Output: Status
- Remote Cascade Output: Value
- Remote Out Output: Status
- Remote Out Output: Value
- Tracking Scale: EU at 100%
- Tracking Scale EU at 0%
- Tracking Scale: Units Index
- Tracking Scale: Decimal
- Tracking Input Discrete: Status
- Tracking Input Descrete: Value
- Tracking Value: Status
- Tracking Value: Value
- Feed Forward Value: Status
- Feed Forward Value: Value
- Feed Forward Scale: EU at 100%
- Feed Forward Scale: EU at 0%
- Feed Forward Scale: Units Index
- Feed Forward Scale: Decimal
- Feed Forward Gain

All (continued)
- Updated Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- Acknowledge Option
- Alarm Hysteresis
- High High Priority
- High High Limit
- High Priority
- High Limit
- Low Priority
- Low Limit
- Low Low Priority
- Low Low Limit
- Deviation High Priority
- Deviation High Limit
- Deviation Low Priority
- Deviation Low Limit
- High High Alarm: Unacknowledged
- High High Alarm: Alarm State
- High High Alarm: Time Stamp
- High High Alarm: Subcode
- High High Alarm: Float Value
- High Alarm: Unacknowledged
- High Alarm: Alarm State
- High Alarm: Time Stamp
- High Alarm: Subcode
- High Alarm: Float Value
- Low Alarm: Unacknowledged
- Low Alarm: Alarm State
- Low Alarm: Time Stamp
- Low Alarm: Subcode
- Low Alarm: Float Value
- Low Low Alarm: Unacknowledged
- Low Low Alarm: Alarm State
- Low Low Alarm: Time Stamp
- Low Low Alarm: Subcode
- Low Low Alarm: Float Value
- Deviation High Alarm: Unacknowledged
- Deviation High Alarm: Alarm State
- Deviation High Alarm: Time Stamp
- Deviation High Alarm: Subcode
- Deviation High Alarm: Float Value
- Deviation Low Alarm: Unacknowledged
- Deviation Low Alarm: Alarm State
- Deviation Low Alarm: Time Stamp
- Deviation Low Alarm: Subcode
- Deviation Low Alarm: Float Value
- Bias
- Error
- SP Work
- SP FTime
- mathform
- structureconfig
- UGamma
- UBeta
- IDeadBand
- StdDev

All (continued)
- Cap StdDev
- T Request
- T State
- T Status
- T Ipgain
- T Ugain
- T Uperiod
- T Psgain
- T Ptimec
- T Pdtime
- T Targetop
- T Hyster
- T Relayss
- T Gain Magnifier
- T Auto Extra DT
- T Auto Hysteresis
- T Aoperiods

Input Selector Function Block Overview 5-100

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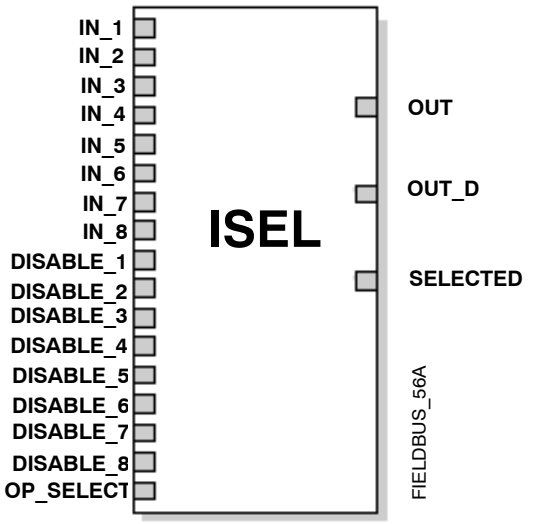


IN (1–8) = **Input used in the selection algorithm.**

DISABLE (1–8) = **Discrete input used to enable or disable the associated input channel.**

OP_SELECT = **Input used to override algorithm.**

SELECTED = **The selected channel number.**

OUT = **The block output and status.**

OUT_D = **Discrete output that signals a selected alarm condition.**

5

Input Selector (ISEL) Function Block Overview

The Input Selector (ISEL) function block can be used to select the first good, maximum, minimum, average, or hot backup from as many as eight input values and place it at the output. The block supports signal status propagation. There is no process alarm detection in the Input Selector function block. Figure 5-14 illustrates the internal components of the ISEL function block. Table 5-39 lists the ISEL block parameters, their index numbers, and descriptions.

Modes

The ISEL function block supports three modes of operation as defined by the MODE_BLK [5] parameter:

- **Manual (Man)**—The block output (OUT [7]) may be entered manually.

- **Automatic (Auto)**—OUT [7] reflects the selected input value.

- **Out of Service (OOS)**—The block is not processed. The BLOCK_ERR [6] parameter shows Out of Service. In this mode, you can make changes to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

The Input Selector block Actual mode will be Out of Service if any of the following are true:

- The Actual mode of the resource block is not Auto

- The Input Selector block Target mode is Out of Service

- The Input Selector block Target mode is Auto, OP_SELECT [22] is not being used, and SELECT_TYPE [19] is 0. In this case, the BLOCK_ERR [6] parameter shows a Block Configuration Error.

The Input Selector block Actual mode will be Manual if all of the above is not true and the Target mode is Manual.

Status Handling

Quality Use and Propagation

In Auto mode, OUT [7] reflects the value and status of the selected input based on the following criteria:

- A bad or disabled input is never used by any of the selection algorithms

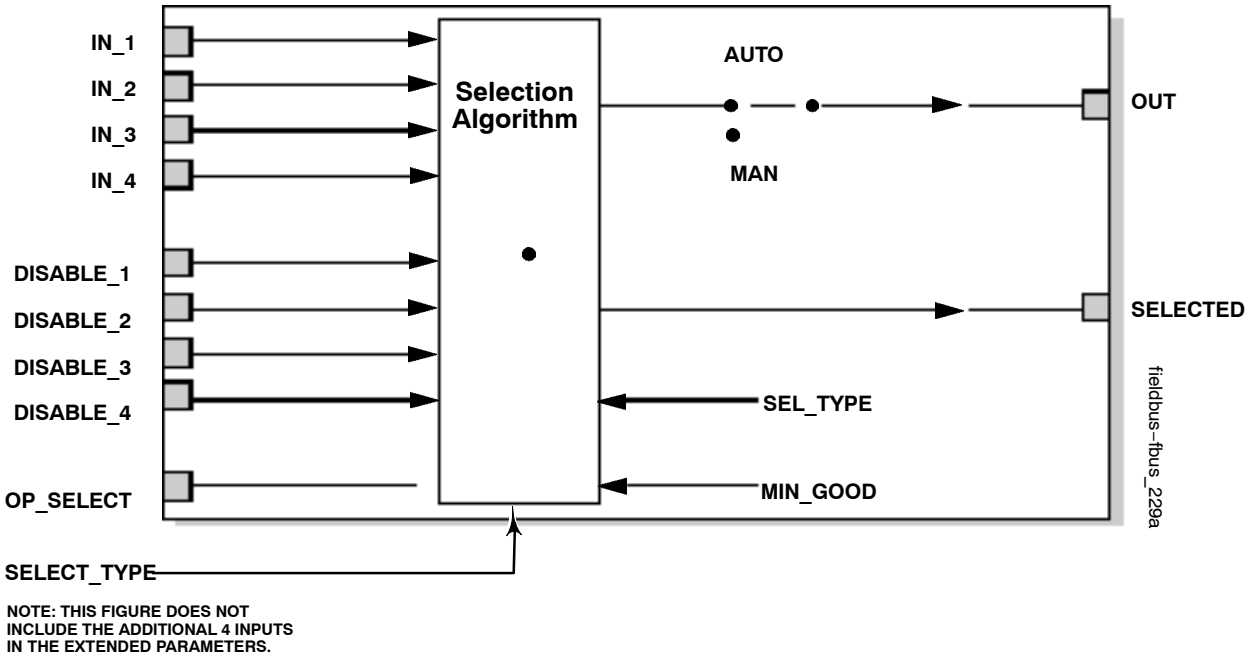


Figure 5-14. Input Selector Function Block Schematic

- For a selection algorithm to use an input with status of Uncertain, the STATUS_OPTS [10] parameter must have “Use Uncertain as Good.”

- STATUS_OPTS [10] is applied before selection.

- If the number of good inputs is less than MIN_GOOD [20], or if the number of inputs evaluated is 0, the status of OUT [7] and SELECTED [21] will be Bad.

- If an input is disabled or its status is Bad and is selected via OP_SELECT [22], then the status of OUT [7] and SELECTED [21] will be Bad. If the quality of the input is Uncertain, and the selection for the STATUS_OPTS [10] parameter is “Use Uncertain as Good,” then the status of OUT [7] and SELECTED [21] will be Uncertain. Otherwise the status of OUT [7] and SELECTED [21] will be Good Noncascade.

When the block is in the Manual mode the status and substatus of OUT [7] and SELECTED [21] will be as follows:

- Substatus will be non-specific and the limit will be constant.

- Quality of OUT [7] and SELECTED [21] will be Uncertain if STATUS_OPTS [10] is “Uncertain if in Manual mode.” Otherwise, the quality of OUT [7] and SELECTED [21] will be Good Noncascade.

Limit Propagation

Refer to figure 5-15. When SELECT_TYPE [19] is Average, Not Limited is propagated unless all inputs have the same limit status. If all inputs have the same limit status, the limit status of the inputs is propagated.

If SELECT_TYPE [19] is Middle and the number of inputs used by the algorithm is greater than one: Not Limited is propagated unless all selected inputs have the same limit status, in which case the limit status of the inputs is propagated.

If SELECT_TYPE [19] is Middle and a single input, or if Maximum or Minimum then: If the selected input is a constant and Middle, Constant is propagated. Otherwise, if the selected input is a constant and Maximum or Minimum, propagate low if Maximum, propagate high if Minimum. If the selected input is not a constant, propagate selected input limit as is.

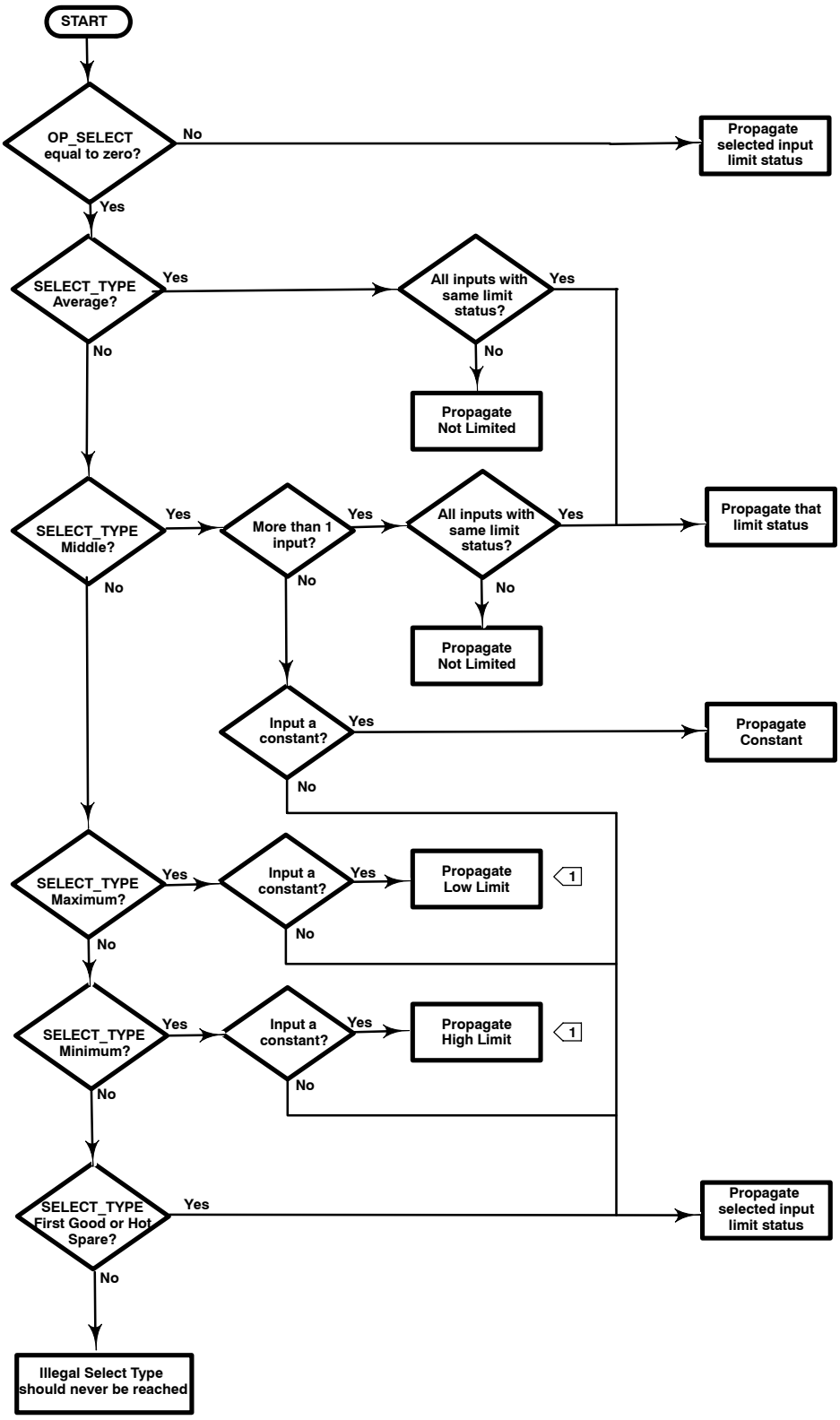
When SELECT_TYPE [19] is First Good or Hot Spare or if OP_SELECT [22] is non-zero, propagate selected input limit as is.

Substatus Propagation

Refer to figure 5-16. For SELECT_TYPE [19] of Maximum, Minimum, First Good, Hot Spare, and Middle with only one input, simply propagate substatus as is.

For SELECT_TYPE [19] of Maximum and Minimum with more than one input with the same value, propagate substatus if all inputs are the same.

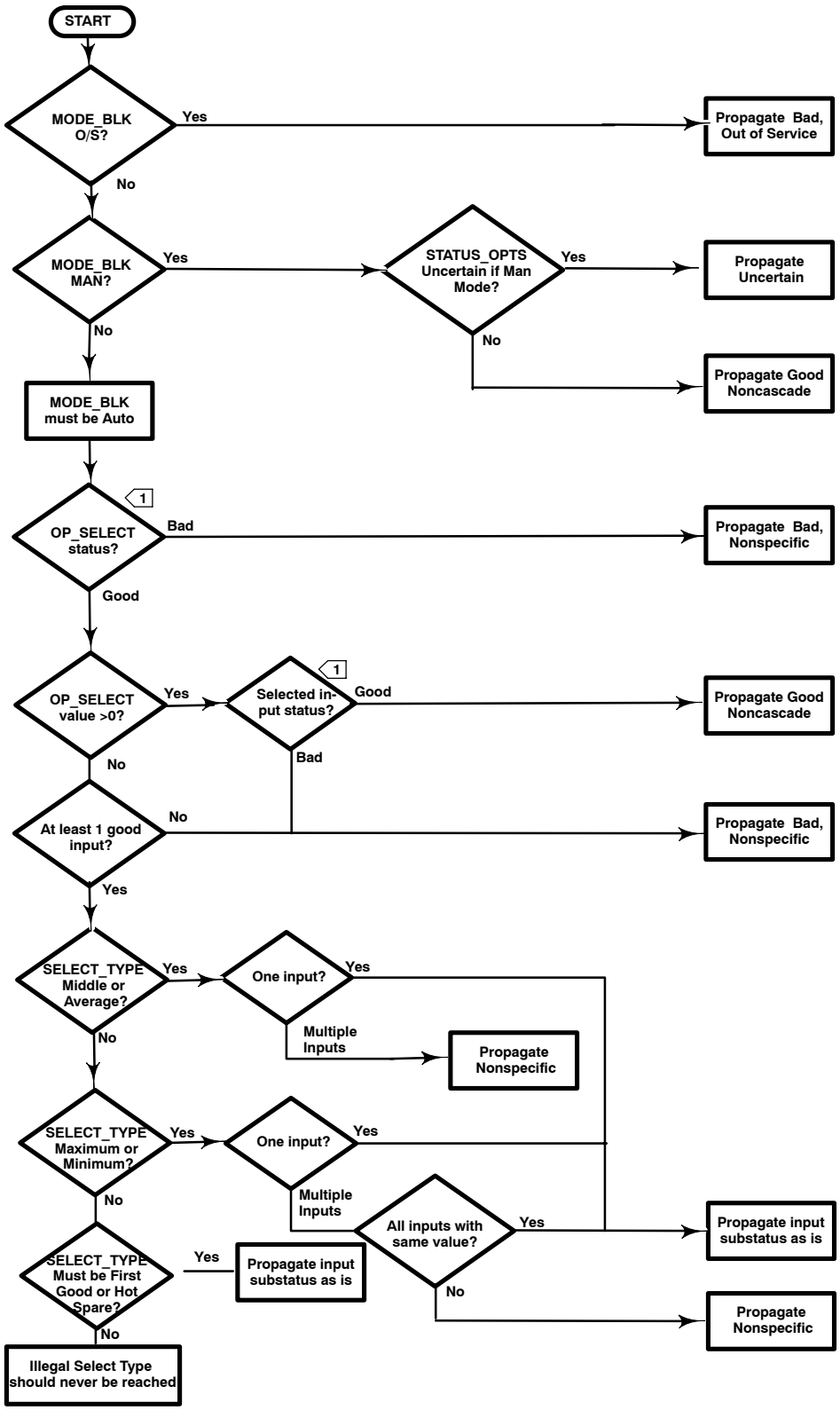
For SELECT_TYPE [19] of Average or Middle with more than one input, propagate NonSpecific.



NOTES:

1 LIMIT MANIPULATION FOR A CONSTANT INPUT FOR MAXIMUM AND MINIMUM IS BASED UPON THE FOUNDATION FIELDBUS SPECIFICATION. THE REASONING IS BASED ON HIGH SELECT PROVIDING A LOW LIMIT STATUS AND LOW SELECT PROVIDING A HIGH LIMIT STATUS.

Figure 5-15. Input Selector Block Limit Propagation



NOTES:

1 AN INPUT STATUS MAY BE BAD, GOOD, OR UNCERTAIN. IF BAD, THE INPUT IS NOT USED AND THE STATUS IS PROPAGATED AS BAD WITH SUBSTATUS NON-SPECIFIC. IF GOOD IT IS USED AND THE STATUS IS PROPAGATED AS GOOD (NON-CASCADE). IF UNCERTAIN, AND STATUS_OPTS IS "USE UNCERTAIN AS GOOD" THEN THE INPUT IS USED AND THE STATUS IS PROPAGATED AS GOOD (NON-CASCADE), OTHERWISE IT IS NOT USED AND THE STATUS IS PROPAGATED AS BAD WITH SUBSTATUS NON-SPECIFIC.

Figure 5-16. Input Selector Block Substatus Propagation

If the status of OUT [7] is Bad, then the substatus will be as follows:

- Out of Service if the Target mode is Out of Service.

- Configuration Error with a BLOCK_ERR [6] of Configuration Error if the Actual mode is Out of Service.

- Otherwise a substatus of Non-Specific.

STATUS_OPTS Supported

In the STATUS_OPTS [10] parameter, you can select from the following options to control the status handling:

5

- **Use Uncertain as Good**—sets the OUT [7] status to Good when the selected input status is Uncertain.

- **Uncertain if in Manual mode**: sets the OUT [7] status to Uncertain when the mode is Manual.

Note

The block mode must be Out of Service to set STATUS_OPTS [10].

Input Selection

The ISEL function block reads the values and statuses of as many as eight inputs (IN_1 [11], IN_2 [12], IN_3 [13], IN_4 [14], IN_5 [25], IN_6 [26], IN_7 [27], IN_8 [28]). To use any of the six selection algorithms to select the output, OP_SELECT [22] must be 0. To specify which algorithm to use, configure the selector type parameter (SELECT_TYPE [19]) as follows:

- **Maximum**—selects the input with the highest value from the inputs that are not bad and not disabled.

- **Minimum**—selects the input with the lowest value from the inputs that are not bad and not disabled.

- **Average**—calculates the average value of the inputs that are not bad and not disabled and provides it as the output. For example, if the number used to average (AVG_USE [33]) is 4 and the number of connected inputs is 6, then the highest and lowest values would be dropped prior to calculating the average. If AVG_USE [33] is 2 and the number of connected inputs is 7, then the two highest and lowest values would be dropped prior to calculating the average and the average would be based on the middle three inputs.

- **Middle**—If the number of good usable inputs is odd, then it selects the middle value. If the number of good usable inputs is even, then it averages the middle two values and selects status as worst of two. If both inputs' limit status are not the same then it sets limit status of Not Limited.

- **First Good**—selects the first input that is not bad and not disabled, starting with IN_1 [11].

- **Hot Spare**—initially uses the input selected as first good. If the selected input goes bad, the first good selection is repeated. If the selected input remains good, it stays selected. If the originally selected input returns to good status the selection does not change. Selection changes only if the currently selected input goes bad.

Disabling Inputs

Use the parameters DISABLE_1 [15], DISABLE_2 [16], DISABLE_3 [17], DISABLE_4 [18], DISABLE_5 [29], DISABLE_6 [30], DISABLE_7 [31] and DISABLE_8 [32] to disable the corresponding inputs. An input that is disabled will not be used by any of the selection algorithms.

The status of the disable parameter must be "Good," "Good_Cascade," or "Uncertain" with a STATUS_OPTS [10] of "Use Uncertain as Good" in order to be evaluated. If the status of the disable parameter is Bad, its last usable value is maintained and acted upon. If the device restarts, losing the last usable value, the last usable value is set to disabled. IN_1 through IN_8 and DISABLE_1 through DISABLE_8 are non-volatile type parameters so if they are Linked they will automatically have Bad status until connections are re-established. If they are not Linked, they will be restored with the previous value from NVM across device restarts.

Direct Selection of Inputs

The parameter OP_SELECT [22] can be used to select a particular input. If OP_SELECT [22] is non-zero, the selection algorithm is bypassed and the value of OP_SELECT [22] is interpreted as the input number to select. If the OP_SELECT [22] value is greater than the number of inputs, then the highest input is selected. The status of OP_SELECT [22] must

be “Good,” “Good_Cascade,” or “Uncertain” with a STATUS_OPTS [10] of “Use Uncertain as Good” in order to be evaluated. If the status of OP_SELECT [22] is Bad, then the OUT [7] status is Bad.

Identification of Selected Inputs

For a SELECT_TYPE [19] of Maximum, Minimum, Middle, First Good, and Hot Spare, SELECTED [21] indicates the number of the selected input. When Middle is computed from more than one input, SELECTED [21] is set to 0.

For a SELECT_TYPE [19] of Average, SELECTED [21] indicates the number of inputs used in the average calculation.

When the block mode is Manual, SELECTED [21] is set to 0.

Alarm Detection

A block alarm will be generated whenever the BLOCK_ERR [6] has an error bit set. The types of block error for the PID block are defined above.

Process alarm detection is based on OUT [7] value. You can configure the alarm limits of the following standard alarms:

- High (HI_LIM [40])
- High high (HI_HI_LIM [38])
- Low (LO_LIM [42])
- Low low (LO_LO_LIM [44])

In order to avoid alarm chattering when the variable is oscillating around the alarm limit, an alarm hysteresis in percent of the PV span can be set using the ALARM_HYS [36] parameter. The priority of each alarm is set in the following parameters:

- HI_PRI [39]
- HI_HI_PRI [37]
- LO_PRI [41]
- LO_LO_PRI [43]

ACK_OPTION [35] is used to set automatic acknowledgement of alarms.

ALARM_SUM [34] indicates the current alert status, unacknowledged states, and disabled states of the alarms associated with the function block.

Alarms are grouped into five levels of priority, as shown in table 5-37.

Table 5-37. ISEL Function Block Alarm Priorities

Priority Number	Priority Description(1)
0	The priority of an alarm condition changes to 0 after the condition that caused the alarm is corrected.
1	An alarm condition with a priority of 1 can be recognized by the system. The device monitors the alarm but does not report it until requested by the host system.
2	An alarm condition with a priority of 2 is reported to the operator, but generally does not require operator attention (such as diagnostics and system alerts).
3–7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8–15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.
1. The priority classes “advise” and critical” have no relationship to Plant Web Alerts.	

5

Block Errors

Table 5-38 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the ISEL block and are provided only for your reference.

Table 5-38. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other (N/A)*
1	**Block Configuration Error** - If OP_SELECT is not being used, and SELECT_TYPE = 0. This implies OP_SELECT status is good and actual mode is AUTO.
2	*Link Configuration Error (N/A)*
3	*Simulate Active (N/A)*
4	*Local Override (N/A)*
5	*Device Fault State Set (N/A)*
6	*Device Needs Maintenance Soon (N/A)*
7	**Input failure/process variable has Bad status** - Set if any IN or any DISABLE or OP_SELECT is bad and connected. This means that a status of BAD NC would not cause an input failure but a status of BAD LUV or BAD no LUV would cause and input failure.
8	Output failure - Set if OUT quality is bad and the Actual mode is not Out of Service.
9	*Memory Failure (N/A)*
10	*Lost Static Data (N/A)*
11	*Lost NV Data (N/A)*
12	*Readback Check Failed (N/A)*
13	*Device Needs Maintenance Now (N/A)*
14	**Power Up** - Set if the Target mode is Out of Service when powered up until the mode is changed.
15	**Out of Service** - The block is in Out of Service (O/S) mode.

Input Selector Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentations and shaded Index Numbers indicate sub-parameters

Table 5-39. Input Selector Function Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
Tag Description TAG_DESC	2	RW	ALL	7 bit ASCII	spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 Valid Bits: 7: OOS, 4: MAN, 3: AUTO The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS, MAN, AUTO	OOS until block is configured, then last valid target	
ACTUAL	5.2	RO	ALL			
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO	OOS+MAN +AUTO	
NORMAL	5.4	RW	ALL		AUTO	
Block Error BLOCK_ERR	6	RO	N/A	1: Block Configuration Error 7: Input Failure / Bad PV status 8: Output Failure 14: Power Up 15: Out-of-Service	Dynamic	Data Type: Bit String 0=Inactive 1=Active This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
Output OUT	7		MAN OOS	Status OUT_RANGE Value	Dynamic	Data Type: DS-65 The block output value and status.
Output Range OUT_RANGE	8		ALL	EU at 100% EU at 0% Units Index Decimal Point	100 0 % 2	Data Type: DS-67 High and low scale values, engineering units code, and number of digits to the right of the decimal point associated with OUT.
Grant Deny GRANT_DENY	9					Data Type: DS-70 Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. Not used by device. GRANT: 0=N/A, 1=granted DENY: 0=N/A, 1=denied
GRANT	9.1		ALL	0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
DENY	9.2		ALL		All bits:0	
Status Options STATUS_OPTS	10		OOS	2: Use Uncertain as GOOD 8: Uncertain if MAN	All bits: 0	Data Type: Bit String Allows you to select options for status handling and processing. The supported status option for the input selector block is: “Use Uncertain as Good”, “Uncertain if Man mode.”
Input 1 IN_1	11		ALL	Status Value	BAD NC constant 0	Data Type: DS-65 The block input value and status.

–Continued–

Table 5-39. Input Selector Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Input 2 IN_2	12		ALL	Status	BAD NC constant	Data Type: DS-65 The block input value and status.
				Value	0	
Input 3 IN_3	13		ALL	Status	BAD NC constant	Data Type: DS-65 The block input value and status.
				Value	0	
Input 4 IN_4	14		ALL	Status	BAD NC constant	Data Type: DS-65 The block input value and status.
				Value	0	
Disable Analog Input 1 DISABLE_1	15		ALL	Status	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_1, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Value 0=Use 1=Disable	0	
Disable Analog Input 2 DISABLE_2	16		ALL	Status	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_2, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Value 0=Use 1=Disable	0	
Disable Analog Input 3 DISABLE_3	17		ALL	Status	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_3, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Value 0=Use 1=Disable	0	
Disable Analog Input 4 DISABLE_4	18		ALL	Status	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_4, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Value 0=Use 1=Disable	0	
Select Type SELECT_TYPE	19		ALL	1=First Good 2=Minimum 3=Maximum 4=Middle 5=Average 6=Hot Spare	0	Data Type: Unsigned8 Determines the selector action
Min Good MIN_GOOD	20		ALL	1 – 4 0 initial value only	0	Data Type: Unsigned8 The minimum number of inputs which are “good” is less than the value of MIN_GOOD then set the OUT status to “bad”.
Selected SELECTED	21	RO	N/A	Status		Data Type: DS-66 The integer indicating the selected input number.
				Value 0 – 8	Dynamic	
Operator Select OP_SELECT	22		ALL	Status	BAD NC constant	Data Type: DS-66 An operator settable parameter to force a given input to be used.
				Value 0 – 8	0	

–Continued–

Table 5-39. Input Selector Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Update Event UPDATE_EVT	23					Data Type: DS-73 This alert is generated by any change to the static data.
UNACKNOWLEDGED	23.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
UPDATE_STATE	23.2	RO	N/A	0=Undefined 1=Update Reported 2=Updated not reported	0	
TIME_STAMP	23.3	RO	N/A		0	
STATIC_REVISION	23.4	RO	N/A		0	
RELATIVE_INDEX	23.5	RO	N/A		0	
Block Alarm BLOCK_ALM	24					Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure, or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in BLOCK_ERR. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
UNACKNOWLEDGED	24.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	24.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0	
TIME_STAMP	24.3	RO	N/A		0	
SUBCODE	24.4	RO	N/A		0	
VALUE	24.5	RO	N/A		0	
Extended Parameters						
In 5 IN_5	25		ALL	Status	BAD NC constant	Data Type: DS-65 Input value and status.
				Value	0	
In 6 IN_6	26		ALL	Status	BAD NC constant	Data Type: DS-65 Input value and status.
				Value	0	
In 7 IN_7	27		ALL	Status	BAD NC constant	Data Type: DS-65 Input value and status.
				Value		
In 8 IN_8	28		ALL	Status	BAD NC constant	Data Type: DS-65 Input value and status.
				Value	0	
Disable Analog Input 5 DISABLE_5	29		ALL	Status	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_5, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Value 0=Use 1=Disable	0	
Disable Analog Input 6 DISABLE_6	30		ALL	Status	BAD NC constant 0	Data Type: DS-66 Enable/Disable for Input_6, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Value 0=Use 1=Disable	0	
Disable Analog Input 7 DISABLE_7	31		ALL	Value	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_7, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Status 0=Use 1=Disable	0	

–Continued–

Table 5-39. Input Selector Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Disable Analog Input 8 DISABLE_8	32		ALL	Value	BAD NC constant	Data Type: DS-66 Enable/Disable for Input_8, If parameter is TRUE then input is disabled. If parameter status is BAD it is not evaluated.
				Status 0=Use 1=Disable	0	
Number used to average AVG_USE	33			1 to 8	0	Data Type: Unsigned8 Number used to average the output. The number of min and max dropped is the number of inputs minus AVG_USE.
Alarm Summary ALARM_SUM	34					Data Type: DS-74 Current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
CURRENT	34.1	RO	NA	1: Hi Hi 2: Hi 3: Lo Lo 4: Lo		
UNACKNOWLEDGED	34.2	RO	NA			
UNREPORTED	34.3	RO	NA			
DISABLED	34.4	RW	ALL			
Acknowledge Option ACK_OPTION	35		ALL	1: Hi Hi 2: Hi 3: Lo Lo 4: Lo	0	Data Type: Bit String Selection of whether alarms associated with the block will be automatically acknowledged. 0=Disable 1=Enable
Alarm Hysteresis ALARM_HYS	36		ALL	0 to 50%	0.50%	Data Type: Float Hysteresis on alarms
High High Priority HI_HI_PRI	37		ALL	0 TO 15	0	Data Type: Unsigned8 Priority of the alarm
High High Limit HI_HI_LIM	38		ALL		0	Data Type: Float Value of analog input which will generate an alarm
High Priority HI_PRI	39		ALL	0 TO 15	0	Data Type: Unsigned8 Priority of the alarm
High Limit HI_LIM	40		ALL		0	Data Type: Float Value of analog input which will generate an alarm
Low Priority LO_PRI	41		ALL	0 TO 15	0	Data Type: Unsigned8 Priority of the alarm
Low Limit LO_LIM	42		ALL		0	Data Type: Float Value of analog input which will generate an alarm
Low Low Priority LO_LO_PRI	43		ALL	0 TO 15	0	Data Type: Unsigned8 Priority of the alarm
Low Low Limit LO_LO_LIM	44		ALL		0	Data Type: Float Value of analog input which will generate an alarm
High High Alarm HI_HI_ALM	45					Data Type: DS-71 The high high alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm.
UNACKNOWLEDGED	45.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	45.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0	
TIME_STAMP	45.3	RO	N/A		0	
SUBCODE	45.4	RO	N/A		0	
VALUE	45.5	RO	N/A		0	

–Continued–

Table 5-39. Input Selector Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
High Alarm HI_ALM	46					
UNACKNOWLEDGED	46.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	46.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0	Data Type: DS-71 The high alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm.
TIME_STAMP	46.3	RO	N/A		0	
SUBCODE	46.4	RO	N/A		0	
VALUE	46.5	RO	N/A		0	
Low Alarm LO_ALM	47					
UNACKNOWLEDGED	47.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	47.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0	Data Type: DS-71 The low alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm.
TIME_STAMP	47.3	RO	N/A		0	
SUBCODE	47.4	RO	N/A		0	
VALUE	47.5	RO	N/A		0	
Low Low Alarm LO_LO_ALM	48					
UNACKNOWLEDGED	48.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	48.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0	Data Type: DS-71 The low low alarm data, which includes a value of the alarm, a timestamp of occurrence, and the state of the alarm.
TIME_STAMP	48.3	RO	N/A		0	
SUBCODE	48.4	RO	N/A		0	
VALUE	48.5	RO	N/A		0	
Output Discrete OUT_D	49		MAN OOS	Status		Data Type: DS-66 Discrete output to indicate a selected alarm value
				Value 0, 1		
Alarm Select ALM_SEL	50		ALL	Status		Data Type: Bit String Used to select the process alarm conditions that will cause the OUT_D parameter to be set.
				1: Hi Hi 2: Hi 3: Lo Lo 4: Lo	All bits:0	

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-40. ISEL Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	OUT
11	IN_1
12	IN_2
13	IN_3
14	IN_4
15	DISABLE_1
16	DISABLE_2
17	DISABLE_3
18	DISABLE_4
21	SELECTED
22	OP_SELECT
25	IN_5
26	IN_6
27	IN_7
28	IN_8
29	DISABLE_5
30	DISABLE_6
31	DISABLE_7
32	DISABLE_8
34.1	ALARM_SUM.CURRENT
34.2	ALARM_SUM.UNACKNOWLEDGED
34.3	ALARM_SUM.UNREPORTED
34.4	ALARM_SUM.DISABLED

Table 5-41. ISEL Function Block, View 2

Index Number	Parameter
1	ST_REV
8	OUT_RANGE
9.1	GRANT_DENY.GRANT
9.2	GRANT_DENY.DENY

Table 5-42. ISEL Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	OUT
11	IN_1
12	IN_2
13	IN_3
14	IN_4
15	DISABLE_1
16	DISABLE_2
17	DISABLE_3
18	DISABLE_4
21	SELECTED
22	OP_SELECT
25	IN_5
26	IN_6
27	IN_7
28	IN_8
29	DISABLE_5
30	DISABLE_6
31	DISABLE_7
32	DISABLE_8
34.1	ALARM_SUM.CURRENT
34.2	ALARM_SUM.UNACKNOWLEDGED
34.3	ALARM_SUM.UNREPORTED
34.4	ALARM_SUM.DISABLED
49	OUT_D

Table 5-43. ISEL Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
10	STATUS_OPTS
19	SELECT_TYPE
20	MIN_GOOD
33	AVG_USE
35	ACK_OPTION
36	ALARM_HYS
37	HI_HI_PRI
38	HI_HI_LIM
39	HI_PRI
40	HI_LIM
41	LO_PRI
42	LO_LIM
43	LO_LO_PRI
44	LO_LO_LIM
50	ALM_SEL

375 Field Communicator Menu Structure

INPUT SELECTOR FUNCTION BLOCK

Quick Config
- Alert Key
- Min Good
- Output Range: EU at 100%
- Output Range: EU at 0%
- Output Range: Units Index
- Output Range: Decimal
- Select Type

Common Config
- Min Good
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output Range: EU at 100%
- Output Range: EU at 0%
- Output Range: Units Index
- Output Range: Decimal
- Select Type

Advanced Config
- Alert Key
- Static Revision
- Status Options
- Strategy

Connectors
- Disable Analog Input 1: Status
- Disable Analog Input 1: Value
- Disable Analog Input 2: Status
- Disable Analog Input 2: Value
- Disable Analog Input 3: Status
- Disable Analog Input 3: Value
- Disable Analog Input 4: Status
- Disable Analog Input 4 : Value
- Input 1: Status
- Input 1: Value
- Input 2: Status
- Input 2: Value
- Input 3: Status
- Input 3: Value
- Input 4: Status
- Input 4: Value
- Operator Select: Status
- Operator Select: Value
- Output: Status
- Output: Value
- Selected: Status
- Selected: Value

Online
- Block Error
- Disable Analog Input 1: Status
- Disable Analog Input 1: Value
- Disable Analog Input 2: Status
- Disable Analog Input 2: Value
- Disable Analog Input 3: Status
- Disable Analog Input 3: Value
- Disable Analog Input 4: Status
- Disable Analog Input 4: Value
- Input 1: Status
- Input 1: Value
- Input 2: Status
- Input 2: Value
- Input 3: Status
- Input 3: Value
- Input 4: Status
- Input 4: Value
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Operator Selected: Status
- Operator Selected: Value
- Output: Status
- Output: Value
- Selected: Status
- Selected: Value

Status
- Block Error

All
- Characteristics
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- Output: Status
- Output: Value
- Output Range: EU at 100%
- Output Range: EU at 0%
- Output Range: Units Index
- Output Range: Decimal
- Grant Deny: Grant
- Grant Deny: Deny
- Status Options
- Input 1: Status
- Input 1: Value
- Input 2: Status
- Input 2: Value
- Input 3: Status
- Input 3: Value
- Input 4: Status
- Input 4: Value
- Disable Analog Input 1: Status
- Disable Analog Input 1: Value
- Disable Analog Input 2: Status
- Disable Analog Input 2: Value
- Disable Analog Input 3: Status
- Disable Analog Input 3: Value
- Disable Analog Input 4: Status
- Disable Analog Input 4: Value
- Select Type
- Min Good
- Selected: Status
- Selected: Value
- Operator Select: Status
- Operator Select: Value
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Analog Input 5: Status
- Analog Input 5: Value
- Analog Input 6: Status
- Analog Input 6: Value
- Analog Input 7: Status
- Analog Input 7: Value
- Analog Input 8: Status
- Analog Input 8: Value
- Disable Analog Input 5: Status
- Disable Analog Input 5: Value
- Disable Analog Input 6: Status
- Disable Analog Input 6: Value
- Disable Analog Input 7: Status
- Disable Analog Input 7: Value
- Disable Analog Input 8: Status
- Disable Analog Input 8: Value
- Number Used to average

All continued
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- Acknowledge Option
- Alarm Hysteresis
- High High Priority
- High High Limit
- High Priority
- High Limit
- Low Priority
- Low Limit
- Low Low Priority
- Low Low Limit
- High High Alarm: Unacknowledged
- High High Alarm: Alarm State
- High High Alarm: Time Stamp
- High High Alarm: Subcode
- High High Alarm: Float Value
- High Alarm: Unacknowledged
- High Alarm: Alarm State
- High High Alarm: Time Stamp
- High Alarm: Subcode
- High Alarm: Float Value
- Low Alarm: Unacknowledged
- Low Alarm: Alarm State
- Low Alarm: Time Stamp
- Low Alarm: Subcode
- Low Alarm: Float Value
- Low Low Alarm: Unacknowledged
- Low Low Alarm: Alarm State
- Low Low Alarm: Time Stamp
- Low Low Alarm: Subcode
- Low Low Alarm: Float Value
- Alarm Output: Status
- Alarm Output: Value
- Alarm Select

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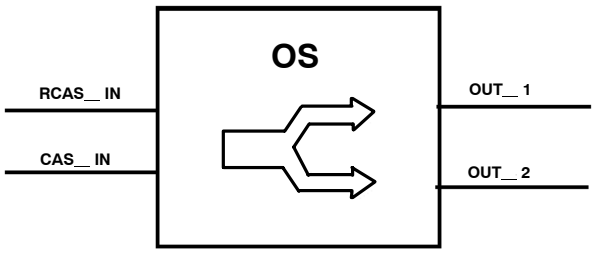

Figure 5-17. Output Splitter (OS) Function Block

A typical sequencing application has both valves closed at 0% input. One valve fully opens as the input rises to 50% and the other stays shut. The second valve opens as the input rises above 50%, and the first valve may remain open or shut off quickly.

Because this block is in the control path, it is able to pass limit and cascade initialization information back to the upstream block. Table 5-47 lists the OS block parameters and their descriptions, units of measure, and index numbers. Figures 5-18 and 5-19 illustrate the internal components of the OS function block.

5

Output Splitter (OS) Function Block Overview

The Output Splitter block provides the capability to drive two control outputs from a single input. Each output is a linear function of some portion of the input. Back calculation support is provided using the same linear function in reverse. Cascade initialization is supported by a decision table for combinations of input and output conditions.

This block is normally used in split ranging or sequencing of multiple valve applications. A typical split range application has both valves closed when the splitter input is 50%. One valve opens fully as the input drops to 0%. The other valve opens as the input rises above 50%.

Modes

The Output Splitter function block supports the following actual modes:

- **Out of Service (OOS)**—The block is not processed. FIELD_VAL and PV are not updated and the OUT status is set to Bad: Out of Service. The BLOCK_ERR parameter shows Out of Service. In this mode, you can make changes to all configured parameters.

By using permitted mode the target mode of a block may be restricted to one or more of the following modes: Cas, Auto or OOS.

- **Initialization Manual (IMan)**—The output path is not complete (for example, the cascade–to–slave path might not be open). In IMan mode, OUT tracks BKCAL_IN, which allows for bumpless transfer of control.

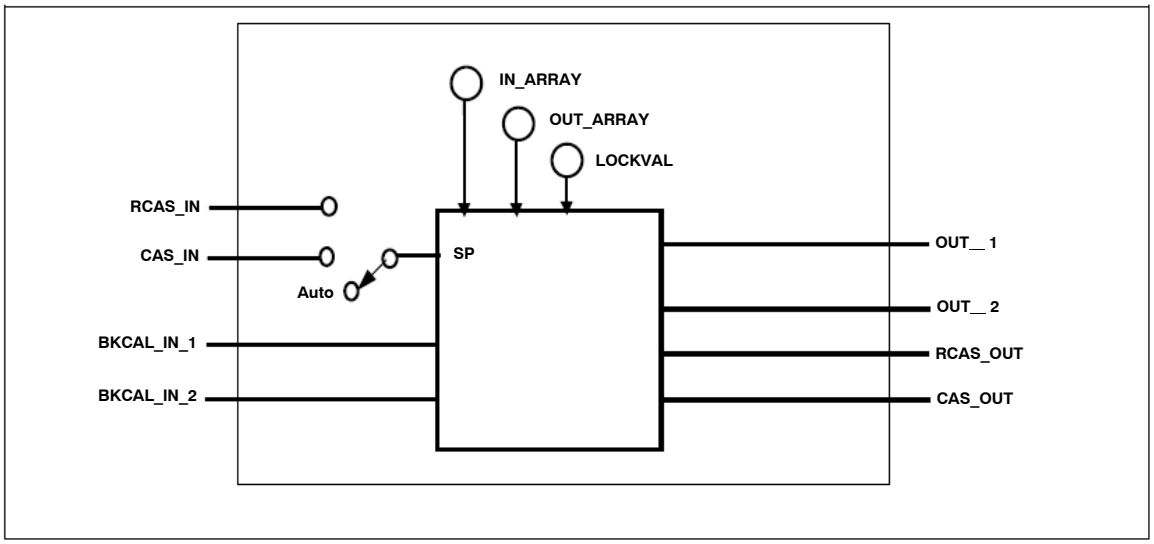

Figure 5-18. Output Splitter Function Block Schematic

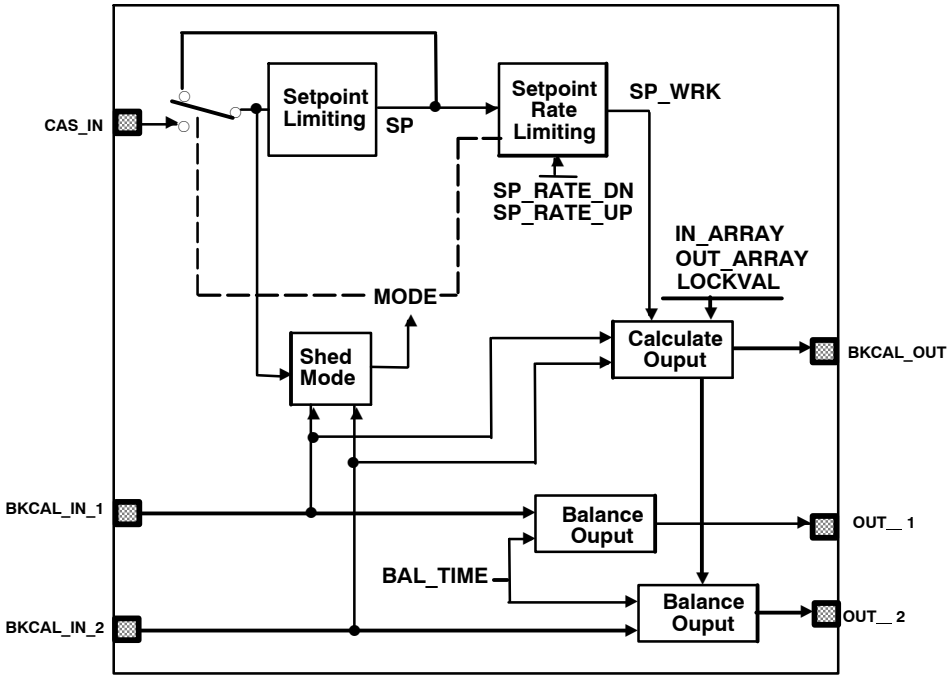

Figure 5-19. Output Splitter Function Block Schematic Diagram

- **Automatic (Auto)**—The block output (OUT) reflects the target operating point specified by the setpoint (SP) parameter.

- **Cascade (Cas)**—The SP parameter is set by another function block through a connection to CAS_IN. The SP value is used to set the OUT parameter automatically. This is the most frequently used mode in the digital valve controller.

The block's normal mode is Cascade (Cas). You can isolate the block for testing by using Automatic (Auto) mode and adjusting the setpoint.

When a block attached to an output requests initialization, one of the following actions might occur:

- When the other output is not in Cas mode, the block attached to the input is initialized.

- When the other output is in Cas mode, this output returns to the value calculated from its slope in a specified time period.

If the Status Option to Propagate failure is set, the block propagates device failure only if both BKCAL_IN show failed status. Otherwise the upstream cascade would be broken by a failure at either output.

The statuses of OUT_1 [8] and OUT_2 [9] are determined by the statuses of BKCAL_IN_1 and BKCAL_IN_2 and the actual mode of the block.

When a BKCAL_IN input sees that its downstream block is not in Cas mode, the Splitter function block sets the corresponding OUT value to the BKCAL_IN value. However, this may not be the same value that is calculated by the splitter algorithm. When the mode of the downstream block is changed to Cas, the difference between the calculated output and the back-calculation input is computed and the difference is added to the calculated output. Next, the difference is reduced to zero over the time defined by the BAL_TIME parameter.

When both BKCAL_IN_1 and BKCAL_IN_2 indicate that the downstream blocks are not in Cas mode or have Bad status, the first downstream block that goes to Cas mode causes the upstream block to initialize so that there is no difference between the calculated output and the back-calculation input. This provides bumpless transfer for the first downstream block.

Status Handling

Sub-status value received at CAS_IN [14] is passed to both outputs, except for those used in the cascade handshake. An IFS goes to both outputs. The status option IFS if Bad CAS_IN is available.

Limit Handling

The splitter function block is designed to combine the limit information from the two downstream blocks into

limits for the upstream block. The general principle is to allow the upstream block to continue control for as long as possible.

The upstream block is high-limited (BKCAL_OUT of the Splitter block has high-limited status) when:

- Both downstream blocks are high-limited (both BKCAL_INS of the Splitter block have high-limited status)

or

- One downstream block is high-limited, the associated output slope is positive, and the other block has Bad status or is not in Cas mode

or

- One downstream block is low-limited, the associated output slope is negative, and the other block has Bad status or is not in Cas mode

or

- SP is greater than or equal to X22

The upstream block is low-limited when:

- Both downstream blocks are low-limited

or

- One downstream block is low-limited, the associated output slope is positive, and the other block has Bad status or is not in Cas mode

or

- One downstream block is high-limited, the associated output slope is negative, and the other block has Bad status or is not in Cas mode

or

- SP is less than or equal to X11

Input to Output Mapping

The relationship of each output to the input may be defined by a line. Each line may be defined by its endpoints. Examples of graphical representations of OUT_1 and OUT_2 vs. SP are shown in figure 5-20 for a split range and a sequencing application.

Table 5-44. IN_ARRAY Coordinates

Index	Coordinate
0	X_{11} – Start value of SP for the OUT_1 line. ($X_{11} < X_{12}$)
1	X_{12} – End value of SP for the OUT_1 line. ($X_{11} < X_{12}$)
2	X_{21} – Start value of SP for the OUT_2 line. ($X_{21} < X_{22}$)
3	X_{22} – End value of SP for the OUT_2 line. ($X_{21} < X_{22}$)

Table 5-45. OUT_ARRAY Coordinates

Index	Coordinate
0	Y_{11} – Value of OUT_1 at X_{11}
1	Y_{12} – Value of OUT_1 at X_{12}
2	Y_{21} – Value of OUT_2 at X_{21}
3	Y_{22} – Value of OUT_2 at X_{22}

The block has the same SP structure as the PID block, except that there is no limiting applied to the SP. The SP may be used in Auto mode for testing. The operator would use the output of the PID to accomplish the same purpose. Each downstream block can be taken out of cascade if it becomes necessary to gain control of them.

The examples shown in figure 5-20 do not show the full range of possibilities. The lines could overlap like an X, or both start from the origin but have different slopes. The endpoints do not have to lie within 0–100%. Limits in the external blocks may effect the useful range of a line. Units of percent are used in the examples because the common application of this block is to valves, but any units may be used to suit the application.

The following parameters as paired coordinates are used to specify the output splitter operation:

X_{11}, Y_{11}, X_{12}, Y_{12}

X_{21}, Y_{21}, X_{22}, Y_{22}

Where X_{nJ} is the value of SP associated with OUT_n and X_{n1} and X_{n2} refer to the 1st and 2nd coordinates of the nth curve respectively. Y_{nJ} is the value of OUT_n and Y_{n1} and Y_{n2} refer to the 1st and 2nd coordinates of the nth curve respectively.

By specifying the coordinates as shown in tables 5-44 and 5-45, the endpoints of the lines are defined. The contents of the respective X's are held in the IN_ARRAY parameter and the contents of the respective Y's are held in the OUT_ARRAY parameter. If a set of points are specified such that a region of the input range is not specified, then the corresponding OUT_n will be set to the closest endpoint of the input value, either high or low, when the specified region is exceeded.

A configuration error is set in BLOCK_ERR and the actual mode of the block goes to Out of Service if the X values have any of the following conditions: $X_{21} < X_{11}$, $X_{12} <= X_{11}$, $X_{22} <= X_{21}$.

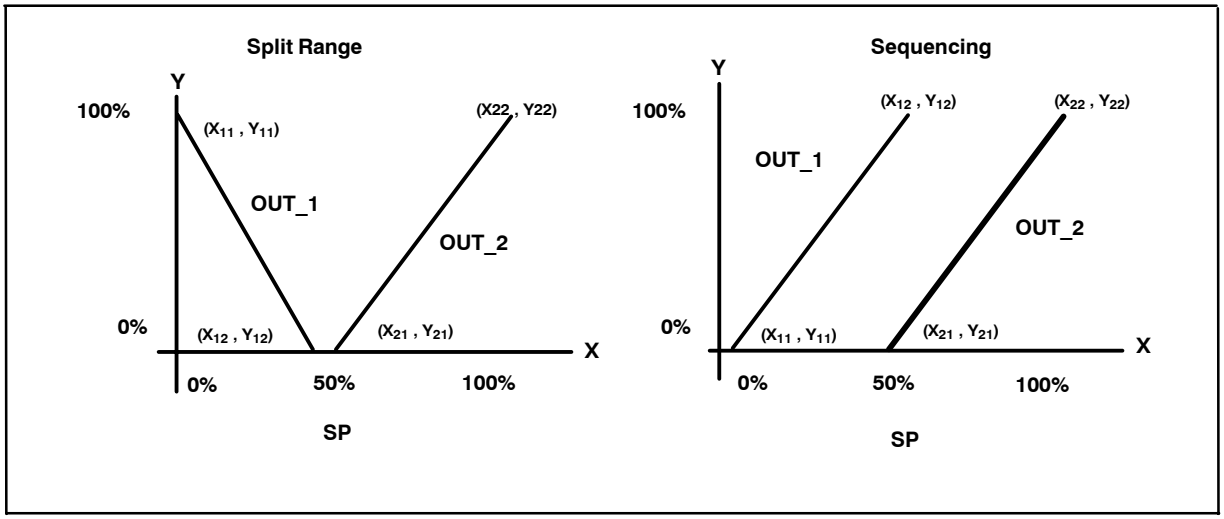

Figure 5-20. Split Range and Sequence Operation

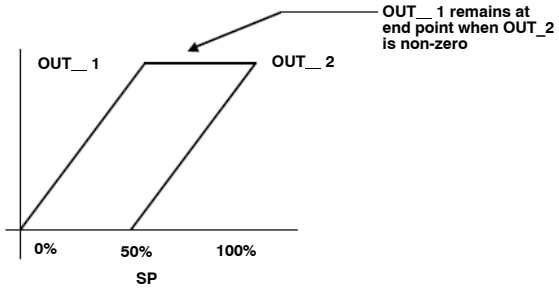

Figure 5-21. OUT with LOCKVAL True

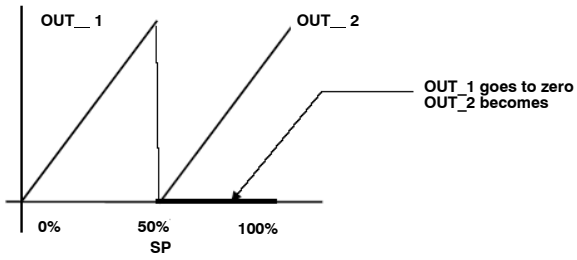

Figure 5-22. OUT with LOCKVAL False

Refer to figure 5-21 for an example of LOCKVAL = true, and figure 5-22 for an example of LOCKVAL = false. The parameter LOCKVAL provides an option to specify whether OUT_1 remains at its ending level when control is switched to OUT_2, or goes to Y_{11}. If LOCKVAL is true, OUT_1 remains at its ending value when X is greater than X_{12}. If LOCKVAL is false, then OUT_1 goes to Y_{11} when X is greater than X_{12} .

Some hysteresis in the switching point may be required because the output may change by a full stroke of the valve. HYSTVAL [12] contains the amount of hysteresis. If X < = X12−HYSTVAL, OUT_1 may be determined by the calculated y value. If X12−HYSTVAL < X < X12 and X has not reached X12 since it was less than X12−HYSTVAL, OUT_1 may be determined by the calculated y value. If X12−HYSTVAL < X < X12 and X has reached X12 since it was less than X12−HYSTVAL, OUT_1 may be determined by the LOCKVAL setting. If X12 < X, OUT_1 may be determined by the LOCKVAL setting.

Initialization and Back Calculation Requirements

Refer to figure 5-23, Output Splitter Configuration, where:

PID1 = Upstream driving controller or function block.

Splitter = Split range function block being described.

AO = Receiver of OUT_1 for 0−50% range of SP

PID2 = Receiver of OUT_2 for 50−100% range of SP

CAS_IN of the Splitter receives the OUT of PID1. BKCAL_IN of PID1 receives BKCAL_OUT of the Splitter. CAS_IN of the AO receives OUT_1 of the Splitter and PID2 receives OUT_2 of the Splitter. BKCAL_IN_1 of the Splitter receives BKCAL_OUT of the AO and BKCAL_IN_2 of the Splitter receives BKCAL_OUT of PID2.

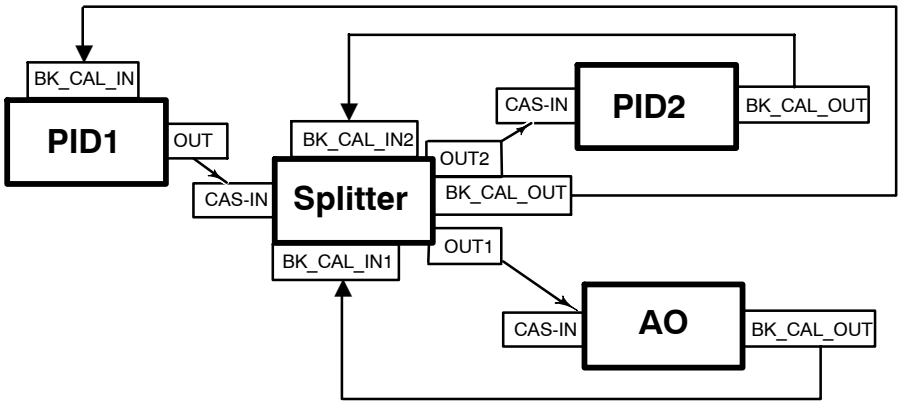

Figure 5-23. Output Splitter Configuration

5

The discussion in this section defines the behavior which is used to handle the initial value calculation and status which can in turn be sent to PID1. This behavior is defined in such a way that no “bumps” are generated by changing modes, and that PID1 does not wind up.

The splitter utilizes special handling for cascade initialization because it has two independent outputs. When a downstream block indicates to the splitter that it wants to initialize, by asserting IR (initialization request) on its BKCAL_OUT, one of two things happens. Under some circumstances, it is possible to pass an initialization request from a downstream block back up to the block upstream of the splitter, so that all three blocks balance for bumpless transfer to cascade mode. Otherwise, the requested splitter output goes to the requested value by placing an internal offset between that output and the output of the curve, and then ramping that offset to zero in BAL_TIME seconds after the cascade is made up.

The splitter normally runs with both outputs connected to blocks in cascade mode. If one or both of the blocks is not in cascade mode, special limiting action is taken. Specifically, if one block indicates that it is not in cascade by NI (not invited) status on its BKCAL_OUT, then the BKCAL_OUT of the splitter asserts limits at the range extremes of the block that is still in cascade mode. Even if the upstream controller does not want to operate in that range, there will be no reset windup when it can move into the range. If both downstream blocks show NI, then the splitter can only wait until one of them requests cascade initialization. BKCAL_OUT of the splitter can hold the upstream block at the value of the SP. The actual mode is IMan.

Table 5-46. OUT_ARRAY Coordinates

BKCAL_IN_1	BKCAL_IN_2	BKCAL_OUT	Action
NI	NI	NI	Not Specified
NI	OK	OK	BKCAL_OUT limited to X21 low and X22 high
OK	NI	OK	BKCAL_OUT limited to X11 and X12 high
IR	NI	IR	Initialize cascade to value given by curve X1 vs Y1
IR	OK	OK	Initialize OUT_1 using internal offset from Y1
NI	IR	IR	Initialize cascade to value given by curve X2 vs Y2
OK	IR	OK	Initialize OUT_2 using internal offset from Y2

Note 1: OK means the cascade is closed.
Note 2: Recommend using the average of BKCAL_IN_1 and BKCAL_IN_2, or just SP.

When cascade initialization is requested, by IR substatus on a BKCAL_IN, it is first necessary to determine if the other BKCAL_IN has NI substatus. If so, the value at the BKCAL_IN asserting IR is taken as the Y value for its curve, and the resulting X value is sent on BKCAL_OUT to PID1. If the other substatus is OK, then the internal offset and BAL_TIME is used. If both blocks have IR substatus, then one output is processed until its cascade is closed. The choice is based on the presence of limit status in BKCAL_IN. If BKCAL_IN_1 is limited, then if BKCAL_IN_2 is not limited then OUT_2 is processed first, else OUT_1 is processed first.

Cascade initialization is also required when the block transitions from Auto to Cas mode. This action is identical to that described for the PID block.

The required actions are summarized in table 5-46.

The BKCAL_OUT status shows limited high if an increase in SP cannot be effectively passed on to either output because the BKCAL_IN_n of both outputs indicates that a move in the needed direction is limited. Similarly, limited low is set if a decrease in SP cannot be effectively passed on to either output. The slope of the limited line(s) affects the limit direction. BKCAL_OUT also shows limit status at the X extremes X11 and X22.

Initialization is not automatic under all circumstance because some situations have conflicting needs. In general, when a control region is in trouble, the upstream controller is limited so it will not drive further into that region. When you want to move to the other active region, you can put the upstream controller into Man mode and move it, or you can drop the good downstream block out of Cas mode for one evaluation cycle and then restore Cas mode. This initializes the upstream controller to the remaining good region of control.

Output Splitter Function Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-47. Output Splitter Function Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
Tag Description TAG_DESC	2	RW	ALL	7 bit ASCII	Spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned 16: The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW		7:OOS 3:AUTO 2:CAS	OOS until block configured, then last valid target	
ACTUAL	5.2	RO			OOS	
PERMITTED	5.3	RW		OOS+AUTO+CAS	OOS AUTO CAS	
NORMAL	5.4	RW			AUTO+CAS	
Block Error BLOCK_ERR	6	RO	N/A	1: Block Configuration Error 7: Input Failure/Bad PV Status 8: Output Failure 14: Power-up 15: Out-of-Service	Dynamic	Data Type: Bit String 0=Inactive 1=Active This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
Setpoint SP	7			PV_SCALE +/– 10%		Data Type: DS-65 Analog setpoint of the block
Output 1 OUT_1	8		MAN OOS	OUT_SCALE +/– 10%		Data Type: DS-65 The primary analog output value calculated as a result of executing the function (the first output value and status).
Output 2 OUT_2	9		MAN OOS	OUT_SCALE +/– 10%		Data Type: DS-65 The primary analog output value calculated as a result of executing the function (the second output value and status).
Output 1 Range OUT_1_RANGE	10	RO		EU at 100% EU at 0 % Unit Index Decimal Point	100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of decimal places to be used in displaying the OUT value, this parameter has no effect on this block.

–Continued–

Table 5-47. Output Splitter Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Output 2 Range OUT_2_RANGE	11	RO		EU at 100% EU at 0 % Unit Index Decimal Point	100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of decimal places to be used in displaying the OUT value, this parameter has not effect on this block.
Grant Deny GRANT_DENY	12					Data Type: DS-70 Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. GRANT:0=N/A, 1=granted DENY: 0=N/A, 1= denied
GRANT	12.1		N/A	0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
DENY	12.2		N/A		All bits: 0	
Status Options STATUS_OPTS	13		OOS	1: IFS if BAD CAS_IN	All bits: 0	Data Type: Bit String 0=Disabled 1=Enabled User option for status
Cascade Input CAS_IN	14			Status	BAD: NC: const	Data Type: DS-65 The remote setpoint from another block.
				Value	0	
Back Calculation Output BKCAL_OUT	15	RO		Status Limits		Data Type: DS-65 Output value to another block for backwards output tracking.
Input Array IN_ARRAY	16				All: 0	Data Type: Float Used with OUT_ARRAY to map input to output. See FF892 3.2.2.
Output Array OUT_ARRAY	17				All: 0	Data Type: Float Used with IN_ARRAY to map input to output. See FF892 3.2.2.
Lockval LOCKVAL	18			0=Undfined 1=no lock 2=lock	0= Undefined	Data Type: Enum Used with OUT_ARRAY to map input to output. See FF892 3.2.2.
Back Calculation Input 1 BKCAL_1_IN	19			Status	BAD: NC: const	Data Type: DS-65 The value and status reflecting the BKCAL_OUT of the lower block associated with OUT_1. It is used for initialization and to prevent windup in upstream blocks.
				Value	0	
Back Calculation Input 2 BKCAL_2_IN	20			Status	BAD: NC: const	Data Type: DS-65 The value and status reflecting the BKCAL_OUT of the lower block associated with OUT_2. It is used for initialization and to prevent windup in upstream blocks.
				Value	0	
Balance Time BAL_TIME	21			Positive	0	Data Type: Float Specifies the time for the internal working value of bias or ratio to return to the operator set bias or ratio, in seconds.
Hystval HYSTVAL	22					
Update Event UPDATE_EVT	23	RO	N/A			Data Type: DS-73 This alert is generated by any change to the static data.
UNACKNOWLEDGED	23.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0= Undefined	
UPDATE STATE	23.2	RO	N/A	0=Undefined 1=Update Reported 2=Updated not reported	0= Undefined	
TIME_STAMP	23.3	RO	N/A		0	
STATIC_REVISION	23.4	RO	N/A		0	
RELATIVE_INDEX	23.5	RO	N/A		0	

–Continued–

Table 5-47. Output Splitter Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Block Alarm BLOCK_ALM	24					Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure, or system problems in the block. The cause of the alert is entered in the subcode field.
UNACKNOWLEDGED	24.1	RW	N/A	0: Undefined 1: Acknowledged 2: Unacknowledged		
ALARM_STATE	24.2	RO	N/A	0: Undefined 1: Clear reported 2: Clear not reported 3: Active reported 4: Active not reported		
TIME_STAMP	24.3	RO	N/A			
SUBCODE	24.4	RO	N/A			
VALUE	24.5	RO	N/A			

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-48. OS Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	SP
8	OUT_1
9	OUT_2
14	CAS_IN

Table 5-49. OS Function Block, View 2

Index Number	Parameter
1	ST_REV
10	OUT_1_RANGE
11	OUT_2_RANGE
12.1	GRANT_DENY.GRANT
12.2	GRANT_DENY.DENY

Table 5-50. OS Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	SP
8	OUT_1
9	OUT_2
14	CAS_IN
15	BKCAL_OUT
19	BKCAL_1_IN
20	BKCAL_2_IN

Table 5-51. OS Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
13	STATUS_OPTS
16	IN_ARRAY
17	OUT_ARRAY
18	LOCKVAL
21	BAL_TIME

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OUTPUT SPLITTER FUNCTION BLOCK

All
Characteristics
Static Revision
Tag Description
Strategy
Alert Key
Block Mode: Target
Block Mode: Actual
Block Mode: Permitted
Block Mode: Normal
Block Error
Setpoint: Status
Setpoint: Value
Output 1: Status
Output 1: Value
Output 2: Status
Output 2: Value
Output 1 Range: EU at 100%
Output 1 Range: EU at 0%
Output 1 Range: Units Index
Output 1 Range: Decimal
Output 2 Range: EU at 100%
Output 2 Range: EU at 0%
Output 2 Range: Units Index
Output 2 Range: Decimal
Grant Deny: Grant
Grant Deny: Deny
Status Options
Cascade Input: Status
Cascade Input: Value
Back Calculation Output: Status
Back Calculation Output: Value
Input Array[1]
Input Array[2]
Input Array[3]
Input Array[4]
Output Array[1]
Output Array[2]
Output Array[3]
Output Array[4]
Lockval
Back Calculation Input 1: Status
Back Calculation Input 1: Value
Back Calculation Input 2: Status
Back Calculation Input 2: Value
Balance Time
Hystval
Update Event: Unacknowledged
Update Event: Update State
Update Event: Time Stamp
Update Event: Static Rev
Update Event: Relative Index
Block Alarm: Unacknowledged
Block Alarm: Alarm State
Block Alarm: Time Stamp
Block Alarm: Subcode
Block Alarm: Value

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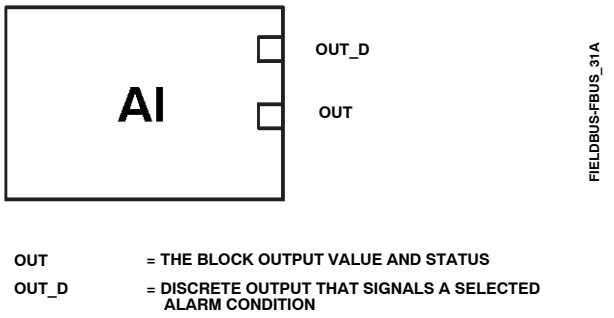


Figure 5-24. Analog Input (AI) Function Block

5

Analog Input (AI) Function Block Overview

The Analog Input (AI) function block processes field device measurements and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The measuring device may have several measurements or derived values available in different channels. Use the channel number to define the variable that the AI block processes.

The AI block supports alarming, signal scaling, signal filtering, signal status calculation, mode control, and simulation. In Automatic mode, the block's output parameter (OUT [8]) reflects the process variable (PV [7]) value and status. In Manual mode, OUT [8] may be set manually. The Manual mode is reflected on the output status. A discrete output (OUT_D [37]) is provided to indicate whether a selected alarm condition is active. Alarm detection is based on the OUT [8] value and user specified alarm limits. Figure 5-26 illustrates the internal components of the AI function block, and table 5-56 lists the AI block parameters and their units of measure, descriptions, and index numbers.

Analog Input Block Modes

The AI function block supports three modes of operation as defined by the MODE_BLK [5] parameter:

- **Manual (Man)** The block output (OUT [8]) may be set manually.

- **Automatic (Auto)** OUT reflects the analog input measurement or the simulated value when simulation is enabled.

- **Out of Service (OOS)** The block is not processed. FIELD_VAL [19] and PV [7] are not updated and the OUT [8] status is set to Bad: Out of Service. The BLOCK_ERR [6] parameter shows Out of Service. In this mode, you can make changes to all configured parameters. The target mode of a block may be restricted to one or more of the supported modes.

Alarm Detection

A block alarm will be generated whenever the BLOCK_ERR [6] has an error bit set. The types of block errors for the AI block are defined in table 5-54.

Process Alarm detection is based on the OUT [8] value. You can configure the alarm limits of the following standard alarms:

- High (HI_LIM [28])
- High high (HI_HI_LIM [26])
- Low (LO_LIM [30])
- Low low (LO_LO_LIM [32])

In order to avoid alarm chattering when the variable is oscillating around the alarm limit, an alarm hysteresis in percent of the PV [7] span can be set using the ALARM_HYS [24] parameter. The priority of each alarm is set in the following parameters:

- HI_PRI [27]
- HI_HI_PRI [25]
- LO_PRI [29]
- LO_LO_PRI [31]

Alarms are grouped into five levels of priority, as shown in table 5-52.

Table 5-52. AI Function Block Alarm Priorities

Priority Number	Priority Description(1)
0	The priority of an alarm condition changes to 0 after the condition that caused the alarm is corrected.
1	An alarm condition with a priority of 1 is recognized by the system, but is not reported to the operator.
2	An alarm condition with a priority of 2 is reported to the operator, but generally does not require operator attention (such as diagnostics and system alerts).
3–7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8–15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.

1. The priority classes "advise" and critical" have no relationship to Plant Web Alerts.

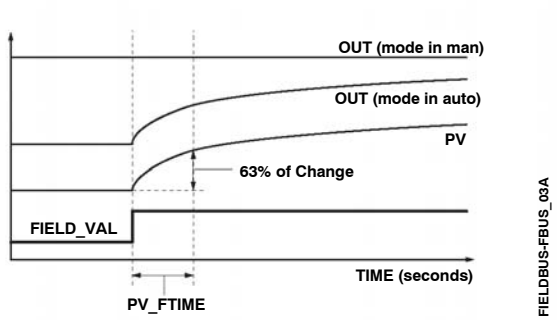


Figure 5-25. Analog Input Function Block Timing Diagram

Status Handling

The AI block only gets Good Non-Specified Unlimited or Bad Device Failure for status from the transducer. This is reflected in FIELD_VAL.STATUS [19.1]. PV.STATUS [7.1] is the same as FIELD_VAL.STATUS [19.1]. OUT.STATUS [8.1] can also reflect Bad, Out of Service in addition to PV.STATUS [7.1] values.

In the STATUS_OPTS [14] parameter, you can select from the following options to control the status handling:

Propagate Fail Forward—If the status from the sensor is Bad, Device failure or Bad, Sensor failure, propogate it to OUT without generating an alarm. The use of these sub-status in OUT is determined by this option. Through this option, you may determine whether alarming (sending out an alert) will be done by the block or propagated downstream for alarming.

Uncertain if in Manual mode—The status of the Output is set to *Uncertain* when the mode is set to Manual.

Note

1. The instrument must be in Out of Service mode to set the status option.

2. The AI block only supports the Uncertain if in Manual and Propagate failure. Unsupported options are not grayed out; they appear on the screen in the same manner as supported options.

Channels

Table 5-53. Channel Selections for the Analog Input Function Block

Channel	Parameter(1)	Block	Index Number
2	TRAVEL_TARGET	TB	49
3	FINAL_POSITION_VALUE	TB	17
4	TRAVEL	TB	34
5	SUPPLY_PRESS	TB	35
6	PRESSURE_A	TB	36
7	PRESSURE_B	TB	37
8	PRESSURE_DIFF	TB	38
9	DRIVE_SIGNAL	TB	53
10	TRAVEL_DEVIATION	TB	52
11	TEMPERATURE	TB	48
12	CYCLE_COUNT	TB	73
13	TRAVEL_ACCUMULATION	TB	72

1. Refer to table 5-13 for transducer block parameter descriptions and table 5-24 for AO parameter descriptions.

Filtering

The filtering feature changes the response time of the device to smooth variations in output readings caused by rapid changes in input. You can adjust the filter time constant (in seconds) using the PV_FTIME [18] parameter. Set the filter time constant to zero to disable the filter feature.

Signal Conversion

You can set the signal conversion type with the Linearization Type (L_TYPE [16]) parameter. You can view the converted signal (in percent of XD_SCALE [10]) through the FIELD_VAL [19] parameter.

$$\text{FIELD_VAL} = \frac{100 \text{ X (Channel Value)} - \text{EU *@0\%}}{\text{(EU *@100\%} - \text{EU *@0\%)}}$$

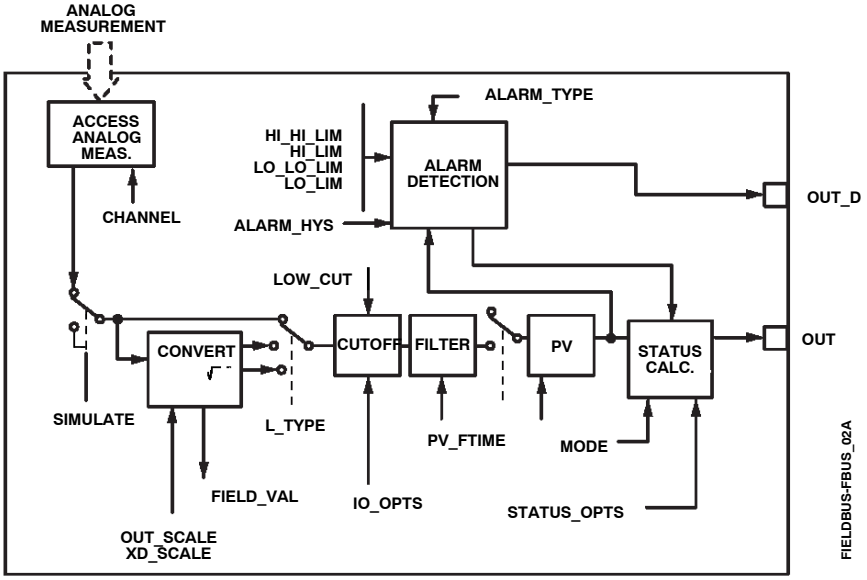
***XD_SCALE values**

You can choose from direct, indirect, or indirect square root signal conversion with the L_TYPE [16] parameter.

Direct

Direct signal conversion allows the signal to pass through the accessed channel input value (or the simulated value when simulation is enabled).

PV = Channel Value



NOTES:
OUT = BLOCK OUTPUT VALUE AND STATUS
OUT_D = DISCRETE OUTPUT THAT SIGNALS A SELECTED ALARM CONDITION.

Figure 5-26. Analog Input Function Block Schematic

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Indirect

Indirect signal conversion converts the signal linearly to the accessed channel input value (or the simulated value when simulation is enabled) from its specified range (XD_SCALE [10]) to the range and units of the PV [7] and OUT [8] parameters (OUT_SCALE [11]).

$$\left(\frac{\text{FIELD_VAL}}{100}\right) \text{X (EU **@100\% - EU **@0\%) + EU **@0\%}$$

****OUT_SCALE values**

Indirect Square Root

Indirect Square Root signal conversion takes the square root of the value computed with the indirect signal conversion and scales it to the range and units of the PV [7] and OUT [8] parameters.

$$\sqrt{\left(\frac{\text{FIELD_VAL}}{100}\right)} \text{X (EU **@100\% - EU **@0\%) + EU **@0\%}$$

****OUT_SCALE values**

When the converted input value is below the limit specified by the LOW_CUT [17] parameter, a value of zero is used for the converted value (PV [7]). This option is useful to eliminate false readings when the differential pressure measurement is close to zero.

Note

Invert is the only I/O option supported by the AI block. You can set the I/O option in Out of Service mode only.

Advanced Features

The AI function block provided with the DVC6000f provides added capability through the addition of the following parameters:

ALARM_SEL—Allows one or more of the process alarm conditions detected by the AI function block to be used in setting its OUT_D [37] parameter.

OUT_D—Discrete output of the AI function block based on the detection of process alarm condition(s). This parameter may be linked to other function blocks that require a discrete input based on the detected alarm condition.

STDDEV and CAP_STDDEV— are diagnostic parameters that can be used to determine the variability of the process.

Simulation

To support testing, you can either change the mode of the block to manual and adjust the output value, or you can enable simulation through the configuration tool and manually enter a value for the measurement value and its status. To enable simulation, you must first install the Simulate Enable jumper across the instrument AUX terminals (see page 2-25). Next you must use the configuration tool to enable the parameter SIMULATE [9].

With simulation enabled, the actual measurement value has no impact on the OUT [8] value or the status.

Block Errors

Table 5-54 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are inactive for the AI block and are given here only for your reference.

Table 5-54. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other*
1	**Block Configuration Error** - the selected channel carries a measurement that is incompatible with the engineering units selected in XD_SCALE, the L_TYPE parameter is not configured, or CHANNEL = zero.
2	*Link Configuration Error*
3	**Simulate Active** - Simulation is enabled and the block is using a simulated value in its execution.
4	*Local Override*
5	*Device Fault State*
6	*Device Needs Maintenance Soon*
7	**Input failure/process variable had Bad status** - The hardware is bad, or a bad status is being simulated
8	*Output failure*
9	*Memory failure*
10	*Lost Static Data*
11	*Lost NV Data*
12	*Readback Check Failed*
13	*Device Needs Maintenance Now*
14	**Power Up** – This condition exists until the AI function block executes for the first time.
15	**Out of Service** - The actual mode is Out of Service.

Troubleshooting

Refer to table 5-55 to troubleshoot any problem that you encounter.

Table 5-55. Troubleshooting

Symptom	Possible Causes	Corrective Action
Mode will not leave OOS	Target mode is not set	Set target mode to something other than OOS
	Configuration error	BLOCK_ERR [6] will show the configuration error bit set. The following are parameters that must be set before the block is allowed out of OOS: ● CHANNEL [15] must be set to a valid value and cannot be left at initial value of 0. ● XD_SCALE [10]. UNITS_INDEX must match the units in the transducer block channel value. ● L_TYPE [16] must be set to Direct, Indirect, or Indirect Square Root and cannot be left at an initial value of 0.
	Resource block	The actual mode of the Resource block is OOS. See Resource Block Diagnostics for corrective action.
	Schedule	Block is not scheduled and therefore cannot execute to go to Target Mode. Schedule the block to execute.
Process and/or block alarms will not work	Features	FEATURES_SEL [18] in the resource block does not have Alerts enabled. Enable the Reports Supported bit.
	Notification	LIM_NOTIFY [32] in the resource block is not high enough. Set equal to MAX_NOTIFY [31], also in the resource block.
	Status Options	STATUS_OPTS [14] has Propagate Fault Forward bit set. This should be cleared to cause an alarm to occur.
Value of output does not make sense	Linearization Type	L_TYPE [16] must be set to Direct, Indirect, or Indirect Square Root and cannot be left at an initial value of 0.
	Scaling	Scaling parameters are set incorrectly: ● XD_SCALE.EU0 and EU100 should match that of the transducer block channel value. ● OUT_SCALE.EU0 and EU100 are not set properly.
Cannot set HI_LIMIT [28], HI_HI_LIMIT [26], LO_LIMIT [30], or LO_LO_LIMIT [32] VALUES	Scaling	Limit values are outside the OUT_SCALE.EU0 and OUT_SCALE.EU100 values. Change OUT_SCALE [11] or set values within range.

AI Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-56. Analog Input Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Write Block Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed
Tag Description TAG_DESC	2		ALL	7 bit ASCII	spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3		ALL	0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4		ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 Valid Bits: 7: OOS, 4: MAN, 3: AUTO The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS MAN AUTO	OOS until block is configured, then last valid target	
ACTUAL	5.2	RO	ALL		OOS	
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO	OOS, MAN, AUTO	
NORMAL	5.4	RW	ALL		AUTO	
Block Error BLOCK_ERR	6	RO		1: Block Configuration Error 3: Simulate Active 7: Input Failure/ Bad PV Status 14: Power-up 15: Out-of-Service		Data Type: Bit String 0=Inactive 1=Active Error status associated with the hardware or software for the AI block.
Process Value PV	7	RO		PV Status set equal to FIELDV_VAL Status		Data Type: DS-65 Reflects the scaled value from the configured channel. Units set by OUT_SCALE and L_TYPE.
Primary Output OUT	8		OOS, MAN	OUT_STATE		Data Type: DS-68 The block output value and status.
Simulate SIMULATE	9					Data Type: DS-82 A group of data that contains the current transducer value and status, the simulated transducer value and status, and the enable/disable bit.
SIMULATE_STATUS	9.1		ALL		0	
SIMULATE_VALUE	9.2		ALL		0	
TRANSDUCER_STATUS	9.3	RO			0	
TRANSDUCER_VALUE	9.4	RO			0	
ENABLE/DISABLE	9.5		ALL	0=Not Initialized 1=Simulation Disabled 2=Simulation Active	1=simulate disabled	
Transducer Scale XD_SCALE	10		OOS	EU at 100% EU at 10% Units Index Decimal Point	100 0 % 2	Data Type: DS-68 Transducer scaling (XD_SCALE) is applied to the value from the channel to produce the FIELD_VAL in percent. The XD_SCALE units code must match the channel units code (if one exists), or the block will remain in OOS mode after being configured.

–Continued–

Table 5-56. Analog Input Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Write Block Mode	Range	Initial Value	Description
Output Scale OUT_SCALE	11		OOS	EU at 100% EU at 10% Units Index Decimal Point	100 0 % 2	Data Type: DS-68 The high and low scale values, engineering units code, and number of decimal places to be used in displaying the OUT parameter and parameters which have the same scaling as OUT.
Grant Deny GRANT_DENY	12					Data Type: DS-70 Options for controlling access of host computer and local control panels to operating, tuning, and alarm parameters of the block. GRANT: 0=N/A, 1=granted DENY: 0=N/A, 1=denied
GRANT	12.1		ALL	Valid Bits 0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
DENY	12.2		ALL		All bits: 0	
I/O Options IO_OPTS	13		OOS	0: Invert	All bits: 0	Data Type: Bit String 0=Disable 1=Enable User options for Output Control.
Status Options STATUS_OPTS	14		OOS	3: Propagate Failure forward 8: Uncertain in Man mode	All bits: 0	Data Type: Bit String 0=Disable 1=Enable User options for Status
AI Channel CHANNEL	15		OOS	See table 5-53	0: Undefined	Data Type: Unsigned16 Used to select the type of threshold that is used to set the output.
Linearization Type L_TYPE	16		OOS, MAN	0: Undefined 1: Direct 2: Indirect 3: Ind. Sqr. Root	0: Undefined	Data Type: Enum Linearization type. Determines whether the field value is used directly (Direct), is converted linearly (Indirect), or is converted with the square root (Indirect Square Root). The OUT_SCALE is normally the same as the transducer, but if L_TYPE is set to Indirect or Ind Sqr Root, OUT_SCALE determines the conversion from FIELD_VAL to the output.
Low Cutoff LOW_CUT	17		ALL	Positive	0	Data Type: Float If calculated output is below this value the output is 0.
Process Value Filter Time PV_FTIME	18		ALL	Positive	0	Data Type: Float Time constant of first order filter on PV, in seconds.
Field Value FIELD_VAL	19	RO			0	Data Type: DS-65 Value of the field device analog input, with a status reflecting the Transducer condition.
Updated Event UPDATE_EVT	20					Data Type: DS-73 This alarm is generated whenever a static parameter is changed.
UNACKNOWLEDGED	20.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	
UPDATE_STATE	20.2	RO	N/A	0=Undefined 1=Update reported 2=Update not reported	0=Undefined	
TIME_STAMP	20.3	RO	N/A		0	
STATIC_REVISION	20.4	RO	N/A		0	
RELATIVE_INDEX	20.5	RO	N/A		0	

–Continued–

Table 5-56. Analog Input Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Write Block Mode	Range	Initial Value	Description
Block Alarm BLOCK_ALM	21					Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field.
UNACKNOWLEDGED	21.1	RW		0=Undefined 1=Acknowledged 2=Unacknowledged		
ALARM_STATE	21.2	RO		0=Undefined 1=Clear-reported 2=Clear-not reported 3=Active-reported 4=Active-not reported		
TIME_STAMP	21.3	RO				
SUBCODE	21.4	RO				
VALUE	21.5	RO				
Alarm Summary ALARM_SUM	22					Data Type: DS-74 Current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block. 0=clear 0=acknowledged 0=reported 0=enabled
CURRENT	22.1	RO	ALL	0: Discrete alarm 1: Hi Hi alarm 2: Hi Alarm 3: Lo Lo Alarm 4: Lo Alarm 7: Block alarm		
UNACKNOWLEDGED	22.2	RO	ALL			
UNREPORTED	22.3	RO	ALL			
DISABLED	22.4	RW	ALL		All bits: 0	
Acknowledge Option ACK_OPTION	23		ALL	0: Discrete alarm 1: Hi Hi alarm 2: Hi Alarm 3: Lo Lo Alarm 4: Lo Alarm 7: Block alarm	All bits: 0	Data Type: Bit String 0=Disable 1=Enable Selection of whether alarms associated with the block will be automatically acknowledged.
Alarm Hysteresis ALARM_HYS	24		ALL	0 – 50%	0.50%	Data Type: Float Hysteresis on alarms.
High High Priority HI_HI_PRI	25		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the hi hi alarm.
High High Limit HI_HI_LIM	26		ALL	XD_SCALE	0	Data Type: Float Value of analog input which will generate an alarm.
High Priority HI_PRI	27		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the high alarm.
Hi Limit HI_LIM	28		ALL	XD_SCALE	0	Data Type: Float Value of analog input which will generate an alarm.
Low Priority LO_PRI	29		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the low alarm.
Low Limit LO_LIM	30		ALL	XD_SCALE	0	Data Type: Float Value of analog input which will generate an alarm.
Low Low Priority LO_LO_PRI	31		ALL	0 to 15	0	Data Type: Unsigned8 The priority of the low low alarm.
Low Low Limit LO_LO_LIM	32		ALL	XD_SCALE	0	Data Type: Float Value of analog input which will generate an alarm.
High High Alarm HI_HI_ALM	33					Data Type: DS-71 The status of the hi hi alarm and its associated time stamp.
UNACKNOWLEDGED	33.1	RW	N/A		0	
ALARM_STATE	33.2	RO			0	
TIME_STAMP	33.3	RO			0	
SUBCODE	33.4	RO			0	
VALUE	33.5	RO			0	
High Alarm HI_ALM	34					Data Type: DS-71 The status of the hi alarm and its associated time stamp.
UNACKNOWLEDGED	34.1	RW	N/A		0	
ALARM_STATE	34.2	RO			0	
TIME_STAMP	34.3	RO			0	
SUBCODE	34.4	RO			0	
VALUE	34.5	RO			0	

–Continued–

Table 5-56. Analog Input Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Write Block Mode	Range	Initial Value	Description
Low Alarm LO_ALM	35					Data Type: DS-71 The status of the lo alarm and its associated time stamp.
UNACKNOWLEDGED	35.1	RW	N/A		0	
ALARM_STATE	35.2	RO			0	
TIME_STAMP	35.3	RO			0	
SUBCODE	35.4	RO			0	
VALUE	35.5	RO			0	
Low Low Alarm LO_LO_ALM	36					Data Type: DS-71 The status of the lo lo alarm and its associated time stamp.
UNACKNOWLEDGED	36.1	RW	N/A		0	
ALARM_STATE	36.2	RO			0	
TIME_STAMP	36.3	RO			0	
SUBCODE	36.4	RO			0	
VALUE	36.5	RO			0	
Extended Parameter						
Output Discrete OUT_D	37		OOS, MAN	OUT_STATE		Data Type: DS-66 Discrete Output this is true (1) if any of the alarms selected in ALM_SEL are active.
Alarm Select ALM_SEL	38		ALL	1: Hi Hi alarm 2: Hi Alarm 3: Lo Lo Alarm 4: Lo Alarm	All bits: 0	Data Type: Bitstring 0=unselected 1=selected Selected alarms that activate the alarm output.
StdDev STDDEV	39	RO	N/A	Positive float		Data Type: Float Standard deviation of the measurement.
Cap StdDev CAP_STDDEV	40	RO	N/A	Positive float		Data Type: Float Capability standard deviation, the best deviation that can be achieved.

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-57. AI Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV
8	OUT
19	FIELD_VAL
22.1	ALARM_SUM.CURRENT
22.2	ALARM_SUM.UNACKNOWLEDGED
22.3	ALARM_SUM.UNREPORTED
22.4	ALARM_SUM.DISABLED

Table 5-58. AI Function Block, View 2

Index Number	Parameter
1	ST_REV
10	XD_SCALE
11	OUT_SCALE
12.1	GRANT_DENY.GRANT
12.2	GRANT_DENY.DENY

Table 5-59. AI Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV
8	OUT
19	FIELD_VAL
22.1	ALARM_SUM.CURRENT
22.2	ALARM_SUM.UNACKNOWLEDGED
22.3	ALARM_SUM.UNREPORTED
22.4	ALARM_SUM.DISABLED
37	OUT_D
38	ALM_SEL
39	STDDEV
40	CAP_STDDEV

Table 5-60. AI Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
13	IO_OPTS
14	STATUS_OPTS
15	CHANNEL
16	L_TYPE
17	LOW_CUT
18	PV_FTIME
23	ACK_OPTION
24	ALARM_HYS
25	HI_HI_PRI
26	HI_HI_LIM
27	HI_PRI
28	HI_LIM
29	LO_PRI
30	LO_LIM
31	LO_LO_PRI
32	LO_LO_LIM

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ANALOG INPUT FUNCTION BLOCK

Quick Config
- AI Channel
- Linearization Type
- Transducer Scale: EU at 100%
- Transducer Scale: EU at 0%
- Transducer Scale: Units Index
- Transducer Scale: Decimal
- Output Scale: EU at 100%
- Output Scale: EU at 0%
- Output Scale: Units Index
- Output Scale: Decimal

Common Config
- Acknowledge Option
- Alarm Hysteresis
- Alert Key
- High High Limit
- High High Priority
- High Limit
- High Priority
- I/O Options
- Linearization Type
- Low Low Limit
- Low Low Priority
- Low Limit
- Low Priority
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output Scale: EU at 100%
- Output Scale: EU at 0%
- Output Scale: Units Index
- Output Scale: Decimal
- Process Value Filter Time

Advanced Config
- Low Cutoff
- Simulate: Simulate Status
- Simulate: Simulate Value
- Simulate: Transducer Status
- Simulate: Transducer Value
- Simulate: Simulate En/Disable
- Static Revision
- Status Options
- Strategy
- Transducer Scale: EU at 100%
- Transducer Scale: EU at 0%
- Transducer Scale: Units Index
- Transducer Scale: Decimal

I/O Reference
- AI Channel

Connectors
- Output: Status
- Output: Value

Online
- Block Error
- Field Value: Status
- Field Value: Value
- Cascade Input: Status
- Cascade Input: Value
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output: Status
- Output: Value
- Process Value: Status
- Process Value: Value

Status
- Block Error

Other
- Tag Description
- Grant Deny: Grant
- Grant Deny: Deny
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- High Alarm: Unacknowledged
- High Alarm: Alarm State
- High Alarm: Time Stamp
- High Alarm: Subcode
- High Alarm: Float Value
- High High Alarm: Unacknowledged
- High High Alarm: Alarm State
- High High Alarm: Time Stamp
- High High Alarm: Subcode
- High High Alarm: Float Value
- Low Alarm: Unacknowledged
- Low Alarm: Alarm State
- Low Alarm: Time Stamp
- Low Alarm: Subcode
- Low Alarm: Float Value
- Low Low Alarm: Unacknowledged
- Low Low Alarm: Alarm State
- Low Low Alarm: Time Stamp
- Low Low Alarm: Subcode
- Low Low Alarm: Float Value
- Alarm output: Status
- Alarm output: Value
- Alarm Select
- StdDev
- Cap StdDev

All
- Characteristics
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- Process Value: Status
- Process Value: Value
- Output: Status
- Output: Value
- Simulate: Simulate Status
- Simulate: Simulate Value
- Simulate: Transducer Status
- Simulate: Transducer Value
- Simulate: Simulate En/Disable
- Transducer Scale: EU at 100%
- Transducer Scale: EU at 0%
- Transducer Scale: Units Index
- Transducer Scale: Decimal
- Output Scale: EU at 100%
- Output Scale: EU at 0%
- Output Scale: Units Index
- Output Scale: Decimal
- Grant Deny: Grant
- Grant Deny: Deny
- I/O Options
- Status Options
- AI Channel
- Linearization Type
- Low Cutoff
- Process Value Filter TIme
- Field Value: Status
- Field Value: Value
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- Acknowledge Option

All (continued)
- Alarm Hysteresis
- High High Priority
- High High Limit
- High Priority
- High Limit
- Low Priority
- Low Limit
- Low Low Priority
- Low Low Limit
- High High Alarm: Unacknowledged
- High High Alarm: Alarm State
- High High Alarm: Time Stamp
- High High Alarm: Subcode
- High High Alarm: Float Value
- High Alarm: Unacknowledged
- High Alarm: Alarm State
- High Alarm: Time Stamp
- High Alarm: Subcode
- High Alarm: Float Value
- Low Alarm: Unacknowledged
- Low Alarm: Alarm State
- Low Alarm: Time Stamp
- Low Alarm: Subcode
- Low Alarm: Float Value
- Low Low Alarm: Unacknowledged
- Low Low Alarm: Alarm State
- Low Low Alarm: Time Stamp
- Low Low Alarm: Subcode
- Low Low Alarm: Float Value
- Alarm output: Status
- Alarm output: Value
- Alarm select
- StdDev
- Cap StdDev

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Modes 5-138

Status Handling 5-138

Application Information 5-138

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Parameter List 5-140

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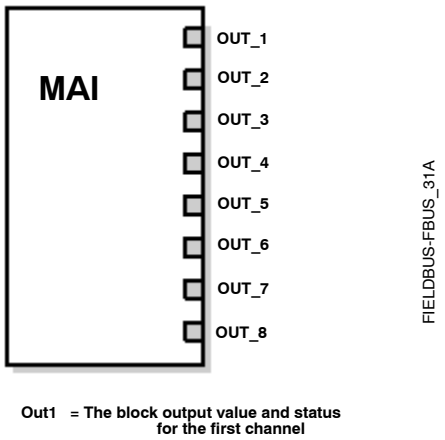

Figure 5-27. Multiple Analog Input (MAI) Function Block

Multiple Analog Input (MAI) Function Block Overview

The Multiple Analog Input (MAI) function block has the ability to process up to eight field device measurements and make them available to other function blocks. The output values from the MAI block are in engineering units and contain a status indicating the quality of the measurement. The measuring device may have several measurements or derived values available in different channels. Use the channel numbers to define the variables that the MAI block processes.

The MAI block supports mode control. In Automatic mode, the block's output parameters (OUT_1 to OUT_8 [8 through 15]) reflects the process variable (PV) values and status. In Manual mode, OUT may be set manually. The Manual mode is reflected in the output status. Table 5-63 lists the MAI block parameters, and their units of measure, description and index numbers.

Modes

The MAI Function Block supports three modes of operation as defined by the MODE_BLK [5] parameter:

- **Manual (Man)**—The block output (OUT_1 to OUT_8 [8 through 15]) may be set manually.
- **Automatic (Auto)**—OUT_1 to OUT_8 [8 through 15] reflects the analog input measurement or the simulated value when the simulation is enabled.
- **Out of Service (OOS)**—The block is not processed. PV is not updated and the OUT status is set to Bad: Out of Service. The BLOCK_ERR [6] parameter shows Out of Service. In this mode, you can make changes to all configurable parameters. The target mode of a block may be restricted to one or more of the supported modes.

Status Handling

In Man mode, the OUT status constant limit is set to indicate that the value is a constant and the OUT status is *Good.*

OUT_X status will be Bad if the transducer detects a problem with sensor associated with the channel.

Application Information

The intended use is for applications where it is necessary to convey DVC6000f measurements from a function.

The configuration of the MAI function block and its associated output channels depends on the specific application.

- **CHANNEL [7]:** Channel must always be set to 21.

The output parameters (OUT_1 to OUT_8 [8 through 15]) are set through the transducer block Instrument menu. Each output has a channel assigned to it in MAI Channel Map (TB.MAI_CHANNEL_MAP [95]) in the transducer block. For additional information, refer to table 5-63.

Block Errors

Table 5-61 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are inactive for the MAI block and are given here only for your reference.

Table 5-61. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other*
1	**Block Configuration Error:** the selected channel carries a measurement that is incompatible with the engineering units selected in XD_SCALE, the L_TYPE parameter is not configured, or WRITE_CHECK = 0.
2	*Link Configuration Error*
3	*Simulate Active*
4	*Local Override*
5	*Device Fault State*
6	*Device Needs Maintenance Soon*
7	**Input failure/process variable had Bad status** - The hardware is bad, or a bad status is being simulated
8	*Output failure*
9	*Memory failure*
10	*Lost Static Data*
11	*Lost NV Data*
12	*Readback Check Failed*
13	*Device Needs Maintenance Now*
14	**Power Up** – This condition exists after power up until the MAI funciton executes for the first time.
15	**Out of Service** - The actual mode is Out of Service.

Troubleshooting

Refer to table 5-62 to troubleshoot any problem that you encounter.

Table 5-62. Troubleshooting

Symptom	Possible Causes	Corrective Action
Mode will not leave OOS	Target mode is not set	Set target mode to something other than OOS
	Configuration error	Channel not set to 21.
	Resource block	The actual mode of the Resource block is OOS. See Resource Block Diagnostics for corrective action.
	Schedule	Block is not scheduled and therefore cannot execute to go to Target Mode. Typically, BLOCK_ERR [6] will show “Power-Up” for all blocks that are not scheduled. Schedule the block to execute.
Block alarms will not work	Features	FEATURES_SEL [18] in the resource block does not have Alerts enabled. Enable the Alerts bit.
	Notification	LIM_NOTIFY [32] in the resource block is not high enough. Set equal to MAX_NOTIFY [31], also in the resource block.

MAI Function Block Parameter List

- Read/Write Capability: RO − Read Only, RW − Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-63. MAI Function Block Parameter Definitions

Label Parameter Name	Index Number	RO / RW	Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the input selector block. The revision value will be incremented each time a static parameter value in the block is changed.
Tag Description TAG_DESC	2			7 bit ASCII	spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3			0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4			1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS, MAN, AUTO	OOS	
ACTUAL	5.2	RO	ALL		OOS	
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO	OOS, MAN, AUTO	
NORMAL	5.4	RW	ALL	AUTO	AUTO	
Block Error BLOCK_ERR	6	RO		1: Block Configuration Error 7: Input Failure/ Bad PV Status 14: Power-up 15: Out-of-Service		Data Type: Bit String 0 = Inactive 1 = Active This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
MAI Channel CHANNEL	7			21 only	0 = undefined	This variable must be set to 21. Channel assignments to the 8 outputs is done through MAI_CHANNEL_MAP parameter in transducer block. 1=FINAL_VALUE 2=TRAVEL_TARGET 3=FINAL_POSITION_VALUE 4=TRAVEL 5=SUPPLY_PRESS 6=ACT_PRESS_A 7=ACT_PRESS_B 8=ACT_PRESS_DIFF 9=DRIVE_SIGNAL 10=TRAVEL_DEVIATION 11=TEMPERATURE 12=CYCLE_COUNT 13=TRAVEL_ACCUM
Ouput 1 OUT_1	8		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.FINAL_VALUE	Data Type: DS-65 The block output value and status.
Output 2 OUT_2	9		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.TRAVEL_TARGET	Data Type: DS-65 The block output value and status.
Output 3 OUT_3	10		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.FINAL_POSITION_VALUE	Data Type: DS-65 The block output value and status.

−Continued−

Table 5-63. MAI Function Block Parameter Definitions

Label Parameter Name	Index Number	RO / RW	Mode	Range	Initial Value	Description
Output 4 OUT_4	11		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.TRAVEL	Data Type: DS-65 The block output value and status.
Output 5 OUT_5	12		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.SUPPLY_PRESS	Data Type: DS-65 The block output value and status.
Output 6 OUT_6	13		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.ACT_PRESS_A	Data Type: DS-65 The block output value and status.
Output 7 OUT_7	14		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.ACT_PRESS_B	Data Type: DS-65 The block output value and status.
Output 8 OUT_8	15		OOS MAN	Channel assigned by TB.MAI_CHANNEL_MAP	TB.ACT_PRESS_DIFF	Data Type: DS-65 The block output value and status.
Update Event UPDATE_EVT	16					Data Type: DS-73 This alarm is generated whenever a static parameter is changed.
UNACKNOWLEDGED	16.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	
UPDATE_STATE	16.2	RO	N/A	0=Undefined 1=Update reported 2=Updated not reported	0=Undefined	
TIME_STAMP	16.3	RO	N/A		0	
STATIC_REVISION	16.4	RO	N/A		0	
RELATIVE_INDEX	16.5	RO	N/A		0	
Block Alarm BLOCK_ALM	17					Data Type: DS-72 The block alarm is used for all configuration , hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field.
UNACKNOWLEDGED	17.1	RW		0=Undefined 1=Acknowledged 2=Unacknowledged		
ALARM_STATE	17.2	RO		0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported		
TIME_STAMP	17.3	RO				
SUBCODE	17.4	RO				
VALUE	17.5	RO				

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-64. MAI Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
8	OUT_1
9	OUT_2
10	OUT_3
11	OUT_4
12	OUT_5
13	OUT_6
14	OUT_7
15	OUT_8

Table 5-65. MAI Function Block, View 2

Index Number	Parameter
1	ST_REV

Table 5-66. MAI Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
8	OUT_1
9	OUT_2
10	OUT_3
11	OUT_4
12	OUT_5
13	OUT_6
14	OUT_7
15	OUT_8

Table 5-67. MAI Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
7	CHANNEL

375 Field Communicator Menu Structure

MULTIPLE ANALOG INPUT FUNCTION BLOCK

Quick Config
- MAI Channel

Common Config
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal

Advanced Config
- Static Revision
- Strategy

I/O Reference
- MAI Channel

Connectors
- Output 1: Status
- Ouput 1: Value
- Output 2: Status
- Ouput 2: Value
- Output 3: Status
- Ouput 3: Value
- Output 4: Status
- Ouput 4: Value
- Output 5: Status
- Ouput 5: Value
- Output 6: Status
- Ouput 6: Value
- Output 7: Status
- Ouput 7: Value
- Output 8: Status
- Ouput 8: Value

Online
- Block Error
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output 1: Status
- Ouput 1: Value
- Output 2: Status
- Ouput 2: Value
- Output 3: Status
- Ouput 3: Value
- Output 4: Status
- Ouput 4: Value
- Output 5: Status
- Ouput 5: Value
- Output 6: Status
- Ouput 6: Value
- Output 7: Status
- Ouput 7: Value
- Output 8: Status
- Ouput 8: Value

Status
- Block Error

Other
- Tag Description
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value

All
- Characteristics
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- MAI Channel
- Output 1: Status
- Ouput 1: Value
- Output 2: Status
- Ouput 2: Value
- Output 3: Status
- Ouput 3: Value
- Output 4: Status
- Ouput 4: Value
- Output 5: Status
- Ouput 5: Value
- Output 6: Status
- Ouput 6: Value
- Output 7: Status
- Ouput 7: Value
- Output 8: Status
- Ouput 8: Value
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value

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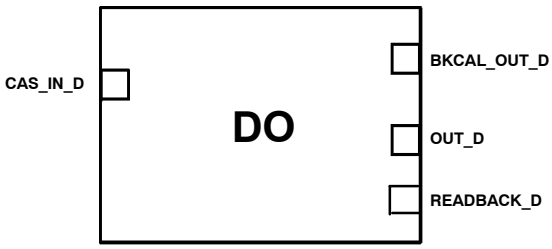

CAS_IN_D = The remote set point value from another function block.
BKCAL_OUT_D = The value and status required by the BKCAL_IN_D input of another block for output tracking.
OUT_D = The block output and status.
READBACK_D = Actual valve position

Figure 5-28. Discrete Output (DO) Function Block

5

Discrete Output (DO) Function Block Overview

The Discrete Output (DO) function block processes a discrete set point and outputs it to the specified I/O channel to produce an output signal. The DVC6000f Series digital valve controller discrete output block provides both normal open/closed control and the ability to position the valve in 5% increments for coarse throttling applications. The digital valve controller measures and uses actual valve position for READBACK_D [16].

The DO block supports mode control and simulation. In operation, the DO function block determines its set point and sets the output. The transducer block provides a readback signal of actual position from the instrument. Figure 5-28 illustrates the primary inputs and outputs of the DO function block, figure 5-29 illustrates the internal components of the DO function block. Table 5-71 lists definitions for the function block parameters.

When setting up the DO block, CHANNEL [18] must be set to 22, and SHED_OPT [23] must be non-zero.

Note

Feature Select in the resource block must have the DO Control option set for the DO block to be fully functional.

Modes

The DO block supports the following modes:

- **Manual (Man)**—The block output OUT_D [9] value may be entered manually.

- **Automatic (Auto)**—The block algorithm uses the local set point SP_D [8]value to determine OUT_D [9].

- **Cascade (Cas)**—The block uses a set point supplied by another function block.

Note

The transducer block must be in Auto for the mode to go to AUTO, CAS or MAN.

- **RemoteCascade (RCas)**—The block uses a set point supplied by a host computer.

- **Out of Service (OOS)**—The block is not processed and the output is not transferred to I/O. The BLOCK_ERR [6] attribute shows Out of service.

Mode Handling

Shed Options — RCAS Mode Only

Shed from or climb to a remote mode is determined by the parameter SHED_OPT [23]. A block climbs and sheds through the same path. For example, if SHED_OPT [23] specifies that a block should shed to Auto, then, if the block target mode is set to RCas, the block goes through Auto on the way to RCas. You can configure the shed option as follows:

Shed With Return Options

Remote cascade connection failure shifts actual mode but keeps trying to restore remote cascade (in other words, the remote cascade target mode stays in effect).

Normal—On failure of a remote cascade connection, the block attempts to attain the highest permitted non-remote mode until remote cascade is restored. Cas is the highest permitted non-remote mode and Auto is is the next permitted non-remote mode. If Cas or Auto are not available, the block will shed by default to Man.

Retained Target—The retained target mode is the target mode for the block before changing the target mode to a remote mode. On failure of a remote cascade connection, the block attempts to attain the retained target mode.

Auto—On failure of a remote cascade connection, the block attempts to attain Auto, if permitted, until remote cascade is restored.

Man—On failure of a remote cascade connection, the block sheds to Man until a remote cascade connection is restored.

Shed With No Return Options

For any shed with no return option, the target mode changes as determined by the option. Therefore, there is no attempt to restore the connection following failure. The behavior on change to the remote cascade target mode is identical to that for Shed With Return Options.

Normal—On failure of a remote cascade connection, the block sets the target mode to the highest permitted non-remote mode. Cas is the highest permitted non-remote mode and Auto is is the next highest permitted non-remote mode. If Cas or Auto are not available, the block will shed by default to Man.

Retained Target—The retained target mode is the target mode for the block before changing the target mode to a remote mode. On failure of a remote cascade connection, the block sets the target mode to the retained target mode.

Auto—On failure of a remote cascade connection, the block sets the target mode to Auto, if permitted.

Man—On failure of remote cascade connection, the block sets the target mode to Man, if permitted.

The user may configure SHED_OPT [23] so that it calls for a target mode that is not permitted. When doing this, the mode logic uses the following rules as applied by the remote logic:

- Shed logic never results in a non-permitted target mode.

- Shed logic never attempts to attain an actual mode of Auto or Cas if that mode is not permitted.

Block Initialization

The Fieldbus Foundation specification requires that certain parameters have initial values of uninitialized in function blocks. In addition to setting the Resource block mode to AUTO, the control system or the user must change those parameters from their uninitialized value to a valid value in order for the function block to move from the Out of Service mode. For the DO function block, the parameters that must be initialized are:

SHED_OPT [23] (see page 5-146 for valid values)

CHANNEL [18]

Status Handling

Under normal operating conditions, the status of OUT_D [9] is Good Non-Cascade, and the status of BKCAL_OUT_D [21] is Good:Cascade. If the output hardware fails, the status of BKCAL_OUT_D [21] is set to Bad:Device Fail, and the BLOCK_ERR [6] shows Output Failure. If the hardware used for output feedback fails, the status of READBACK_D [16] and PV_D [7] is set to Bad:DeviceFail, and the BLOCK_ERR [6] shows Process Variable has Bad Status. If the transducer block mode is Out of Service, the status of READBACK_D [16] and PV_D [7] is set to Bad:Out of Service.

I/O Selection

To select the I/O associated with the discrete output, configure the value of the CHANNEL [18] parameter. Table 5-68 lists the valid Channel selections for the DO block.

Table 5-68. Channel Selections for the Discrete Output Function Block

Selection	Transducer Block Parameter	Transducer block Index	Description
22	SETPOINT_D	32	Discrete Valve Control
0	–	–	Uninitialized

Setting the Output

To set the output for the DO block, you must first set the mode to define the manner in which the block determines its set point and output. In Cascade mode, the set point equals the input value at the CAS_IN_D [17] parameter. In Automatic or Manual mode, the set point must be entered manually by the user. For Automatic, the value must be written to the SP_D [8] parameter and for Manual, the value must be written to OUT_D [9]. In Remote Cascade mode, the set point is determined by a host computer that is writing to the RCAS_IN_D [22] parameter. Table 5-69 lists discrete

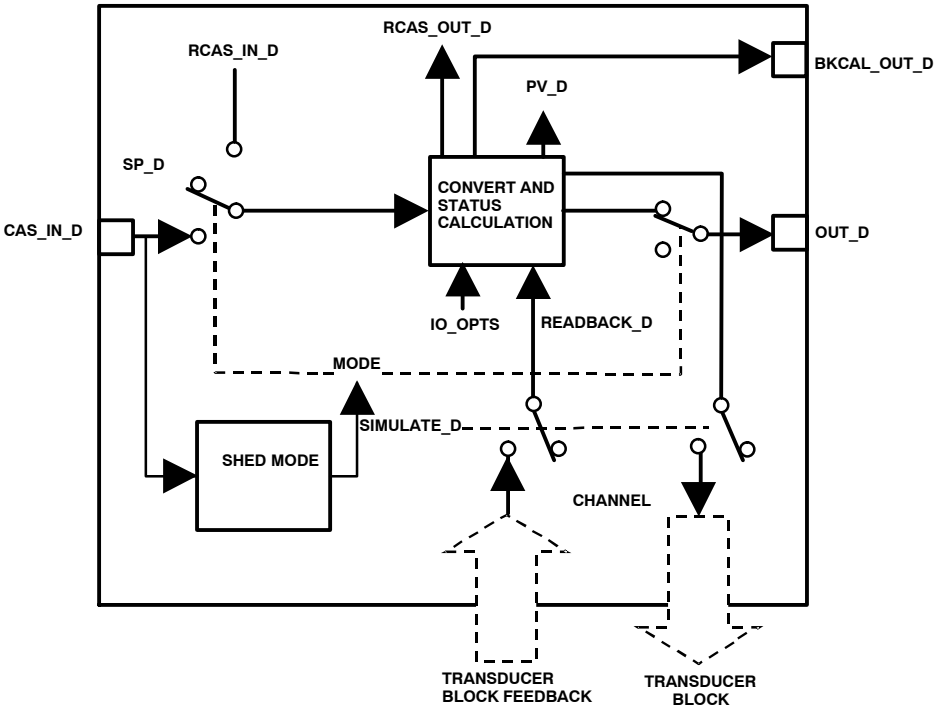

Figure 5-29. Discrete Output Function Block Schematic

states used by the digital valve controller for the set point.

To further customize the output, configure the following supported I/O options: SP tracks PV in Man, SP tracks PV in LO, SP Track retained target in Man or LO, Fault State to Value, Use Fault State value on restart, Target to Man if Fault State activated, and US PV for BKCAL_OUT.

Note

You can configure the supported I/O options in Out of Service mode only.

The SP_PV Track in Man option permits the set point to track the process variable when the block is in Manual mode. With this option enabled, the set point (SP_D [8]) becomes a copy of the process variable (PV_D [7]), and a manually-entered SP_D [8] value is overwritten on the block's next execution cycle. This option can prevent a state change when transitioning from Manual to Automatic mode. You can disable this option in Manual or Out of Service mode only.

Table 5-69. Valve Set Point for Discrete State

Discrete State	Valve Set Point with IO_OPTS Invert = 0	Valve Set Point with IO_OPTS Invert = 1
0	Closed	Open
1	Open	Closed
5	5%	Closed
10	10%	Closed
15	15%	Closed
20	20%	Closed
25	25%	Closed
30	30%	Closed
35	35%	Closed
40	40%	Closed
45	45%	Closed
50	50%	Closed
55	55%	Closed
60	60%	Closed
65	65%	Closed
70	70%	Closed
75	75%	Closed
80	80%	Closed
85	85%	Closed
90	90%	Closed
95	95%	Closed
100	Open	Closed

The Invert option inverts the set point at SP_D [8] before it is stored in OUT_D [9]. With this option enabled, OUT_D [9] becomes an inverted copy of SP_D [8] where non-zero values of SP_D [8] are

considered a logic 1**.** With this option disabled, OUT_D [9] is a direct copy of SP_D [8]. The readback value is processed through the Invert option to become PV_D [7]. The Use PV for BKCAL_OUT option specifies that BKCAL _OUT equal the value of the process variable (PV_D [7]) instead of the set point (SP_D [8]). If you do not enable this option, BKCAL_OUT will equal SP_D [8].

Output Block PV Status

The Output Block PV Status is determined by the enabled status of the Resource Block parameter FEATURE_SEL [18], the Transducer Block mode, and enabled Active PlantWeb alarms. Refer to table 5-1.

Block Errors

Table 5-70 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the DO block and are provided only for your reference.

Table 5-70. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other (N/A)*
1	**Block Configuration Error** - SHED_OPT or CHANNEL set to 0 (uninitialized)
2	*Link Configuration Error (N/A)*
3	**Simulate active** - Simulation is enabled and the block is using a simulated value in its execution.
4	**Local Override** - Device in fault state. Actual mode LO.
5	**Device Fault State Set** - DO block in fault state after FSTATE_TIME because of Bad status or IFS substatus on CAS_IN_D or Resource block commanded fault state.
6	**Device Needs Maintenance Soon** - Indicates a Maintenance PlantWeb Alert condition is active if Block Error Reporting is enabled. See page 5-39.
7	**Input failure/process variable has Bad status** - PV has bad status and Feature Select in the Resource block has the Out Readback bit set or the transducer block mode is Out of Service.
8	**Output failure** - PV has bad status or the transducer block mode is Out of Service.
9	*Memory Failure (N/A)*
10	*Lost Static Data (N/A)*
11	*Lost NV Data (N/A)*
12	*Readback Check Failed (N/A)*
13	**Device Needs Maintenance Now** - Indicates Failed PlantWeb Alert condition is active if Block Error Reporting is enabled. See page 5-39.
14	**Power Up** - This condition exists after power up until actual mode is not Out of Service.
15	**Out of Service** - The block is in Out of Service (OOS) mode.

Action on Fault Detection

Fault State is caused by one of three sources: A status pertaining to CAS, A status pertaining to RCAS, or SET_FSTATE [29] in the resource block. To implement Fault State, configure the following parameters:

IO_OPTS [14]: Determines the action OUT_D [9] will take upon a fault state. If the IO_OPTS [14] “Fault State to Value” is not selected, then OUT_D [9] holds its last position when Fault State is set. If “Fault State to Value” is selected, OUT_D [9] goes to the FSTATE_VAL_D [20] value when Fault State is set.

FSTATE_TIME [19]: The length of time, in seconds, that the DO block will wait to set Fault State. When Fault State is set, the OUT_D [9] value goes to either the FSTATE_VAL_D [20] value or holds its last position, depending on I/O_OPTS [14]. When the block has a target mode of CAS, a fault condition will be detected if the CAS_IN_D [17] has a BAD status or an Initiate Fault State substatus is received from the upstream block.

FSTATE_VAL_D [20]: Determines the OUT_D [9] value if IO_OPTS [14] “Fault State to Value” is selected. The OUT_D [9] value transitions to FSTATE_VAL_D [20] after FSTATE_TIME [19] elapses and the fault condition has not cleared.

Simulation

To support testing of the control strategy, you can enable the SIMULATE_D [17] parameter. Normally, the valve position value and status used for READBACK_D [16] in the DO block reflect actual process values to the nearest 5%, as provided by the transducer block. When the SIMULATE_D [17] parameter is enabled, value and status used for READBACK_D [16] is supplied by the user manually. To enable simulation in the DO function block, the simulate jumper must be installed. For information on the installation of this jumper, see the page 2-25 Installation section.

Note

When simulate discrete is active, the output block no longer writes values to the transducer block. If the Output Blk Timeout period is exceeded, the transducer block will move the valve to the Zero Power Condition. The DO block will also cause an Output Timeout in the transducer block if simulate discrete is active.

The SIMULATE_D [10] parameter has three components:

5

- Simulate Enable_Disable determines whether the function block will use the actual valve position value and status, or Simulate Value and Simulate Status.
- Transducer Value and Status reflect the process values provided by the transducer block.
- Simulate Value and Status may be entered by the user when Simulate Enable_Disable is set to Enabled.

To use simulate, first install the simulate jumper in the terminal box, then set Simulate Enable_Disable to Enabled, then enter the desired values for Simulate Value and Status.

When SIMULATE_D [10] is Enabled, the Simulate Active bit of the BLOCK_ERR [6] parameter is set (refer to the Block Errors description). When the simulate jumper is installed, the Simulate Jumper bit of the transducer block parameter SELFTEST_STATUS [78] is set.

Discrete Output Function Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-71. Discrete Output Function Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
Tag Description TAG_DESC	2	RW	ALL	7 bit ASCII	Spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 Valid Bits: 7: OOS, 5: LO, 4: MAN, 3: AUTO 2: CAS, 1: RCAS The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS MAN AUTO AUTO-CAS, AUTO-RCAS	OOS until block is configured, then last valid target	
ACTUAL	5.2	RO	ALL		OOS	
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO+ CAS+RCAS	OOS+MAN+ AUTO+CAS +RCAS	
NORMAL	5.4	RW	ALL		AUTO+CAS	
Block Error BLOCK_ERR	6	RO	N/A	1: Block Configuration Error 3: Simulate Active 4: Local Override 5: Device Fault State Set 7: Input Failure / Bad PV Status 8: Output Failure 14: Power-up 15: Out-of-Service	Dynamic	Data Type: Bit String 0=Inactive 1=Active This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
Process Value Discrete PV_D	7	RO	N/A	PV_D Status set equal to Readback_D Status	Dynamic	Data Type: DS-66 The discrete process variable calculated from READBACK_D.
Setpoint Discrete SP_D	8		OOS MAN AUTO	PV_STATE		Data Type: DS-66 The discrete target block output value (set point).
Output Discrete OUT_D	9		MAN	OUT_STATE		Data Type: DS-66 Position target of valve. 0=closed, 1=open, 2–100 position the value in 5% steps.
Simulate Discrete SIMULATE_D	10					Data Type: DS-83 Allows the transducer discrete input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
SIMULATE_STATUS	10.1		ALL		0	
SIMULATE_VALUE	10.2		ALL		0	
TRANSDUCER_STATUS	10.3	RO			0	
TRANSDUCER_VALUE	10.4	RO			0	
ENABLE/DISABLE	10.5		ALL	0=Not initialized 1=Simulation Disabled 2=Simulation Active	1	

–Continued–

Table 5-71. Discrete Output Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Process Value State PV_STATE	11		ALL		0	Data Type: Uint16 Index to the text describing the states of a discrete output.
Transducer State XD_STATE	12		ALL		0	Data Type: Uint16 Index to the text describing the states of a discrete for the value obtained from the transducer.
Grant Deny GRANT_DENY	13					Data Type: DS-70 Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. GRANT:0=N/A, 1=granted DENY: 0=N/A, 1=denied
GRANT	13.1		N/A	0: Program 1: Tune 2: Alarm 3: Local	All bits: 0	
DENY	13.2		N/A		All bits: 0	
I/O Options IO_OPTS	14		OOS	Valid Bits 0: Invert 1: SP tracks PV in Man 3: SP tracks PV in LO 4: SP Track retained target in Man or LO 6: Fault State to value 0: freeze 1: go to Fault State value 7: Use Fault State value on restart 8: Target to Man if Fault State activated 9: Use PV for BKCAL_OUT 0: SP 1: PV	All bits: 0	Data Type: Bit String 0=Disable 1=Enable Allows you to select the type of tracking and the output value when a fault condition occurs. Supported I/O options for the DO function block are SP Tracks PV in Man, SP Tracks PV in LO, SP Tracks Retained Target in Man or LO, Fault State to Value, Use Fault state on Restart, Target to Man if Fault State Activated, and Use PV for BKCAL_OUT.
Status Options STATUS_OPTS	15		OOS	4: Propagate Failure Backward	All bits: 0	Data Type: Bit String 0=Disable 1=Enable Options the user may select for the block processing of status.
Readback Discrete READBACK_D	16	RO	N/A		Dynamic	Data Type: DS-66 0=closed, 1=open, 5, 10, 15, 30...etc. are position in 5% increments.
Cascade Input Discrete CAS_IN_D	17		ALL	Status	BAD: NC: const	Data Type: DS-66 The remote set point value from another block.
				Value	0	
DO Channel CHANNEL	18		OOS	0=undefined 22=Setpoint (D)	22= Setpoint (D)	Data Type: Unsigned16 Defines which transducer parameter receives the DO output. Select Setpoint (D) to control valve position.
Fault State Time FSTATE_TIME	19		ALL	Positive	0	Data Type: Float Time from detection of a fault in the remote set point to the Fault State output action.
Fault State Value Discrete FSTATE_VAL_D	20		ALL		0	Date Type: Unsigned8 Preset discrete SP_D value to use if I/O_OPTS Fault State to Value is set.
Back Calculation Output Discrete BKCAL_OUT_D	21	RO	N/A		Dynamic	Data Type: DS-66 The value and status required by the BKCAL_IN_D input of another block for output tracking
Remote Cascade Input Discrete RCAS_IN_D	22		ALL	Status	BAD: NoCom: NoVal: const	Date Type: DS-66 Target set point and status provided by a supervisory host to a discrete control or output block.
				Value	0	

–Continued–

Table 5-71. Discrete Output Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Mode	Range	Initial Value	Description
Shed Options SHED_OPT	23		ALL	0=Uninitialized 1=Normal Shed, Normal Return 2=Normal Shed, No Return 3=Shed to Auto, normal return 4=Shed to Auto, no return. Target mode changes to Auto on detection of a shed condition 5=Shed to Manual, normal return 6=Shed to Manual, No return. Target mode changes to MAN on detection of a shed condition. 7=Shed to retained target, normal return 8=Shed to retained target, no return. (Change target to retained target)	0	Data Type: Unsigned8 Defines action to be taken on remote control device timeout. Normal Return – actual mode changes to the next lowest priority non-remote mode permitted but returns to the target remote mode when the remote computer completes the initialization handshake. No Return – Target mode changes to the next lowest priority non-remote mode permitted. The target remote mode is lost, so no return occurs.
Remote Cascade Output Discrete RCAS_OUT_D	24	RO	N/A		Dynamic	Data Type: DS-66 Block set point and status after ramping, provided to a supervisory host for back calculation and to allow action to be taken under limiting conditions or mode change.
Update Event UPDATE_EVT	25					Data Type: DS-73 This alert is generated by any change to the static data.
UNACKNOWLEDGED	25.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	
UPDATE_STATE	25.2	RO	N/A	0=Undefined 1=Update reported 2=Update not reported	0=Undefined	
TIME_STAMP	25.3	RO	N/A		0	
STATIC_REVISION	25.4	RO	N/A		0	
RELATIVE_INDEX	25.5	RO	N/A		0	
Block Alarm BLOCK_ALM	26					Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure, or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the status parameter. As soon as the Unreported status is cleared by the alert reporting procedure, and other block alert may be reported without clearing the Active status, if the subcode has changed.
UNACKNOWLEDGED	26.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0	
ALARM_STATE	26.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported	0	
TIME_STAMP	26.3	RO	N/A		0	
SUBCODE	26.4	RO	N/A		0	
VALUE	26.5	RO	N/A		0	
Extended Blocks						
Setpoint Rate Up SP_RATE_UP	27			> = 0	0	Data Type: Float The ramp rate for SP up in AUTO, CAS, and RCAS modes. Measured in PV units/sec.
Setpoint Rate Down SP_RATE_DN	28			> = 0	0	Data Type: Float The ramp rate for SP down in AUTO, CAS, and RCAS modes. Measured in PV units/sec.

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-72. DO Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV_D
8	SP_D
9	OUT_D
16	READBACK_D
17	CAS_IN_D

Table 5-73. DO Function Block, View 2

Index Number	Parameter
1	ST_REV
11	PV_STATE
12	XD_STATE
13.1	GRANT_DENY.GRANT
13.2	GRANT_DENY.DENY

Table 5-74. DO Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV_D
8	SP_D
9	OUT_D
16	READBACK_D
17	CAS_IN
21	BKCAL_OUT_D
22	RCAS_IN_D
24	RCAS_OUT_D

Table 5-75. DO Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
14	IO_OPTS
15	STATUS_OPTS
18	CHANNEL
19	FSTATE_TIME
20	FSTATE_VAL_D
24	SHED_OPT
27	SP_RATE_UP
28	SP_RATE_DN

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DISCRETE OUTPUT FUNCTION BLOCK

Quick Config
- Alert Key
- Process Value Discrete: Status
- Process Value Discrete: Value
- Setpoint Discrete: Status
- Setpoint Discrete: Value

Common Config
- Alert Key
- I/O Options
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Setpoint Discrete: Status
- Setpoint Discrete: Value

Advanced Config
- Fault State Time
- Fault State Value Discrete
- Process Value State
- Shed Options
- Simulate Discrete: Simulate Status
- Simulate Discrete: Simulate Value
- Simulate Discrete: Transducer Status
- Simulate Discrete: Transducer Value
- Simulate Discrete: Simulate En/Disable
- Static Revision
- Status Options
- Strategy
- Transducer State

I/O Reference
- DO Channel

Connectors
- Back Calculation Output Discrete: Status
- Back Calculation Output Discrete: Value
- Cascade Input Discrete: Status
- Cascade Input Discrete: Value
- Output Discrete: Status
- Output Discrete: Value

Online
- Back Calculation Output Discrete: Status
- Back Calculation Output Discrete: Value
- Block Error
- Cascade Input Discrete: Status
- Cascade Input Discrete: Value
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output Discrete: Status
- Output Discrete: Value
- Process Value Discrete: Status
- Process Value Discrete: Value
- Remote Cascade Input Discrete: Status
- Remote Cascade Input Discrete: Value
- Remote Cascade Output Discrete: Status
- Remote Cascade Output Discrete: Value
- Readback Discrete: Status
- Readback Discrete: Value
- Setpoint Discrete: Status
- Setpoint Discrete: Value

Status
- Block Error

Other
- Tag Description
- Grant Deny: Grant
- Grant Deny: Deny
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Setpoint Rate Up
- Setpoint Rate Down

All
- Characteristics
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- Process Value Discrete: Status
- Process Value Discrete: Value
- Setpoint Discrete: Status
- Setpoint Discrete: Value
- Output Discrete: Status
- Output Discrete: Value
- Simulate Discrete: Simulate Status
- Simulate Discrete: Simulate Value
- Simulate Discrete: Transducer Status
- Simulate Discrete: Transducer Value
- Simulate Discrete: Simulate En/Disable
- Process Value State
- Transducer State
- Grant Deny: Grant
- Grant Deny: Deny
- I/O Options
- Status Options
- Readback Discrete: Status
- Readback Discrete: Value
- Cascade Input Discrete: Status
- Cascade Input Discrete: Value
- DO Channel
- Fault State Time
- Fault State Value
- Back Calculation Output Discrete: Status
- Back Calculation Output Discrete: Value
- Remote Cascade Input Discrete: Status
- Remote Cascade Input Discrete: Value
- Shed Options
- Remote Cascade Output Discrete: Status
- Remote Cascade Output Discrete: Value
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Setpoint Rate Up
- Setpoint Rate Down

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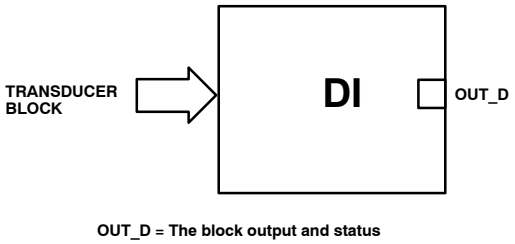

Figure 5-30. Discrete Input (DI) Function Block

Discrete Input (DI) Function Block Overview

5

The Discrete Input (DI) function block processes a single discrete input from a field device and makes it available to other function blocks. You can configure inversion and alarm detection on the input value. In the DVC6000f Series digital valve controller, the discrete input function block can provide limit switch functionality and valve position proximity detection. The DI function block supports mode control, signal status propagation, and simulation.

Normally, the block is used in Automatic mode so that the process variable (PV_D [7]) is copied to the output (OUT_D [8]). You can change the mode to Manual to disconnect the field signal and substitute a manually-entered value for the output. In this case, PV_D [7] continues to show the value that will become the OUT_D [8] when the mode is changed to Automatic.

To support testing, you can enable simulation, which allows the measurement value to be supplied manually through the SIMULATE_D [9] parameter. Figure 5-31 illustrates the internal components of the DI function block, and table 5-80 lists the definitions of the block parameters.

Modes

The Discrete Input function block supports the following modes:

- **Manual (Man)**—The block output (OUT_D [8]) is disconnected from the field and set manually.

- **Automatic (Auto)**—The block algorithm determines output.

- **Out of Service (OOS)**—The block is not processed. The OUT_D [8] status is set to Bad: Out of Service. The BLOCK_ERR [6] parameter shows Out of Service.

Block Initialization

The Fieldbus Foundation specification requires that certain parameters in the function blocks have initial values of uninitialized. In addition to setting the Resource block mode to AUTO, the control system or the user must change those parameters from their uninitialized value to a valid value in order for the function block to move from the Out of Service mode. For the DI function block, the CHANNEL [15] parameter must be initialized.

Status Handling

Under normal conditions, a Good: Non-Cascade status is passed through to OUT_D [8]. The block also supports the Status Action On Failure and BLOCK_ERR [6] indications.

When SIMULATE_D [9] is enabled, FIELD_VAL_D [7], PV_D [7], and OUT_D [8] change to the simulated status. When the block is set to Manual mode, OUT_D [7] is set to Good: Non−cascade, Constant status.

I/O Selection

To select the I/O associated with the discrete measurement, configure the value of the CHANNEL [15] parameter.

In the digital valve controller, the three classes of channels are

- Valve travel

- Open/Closed limit switch

- Variable limit switch based on transducer block travel alarm settings.

- Proximity position detection based on transducer block travel alarm settings.

The CHANNEL [15] parameter for each of the four DI blocks available in the digital valve controller may be set independently to achieve the desired position detection. The DI block CHANNEL [15] definitions are listed in table 5-76. Refer to the following descriptions for details of the operation of these channels.

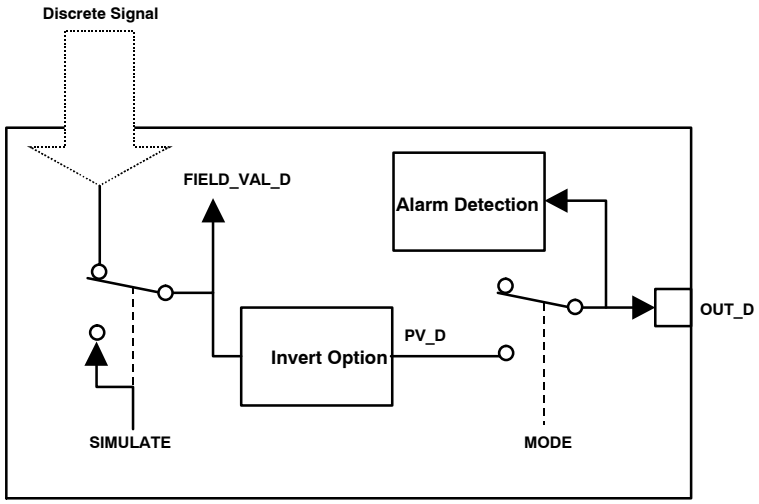

Figure 5-31. Discrete Input Function Block Schematic

Table 5-76. Channel Selection for the Discrete Input Function Block

Selection	Transducer Block Parameter(1)	Transducer Block Index Number	Bit Number(2)
23	TRAVEL_D	33	N/A
24	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	0: Travel Open
25	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	1: Travel Closed
26	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	2: Travel Limit Lo Lo
27	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	4: Travel Limit Lo
28	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	3: Travel Limit Hi
29	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	1: Travel Limit Hi Hi
30	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	5: Proximity Lo Lo
31	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	4: Proximity Lo
32	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	3: Proximity Hi
33	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	2: Proximity Hi Hi

1. Refer to table 5-13 for parameter descriptions.
2. See pages 5-32 and 5-34, Tvl and Prox, for information on accessing these alerts. Refer to Appendix C for information on accessing these alerts through DeltaV.

Valve Travel

Channel 23 provides valve travel.

0 = Closed, 1 = 100% open, 5 = 5% open, 10 = 10% open, 15 = 15% open, etc.

Open/Closed Limit Switch

Channels 24 and 25 provide valve open and closed limit switch functionality for the DI block. These channels will detect if the valve position is more than the Travel Open Alert Point for open detection or less than the Travel Closed Alert Point for closed detection. These channels provide an adjustable deadband to clear the detected position.

0= Not Active, 1= Active

Variable Limit Switch

Channels 26 through 29 provide variable limit switch functionality for the DI block. Trip points for this limit switch functionality are based on the Travel Alert settings in the transducer Block. The DI function block provides the same type of position detection as the travel alerts in the transducer block. Table 5-77 lists the transducer block parameters used with DI block channels 26 through 29. Refer to Tvl and Prox, on page 5-32 for more information on the transducer block travel alerts.

0= Not Active, 1= Active

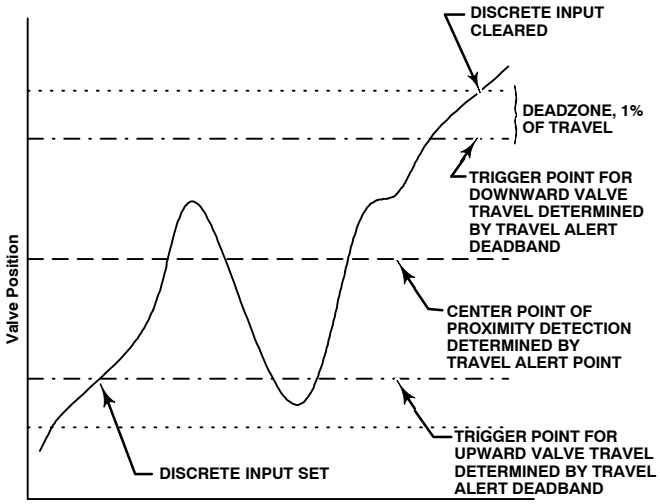

Figure 5-32. Discrete Input Proximity Detection Function

Valve Position Proximity Detection

Channels 30 through 33 provide valve position proximity detection for the DI block. The transducer block Travel Alrt Pt and Travel Alrt DB parameters are also used with the valve position proximity, but they provide a different function. The Travel Alrt Pt for the selected channel determines the center point for the position to be detected. The Travel Alrt DB for the selected channel sets the upper and lower trigger points, or the width of the proximity detection band. A 1% deadzone exists above and below this band that the travel must exceed to clear the detected position. Figure 5-32 illustrates the operation of the proximity detection function. Travel Alrt Pt refers to Tvl Lo Alrt Pt, Tvl Hi Alrt Pt, Tvl Lo Lo Alrt Pt, and Tvl Hi Hi Alrt Pt in table 5-78. Travel Alrt DB refers to Tvl Lo Alrt DB, Tvl Hi Alrt DB, Tvl Lo Lo Alrt DB, and Tvl Hi Hi Alrt DB in table 5-78.

0= Not Active, 1= Active

Table 5-78 lists the transducer block parameters used for proximity detection with DI block channels 30 through 33.

Table 5-77. Transducer Block Parameters Used with Discrete Input Function Block Channels 26 through 29 (Variable Limit Switch)

Transducer Block Parameter	Parameter Function
Tvl Lo Lo Alrt Pt	Lo Lo Limit Switch trip point
Tvl Lo Lo Alrt DB	Lo Lo Limit Switch deadband
Tvl Lo Alrt Pt	Lo Limit Switch trip point
Tvl Lo Alrt DB	Lo Limit Switch deadband
Tvl Hi Alrt Pt	Hi Limit Switch trip point
Tvl Hi Alrt DB	Hi Limit Switch deadband
Tvl Hi Hi Alrt Pt	Hi Hi Limit Switch trip point
Tvl Hi Hi Alrt DB	Hi Hi Limit Switch deadband

Table 5-78. Transducer Block Parameters Used with Discrete Input Function Block Channels 30 through 33

Transducer Block Parameter	Parameter Function
Tvl Lo Lo Alrt Pt	Lo Lo Proximity Detection Center Point
Tvl Lo Lo Alrt DB	Lo Lo Proximity Detection Width
Tvl Lo Alrt Pt	Lo Proximity Detection Center Point
Tvl Lo Alrt DB	Lo Proximity Detection Width
Tvl Hi Alrt Pt	Hi Proximity Detection Center Point
Tvl Hi Alrt DB	Hi Proximity Detection Width
Tvl Hi Hi Alrt Pt	Hi Hi Proximity Detection Center Point
Tvl Hi Hi Alrt DB	Hi Hi Proximity Detection Width

PV_D [7] value goes to the mode switch where it becomes OUT_D [8] when the actual mode is AUTO. OUT_D [8] is also tested for an alarm state.

Note

Invert is the only I/O option that the DI block supports. You can set the I/O option only when the block mode is Out of Service.

Field Value Processing

The Invert bit of the IO_OPTS [13] parameter may be used to logically invert the value of FIELD_VAL_D [17] before it is stored as PV_D [7]. PV_FTIME [16] may be used to set the length of time that FIELD_VAL_D [17] must be in a new state before that new state is reflected in PV_D. The

Alarm Detection

To select the state that initiates an input alarm, and to set discrete alarm substatus in the output, configure the DISC_LIM [23] parameter. You can enter any value between 0 and 255. A value of 255 disables the alarm. When OUT_D [8] matches the DISC_LIM [23] state, the discrete value of an alarm is set.

Table 5-79. BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	*Other (N/A)*
1	**Block Configuration Error**—CHANNEL set to 0 through 10 (uninitialized)
2	*Link Configuration Error (N/A)*
3	**Simulate Active**—Simulate is enabled. Output does not reflect process conditions
4	*Local Override (N/A)*
5	*Device Fault State Set (N/A)*
6	*Device Needs Maintenance Soon (N/A)*
7	**Input failure/process variable has Bad status**—The hardware is bad or the transducer block mode is Out of Service
8	*Output Failure (N/A)*
9	*Memory Failure (N/A)*
10	*Lost Static Data (N/A)*
11	*Lost NV Data (N/A)*
12	*Readback Check Failed (N/A)*
13	*Device Needs Maintenance Now (N/A)*
14	**Power Up**—Set after power-up until actual mode is not Out of Service
15	**Out of Service**—The actual mode is Out of Service (OOS). The block is not being processed.

Block Errors

Table 5-79 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the DI block and are provided only for your reference.

Action on Failure

In case of hardware failure, FIELD_VAL_D [17], PV_D [7], and OUT_D [8] change to a Bad status and the BLOCK_ ERR [6] parameter shows Process Variable has Bad Status. If the transducer block mode is Out of Service, the status of FIELD_VAL_D [17], PV_D [7], and OUT_D [8] is set to Bad:Out of Service.

Simulation

To support testing of the control strategy, you can enable the SIMULATE_D [9] parameter. Normally the measurement value and status used for FIELD_VAL_D [17] in the DI block reflect actual process values as provided by the transducer block. When the SIMULATE_D [9] parameter is enabled, value and status used for FIELD_VAL_D [17] is supplied by the user manually. To enable simulation in the DI function block, the simulate jumper must be installed. For information on the installation of this jumper, see the Installation section.

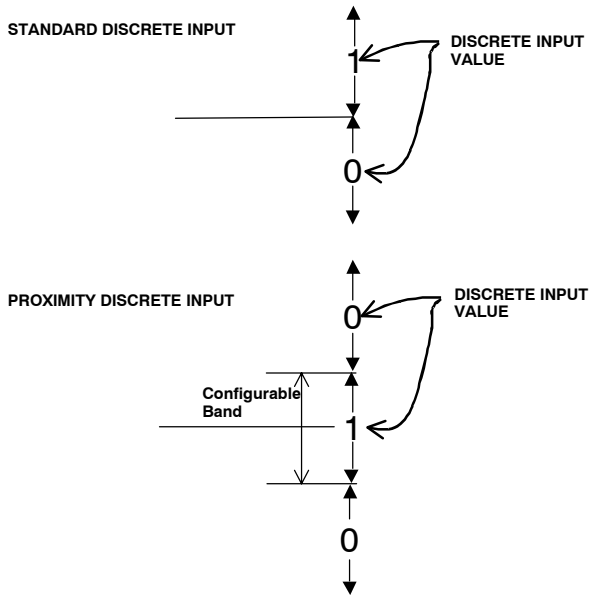

Figure 5-33. Proximity Discrete Input Compared to a Standard Discrete Input

Note

When simulate discrete is active, the output block no longer writes values to the transducer block. If the Output Blk Timeout period is exceeded, the transducer block will move the valve to the Zero Power Condition. The DI block will also cause an Output Timeout in the transducer block if simulate discrete is active.

The SIMULATE_D [9] parameter has three components:

- Simulate_D enable/disable determines whether the function block will use the actual process value and status, or Simulate Value and Simulate Status.
- Transducer Value and Status reflect the process values provided by the transducer block.
- Simulate Value and Status may be entered by the user when enable/disable is set to enabled.

To use simulate, first install the simulate jumper in the terminal box, then set Simulate_D enable/disable to enabled, then enter the desired values for Simulate Value and Status.

When SIMULATE_D [9] is enabled, the Simulate Active bit of the BLOCK_ERR [6] parameter is set (refer to the Block Errors description). When the simulate jumper is installed, the Simulate Jumper bit of the transducer block parameter SELFTEST_STATUS [78] is set.

Application Information

Figure 5-33 compares the operation of a standard discrete input to a proximity discrete input. With the standard discrete input, the discrete input changes state when the valve position passes a configurable trip point. This can be used to indicate if the valve position is above or below the trip point.

With the proximity discrete input a configurable band can be established about a central point. Whenever the valve position enters this configurable band, the discrete input changes state. A proximity discrete input is useful for applications which require knowing the location of the valve when the valve is not near 0% or 100%.

Discrete Input Function Block Parameter List

- Read/Write Capability: RO – Read Only, RW – Read Write
- Mode: The block mode(s) required to write to the parameter
- Double indentation and shaded Index Number indicates sub-parameter

Table 5-80. Discrete Input Function Block Parameter Definitions

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Static Revision ST_REV	1	RO	N/A	0 to 65535	0	Data Type: Unsigned16 The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
Tag Description TAG_DESC	2	RW	ALL	7 bit ASCII	Spaces	Data Type: Octet String The user description of the intended application of the block.
Strategy STRATEGY	3	RW	ALL	0 to 65535	0	Data Type: Unsigned16 The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
Alert Key ALERT_KEY	4	RW	ALL	1 to 255	0	Data Type: Unsigned8 The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
Block Mode MODE_BLK	5					Data Type: DS-69 Valid Bits: 7:OOS, 4:MAN, 3:AUTO The actual, target, permitted, and normal modes of the block. Target: The requested block mode Actual: The current mode of the block Permitted: Allowed modes for Target Normal: Most common mode for Target
TARGET	5.1	RW	ALL	OOS MAN AUTO	OOS until block is configured, then last valid target	
ACTUAL	5.2	RO	ALL		OOS	
PERMITTED	5.3	RW	ALL	OOS+MAN+AUTO	OOS+MAN+AUTO	
NORMAL	5.4	RO	ALL		AUTO	
Block Error BLOCK_ERR	6	RO	N/A	Defined Bits 1: Block Configuration Error 3: Simulate Active 7: Input Failure / Bad PV Status 14: Power-up 15: Out-of-Service	Dynamic	Data Type: Bit String 0=Inactive 1=Active This parameter reflects the error status associated with the hardware or software components associated with a block. Multiple errors may be shown, see table 5-79.
Process Value Discrete PV_D	7	RO	N/A	PV_D Status set equal to Field_Val_D Status	Dynamic	Data Type: DS-66 The process variable used in block execution. Value is converted from Readback to show the actuator position in the same units as the set point value.
Output Discrete OUT_D	8		OOS MAN	OUT_STATE		Data Type: DS-66 The primary discrete value calculated as a result of executing the function.
Simulate Discrete SIMULATE_D	9					Data Type: DS-83 Allows the transducer discrete input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
SIMULATE_STATUS	9.1		ALL		0	
SIMULATE_VALUE	9.2		ALL		0	
TRANSDUCER_STATUS	9.3	RO	ALL		0	
TRANSDUCER_VALUE	9.4	RO	ALL		0	
ENABLE/DISABLE	9.5			0=Not initialized 1=Simulation Disabled 2=Simulation Active	1=Simulation Disabled	

–Continued–

Table 5-80. Discrete Input Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Transducer State XD_STATE	10		ALL		0	Data Type: Uint16 Index to the text describing the states of a discrete for the value obtained from the transducer.
Output State OUT_STATE	11		ALL		0	Data Type: Unsigned16 Index to the text describing the states of a discrete output.
Grant Deny GRANT_DENY	12					Data Type: DS-70 Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. GRANT: 0=NA, 1=granted DENY: 0=NA, 1=denied
GRANT	12.1		ALL	0: Program 1: Tune 2: Alarm 3: Local	All bits:0	
DENY	12.2		ALL		All bits: 0	
I/O Options IO_OPTS	13		OOS	0: Invert	All bits:0	Data Type: Bit String 0=Disable 1=Enable Allows you to select how the I/O signals are processed.
Status Options STATUS_OPTS	14		OOS	3=Propagate Failure Forward 8=Uncertain in MAN mode	All bits:0	Data Type: Bit String 0=Disable 1=Enable Options the user may select for the block processing of status.
DI Channel CHANNEL	15		OOS	0=undefined 23=Valve Position or Pressure (Discrete) 24= PV > 97% 25= PV < 3% 26=PV Below LO LO limit 27=PV Below LO limit 28=PV Above HI limit 29=PV Above HI HI limit 30=PV Within Proximity of LO LO 31=PV Within Proximity of LO 32=PV within Proximity of HI 33=PV within Proximity of HI HI	0=Undefined	Data Type: Unsigned16 Defines the functionality of the discrete input. See I/O Selection for details. Refer to table 5-76.
Process Value Filter Time PV_FTIME	16		ALL	Positive	0	Data Type: Float Time that FIELD_VAL_D must be in a new state, before the change is reflected to PV_D and OUT_D.
Field Value Discrete FIELD_VAL_D	17	RO			0	Data Type: DS-66 Raw value of the field device discrete input, with a status reflecting the transducer condition.
Update Event UPDATE_EVT	18					Data Type: DS-73 This alert is generated by any change to the static data.
UNACKNOWLEDGED	18.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged	0=Undefined	
UPDATE_STATE	18.2	RO	N/A	0=Undefined 1=Update Reported 2=Updated not reported	0=Undefined	
TIME_STAMP	18.3	RO	N/A		0	
STATIC_REVISION	18.4	RO	N/A		0	
RELATIVE_INDEX	18.5	RO	N/A		0	

–Continued–

Table 5-80. Discrete Input Function Block Parameter Definitions (Continued)

Label PARAMETER_NAME	Index Number	RO / RW	Block Mode	Range	Initial Value	Description
Block Alarm BLOCK_ALM	19				Dynamic	Data Type: DS-72 The block alarm is used for all configuration, hardware, connection failure, or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the active status in the status parameter. As soon as the unreported status is cleared by the alert reporting procedure, and other block alert may be reported without clearing the active status, if the subcode has changed.
UNACKNOWLEDGED	19.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged		
ALARM_STATE	19.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported		
TIME_STAMP	19.3	RO	N/A			
SUBCODE	19.4	RO	N/A			
VALUE	19.5	RO				
Alarm Summary ALARM_SUM	20			0: Discrete alarm 7: Block Alarm		Data Type: DS-74 The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block. 0=clear reported 0=acknowledged 0=reported 0=enabled
CURRENT	20.1	RO			All bits: 0	
UNACKNOWLEDGED	20.2	RO			All bits: 0	
UNREPORTED	20.3	RO			All bits: 0	
DISABLED	20.4	RW			All bits: 0	
Acknowledge Option ACK_OPTION	21		ALL	0: Discrete 1: Block Alarm	All bits: 0	Data Type: Bit String 0=Disable 1=Enable Used to set auto acknowledgement of alarms
Discrete Priority DISC_PRI	22		ALL	0 to 15	0	Data Type: Unsigned8 Priority of the discrete alarm.
Discrete Limit DISC_LIM	23		ALL	PV_STATE	0	Data Type: Unsigned8 State of discrete input which will generate an alarm.
Discrete Alarm DISC_ALM	24					Data Type: DS-72 The discrete alarm is used for indication of a state change in selected discrete channel.
UNACKNOWLEDGED	24.1	RW	N/A	0=Undefined 1=Acknowledged 2=Unacknowledged		
ALARM_STATE	24.2	RO	N/A	0=Undefined 1=Clear reported 2=Clear not reported 3=Active reported 4=Active not reported		
TIME_STAMP	24.3	RO	N/A			
SUBCODE	24.4	RO	N/A			
VALUE	24.5	RO	N/A			

View Lists

View lists allow the values of a set of parameters to be accessed at the same time. Views 1 and 2 contain operating parameters and are defined by the Fieldbus Foundation. View 3 contains dynamic parameters and View 4 contains static parameters with configuration and maintenance information. Views 3 and 4 are defined by the manufacturer.

Table 5-81. DI Function Block, View 1

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV_D
8	OUT_D
17	FIELD_VAL_D
20.1	ALARM_SUM.CURRENT
20.2	ALARM_SUM.UNACKNOWLEDGED
20.3	ALARM_SUM.UNREPORTED
20.4	ALARM_SUM.DISABLED

Table 5-82. DI Function Block, View 2

Index Number	Parameter
1	ST_REV
10	XD_STATE
11	OUT_STATE
12.1	GRANT_DENY.GRANT
12.2	GRANT_DENY.DENY

Table 5-83. DI Function Block, View 3

Index Number	Parameter
1	ST_REV
5.1	MODE_BLK.TARGET_MODE
5.2	MODE_BLK.ACTUAL_MODE
5.3	MODE_BLK.PERMITTED_MODE
5.4	MODE_BLK.NORMAL_MODE
6	BLOCK_ERR
7	PV_D
8	OUT_D
17	FIELD_VAL_D
20.1	ALARM_SUM.CURRENT
20.2	ALARM_SUM.UNACKNOWLEDGED
20.3	ALARM_SUM.UNREPORTED
20.4	ALARM_SUM.DISABLED

Table 5-84. DI Function Block, View 4

Index Number	Parameter
1	ST_REV
3	STRATEGY
4	ALERT_KEY
13	IO_OPTS
14	STATUS_OPTS
15	CHANNEL
16	PV_FTIME
21	ACK_OPTION
22	DISC_PRI
23	DISC_LIM

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DISCRETE INPUT FUNCTION BLOCK

Quick Config
- Alert Key
- Process Value Discrete: Status
- Process Value Discrete: Value

Common Config
- Alert Key
- Discrete Limit
- I/O Options
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Process Value Filter Time

Advanced Config
- DI Channel
- Output State
- Simulate Discrete: Simulate Status
- Simulate Discrete: Simulate Value
- Simulate Discrete: Transducer Status
- Simulate Discrete: Transducer Value
- Simulate Discrete: Simulate En/Disable
- Static Revision
- Status Options
- Transducer State

Connectors
- Output Discrete: Status
- Output Discrete: Value
- Strategy

Online
- Block Error
- Field Value Discrete: Status
- Field Value Discrete: Value
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Output Discrete: Status
- Output Discrete: Value
- Process Value Discrete: Status
- Process Value Discrete: Value

Status
- Block Error

Other
- Tag Description
- Grant Deny: Grant
- Grant Deny: Deny
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- Acknowledge Option
- Discrete Alarm: Unacknowledged
- Discrete Alarm: Alarm State
- Discrete Alarm: Time Stamp
- Discrete Alarm: Subcode
- Discrete Alarm: Discrete Value

All
- Characteristics
- Static Revision
- Tag Description
- Strategy
- Alert Key
- Block Mode: Target
- Block Mode: Actual
- Block Mode: Permitted
- Block Mode: Normal
- Block Error
- Process Value Discrete: Status
- Process Value Discrete: Value
- Output Discrete: Status
- Output Discrete: Value
- Simulate Discrete: Simulate Status
- Simulate Discrete: Simulate Value
- Simulate Discrete: Transducer Status
- Simulate Discrete: Transducer Value
- Simulate Discrete: Simulate En/Disable
- Transducer State
- Outputu State
- Grant Deny: Grant
- Grant Deny: Deny
- I/O Options
- Status Options
- DI Channel
- Process Value Filter Time
- Field Value Discrete: Status
- Field Value Discrete: Value
- Update Event: Unacknowledged
- Update Event: Update State
- Update Event: Time Stamp
- Update Event: Static Rev
- Update Event: Relative Index
- Block Alarm: Unacknowledged
- Block Alarm: Alarm State
- Block Alarm: Time Stamp
- Block Alarm: Subcode
- Block Alarm: Value
- Alarm Summary: Current
- Alarm Summary: Unacknowledged
- Alarm Summary: Unreported
- Alarm Summary: Disabled
- Acknowledge Option
- Discrete Priority
- Discrete Limit
- Discrete Alarm: Unacknowledged
- Discrete Alarm: Alarm State
- Discrete Alarm: Time Stamp
- Discrete Alarm: Subcode
- Discrete Alarm: Discrete Value

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Block Channel Index 5-183

Table 5-85. Block Parameter Index

Label	Parameter Name	Block	Index Number	Page Numbers
Acknowledge Option	ACK_OPTION	AI	23	5-133
		DI	21	5-165
		ISEL	35	5-105, 5-109
		PID	46	5-90
		Resource	38	5-6, 5-16
Actual Travel	ACTUAL_TRAVEL	Transducer	83.4	5-36, 5-58
Actuator Fail Action	ACT_FAIL_ACTION	Transducer	21	5-37, 5-42
Actuator Manufacturer Id	ACT_MAN_ID	Transducer	22	5-37, 5-42
Actuator Model Number	ACT_MODEL_NUM	Transducer	23	5-37, 5-42
Actuator Serial Number	ACT_SN	Transducer	24	5-37, 5-42
Actuator Size	ACTUATOR SIZE	Transducer	85.1	5-37, 5-59
Actuator Style	ACTUATOR_STYLE	Transducer	42.1	5-24, 5-44
Advise Active	ADVISE_ACTIVE	Transducer	61	5-39, 5-49
Advise Alarm	ADVISE_ALM	Transducer	58	5-48
Advise Enable	ADVISE_ENABLE	Transducer	64	5-30, 5-49
Advise Pri	ADVISE_PRI	Transducer	70	9-3, 5-50
Advise Supress	ADVISE_MASK	Transducer	67	9-3, 5-30, 5-50
Air	AIR	Transducer	85.3	5-38, 5-59
Alarm Hysteresis	ALARM_HYS	AI	24	5-126, 5-133
		ISEL	36	5-109
		PID	47	5-84, 5-90
Alarm Select	ALM_SEL	AI	38	5-128, 5-134
		ISEL	50	5-110
Alarm Summary	ALARM_SUM	AI	22	5-133
		DI	20	5-165
		ISEL	34	5-105, 5-109
		PID	45	5-90
		Resource	37	5-6, 5-16
Alert Key	ALERT_KEY	AI	4	5-131
		AO	4	5-72
		DI	4	5-163
		DO	4	5-151
		ISEL	4	5-106
		MAI	4	5-140
		OS	4	5-120
		PID	4	5-86
		Resource	4	5-5, 5-12
		Transducer	4	5-31, 5-40
Area Units	AREA_UNITS	Transducer	93	5-35, 5-60
Back Calculation Hysteresis	BKCAL_HYS	PID	30	5-88
Back Calculation Input	BKCAL_IN	PID	27	5-80, 5-83, 5-88
Back Calculation Input 1	BKCAL_1_IN	OS	19	5-121
Back Calculation Input 2	BKCAL_2_IN	OS	20	5-121
Back Calculation Output	BKCAL_OUT	AO	25	5-67, 5-68, 5-70, 5-74
		OS	15	5-121
		PID	31	5-83 5-88
Back Calcualation Output Discrete	BKCAL_OUT_D	DO	21	5-147, 5-152
Balance Time	BAL_TIME	OS	21	5-121
		PID	25	5-88
Bias	BIAS	PID	66	5-92

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Table 5-85. Block Parameter Index (Continued)

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Block Alarm	BLOCK_ALM	AI	21	5-133
		AO	30	5-75
		DI	19	5-165
		DO	26	5-153
		ISEL	24	5-108
		MAI	17	5-141
		OS	24	5-122
		PID	44	5-90
		Resource	36	5-6, 5-16
		Transducer	8	5-41
Block Error	BLOCK_ERR	AI	6	5-126, 5-131
		AO	6	5-71, 5-72
		DI	6	5-161, 5-162, 5-163
		DO	6	5-149, 5-151
		ISEL	6	5-100, 5-105, 5-106
		MAI	6	5-140
		OS	6	5-120
		PID	6	5-81, 5-84, 5-85, 5-86
		Resource	6	5-7, 5-12, 7-3
		Transducer	6	5-39, 5-40, 7-7
Block Mode	MODE_BLK	AI	5	5-126, 5-131
		AO	5	5-72
		DI	5	5-163
		DO	5	5-151
		ISEL	5	5-106
		MAI	5	5-140
		OS	5	5-120
		PID	5	5-86
		Resource	6	5-4, 5-12
		Transducer	5	5-23, 5-40, 7-5
Bypass	BYPASS	PID	17	5-87
Calib Date	XD_CAL_DATE	Transducer	30	5-36, 5-42
Calib Location	XD_CAL_WHO	Transducer	31	5-36, 5-42
Calib Person	XD_CAL_LOC	Transducer	29	5-36, 5-42
Cap StdDev	CAP_STDDEV	AI	40	5-128, 5-134
		AO	32	5-75
		PID	76	5-93
Cascade Input	CAS_IN	AO	17	5-66, 5-67, 5-69, 5-70, 5-71, 5-71, 5-73
		OS	14	5-121
		PID	18	5-80, 5-83, 5-87
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		DI	15	5-158, 5-164
		DO	18	5-147, 5-152
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Clear Fault State	CLR_FSTATE	Resource	30	5-15, 7-4
Collection Directory	COLLECTION_DIRECTORY	Transducer	12	5-41
Comm Error Count	COMM_ERROR_COUNT	Transducer	86.9	5-59
Confirm Time	CONFIRM_TIME	Resource	33	5-5, 5-16
Control Options	CONTROL_OPTS	PID	12	5-83, 5-87

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Table 5-85. Block Parameter Index (Continued)

Label	Parameter Name	Block	Index Number	Page Numbers
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Cycle Count Alrt Pt	CYCLE_COUNT_ALRT_PT	Transducer	77.6	5-34, 5-56
Cycle Count DB	CYCLE_COUNT_DB	Transducer	77.7	5-34, 5-56
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Cycle Type	CYCLE_TYPE	Resource	19	5-14
DD Resource	DD_RESOURCE	Resource	9	5-12
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Detailed Status	DETAILED_STATUS	Resource	52	5-18
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Deviation High Limit	DV_HI_LIM	PID	57	5-84, 5-91
Deviation High Priority	DV_HI_PRI	PID	56	5-84, 5-91
Deviation Low Alarm	DV_LO_ALM	PID	65	5-92
Deviation Low Limit	DV_LO_LIM	PID	59	5-84, 5-91
Deviation Low Priority	DV_LO_PRI	PID	58	5-84, 5-91
Device ID	DEVICE ID	Resource	54	5-18, 7-2
Device Record	DEVICE_RECORD	Transducer	86	5-59
Device Revision	DEV_REV	Resource	12	5-13, 7-3
Device State	RS_STATE	Resource	7	5-12, 7-4
Device String Array	DEV_STRING	Resource	43	5-17
Device Type	DEV_TYPE	Resource	11	5-13, 7-2
Diag Options	DIAG_OPTIONS	Resource	45	5-17, 7-3
Disable Analog Input 1	DISABLE_1	ISEL	15	5-104, 5-107
Disable Analog Input 2	DISABLE_2	ISEL	16	5-104, 5-107
Disable Analog Input 3	DISABLE_3	ISEL	17	5-104, 5-107
Disable Analog Input 4	DISABLE_4	ISEL	18	5-104, 5-107
Disable Analog Input 5	DISABLE_5	ISEL	29	5-104, 5-108
Disable Analog Input 6	DISABLE_6	ISEL	30	5-104, 5-108
Disable Analog Input 7	DISABLE_7	ISEL	31	5-104, 5-108
Disable Analog Input 8	DISABLE_8	ISEL	32	5-104, 5-109
Discrete Alarm	DISC_ALM	DI	24	5-165
Discrete Limit	DISC_LIM	DI	23	5-160, 5-165
Discrete Priority	DISC_PRI	DI	22	5-165
Drive Current	DRIVE_CURRENT	Transducer	54	5-31, 5-47
Drive Current Alrt Pt	DRIVE_CURRENT_ALRT_PT	Transducer	76.4	5-31, 5-55
Drive Current Alrt Time	DRIVE_CURRENT_TIME	Transducer	76.5	5-31, 5-55
Drive Signal	DRIVE_SIGNAL	Transducer	53	5-31, 5-47, 7-5
Effective Area	EFFECTIVE AREA	Transducer	85.2	5-38, 5-59
Elect Active	ELECT_ACTIVE	Transducer	74.1	5-30 5-51
Elect Enable	ELECT_ENABLE	Transducer	75.1	5-30, 5-54
Electronics Serial Number	ELECTRONICS_SN	Resource	49	5-17, 7-2
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Error	ERROR	PID	67	5-92
Factory Serial Number	FACTORY_SN	Resource	50	5-18, 7-2
Failed Active	FAILED_ACTIVE	Transducer	59	5-39, 5-48
Failed Alarm	FAILED_ALM	Transducer	56	5-47
Failed Enable	FAILED_ENABLE	Transducer	62	5-30, 5-49
Failed Pri	FAILED_PRI	Transducer	68	9-3, 5-50
Failed Suppress	FAILED_MASK	Transducer	65	9-3, 5-30, 5-49

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Table 5-85. Block Parameter Index (Continued)

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		DO	19	5-149, 5-152
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Fault State Value Discrete	FSTATE_VAL_D	DO	20	5-149, 5-152
Features	FEATURES	Resource	17	5-13, 7-3
Feature Selection	FEATURE_SEL	Resource	18	5-5, 5-14, 5-149, 7-3
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Feed Forward Gain	FF_GAIN	PID	42	5-83, 5-89
Feed Forward Scale	FF_SCALE	PID	41	5-83, 5-89
Feed Forward Value	FF_VAL	PID	40	5-83, 5-89
Field Serial Number	FIELD_SN	Resource	51	5-6, 5-18, 7-2
Field Value	FIELD_VAL	AI	19	5-126, 5-127, 5-132
Field Value Discrete	FIELD_VAL_D	DI	17	5-160, 5-161, 5-164
Flow Direction	FLOW_DIRECTION	Transducer	84.5	5-37, 5-58
Flow Tends To	FLOW_TENDS_TO	Transducer	84.7	5-37, 5-58
Free Space	FREE_SPACE	Resource	24	5-14
Free Time	FREE_TIME	Resource	25	5-14
Function Block Options	FB_OPTIONS	Resource	44	5-17, 7-3
Gain	GAIN	PID	23	5-80, 5-88
Grant Deny	GRANT_DENY	AI	12	5-132
		AO	13	5-73
		DI	12	5-164
		DO	13	5-152
		ISEL	9	5-106
		OS	12	5-121
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		Transducer	40	5-43
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Hardware Revision	HARDWARE_REV	Resource	48	5-17
Health Index	HEALTH_INDEX	Transducer	79	5-57
High Alarm	HI_ALM	AI	34	5-133
		ISEL	46	5-110
		PID	61	5-91
High High Alarm	HI_HI_ALM	AI	33	5-133
		ISEL	45	5-109
		PID	60	5-91
High High Limit	HI_HI_LIM	AI	26	5-126, 5-133
		ISEL	38	5-105, 5-109
		PID	49	5-84, 5-90
High High Priority	HI_HI_PRI	AI	25	5-126, 5-133
		ISEL	37	5-105, 5-109
		PID	48	5-84, 5-90
High Limit	HI_LIM	AI	28	5-126, 5-133
		ISEL	40	5-105, 5-109
		PID	51	5-84, 5-90
High Priority	HI_PRI	AI	27	5-126, 5-133
		ISEL	39	5-105, 5-109
		PID	50	5-84, 5-90
Hystval	HYSTVAL	OS	22	5-121

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Table 5-85. Block Parameter Index (Continued)

Label	Parameter Name	Block	Index Number	Page Numbers
IDeadBand	IDEADBAND	PID	74	5-93
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Input 2	IN_2	ISEL	12	5-104, 5-107
Input 3	IN_3	ISEL	13	5-104, 5-107
Input 4	IN_4	ISEL	14	5-104, 5-107
Input 5	IN_5	ISEL	25	5-104, 5-108
Input 6	IN_6	ISEL	26	5-104, 5-108
Input 7	IN_7	ISEL	27	5-104, 5-108
Input 8	IN_8	ISEL	28	5-104, 5-108
Input Array	IN_ARRAY	OS	16	5-121
Input Char	INPUT_CHAR	Transducer	50	5-29, 5-46, 7-6
I/O Options	IO_OPTS	AI	13	5-132
		AO	14	5-70, 5-71, 5-73
		DI	13	5-160, 5-164
		DO	14	5-149, 5-152
ITK Version	ITK_VER	Resource	41	5-17, 7-3
Leak Class	LEAK_CLASS	Transducer	84.2	5-37, 5-58
Length Units	LENGTH_UNITS	Transducer	92	5-35, 5-60
Lever Style	LEVER_STYLE	Transducer	85.10	5-38, 5-59
Linearization Type	L_TYPE	AI	16	5-127, 5-132
Lockval	LOCKVAL	OS	18	5-121
Low Alarm	LO_ALM	AI	35	5-134
		ISEL	47	5-110
		PID	62	5-91
Low Cutoff	LOW_CUT	AI	17	5-128, 5-132
Lower Bench Set	LOWER_BENCH_SET	Transducer	85.4	5-38, 5-59
Low Limit	LO_LIM	AI	30	5-126, 5-133
		ISEL	42	5-105, 5-109
		PID	53	5-84, 5-90
Low Low Alarm	LO_LO_ALM	AI	36	5-134
		ISEL	48	5-110
		PID	63	5-91
Low Low Limit	LO_LO_LIM	AI	32	5-126, 5-133
		ISEL	44	5-105, 5-109
		PID	55	5-84, 5-90
Low Low Priority	LO_LO_PRI	AI	31	5-126, 5-133
		ISEL	43	5-105, 5-109
		PID	54	5-84, 5-90
Low Priority	LO_PRI	AI	29	5-126, 5-133
		ISEL	41	5-105, 5-109
		PID	52	5-84, 5-90
MAI Channel 1	MAI_CHANNEL_1	Transducer	95.1	5-60
MAI Channel 2	MAI_CHANNEL_2	Transducer	95.2	5-60
MAI Channel 3	MAI_CHANNEL_3	Transducer	95.3	5-60
MAI Channel 4	MAI_CHANNEL_4	Transducer	95.4	5-60
MAI Channel 5	MAI_CHANNEL_5	Transducer	95.5	5-60
MAI Channel 6	MAI_CHANNEL_6	Transducer	95.6	5-60
MAI Channel 7	MAI_CHANNEL_7	Transducer	95.7	5-60
MAI Channel 8	MAI_CHANNEL_8	Transducer	95.8	5-60

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Table 5-85. Block Parameter Index (Continued)

Label	Parameter Name	Block	Index Number	Page Numbers
MAI Channel Map	MAI_CHANNEL_MAP	Transducer	95	5-60
Maint Active	MAINT_ACTIVE	Transducer	60	5-39, 5-48
Maint Alarm	MAINT_ALM	Transducer	57	5-47
Maint Enable	MAINT_ENABLE	Transducer	63	5-30, 5-49
Maint Pri	MAINT_PRI	Transducer	69	9-3, 5-50
Maint Supress	MAINT_MASK	Transducer	66	9-3, 5-30, 5-50
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Math Form	MATHFORM	PID	70	5-80, 5-92
Max Alerts Allow	LIM_NOTIFY	Resource	32	5-6, 5-15
Max Notify	MAX_NOTIFY	Resource	31	5-6, 5-15
Max Supp Press	MAX_SUPP_PRESS	Transducer	42.6	5-35, 5-44
Memory Size	MEMORY_SIZE	Resource	22	5-14
Min Good	MIN_GOOD	ISEL	20	5-107
Minimum Cycle Time	MIN_CYCLE_T	Resource	21	5-14
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Moment Arm	MOMENT_ARM	Transducer	85.11	5-38, 5-59
Nominal Supply Pressure	NOMINAL_SUPPLY_PRESSURE	Transducer	85.6	5-38, 5-59
Nonvolatile Cycle Time	NV_CYCLE_T	Resource	23	5-14
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Outlet Pressure	OUTLET_PRESSURE	Transducer	83.8	5-37, 5-58
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		AO	9	5-66, 5-67, 5-68, 5-69, 5-72
		ISEL	7	5-106
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		OS	8	5-120
Ouput 1 Range	OUT_1_RANGE	OS	10	5-120
Output 2	OUT_2	MAI	9	5-140
		OS	9	5-120
Output 2 Range	OUT_2_RANGE	OS	11	5-121
Output 3	OUT_3	MAI	10	5-140
Output 4	OUT_4	MAI	11	5-141
Output 5	OUT_5	MAI	12	5-141
Output 6	OUT_6	MAI	13	5-141
Output 7	OUT_7	MAI	14	5-141
Output 8	OUT_8	MAI	15	5-141
Output Array	OUT_ARRAY	OS	17	5-121
Output Blk Timeout	OUTPUT_BLK_TIMEOUT	Transducer	76.3	5-31, 5-55
Output Discrete	OUT_D	AI	37	5-126, 5-128, 5-134
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		ISEL	49	5-110
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Output Low Limit	OUT_LO_LIM	PID	29	5-82, 5-88
Output Range	OUT_RANGE	ISEL	8	5-106
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Table 5-85. Block Parameter Index (Continued)

Label	Parameter Name	Block	Index Number	Page Numbers
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PD Detail 2 Active	PD_DETAIL2_ACTIVE	Transducer	74.10	5-52
PD Detail 3 Active	PD_DETAIL3_ACTIVE	Transducer	74.11	5-52
PD Detail 4 Active	PD_DETAIL4_ACTIVE	Transducer	74.12	5-52
PD Detail 5 Active	PD_DETAIL5_ACTIVE	Transducer	74.13	5-53
PD Detail 6 Active	PD_DETAIL6_ACTIVE	Transducer	74.14	5-53
PD Event Active	PD_EVENT_ACTIVE	Transducer	74.8	5-51
PD Extra	PD_EXTRA	Transducer	88.4	5-59
PD Run	PD_COMMAND	Transducer	88.1	5-59
PD Status	PD_STATUS	Transducer	88.2	5-59
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Performance Active	PERF_ACTIVE	Transducer	74.7	5-35, 5-51
Performance Enable	PERF_ENABLE	Transducer	75.7	5-35, 5-54
Port Diameter	PORT_DIAMETER	Transducer	84.3	5-37, 5-58
Port Type	PORT_TYPE	Transducer	84.4	5-37, 5-58
Press A Offset	PRESS_A_OFFSET	Transducer	46.4	5-46
Press A Scale	PRESS_A_SCALE	Transducer	46.3	5-46
Press B Offset	PRESS_B_OFFSET	Transducer	46.6	5-46
Press B Scale	PRESS_B_SCALE	Transducer	46.5	5-46
Press Cutoff Hi	PRESS_CUTOFF_HI	Transducer	47.1	5-28, 5-46
Press Cutoff Lo	PRESS_CUTOFF_LO	Transducer	47.2	5-29, 5-46
Press Integ DeadZ	PRESS_INTEG_DEADZ	Transducer	47.6	5-27, 5-46
Pres Integ Gain	PRESS_INTEG_GAIN	Transducer	47.4	5-27, 5-46
Press Integ Hi Lim	PRESS_INTEG_HI_LIM	Transducer	47.7	5-27, 5-46
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Press MLFB Bias	PRESS_MLFB_BIAS	Transducer	46.8	5-46
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Pressure Diff Status Press Diff	PRESSURE_DIFF STATUS VALUE	Transducer	38 38.1 38.2	5-43, 7-6
Pressure Units	PRESSURE_UNITS	Transducer	90	5-35, 5-60
Private Label Distributor	DISTRIBUTOR	Resource	42	5-17
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		PID	16	5-82, 5-87
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		PID	10	5-86
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Prox Enable	PROX_ENABLE	Transducer	75.5	5-34, 5-54
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Rated Travel	RATED_TRAVEL	Transducer	83.3	5-36, 5-58
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Setpoint Status Setpoint	FINAL_VALUE STATUS VALUE	Transducer	13	5-41, 7-5
Shaft Stem Dia	SHAFT_STEM_DIA	Transducer	83.5	5-36, 5-58
Shed Options	SHED_OPT	AO	27	5-67, 5-67, 5-71, 5-74
		DO	23	5-146, 5-153
		PID	34	5-81, 5-82, 5-89
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Shutdown Trigger	SHUTDOWN_TRIGGER	Transducer	76.1	5-31, 5-31, 5-55
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		AO	10	5-73
Simulate Discrete	SIMULATE_D	DI	9	5-158, 5-161, 5-163
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Supp Press Max Time	SUPP_PRESS_MAX_TIME	Transducer	86.6	5-59, 7-7
Supp Press Min	SUPP_PRESS_MIN	Transducer	86.7	5-59, 7-7
Supp Press Min Time	SUPP_PRESS_MIN_TIME	Transducer	86.8	5-59, 7-7
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Supp Press Scale	SUPP_PRESS_SCALE	Transducer	46.1	5-46
Supply Press Status Supply Press	SUPPLY_PRESSURE STATUS VALUE	Transducer	35 35.1 35.2	5-32, 5-43, 7-5, 7-6
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T Hyster	T_HYSTER	PID	87	5-93
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Temp Hi Alrt Pt	TEMP_HI_ALRT_PT	Transducer	76.6	5-32, 5-55
Temp Lo Alrt Pt	TEMP_LO_ALRT_PT	Transducer	77.7	5-32, 5-55
Temp Max	TEMP_MAX	Transducer	86.1	5-59, 7-7
Temp Max Time	TEMP_MAX_TIME	Transducer	86.2	5-59, 7-7
Temp Min	TEMP_MIN	Transducer	86.3	5-59, 7-7
Temp Min Time	TEMP_MIN_TIME	Transducer	86.4	5-59, 7-7
Test Read Write	TEST_RW	Resource	8	5-12
Time Since Reset	TIME_SINCE_RESET	Resource	53	5-18
Tracking Input Discrete	TRK_IN_D	PID	38	5-83, 5-89
Tracking Scale	TRK_SCALE	PID	37	5-83, 5-89
Tracking Value	TRK_VAL	PID	39	5-80, 5-83, 5-89
Transducer Directory	TRANSDUCER_DIRECTORY	Transducer	9	5-41
Transducer Error	XD_ERROR	Transducer	11	5-41
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		AO	12	5-73
Transducer State	XD_STATE	DI	10	5-164
		DO	12	5-152
Transducer Type	TRANSDUCER_TYPE	Transducer	10	5-41
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Travel (D) Status Travel (D)	TRAVEL_D STATUS VALUE	Transducer	33 33.1 33.2	5-42, 7-5
Travel Enable	TRAVEL_ENABLE	Transducer	75.4	5-32, 5-54
Travel Status Travel	TRAVEL STATUS VALUE	Transducer	34 34.1 34.2	5-33, 5-43, 7-6
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Trim Style 1	TRIM_STYLE_1	Transducer	84.9	5-38, 5-58
Trim Style 2	TRIM_STYLE_2	Transducer	84.10	5-38, 5-58
Tvl Accum Alrt Pt	TVL_ACCUM_ALRT_PT	Transducer	77.4	5-34, 5-56
Tvl Accum DB	TVL_ACCUM_DB	Transducer	77.5	5-35, 5-56
Tvl Active	TRAVEL_ACTIVE	Transducer	74.4	5-32, 5-51
Tvl Cal Cmd	TVL_CAL_CMD	Transducer	45.1	5-45
Tvl Cal Prog	TVL_CAL_PROG	Transducer	45.2	5-45
Tvl Cal Status	TVL_CAL_STATUS	Transducer	45.3	5-45
Tvl Cal Trigger	TVL_CAL_TRIGGER	Transducer	42.9	5-44
Tvl Closed Alrt Pt	TVL_CLOSED_ALRT_PT	Transducer	77.10	5-34,
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Tvl Count	TVL_COUNT	Transducer	43.1	5-44, 7-6
Tvl Crossover	TVL_CROSSOVER	Transducer	43.4	5-44
Tvl Cutoff Hi	FINAL_VALUE_CUTOFF_HI	Transducer	15	5-28, 5-41
Tvl Cutoff Lo	FINAL_VALUE_CUTOFF_LO	Transducer	16	5-24, 5-28, 5-41
Tvl Dev Alrt Pt	TVL_DEV_ALRT_PT	Transducer	77.1	5-33, 5-56
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Tvl Hi Alrt Pt	TVL_HI_ALRT_PT	Transducer	77.16	5-33, 5-56
Tvl Hi Cal	TVL_HI_CAL	Transducer	43.2	5-44
Tvl Hi DB	TVL_HI_DB	Transducer	77.17	5-33, 5-56
Tvl Hi Hi Alrt Pt	TVL_HI_HI_ALRT_PT	Transducer	77.18	5-33, 5-56
Tvl Hi Hi DB	TVL_HI_HI_DB	Transducer	77.19	5-33, 5-56
Tvl History Active	TVL_HISTORY_ACTIVE	Transducer	74.6	5-34, 5-51
Tvl History Enable	TVL_HISTORY_ENABLE	Transducer	75.6	5-34, 5-54
Tvl Integ DeadZ	TVL_INTEG_DEADZ	Transducer	44.4	5-26, 5-45
Tvl Integ Enable	TVL_INTEG_ENABLE	Transducer	44.1	5-26, 5-45
Tvl Integ Lim Hi	TVL_INTEG_LIM_HI	Transducer	44.2	5-26, 5-45
Tvl Integ Lim Lo	TVL_INTEG_LIM_LO	Transducer	44.3	5-26, 5-45
Tvl Integral Gain	SERVO_RESET	Transducer	19	5-26, 5-42
Tvl IP Bias	TVL_IP_BIAS	Transducer	43.7	5-44
Tvl Lo Alrt Pt	TVL_LO_ALRT_PT	Transducer	77.14	5-33, 5-56
Tvl Lo Cal	TVL_LO_CAL	Transducer	43.3	5-44
Tvl Lo DB	TVL_LO_DB	Transducer	77.15	5-33, 5-56
Tvl Lo Lo Alrt Pt	TVL_LO_LO_ALRT_PT	Transducer	77.12	5-33, 5-56
Tvl Lo Lo DB	TVL_LO_LO_DB	Transducer	77.13	5-33, 5-56
Tvl MLFB Bias	TVL_MLFB_BIAS	Transducer	43.8	5-44
Tvl MLFB Gain	TVL_MLFB_GAIN	Transducer	44.5	5-26, 5-45
Tvl Open Alrt Pt	TVL_OPEN_ALRT_PT	Transducer	77.8	5-34, 5-56
Tvl Open DB	TVL_OPEN_DB	Transducer	77.9	5-34, 5-56
Tvl/Press Select	TVL_PRESS_SELECT	Transducer	41.1	5-23, 5-28, 5-43
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Tvl Prop Gain	SERVO_GAIN	Transducer	18	5-25, 5-42
Tvl Sen Motion	TRAVEL_SEN_MOTION	Transducer	42.3	5-24, 5-38, 5-44
Tvl Tuning Set	TVL_TUNING_SET	Transducer	42.10	5-25, 5-44
Tvl Units	TVL_UNITS	Transducer	91	5-35, 5-60
Tvl Velocity Gain	SERVO_RATE	Transducer	20	5-26, 5-42
UBeta	BETA (ubeta)	PID	73	5-93
UGamma	GAMMA (ugamma)	PID	72	5-92
Unbalanced Area	UNBALANCED_AREA	Transducer	84.8	5-37, 5-58
Update Event	UPDATE_EVT	AI	20	5-132
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		DI	18	5-164
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Valve Class	VALVE_CLASS	Transducer	83.2	5-36, 5-58
Valve Manufacture Id	VALVE_MAN_ID	Transducer	25	5-36, 5-42
Valve Model Number	VALVE_MODEL_NUM	Transducer	26	5-36, 5-42
Valve Size	VALVE_SIZE	Transducer	83.1	5-58
Valve Serial Number	VALVE_SN	Transducer	27	5-36, 5-42

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Write Lock	WRITE_LOCK	Resource	34	5-4, 5-16, 5-23, 7-4
Write Priority	WRITE_PRI	Resource	39	5-4, 5-16
Zero Pwr Cond	ZERO_PWR_COND	Transducer	42.2	5-24, 5-44
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	INST_ALERTS_CONFIG	Transducer	76	5-55
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	INST_ALERTS_ENABLE	Transducer	75	5-54
	PRESS_CAL	Transducer	46	5-46
	PRESS_TUNE	Transducer	47	5-46
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	SPEC_SHEET_TRIM	Transducer	84	5-58
	SPEC_SHEET_VALVE	Transducer	83	5-58
	TRAVEL_CAL	Transducer	43	5-44
	TRAVEL_CAL_RUN	Transducer	45	5-45
	TRAVEL_TUNE	Transducer	44	5-45
	TVL_PRESS_CONTROL	Transducer	41	5-43

Table 5-86. Block Channel Index

Channel	Transducer Block Parameter	Index Number	Bit Number (if applicable)	Block Where Used
1	FINAL_VALUE	13		AO.OUT
3	FINAL_POSITION_VALUE	17		AO.READBACK
2	TRAVEL_TARGET	49		AI
3	FINAL_POSITION_VALUE	17		AI
4	TRAVEL	34		AI
5	SUPPLY_PRESS	35		AI
6	PRESSURE_A	36		AI
7	PRESSURE_B	37		AI
8	PRESSURE_DIFF	38		AI
9	DRIVE_SIGNAL	53		AI
10	TRAVEL_DEVIATION	52		AI
11	TEMPERATURE	48		AI
12	CYCLE_COUNT	73		AI
13	TRAVEL_ACCUMULATION	72		AI
14				
15				
16				
17				
18				
19				
20				
21	MAI_CHANNEL_MAP	95		MAI
22	SETPOINT_D	32		DO.OUT_D
23	TRAVEL_D	33		DO.READBACK_D
23	TRAVEL_D	33		DI
24	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	0: Travel Open	DI
25	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	1: Travel Closed	DI
26	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	2: Travel Limit Lo Lo	DI
27	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	4: Travel Limit Lo	DI
28	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	3: Travel Limit Hi	DI
29	INST_ALERTS_ACTIVE:TRAVEL_ACTIVE	74.4	1: Travel Limit Hi HI	DI
30	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	5: Proximity Lo Lo	DI
31	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	4: Proximity Lo	DI
32	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	3: Proximity Hi	DI
33	INST_ALERTS_ACTIVE:PROX_ACTIVE	74.5	2: Proximity Hi Hi	DI

Section 6 Calibration

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Relay Adjustment 6-5

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Output Pressure Sensor Calibration 6-10

Calibration

When a DVC6000f Series digital valve controller is ordered as part of a control valve assembly, the factory mounts the digital valve controller on the actuator and connects the necessary tubing, then sets up and calibrates the instrument. For remote-mounted digital valve controllers, the Type DVC6005f base unit ships separately from the control valve and does not include tubing, fittings or wiring.

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

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

- **Manual Travel Calibrate**—This calibration procedure allows you to manually determine the 0% and 100% calibration points on the valve.

- **Relay Adjustment**—This procedure permits adjustment of the pneumatic relay when switching from single-acting to double-acting or back.

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

- **Supply Pressure Sensor Calibrate**—This procedure permits calibrating the supply pressure sensor. Normally this sensor is calibrated at the factory and should not need calibration.

- **Output A Sensor Cal**—This procedure permits calibrating the Output A Sensor. Normally this sensor is calibrated at the factory, and should not need calibration.

- **Output B Sensor Cal**—This procedure permits calibrating the Output B sensor. Normally this sensor is calibrated at the factory, and should not need calibration.

Note

The Transducer Block Mode must be set to Manual and the Protection set to None before the instrument can be calibrated.

WARNING

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

Travel Calibration

There are two procedures available for calibrating travel:

- Auto Travel Calibration

- Manual Travel Calibration

Note

Prior to Calibration, several parameters need to be set up. Travel mode needs to be selected in TVL_PRESS_CNTL [41], and in Basic Setup (BASIC_SETUP [42]) the following parameters must be configured: Actuator Style (ACTUATOR_STYLE [42. 1]), Zero Pwr Cond (ZERO_PWR_COND [42.2], Feedback Conn (FEEDBACK_CONN [42.4]), Relay Type (RELAY_TYPE [42.5]), and Tvl Tuning Set (TVL_TUNING_SET [42.10]).

Autocal will automatically set Tvl Sen Motion (TRAVEL_SEN_MOTION [42.3]), however, this will need to be selected prior to Manual Calibration.

These parameter are set automatically by the Setup Wizard, with the exception of Relay Type (RELAY_TYPE [42.5]). Relay Type needs to be changed only if a Type B relay is used.

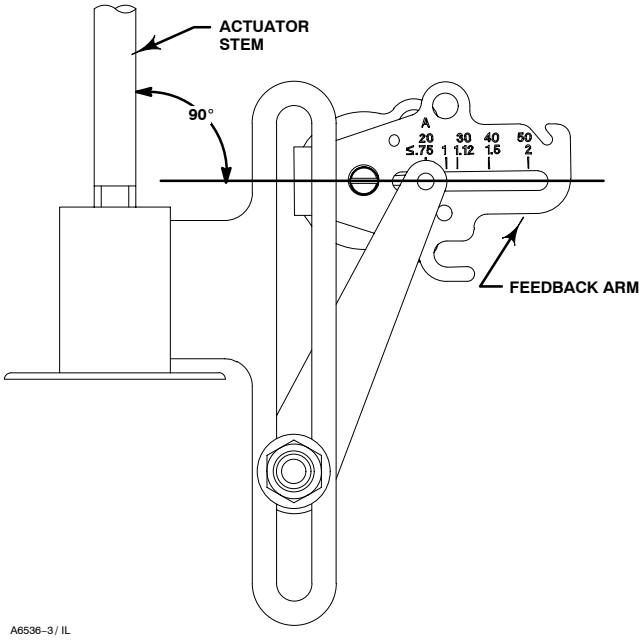

Figure 6-1. Crossover Point

Auto Tvl Calib

(TB > Calibrate > Auto Tvl Calib)

WARNING

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

There are two auto travel calibration options available; autocalibrate-standard or autocalibrate– extended. Autocalibrate-extended is used for large actuators or actuators with accessories.

Auto Travel Calibration requires user interaction only when the Feedback Connection is SStem - Standard. If the Feedback Connection is Rotary - All, SStem - Roller, no user interaction is required. For valves with the SStem - Standard Feedback Connection, interaction provides a more accurate crossover adjustment.

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

If you select Last Value, the crossover setting currently stored in the instrument is used and there are no further user interactions with the auto-calibration routine (go to step 3). If you select Default, an approximate value for the crossover is sent to the instrument and there are no further user interactions with the auto-calibration routine (go to step 3). If you select Manual, the Field Communicator prompts you to adjust the arm until the feedback arm is 90° to the actuator stem, as shown in figure 6-1. After you have made the adjustment (step 2), press OK and go to step 3.

2. The Field Communicator displays a menu to allow you to adjust the crossover.

Select the direction and size of change required to set the feedback arm so it is 90° to the actuator stem, as shown in figure 6-1.

If another adjustment is required, repeat step 2. Otherwise, select Done, and then Next and go to step 3.

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

Note

If the instrument is in the travel control state (Travel, Travel with Pressure Fallback Auto Recovery, or Travel with Pressure Fallback Manual Recovery) you will be prompted to calibrate the pressure range. If you select "yes" the valve is moved from 1% to 99%, and Press Range Lo (PRESS_RANGE_LO [42.8]) and Press Range Hi (PRESS_RANGE_HI [42.7]) are set.

4. When the calibration procedure has finished, you will be prompted to enter the name of the person performing the calibration procedure.

5. Enter the location of the calibration procedure, if desired.

6. Enter the date of the calibration procedure, if desired.

7. Place the Transducer Block Mode in Auto and verify that the travel properly tracks the setpoint changes.

Manual Tvl Calib

(TB > Calibrate > Manual Tvl Calib)

WARNING

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

Note

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

1. From the adjustment menu, select the direction and size of change required to adjust the output until the valve is near mid-travel (50%). Selecting large, medium, and small adjustments causes changes of approximately 10.0°, 1.0°, and 0.1°, respectively, to the feedback arm rotation. Selecting Next will implement the adjustment.

If another adjustment is required, repeat step 1. Otherwise, select Done and go to step 2.

2. If the feedback connection is Rotary - All, SStem - Roller, go to step 4.

If the feedback connection is SStem - Standard, adjust the feedback arm to the crossover point by pressing OK to get to the adjustment menu. Continue on with step 3.

3. From the adjustment menu, select the method of crossover; manual, last value or default. Manual adjustment is recommended.

If you select Last Value, the crossover setting currently stored in the instrument is used and there are no further user interactions with the auto-calibration routine (go to step 4). If you select Default, an approximate value for the crossover is sent to the instrument and there are no further user interactions with the calibration routine (go to step 4). If you select Manual, the Field Communicator prompts you to adjust the arm until the feedback arm is 90° to the actuator stem, as shown in figure 6-1.

If another adjustment is required, repeat step 3. Otherwise, select Done and go to step 4.

4. From the adjustment menu, select the direction and size of change required to set the travel to 0% (move the valve to close).

If another adjustment is required, repeat step 4. Otherwise, select Done and go to step 5.

5. From the adjustment menu, select the direction and size of change required to set the travel to 100% (move the valve to open).

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

6. Enter the name of the person performing the calibration procedure.

7. Enter the location of the calibration procedure.

8. Enter the date of the calibration procedure.

9. Place the Transducer Block Mode in Manual and verify that the travel properly tracks the setpoint changes.

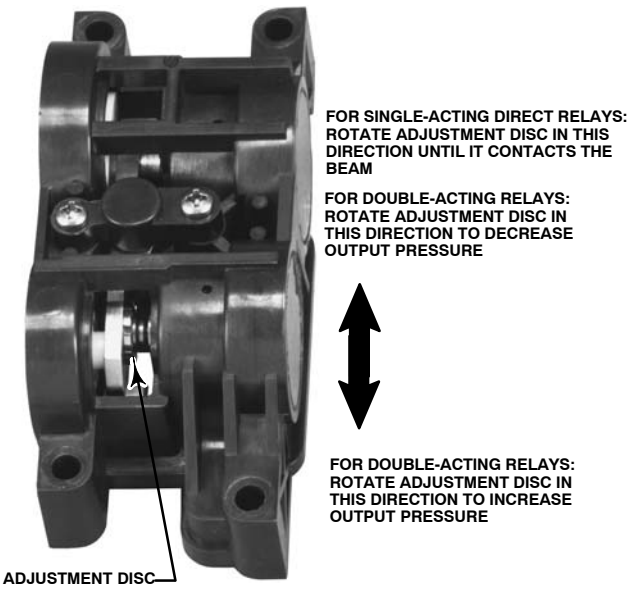

Figure 6-2. Location of Relay Adjustment (Shroud Removed for Clarity)

Relay Adjust

(TB > Calibrate > Relay Adjust)

Note

Relay adjustment for single acting relays is not normally required. However, it is recommended that you check the relay adjustment for double acting relays in new installations before proceeding with travel calibration.

Single-Acting Actuators

For single-acting direct digital valve controllers, make sure the adjustment disc is against the beam, as shown in figure 6-2. For single-acting reverse digital valve controllers, the relay is adjusted at the factory, no further adjustment is necessary.

Double-Acting Actuators

Note

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

For double-acting actuators, the valve must be near mid-travel to properly adjust the relay. The Field Communicator will automatically position the valve when *Relay Adjust* is selected.

Rotate the adjustment disc, shown in figure 6-2, until the output pressure displayed on the Field Communicator is between 50 and 70% of supply pressure. This adjustment is very sensitive. Be sure to allow the pressure reading to stabilize before making another adjustment (stabilization may take up to 30 seconds or more for large actuators).

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

Reverse Acting Relay

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

1. Verify Configuration

A reverse acting DVC6000f Series digital valve controller requires different configuration settings for

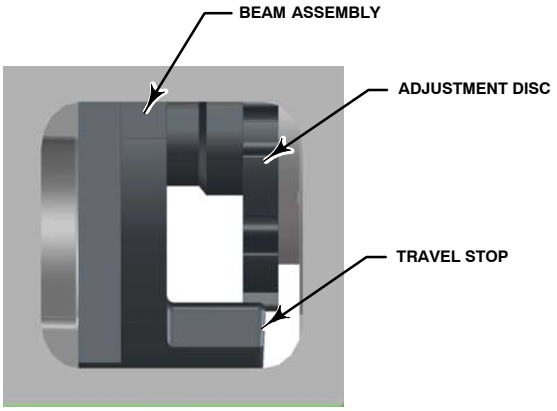

Figure 6-3. Shroud Opening Showing Rough Alignment of Adjustment Disc

proper operation. First verify that these settings are correct:

a. Relay Type – "B"

b. Travel Sensor Motion – "Clockwise or Counterclockwise"

What direction does the potentiometer shaft rotate on decreasing Output Pressure B)?

c. Zero Power Condition – "Open or Closed"

When the instrument electrical power is removed (Output Pressure B at full supply), what is the valve position?

2. Rough Relay Adjustment Check

Visually examine the location of the adjustment disc in relation to the end of the travel stop on the beam assembly. You can view the adjustment disc through the opening in the metal shroud. It should be located approximately as shown in figure 6-3. If it is not in the position shown, rotate the adjustment disc until the correct position is attained.

Note

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

3. Obtain Control Valve Mid-Travel

Make sure the transducer block mode is Manual and that there is supply pressure to the instrument. Follow the Field Communicator prompts to position the valve at mid-travel. (The important thing is to make sure that Output B is not fully saturated with full air supply or fully vented with no air supply.) If mid-travel cannot be obtained, perform the Travel Calibration routine to roughly calibrate the instrument. If the instrument will not calibrate, return to step 1.

4. Balance the Beam

Visually examine the travel stops on the beam assembly with respect to the relay body. The gap between the travel stops and the relay body should be equal on both sides of the beam assembly (figures 6-4 and 6-5). If the gap is not equal, rotate the adjustment disc as follows:

- Rotate the adjustment disc in the "+" direction to move the lower travel stop away from the relay body.

- Rotate the adjustment disc in the "–" direction to move the lower travel stop closer to the relay body.

5. Proper Calibration

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

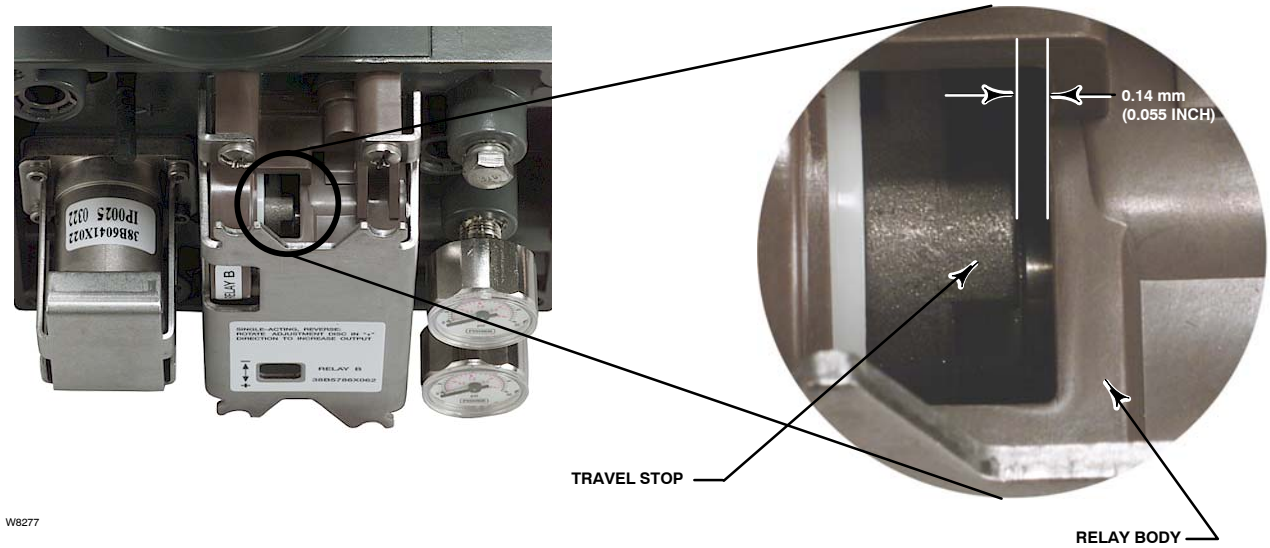

Figure 6-4. Relay Beam, Upper View

Travel Sensor Adjust

(TB > Calibrate > Travel Sensor Adjust)

The travel sensor is normally adjusted at the factory and should not require adjustment. However, if the travel sensor has been replaced, adjust the travel sensor by performing the appropriate procedure. See the Maintenance section for Travel Sensor Replacement procedures.

WARNING

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

DVC6010f, DVC6015, DVC6030f and DVC6035 Digital Valve Controllers

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

WARNING

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

2. As shown in figure 6-6, align the feedback arm (key 79) with the housing by inserting the alignment pin (key 46) through the hole marked “A” on the feedback arm. Fully engage the alignment pin into the tapped hole in the housing.

Note

The alignment pin (key 46) is stored inside the digital valve controller housing.

3. Loosen the screw that secures the feedback arm to the travel sensor shaft. Position the feedback arm so that the surface of the feedback arm is flush with the end of the travel sensor shaft.

4. Connect a Fieldbus power source and the Field Communicator to the instrument LOOP − and LOOP + terminals.

5. Before beginning the travel sensor adjustment, set the Transducer Block Mode to Manual and the protection to None.

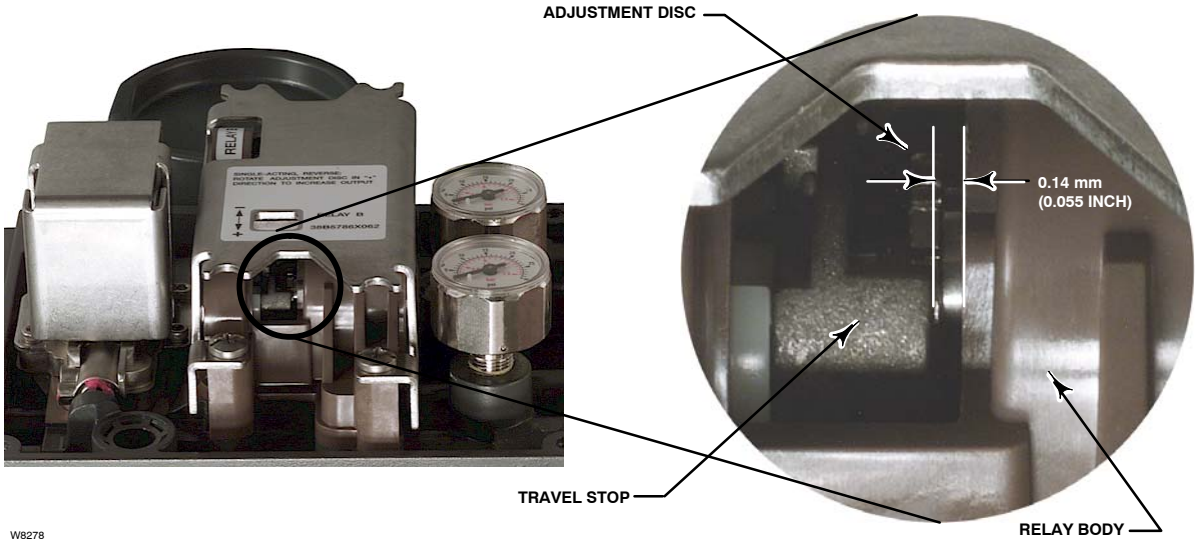

Figure 6-5. Relay Beam, Lower View

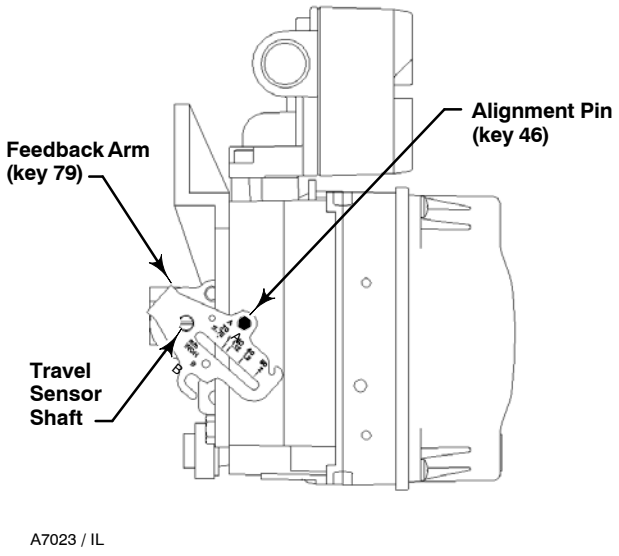

Figure 6-6. Type DVC6010f Digital Valve Controller Showing Feedback Arm in Position for Travel Sensor Adjustment

6. From the *Calibrate* menu, select *Travel Sensor Adjust.* Follow the prompts on the Field Communicator display to adjust the travel sensor counts to the value listed in table 6-1.

Table 6-1. Travel Sensor Counts

Digital Valve Controller	Travel Sensor Counts
Type DVC6010f / DVC6015	3375 ± 150 counts
Type DVC6020f / DVC6025	8400 ± 150 counts
Type DVC6030f / DVC6035	3375 ± 150 counts

Note

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

7. While observing the travel sensor counts, tighten the screw that secures the feedback arm to the travel sensor shaft. Be sure the travel sensor counts remain within the tolerances listed in table 6-1. Paint the screw to discourage tampering with the connection.

8. Disconnect the Field Communicator and Fieldbus power source from the instrument.

9. Remove the alignment pin and store it in the instrument housing.

10. Install the digital valve controller on the actuator.

DVC6020f and DVC6025 Digital Valve Controllers

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

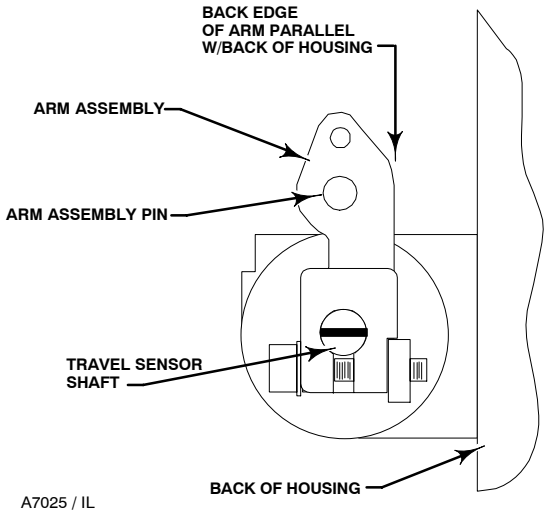

Figure 6-7. Type DVC6020f Travel Sensor Arm/Housing Back Plane Alignment

WARNING

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

2. See figure 6-8 for parts identification. Disconnect the bias spring (key 82) from the feedback arm assembly (key 84) and the arm assembly (key 91). Remove the mounting bracket (key 74) from the back of the digital controller. Hold the arm assembly (key 91) so that the arm assembly points toward the terminal box and the arm is parallel to the back of the housing, as shown in figure 6-7.

3. Loosen the screw that secures the arm assembly to the travel sensor shaft. Position the arm assembly so that the outer surface is flush with the end of the travel sensor shaft.

4. Connect a fieldbus power source and the Field Communicator to the instrument LOOP− and LOOP+ terminals.

5. Before beginning the travel sensor adjustment, set the Transducer Block Mode to Manual and the protection to None.

6. From the *Calibrate* menu, select *Travel Sensor Adjust.* Follow the prompts on the Field Communicator display to adjust the travel sensor counts to the value listed in table 6-1.

Note

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

7. While observing the travel sensor counts, tighten the screw that secures the arm assembly to the travel sensor shaft. Be sure the travel sensor counts remain within the tolerances listed in table 6-1. Paint the screw to discourage tampering with the connection.

8. Disconnect the Field Communicator and Fieldbus power source from the instrument.

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

10. Replace the mounting bracket on the back of the instrument and reconnect the bias spring between the feedback arm assembly and the arm assembly on the travel sensor shaft.

11. Install the digital valve controller on the actuator.

6

Pressure Sensor Calibration

There are three pressure sensors: Supply, Output A, and Output B. Select the appropriate menu depending upon which pressure sensor you are calibrating.

Note

The pressure sensors are calibrated at the factory and should not require calibration.

Supply Press Sensor Cal

(TB > Calibrate > Supply Press Sensor Cal)

For a Zero Only calibration, select Zero Only and follow the prompts on the Field Communicator.

To calibrate for Zero and Span, connect an external reference gauge to the output side of the supply regulator. The gauge should be capable of measuring maximum instrument supply pressure. Select Zero and Span and follow the prompts on the Field communicator.

When finished place the Transducer Block Mode in Auto. Verify that the displayed pressure matches the measured output pressure.

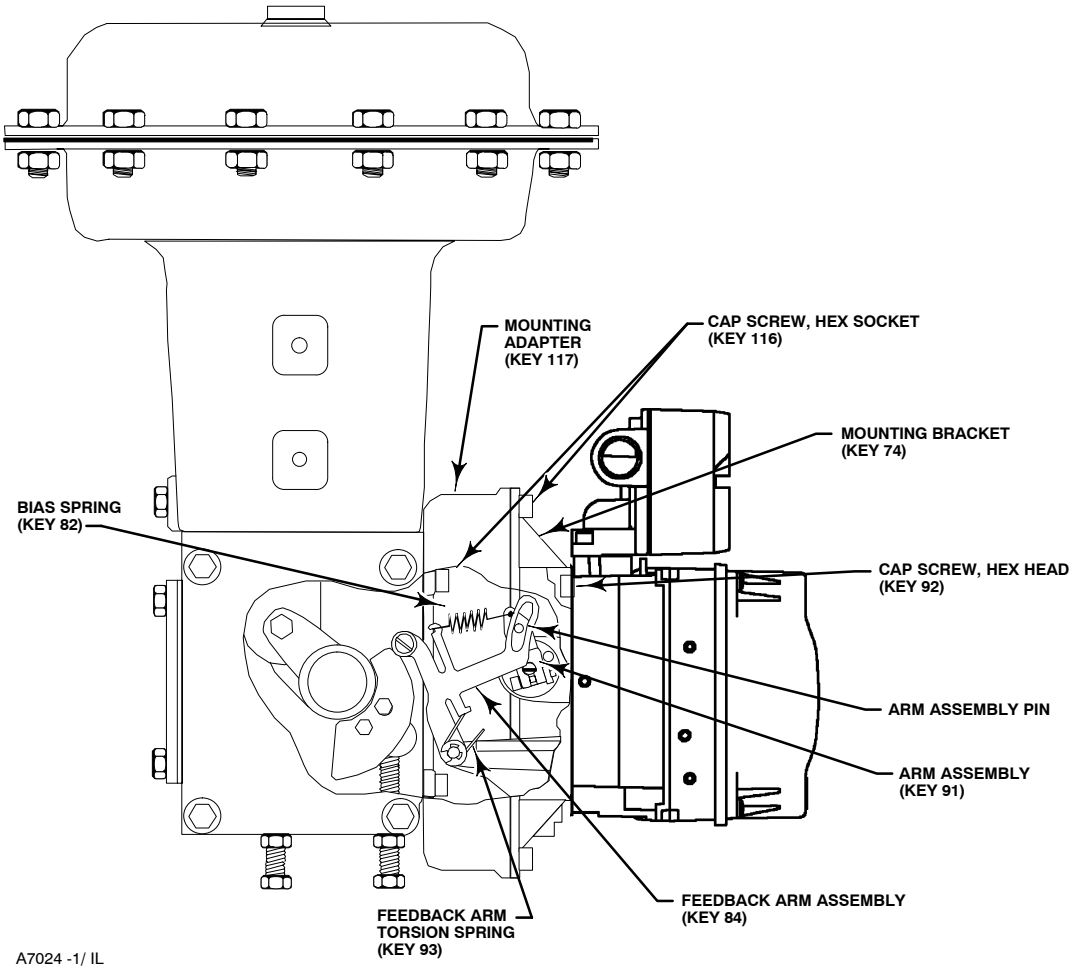

Figure 6-8. Type DVC6020f Digital Valve Controller Mounted on Type 1052, Size 33 Actuator

Output A / Output B Sensor Cal

(TB > Calibrate > Output A / Output B Sensor Cal)

For a Zero Only calibration, select Zero only and follow the prompts on the Field Communicator. Depending upon the sensor you wish to calibrate, select either *Output A Sensor Cal* or *Output B Sensor Cal* from the *Calibrate* menu.

To do a Zero and Span calibration on the output pressure sensors, connect an external reference gauge to the output being calibrated. The gauge should be capable of measuring maximum instrument supply pressure. Select Zero and Span and follow the prompts on the Field Communicator. Depending upon the sensor you wish to calibrate, select either *Output A Sensor Cal* or *Output B Sensor Cal* from the *Calibrate* menu.

When finished place the Transducer Block Mode in Auto. Verify that the displayed pressure matches the measured output pressure.

Section 7 Viewing Device Information

Instrument Identification 7-2

View Lists 7-2

Resource Block 7-2

Transducer Block 7-5

Instrument Identification

Read-only parameters on the resource and transducer block configuration pages provide identification information about the instrument. Detailed information for these parameters is provided in this section.

View Lists

View Lists allow the values of a set of parameters to be accessed at the same time. View lists are available for the resource and transducer blocks, and the function blocks.

Resource Block—tables 5-6 through 5-9

Transducer Block—tables 5-14 through 5-20

AO Function Block—tables 5-25 through 5-28

PID Function Block—tables 5-32 through 5-35

IS Function Block—tables 5-40 through 5-43

OS Function Block—tables 5-48 through 5-51

AI Function Block—tables 5-57 through 5-60

MAI Function Block—tables 5-64 through 5-67

DO Function Block—tables 5-72 through 5-75

DI Function Block—tables 5-81 through 5-84

Note

Views Lists are used by hosts for efficient monitoring of multiple parameters. Normally you will not be aware of view list usage, as they are hidden by the host software.

Resource Block

This section contains information on the DVC6000f Series digital valve controller resource block. The resource block defines the physical resources of the device. The resource block also handles functionality that is common across multiple blocks. The block has no linkable inputs or outputs.

Display

Instrument

(RB > Display > Instrument)

The following parameters are contained in the the Instrument menu of the resource block.

- **Strategy**

Strategy (STRATEGY [3]) permits strategic grouping of blocks so the operator can identify where the block is located. The blocks may be grouped by plant area, plant equipment, etc. Enter a value between 0 and 65535 in the Strategy field.

- **Tag Description**

The Tag Description (TAG_DESC [2]) is unique description of each block within the digital valve controller, used to describe the intended application for the block. Follow the prompts on the Field Communicator to enter an up to 32 character description for the block in the Tag Description field. (This parameter is read/write.)

- **Device ID**

The 32 character Device ID (DEVICE_ID [54]).

- **Electronics Serial Number**

The Electronics Serial Number (ELECTRONICS_SN [49]) set at the factory.

- **Factory Serial Number**

The Factory Serial Number (FACTORY_SN [50]) is the instrument serial number set at the factory.

- **Field Serial Number**

The Field Serial Number (FIELD_SN [51]) is the serial number of the valve and actuator on which the instrument is mounted.

- **Manf ID**

Manufacturer Identification (MANUFAC_ID [10]) identifies the manufacturer of the instrument. It is used by the host system to locate the DD file for the device. For Fisher the Manf ID is 0x5100.

- **Device Type**

Device Type (DEV_TYPE [11]) identifies the type of device. It is used by the host system to locate the DD file for the device. For a DVC6000f digital valve controller with Standard Control the device type is 0x4601.

- **Device Revision**

Device Revision (DEV_REV [12]) identifies the device revision number. It is used by the host system to locate the DD file for the device.

- **DD Revision**

DD Revision (DD_REV [13]) identifies the minimum revision of the device description (DD) that is compatible with the Device Revision (DEV_REV [12]) of the instrument.

- **ITK Version**

ITK Version (ITK_VER [41]) identifies the major version of the Interoperability Tester used by the Fieldbus Foundation in certifying the device as interoperable. This device revision meets the requirements of version 4.

- **Features**

Features (FEATURES [17]) shows the supported resource block options.

- **Software Rev All**

Software Revision All (SOFTWARE_REV_ALL [47.6]) shows all device software revisions currently in operation.

- **Stby Software Rev All**

Standby Software Revision All (STBY_SOFTWARE_REV_ALL [55.6]) shows all device software revisions currently in standby.

Options

(RB > Display > Options)

The following parameters are contained in the the Options menu of the resource block.

- **Diag Options**

Diagnostic Options (DIAG_OPTIONS [45]) shows the diagnostic options available in the instrument.

- **Function Block Options**

Function Block Options (FB_OPTIONS [44]) shows which function blocks are available in the instrument.

- **Misc Options**

Miscellaneous Options (MISC_OPTIONS [46]) indicates which miscellaneous licensing options are enabled.

- **Feature Selection**

Feature Selection (FEATURE_SEL [18]) indicates which device features have been selected.

Resource Status

(RB > Display > Resource Status)

The following parameters are contained in the the Resource Status menu of the resource block.

- **Block Error**

Block Error (BLOCK_ERR [6]) indicates an error status associated with hardware or software for the resource block.

Table 7-1 lists conditions reported in the BLOCK_ERR [6] parameter. Conditions in *italics* are not applicable for the resource block and are provided only for your reference.

Table 7-1. Resource Block BLOCK_ERR Conditions

Condition Number	Condition Name and Description
0	**Other** - Set if a device initialization error occured.
1	**Block Configuration Error** - Set if FEATURE_SEL, CYCLE_SEL, or CYCLE_TYPE is set incorrectly.
2	*Link Configuration Error - N/A*
3	**Simulate Active** - Indicates that the simulation jumper is in place on the aux terminals. This is not an indication that the I/O blocks are using simulation data. See AO block paramter SIMULATE [10] and DO block parameter SIMULATE_D [10].
4	*Local Override - N/A*
5	*Device Fault State - N/A*
6	**Device Needs Maintenance Soon** - Indicates a Maintenance PlantWeb Alert condition is active.
7	*Input failure/process variable had Bad status - N/A*
8	*Output failure - N/A*
9	**Memory failure** - Indicates a pending Flash or NVM failure.
10	**Lost Static Data** - Indicates failure of the memory containing static parameters
11	**Lost NV Data** - Indicates failure of the memory containing non-volatile parameters.
12	*Readback Check Failed - NA*
13	**Device Needs Maintenance Now** - Indicates a Failed PlantWeb Alert condition is active.
14	**Power Up** - Indicates the device has been powered up and the Resource Block is not running normally.
15	**Out of Service (MSB)** - The resource block actual mode is Out of Service.

- **Device State**

Device State (RS_STATE [7]) indicates the state of the function blocks. Four states are possible:

○ **Initialization**—The instrument enters this state upon restart or failure. The function blocks are in the IMan mode. During the initialization state, all unreported function block alarms are automatically confirmed and acknowledged. Once the instrument is considered operational, block execution is scheduled and the instrument state moves to Online.

○ **Online**—The instrument will be in this state if it is operational. The function blocks are initially in the Auto mode, but can be changed to a higher level mode.

○ **Standby**—The instrument enters this state if the resource block mode is Out of Service (OOS). In this state all function block modes are forced to Out of Service. The transducer block mode is not affected. When the resource block mode is changed to Auto, the instrument state moves to Online.

○ **Failure**— The instrument moves to this state whenever a hardware or memory failure is detected which would prevent reliable operation. All function blocks and the transducer block modes are Out of Service.

- **Fault State**

Fault State (FAULT_STATE [28]), when active, indicates a loss of communication to an output block, a fault promoted to an output block, or loss of a physical contact. If the fault state is active, the output function blocks perform their FSTATE [28] actions. Selecting Fault State enables the ability to manually set and clear the fault state. Setting Set FState (SET_FSTATE [29]) to SET manually places the instrument in the fault state. Setting Clear FState (CLR_FSTATE [30]) to CLEAR clears the device fault state, if no faults are currently active. You can test the actions the output blocks will perform by manually setting fault state active.

- **Write Lock**

Write Lock (WRITE_LOCK [34]) determines if writes are permissible to other device parameters. The Soft Write Lock feature must be selected to be able to use Write Lock (see Selecting Features). When Write Lock is set to Locked, no writes are permitted to any parameters within the device except to set Write Lock to Not Locked. When locked, the block functions normally, updating inputs and outputs and executing algorithms. When Write Lock is set to Not Locked, the Write Alarm alert is active.

Transducer Block

This section contains information on the DVC6000f Series digital valve controller transducer block. Descriptions of all transducer block parameters are included. The transducer block decouples function blocks from the local output functions required to command output hardware. The transducer block typically contains setup and calibration information.

Display

(TB > Display)

The following parameters are contained in the Display menu of the transducer block.

- **Trans Block Mode**

  - **Block Mode: Target**

The Target (TARGET [5.1]) mode is the mode requested by the user or host system. Generally, only one mode is allowed to be set, and it must be a permitted mode as defined by the permitted attribute of the mode parameter. Additionally, all cascade targets (Cas, Rcas) must have AUTO set.

  - **Block Mode: Actual**

This is the current mode of the block. The actual (ACTUAL [5.2]) mode may differ from the target mode due to operating conditions of the block.

Note

Block Mode:Actual drops the AUTO bit for the cascade targets. For example, target mode might have Cas and Auto set, but actual mode will only have Cas set.

  - **Block Mode: Permitted**

The permitted (PERMITTED [5.3]) mode defines the modes allowed for the block. This is set by the user or host system but is restricted by the instrument to modes supported by the instrument for the particular block. Any change request to the Target or Normal attribute is checked against the permitted attribute to ensure the requested mode is permitted. When setting the Permitted mode, there is no check against any of the other attributes (Normal or Target modes).

Therefore, the normal or target mode attributes may have a value that is not permitted because the permitted attribute was modified after the Normal or Target mode was set. This will have no effect on the instrument until the user attempts to modify the Target or Normal mode. At this time these attributes are tested against the Permitted modes, thus the user cannot change the Normal or Target modes to what was formerly permitted.

  - **Block Mode: Normal**

The normal (NORMAL [5.4]) mode is the mode the block should be in during normal operating conditions. The normal mode is set by the user or host system and can only be set to a permitted mode (see permitted mode). The user or host system can compare the actual mode to the normal mode and, based on the results, determine if the block is operating normally.

- **Setpoint**

Setpoint (FINAL_VALUE.VALUE [13.2]) shows the value of the setpoint in % (percent) of ranged travel or pressure. Setpoint is used for both travel and pressure control. Written directly or by the AO block. This value is not automatically updated unless the AO block and the transducer block are both in Auto.

Discrete Setpoint (SETPOINT_D.VALUE [32.2]) shows the value of the setpoint in discrete values. 0 = closed, 1 = open, 5, 10, 15... = setpoint in 5% units. Written directly or by DO block. This value is not automatically updated unless the AO block and the transducer block are both in Auto.

- **Travel**

Travel (FINAL_POSITION_VALUE.VALUE [17.2]) shows the value of of the travel in % (percent) of ranged travel. Travel always represents how far the valve is open.

Travel (TRAVEL_D.VALUE [33.2]) shows the value of the setpoint in discrete values. 0 = closed, 1 = open, 5, 10, 15... = setpoint in 5% units.

- **Drive Signal**

Drive Signal (DRIVE_SIGNAL [53]) indicates the drive signal, as a percentage of the maximum drive available, going to the I/P converter from the printed wiring board. In most applications, the drive signal ranges between 50% and 75% of the maximum drive signal.

- **Supply Press**

Supply Pressure (SUPPLY_PRESSURE_VALUE [35.2]) shows the value of the supply pressure in psi, bar or kPa.

- **Pressure A**

Pressure A (PRESSURE_A.VALUE [36.2]) shows the value of Output Pressure A in psi, bar or kPa.

- **Pressure B**

Pressure B (PRESSURE_B.VALUE [37.2]) shows the value of Output Pressure B in psi, bar or kPa.

- **Pressure Diff**

Pressure Differential (PRESSURE_DIFF.VALUE [38.2]) shows the value of the output pressure differential in psi, bar or kPa.

- **Temperature**

Temperature (TEMPERATURE [48]) displays the internal temperature of the instrument in either degrees Fahrenheit or Celsius.

- **Tvl/Press State**

Travel/Pressure State (TVL_PRESS.STATE [41.2]) indicates if the instrument is being used for travel control (position control) or as an I/P (pressure control)

- **Input Char**

Input Characteristic (INPUT_CHAR [50]) defines the relationship between the travel target and ranged set point. Ranged set point is the input to the characterization function. If the zero control signal equals closed, then a set point of 0% corresponds to a ranged input of 0%. If the zero control signal equals open, a set point of 0% corresponds to a ranged input of 100%. Travel target is the output from the characterization function.

- **Cycle Count**

Cycle Counter (CYCLE_COUNT [73]) records the number of times the travel changes direction. The change in direction must occur after the deadband has been exceeded before it can be counted as a cycle.

- **Travel Accum**

Travel Accumulator (TRAVEL_ACCUM [72]) indicates the total change in travel, in percent of ranged travel. The accumulator only increments when travel exceeds the deadband. Then the greatest amount of change in one direction from the original reference point (after the deadband has been exceeded) will be added to the Travel Accumulator.

- **Tvl Count**

Travel Count (TVL_COUNT [43.1]) is the Travel Sensor readback displayed in A/D counts.

Tvl Press Status

(TB > Display > Tvl Press Status)

The following parameters are contained in the Tvl Press Status menu of the transducer block.

- **Travel**

Travel (TRAVEL.VALUE [34.2]) indicates the value of the DVC6000f Series digital valve controller travel in percent (%) of travel. Travel always represents how far the valve is open.

- **Travel Status**

Travel Status (TRAVEL.STATUS [34.1]) indicates a fault that makes the travel measurement bad or prevents the actuator from responding. This information is passed along with each transmission of the travel in the form of a status attribute.

- **Supply Press**

Supply Pressure (SUPPLY_PRESSURE.VALUE [35.2]) shows the value of the supply pressure in psi, bar, or kPa.

- **Supply Press Status**

Supply Pressure Status (SUPPLY_PRESSURE.STATUS [35.1]) shows the validity of the Supply Pressure value.

- **Pressure A**

Pressure A (PRESSURE_A.VALUE [36.2]) shows the value of Output Pressure A in psi, bar, or kPa.

- **Pressure A Status**

Pressure A (PRESSURE_A.STATUS [36.1]) shows the validity of the Output Pressure A value.

- **Pressure B**

Pressure B (PRESSURE_B.VALUE [37.2]) shows the value of the Output Pressure B in psi, bar, or kPa.

- **Pressure B Status**

Pressure B Status (PRESSURE_B.STATUS [37.1]) shows the validity of the Output Pressure B status.

- **Pressure Diff**

Pressure Differential (PRESS_DIFF.VALUE [38.2]) shows the value of the output pressure differential in psi, bar, or kPa.

- **Pressure Diff Status**

Pressure Differential Status (PRESS_DIFF.STATUS [38.1]) shows the validity of the pressure differential status.

Device Record

(TB > Display > Device Record)

The following parameters are contained in the Device Record menu of the transducer block.

- **Temp Max**

Temperature Maximum (TEMP_MAX [86.1]) shows the maximum temperature the instrument has experienced since installation.

- **Temp Max Time**

Temperature Maximum Time (TEMP_MAX_TIME [86.2]) shows the date and time when the Temp Max occurred.

- **Temp Min**

Temperature Minimum (TEMP_MIN [86.3]) shows the minimum temperature the instrument has experienced since installation.

- **Temp Min Time**

Temperature Minimum Time (TEMP_MIN_TIME [86.4]) shows the date and time when the Temp Min occurred.

- **Supp Press Max**

Supply Pressure Maximum (SUPPLY_PRESS_MAX [86.5]) shows the maximum supply pressure the instrument has experienced since installation.

- **Supp Press Max Time**

Supply Pressure Maximum Time (SUPP_PRESS_MAX_TIME [86.6]) shows the date and time when the Supp Press Max occurred.

- **Supp Press Min**

Supply Pressure Minimum (SUPP_PRESS_MIN [86.7]) shows the minimum supply pressure the instrument has experienced since installation.

- **Supp Press Min Time**

Supply Pressure Minimum Time (SUPP_PRESS_MIN_TIME [86.8]) shows the date and time when the Supp Press Min occurred.

Block Errors

Table 7-2 lists conditions reported in the BLOCK_ERR [6] and XD_ERROR [11] parameters. Conditions in *italics* are not applicable for the transducer block and are provided only for your reference.

Table 7-2. Transducer Block BLOCK_ERR and XD_ERROR Conditions

Condition Number	Condition Name and Description
0	*Other - (N/A)*
1	**Block Configuration Error** - Indicates that one of the following parameters have been configured out of the proper range: 15, 16, 47.1, 47.2, 46.3, 46.5, 42.7, 42.8.
2	*Link Configuration Error - (N/A)*
3	**Simulate Active** - Indicates that the simulation jumper is in place on the aux terminals. This is not an indication that the I/O blocks are using simulation data. See AO block paramter SIMULATE [10] and DO block parameter SIMULATE_D [10].
4	*Local Override - (N/A)*
5	*Device Fault State – (NA)*
6	*Maintenance Needed Soon - (N/A)*
7	*Input failure/process variable has Bad status - (N/A)*
8	*Output failure - (N/A)*
9	*Memory failure - (N/A)*
10	**Lost Static Data** - Indicates that manufacturing functional or thermal tests were incomplete
11	*Lost NV Data - (N/A)*
12	*Readback Check Failed - (N/A)*
13	**Device Needs Maintenance Now** - Indicates that manufacturing functional or thermal tests were incomplete
14	*Power Up - (N/A)*
15	**Out of Service** - Indicates Out of Service Mode.

Section 8 Principle of Operation

Digital Valve Controller Operation 8-2

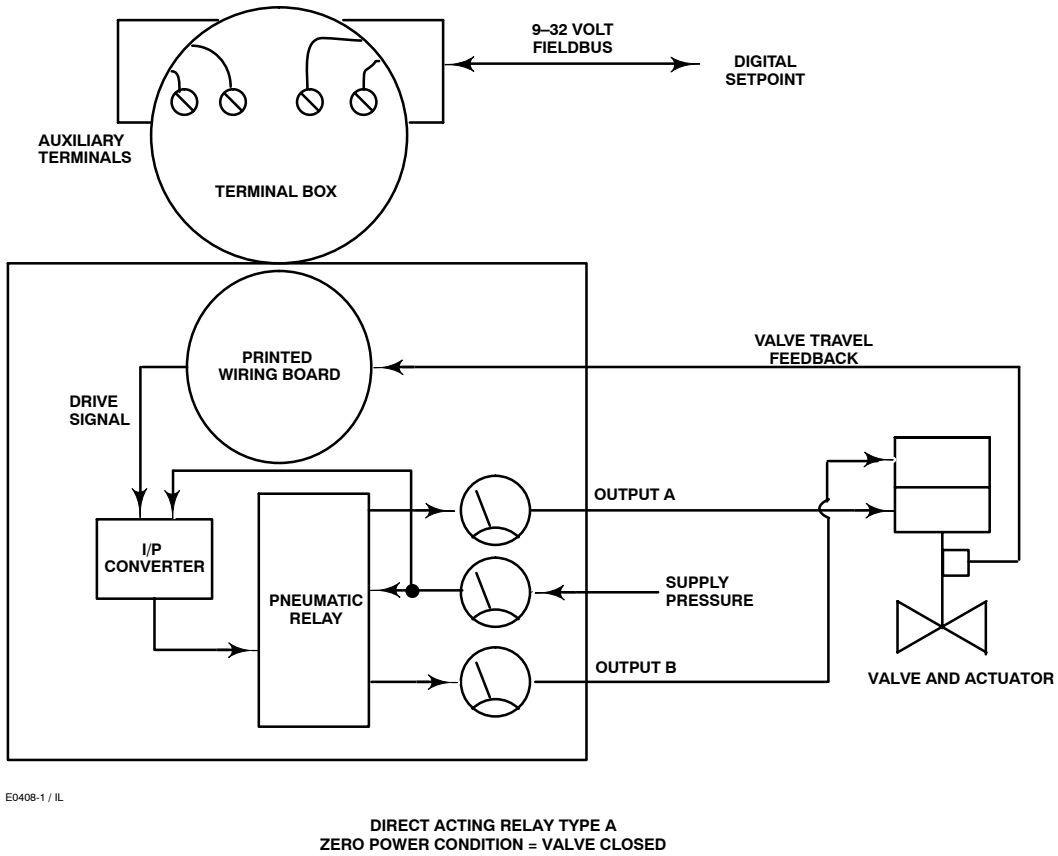

Figure 8-1. DVC6000f Series Digital Valve Controller Block Diagram

Digital Valve Controller Operation

DVC6000f Series digital valve controllers have a single module base that may be easily replaced in the field without disconnecting field wiring or tubing. The master module contains the following submodules: current-to-pneumatic (I/P) converter, printed wiring board assembly, and pneumatic relay. The master module can be rebuilt by replacing the submodules. See figures 8-1 and 8-2.

DVC6000f Series digital valve controllers are bus-powered instruments that provide a control valve position in response to a digital setpoint from the control room. The following describes a direct acting Type DVC6010f digital valve controller mounted on a sliding stem piston actuator, where the valve is closed with zero power to the instrument.

The setpoint is routed into the terminal box through a single pair of wires and then to the printed wiring board assembly submodule where it is read by the microprocessor, processed by a digital algorithm, and converted into an analog I/P drive signal.

As the setpoint 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 Relay Type A, an increasing setpoint will produce increasing pressure at output A and decreasing pressure at output B (with Relay Type B only output A is available and is reversed). 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.

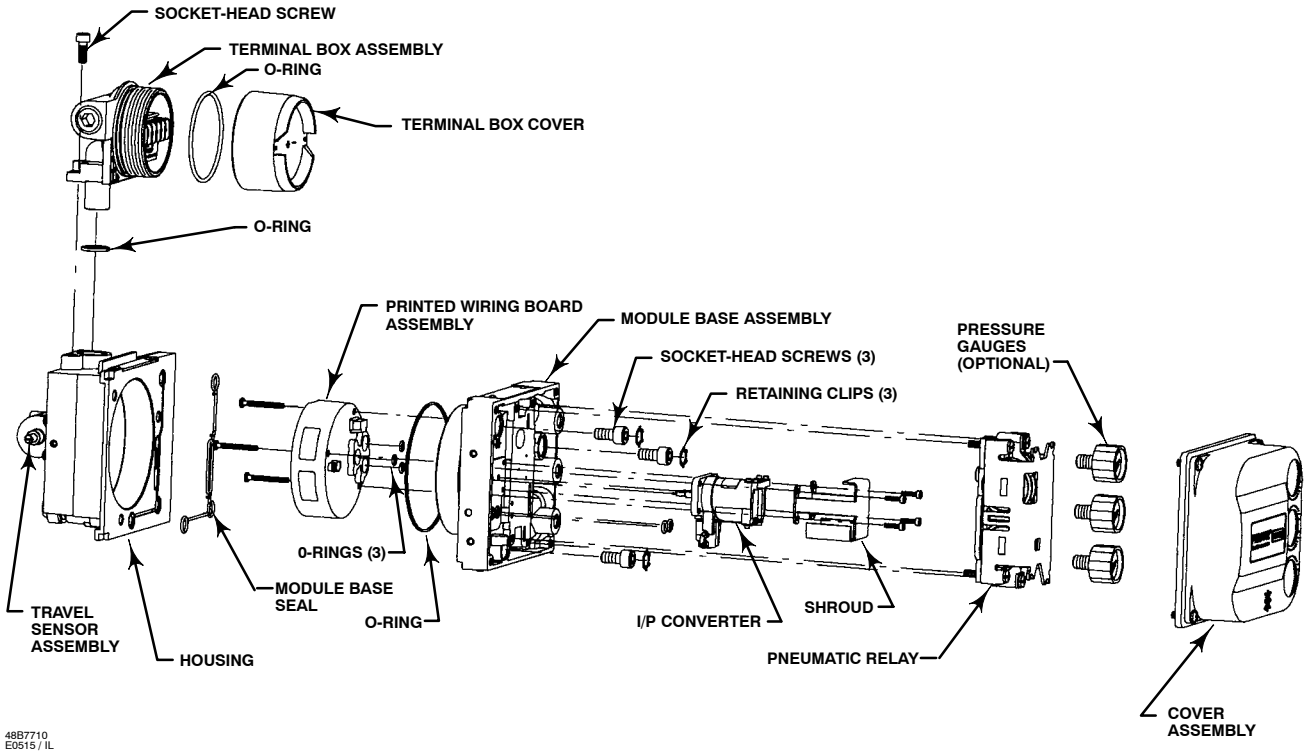

Figure 8-2 . DVC6000f Series Digital Valve Controller Assembly

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As shown in figure 8-1, the increased output A pressure causes the actuator stem to move upward. Stem position is sensed through the feedback linkage by the travel sensor which is electrically connected to the printed wiring board assembly submodule. The stem continues to move downward until the correct stem position is attained. At this point the printed wiring board assembly stabilizes the I/P drive signal. This prevents any further increase in the pneumatic signal from the I/P converter.

As the digital setpoint 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 downward until the correct position is attained. At this point the printed wiring board assembly stabilizes the I/P drive signal. This prevents any decrease in the pneumatic signal from the I/P converter.

Section 9 PlantWeb® Alerts

Instrument Alert Conditions 9-2

PlantWeb Alerts 9-2

Alert Handling 9-2

Alert Reporting 9-3

PlantWeb Alerts Set Block Status 9-3

Setting PlantWeb Alerts 9-3

Using PlantWeb Alerts 9-3

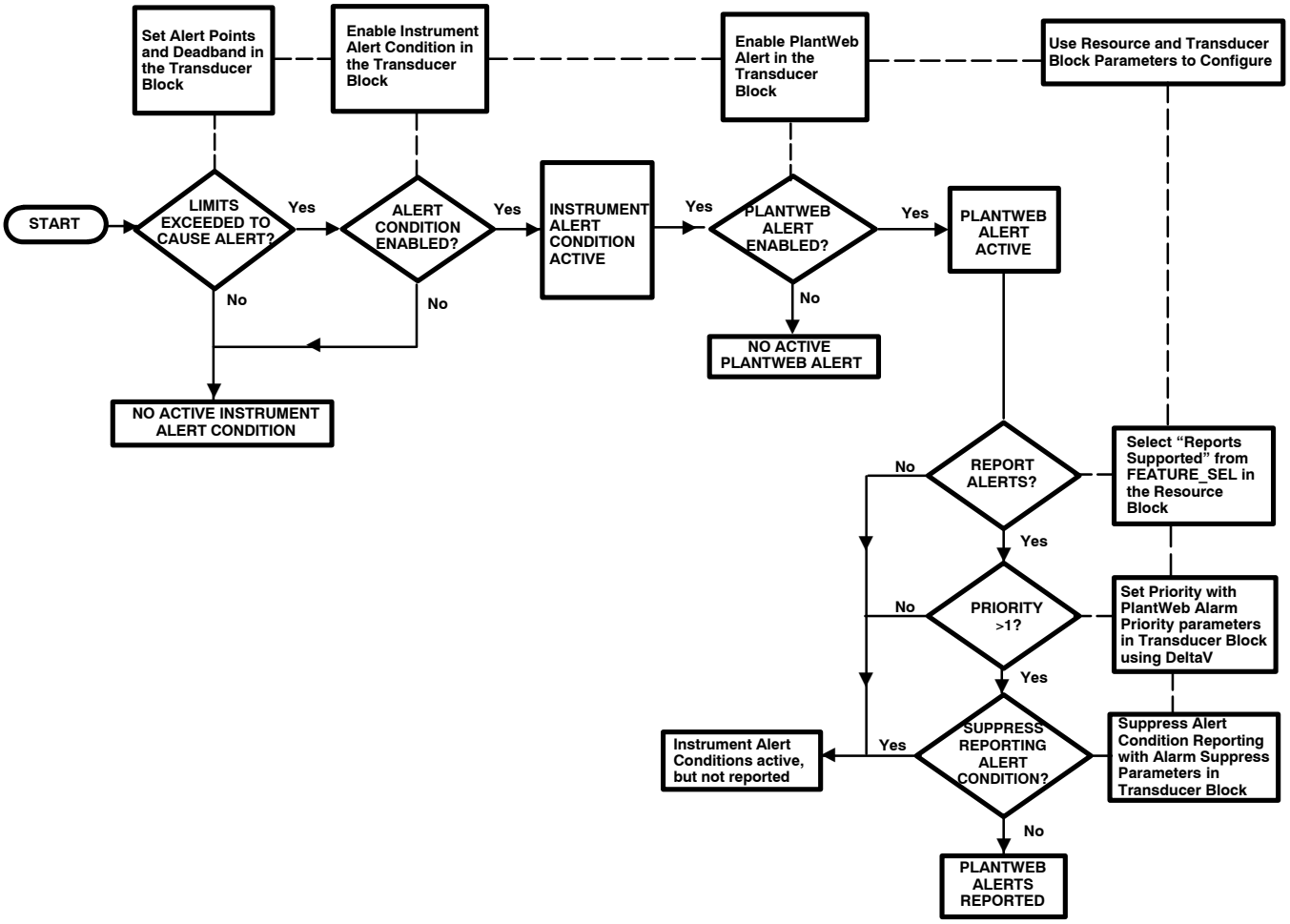

Figure 9-1. Alert Handling for DVC6000f

Instrument Alert Conditions

Instrument Alert Conditions, when enabled, detect many operational and performance issues that may be of interest. To view these alerts, the user must open the appropriate status screen on a host such as DeltaV, AMS ValveLink Software or a 375 Field Communicator.

PlantWeb Alerts

Some instrument alert conditions can also be used to trigger PlantWeb alerts that will be reported in Failed, Maintenance or Advisory categories, as configured by the user. PlantWeb alerts, when enabled, can participate in the DeltaV alarm interface tools such as the alarm banner, alarm list and alarm summary.

When a PlantWeb alert occurs, the DVC6000f sends an event notification and waits a specified period of time for an acknowledgment to be received. This occurs even if the condition that caused the alert no longer exists. If the acknowledgment is not received within the pre-specified time-out period, the event notification is retransmitted. This reduces the possibility of alert messages getting lost.

Alert Handling

Alert handling is diagrammed in figure 9-1. There are two ways of seeing PlantWeb alerts. One way is to see if the instrument alert condition causing a PlantWeb alert is detected. The second is to view alerts reported to the system operator console. For a PlantWeb alert to be active, it has to pass three tests. The first is to check if the Instrument alert condition is enabled. If a condition is not enabled, the instrument does not check for the alert condition.

Second, the condition that will cause an alert must exist. For example, the current travel is above the Travel Limit Hi Alert Point.

Third, the corresponding PlantWeb alert must be enabled in one or more of the three categories: Failed, Maintenance or Advise.

Note

Additional details on setting up and using Instrument Alerts can be found on page 5-29 of this manual.

Alert Reporting

For PlantWeb alerts to be reported to the operator console, they must pass four tests:

- Alerts must be active
- Reports must be selected in Feature Select
- Alert priority must be greater than 1
- Reporting must not be suppressed for those conditions that caused active alerts.

Feature Select in the Resource block determines if reporting by the instrument is supported. Refer to page 5-5 for additional information on Feature Select.

Failed Priority (FAILED_PRI [68]), Maintenance Priority (MAINT_PRI [69]), and Advise Priority (ADVISE_PRI [70]) determine the PlantWeb alert priorities. Although 16 priorities are available only three are actually meaningful for PlantWeb alerts. If the priority is 0, no reporting occurs. If the priority is 1, reporting is simulated within the instrument, but the alert is not actually reported over the bus. The alert condition is reported for priorities 2 through 15, with the higher priorities taking precedence over the lower priorities.

Failed Suppress (FAILED_MASK [65]), Maintenance Suppress (MAINT_MASK [66]), and Advise Suppress (ADVISE_MASK [67]) determine which of the alert conditions are suppressed so that they are not reported.

PlantWeb Alerts Set Block Status

If a PlantWeb Alert is active, the AO or DO Block Readback parameter status may change. This behavior is controlled with Feature Select in the resource block. Refer to page 5-5 for additional information on Feature Select.

Setting PlantWeb Alerts

Refer to table 9-1 for information on setting PlantWeb alerts. When selected, PlantWeb alarms will set the PV status according to table 9-3.

Using PlantWeb Alerts

Refer to table 9-2 for information on using PlantWeb alerts.

Table 9-1. Setting PlantWeb Alerts

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Related Parameters and (Default)	Guidelines for Setting
Drive Current (Electronics)	User Config. (Failed)	Drive Current (Enabled)	The difference between the expected Drive Current and the actual Drive Current has exceeded the configured limit.	Self Test Shutdown (No) Shutdown Recovery (Auto) Alert Point (50%) Alert Time (5 sec)	Use default settings
Drive Signal (Electronics)	User Config. (Maintenance)	Drive Signal (Enabled)	The Drive Signal is greater or less than the expected maximum or minimum.		Use default setting
Processor Impaired (Electronics)	User Config. (Maintenance)	Program Memory (Enabled)	A failure in the Flash Memory where the program is stored.	Self Test Shutdown (No) Shutdown Recovery (Auto)	Use default settings
		Static Memory (Enabled)	A failure of the FRAM memory where static parameters are stored.	Self Test Shutdown (No) Shutdown Recovery (Auto)	Use default settings
		Processor (Enabled)	A failure of the main Processor.	Self Test Shutdown (No) Shutdown Recovery (Auto)	Use default settings
		I/O Processor (Enabled)	A failure of the I/O Processor.	Self Test Shutdown (No) Shutdown Recovery (Auto)	Use default settings
Output Block Timeout (Configuration)	User Config. (Maintenance)	Output Block Timeout (Disabled)	If the analog or discrete output block has not executed or has remained out of service for longer than the configure timeout, this alert is detected.	Timeout Alert Point (600 s) Self Test Shutdown (No) Shutdown Recovery (Auto)	Enable this alert for loops where the execution is critical. If the AO or DO block is not scheduled, or scheduled incorrectly, it will trigger an alert after the Timeout Alert Point has been exceeded. Set the Timeout Alert Point to a value between a. 30 seconds and b. the maximum time before a user should be notified. The minimum number depends on the time it takes for a host to download a configuration to the device. Shutdown can be enabled if it is desired to move the valve to the Zero Power Condition at the same time that the alert is generated.
Blocks Set to Default (Configuration)	User Config. (Failed)	Blocks Set to Default (Enabled)	If the user has restarted with defaults, all blocks have been restored to original factory settings.	None	Use default settings
Shutdown Alert (Configuration)	User Config. (Failed)	N/A	A user configured Self Test Shutdown condition has taken the instrument to OOS.	None	Use default settings

–Continued–

Table 9-1. Setting PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Related Parameters and (Default)	Guidelines for Setting
Travel Sensor (Sensors)	User Config. (Failed)	Travel Sensor (Enabled)	The parameter TVL_COUNT is greater than TVL_FAC_HI or less than TVL_FAC_LO.	Self Test Shutdown (No) Shutdown Recovery (Auto)	**Double Acting Actuators**—Enable the alert and configure it to report in the Failed Alert Category. Self Test Shutdown is generally not enabled. **Single Acting Actuators**—If Travel / Pressure Control is configured as Travel with Pressure Fallback: enable the alert and configure it to report in the Maintenance Alert Category. Do not enable Self Test Shutdown. If Travel / Pressure Control is configured as Pressure: Do not enable the alert or the Self Test Shutdown. If Travel / Pressure Control is configured as Travel: Enable the alert and configure it to report in the Failed Alert Category. Self Test Shutdown is generally not enabled.
Output Press Sensor (Sensors)	User Config. (Maintenance)	Port A Pressure Sensor (Enabled)	The pressure sensor reading is outside the functional range of the sensor.	Self Test Shutdown (No) Shutdown Recovery (Auto)	If Travel / Pressure Control is configured as Pressure: enable the alert and configure it to report in the Failed Alert Category. Enable the Self Test Shutdown. For all other Travel / Pressure Control selections, enable the alert to report in the Maintenance Alert Category and do not enable the Self Test Shutdown.
		Port B Pressure Sensor (Enabled)		None	Use default settings
Supply Press Sensor (Sensors)	User Config. (Advisory)	Supply Press Sensor (Enabled)	The pressure sensor reading is outside the functional range of the sensor.	None	Use default settings
Temperature Sensor (Sensors)	User Config. (Advisory)	Temperature Sensor (Enabled)	The temperature sensor reading is outside the functional range of the sensor.	None	Use default settings

–Continued–

Table 9-1. Setting PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Related Parameters and (Default)	Guidelines for Setting
Supply Pressure (Environment)	User Config. (Maintenance)	Supply Press High (Enabled)	The supply pressure reading is above the user adjusted threshold.	Alert Point (145 psig)	Enable the alert in the Maintenance Alert Category. Set the Alert Point to which ever is lower of a. the maximum instrument pressure of 145 psig or b. the maximum actuator casing pressure.
		Supply Press Low (Enabled)	The supply pressure reading is below the user adjusted threshold	Alert Point (19 psig)	Enable the alert in the Maintenance Alert Category. **Double Acting Actuators—** Set the Alert Point above the minimum required for valve shutoff and no greater than 1 psig below the supply regulator setting **Single Acting Actuators—** Set the Alert Point above the minimum required for valve shutoff and no greater than 1 psig below the supply regulator setting. This is generally about 3 psig above the actuator upper bench set (stroking) pressure.
Temperature Limit (Environment)	User Config. (Advisory)	Temperature High (Enabled)	The instrument temperature is above the used adjusted threshold.	Alert Point (186°C)	Use default settings Other alert points may be chosen to indicate changes in the instrument environment.
		Temperature Low (Enabled)	The instrument temperature is below the user adjusted threshold.	Alert Point (−63°C)	Enable the alert in the Maintenance Alert Category. Set the Alert Point at −40°F if the instrument uses Nitrile elastomers and −63°F if it uses Fluorosilicone elastomers. Other alert points may be chosen to indicate changes in the instrument environment.
Travel Deviation (Travel)	User Config. (Maintenance)	Travel Deviation (Enabled)	The difference between Setpoint and Travel is greater than the configured limits.	Alert Point (5%) Alert Time (10 sec) Deadband (2%)	Enable the alert in the Maintenance Alert Category. Use the default settings with valves that are 4 inch and smaller with PTFE packing systems. With other valves, the user can refine the settings with AMS ValveLink Software Dynamic Error Band and Step Response Tests. Set the related parameters as follows: Tvl Dev Alert Point—set equal times 2 the Maximum Dynamic Error, minimum 3% Tvl Dev DB—set equal to the Dynamic Error Band, minimum 2% Tvl Dev Time—set equal to the T98 time for a Step Test from 0 to 100% Travel, minimum 10 seconds.

−Continued−

Table 9-1. Setting PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Related Parameters and (Default)	Guidelines for Setting
Travel Limit (Travel)	User Config. (Advisory)	Travel Limit Hi Hi (Disabled)	The Travel is greater than the configured limit.	Alert Point (125%) Deadband (5%)	Enable this alert for critical loops, where it is important to alert an operator if the valve is approaching the wide open position. A typical setting might be 95%.
		Travel Limit Lo Lo (Disabled)	The Travel is lower than the configured limit.	Alert Point (–25%) Deadband (5%)	Enable this alert for critical loops, where it is important to alert an operator if the valve is approaching the closed position. A typical setting might be 5%.
N/A (Travel)	User Config. (N/A)	Travel Limit Hi (Disabled)	The Travel is greater than the configured limit.	Alert Point (125%) Deadband (5%)	Use the Alert Points and Deadband to configure the Proximity Alerts below.
		Travel Limit Lo (Disabled)	The Travel is lower than the configured limit.	Alert Point (–25%) Deadband (5%)	Use the Alert Points and Deadband to configure the Proximity Alerts below.
N/A (Proximity)	User Config. (N/A)	Travel Open (Disabled)	The Travel is greater than the Open Alert Point	Alert Point (99.5%) Deadband (5%)	Enable and set to report Travel with DI Block
		Travel Closed (Disabled)	The Travel is greater than the Closed Alert Point	Alert Point (0.5%) Deadband (5%)	Enable and set to report Travel with DI Block
		Proximity Hi Hi (Disabled)	The Travel is within the configured band of the configured center point.	Alert Point (125%) Deadband (5%)	Enable and set to report Travel with DI Block
		Proximity Hi (Disabled)		Alert Point (125%) Deadband (5%)	Enable and set to report Travel with DI Block
		Proximity Lo (Disabled)		Alert Point (–25%) Deadband (5%)	Enable and set to report Travel with DI Block
		Proximity Lo Lo (Disabled)		Alert Point (–25%) Deadband (5%)	Enable and set to report Travel with DI Block
Cycle Counter (Travel History)	User Config. (Maintenance)	Cycle Counter (Disabled)	The number of travel reversals has exceeded the configured limit.	Alert Point (1,000,000) Deadband (1%)	Bellows Seal Bonnets— enable the alert in the Maintenance Alert Category. Use the bellows manufacturer's cycle life data to set cycle limits.
Travel Accumulator (Travel History)	User Config. (Maintenance)	Travel Accumulator (Disabled)	The accumulated travel has exceeded the configured limit.	Alert Point (1,000,000) Deadband (1%)	Packing Bonnets— enable the alert in the Maintenance Alert Category. When packing leaks are discovered, set the Travel Accumulator alert to 90% of the current Travel Accumulator Value, triggering an alert prior to anticipated leak.
Performance Critical (Performance)	User Config. (Failed)	Performance Critical (Enabled)	Critical performance issues based on continuous PD tests internal to the instrument.	None	Use default setting
Performance Reduced (Performance)	User Config. (Maintenance)	Performance Reduced (Enabled)	Reduced performance issues based on continuous PD tests internal to the instrument.	None	Use default setting
Performance Information (Performance)	User Config. (Advisory)	Performance Information (Enabled)	Performance Information based on continuous PD tests internal to the instrument.	None	Use default setting

Table 9-2. Using PlantWeb Alerts

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Effect on Valve / Instrument	Recommended Action	Help
Drive Current (Electronics)	User Config. (Failed)	Drive Current (Enabled)	The difference between the expected Drive Current and the actual Drive Current has exceeded the configured limit.	If configured for Self Test Shutdown, then the transducer Actual mode is placed Out of Service until the problem is fixed. Out of Service results in the instrument output pressure(s) and actuator position being at the Zero Power Condition.	Check I/P module	The instrument has detected that the difference between the expected Drive Current and the actual Drive Current is greater than the configured limit 1) Replace the I/P module 2) Calibrate the device. If the problem persists, replace the printed wiring board (PWB) assembly.
Drive Signal (Electronics)	User Config. (Maintenance)	Drive Signal (Enabled)	The Drive Signal is greater or less than the expected maximum or minimum.	None – Indicates reduced performance.	Check instrument pneumatics	The instrument I/P drive signal necessary to generate the pressure output from the instrument is not within the expected range. Potential causes include I/P filter plugged, instrument pneumatic relay failure, low supply pressure, air leaks, or valve sticking. Test the control valve assembly for proper operation. ValveLink diagnostics can be used for this purpose.
Processor Impaired (Electronics)	User Config. (Maintenance)	Program Memory (Enabled)	A failure in the Flash Memory where the program is stored.	If configured for Self Test Shutdown, then the transducer Actual mode is placed Out of Service until the problem is fixed. Out of Service results in the instrument output pressure(s) and actuator position being at the Zero Power Condition.	Replace PWB assembly	An error has been detected in the printed wiring board (PWB) assembly. Replace the PWB assembly.
		Static Memory (Enabled)	A failure of the FRAM memory where static parameters are stored.			
		Processor (Enabled)	A failure of the main Processor.			
		I/O Processor (Enabled)	A failure of the I/O Processor.			

–Continued–

Table 9-2. Using PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Effect on Valve / Instrument	Recommended Action	Help
Output Block Timeout (Configuration)	User Config. (Maintenance)	Output Block Timeout (Disabled)	If the AO or DO block has not executed or has remained out of service for longer than the configure timeout, this alert is detected.	If configured for Self Test Shutdown, then the transducer Actual mode is placed Out of Service until the problem is fixed. Out of Service results in the instrument output pressure(s) and actuator position being at the Zero Power Condition.	Check Output Block	The function block providing the setpoint for the valve position (AO or DO function block) has not executed within the user configured time limit. If configured for Self Test Shutdown, the transducer Actual mode is set to Out of Service. 1) Change the output block mode to another mode other than Out of Service (OOS). 2) Download the control schedule from the host configuration device. 3) Make sure the Time Out Alert Point is greater than the block execution schedule. This alert should only be utilized in very critical loops where execution time is critical.
Blocks Set to Default (Configuration)	User Config. (Failed)	Blocks Set to Default (Enabled)	If the user has restarted with defaults, all blocks have been restored to original factory settings.	The transducer "Actual" mode is placed Out of Service until the problem is fixed. Out of service results in the actuator being at the Zero Power Condition.	Download device configuration	When restoring power to the device, the configuration parameters could not be recalled from non-volatile memory. When the instrument detects this condition, the transducer Actual mode is set to Out of Service. To correct this situation, download the configuration to the device and set the Target Mode of the Resource block.
Shutdown Alert (Configuration)	User Config. (Failed)	N/A	A user configured Self Test Shutdown condition has taken the instrument to OOS.	None – Indicates why the instrument remains OOS.	Same as the configured Self Test Shutdown.	The instrument Actual mode remains OOS due to a configured Self Test Shutdown, where Manual Recovery was specified, even though the condition may have cleared. Check Recommended Action for the indicated condition.

–Continued–

Table 9-2. Using PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default))	What the Alert is Detecting	Effect on Valve / Instrument	Recommended Action	Help
Travel Sensor (Sensors)	User Config. (Failed)	Travel Sensor (Enabled)	The parameter TVL_COUNT is greater than TVL_FAC_HI or less than TVL_FAC_LO.	If configured for Self Test Shutdown, then the transducer "Actual" mode is placed Out of Service until the problem is fixed. Out of service results in the actuator being at the Zero Power Condition.	Check mounting and linkage	Travel feedback value is outside expected limits. If this problem occurs during instrument set-up, the most likely cause is faulty mounting or improper adjustment of the travel sensor. If this problem occurs during normal operation, the most likely cause is a failure of the travel sensor or damaged linkage. To correct, 1) Insure proper mounting and linkage adjustment. 2) Inspect and test travel sensor 3) Toggle the transducer target mode. If the problem persists, replace the printed wiring board (PWB) assembly.
Output Press Sensor (Sensors)	User Config. (Maintenance)	Port A Pressure Sensor (Enabled)	The pressure sensor reading is outside the functional range of the sensor.	If configured for Self Test Shutdown, then the transducer "Actual" mode is placed Out of Service until the problem is fixed. Out of service results in the actuator being at the "No Power" condition.	Confirm proper air supply	The pressure sensor on-board the device has failed. This may be due to excessive supply pressure or contaminated air. If it is verified that the air supply is ok, replace the printed wiring board (PWB) assembly.
		Port B Pressure Sensor (Enabled)		None – Indicates a possible hardware problem that would degrade diagnostic capability.		
Supply Press Sensor (Sensors)	User Config. (Advisory)	Supply Press Sensor (Enabled)	The pressure sensor reading is outside the functional range of the sensor.	None – Indicates a possible hardware problem that would degrade diagnostic capability.	Confirm proper air supply	The pressure sensor on-board the device has failed. This may be due to excessive supply pressure or contaminated air. If it is verified that the air supply is ok, replace the printed wiring board (PWB) assembly.

–Continued–

Table 9-2. Using PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Effect on Valve / Instrument	Recommended Action	Help
Temperature Sensor (Sensors)	User Config. (Advisory)	Temperature Sensor (Enabled)	The temperature sensor reading is outside the functional range of the sensor.	None – Indicates a possible hardware problem that would degrade instrument calibration and diagnostic capability.	Replace PWB assembly.	The temperature sensor on-board the device has failed or the unit has been exposed to an temperature extreme beyond the recommended limits.
Supply Pressure (Environment)	User Config. (Maintenance)	Supply Press High (Enabled)	The supply pressure reading is above the user adjusted threshold.	None – indicates a condition that could cause damage to the instrument or actuator.	Confirm proper air supply.	The Supply Pressure sensor on-board has detected an abnormally high supply pressure. Verify the proper supply pressure and that the alert is properly set.
		Supply Press Low (Enabled)	The supply pressure reading is below the user adjusted threshold	None – indicates a condition that could reduce performance or prevent the valve from shutting tightly.		The Supply Pressure sensor on-board has detected an abnormally low supply pressure. Verify the proper supply pressure and that the alert is properly set.
Temperature Limit (Environment)	User Config. (Advisory)	Temperature High (Enabled)	The instrument temperature is above the user adjusted threshold.	None – indicates a condition that could shorten service life or lead to reduced performance.	Check instrument environment.	The instrument temperature has exceeded the user configured high temperature limit. Operation of the instrument above the rated temperature may degrade instrument components. This may affect instrument performance and/or reduce the life of the instrument.
		Temperature Low (Enabled)	The instrument temperature is below the user adjusted threshold.			The instrument temperature has dropped below the user configured low temperature limit. Operation of the instrument below the rated temperature may degrade instrument components. This may affect instrument performance and/or reduce the life of the instrument.

–Continued–

Table 9-2. Using PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default)	What the Alert is Detecting	Effect on Valve / Instrument	Recommended Action	Help
Travel Deviation (Travel)	User Config. (Maintenance)	Travel Deviation (Enabled)	The difference between Setpoint and Travel is greater than the configured limits.	None – Indicates a reduced performance condition.	Check valve friction, supply air, instrument tuning	The valve travel is not following setpoint. Check operation of the valve and instrument. Possible items include; sticking valve, low supply pressure, broken feedback linkage, instrument pneumatic components, actuator, instrument tubing, poor instrument tuning, etc. Test the control valve assembly for proper operation. AMS ValveLink Software diagnostics can be used for this purpose.
Travel Limit (Travel)	User Config. (Advisory)	Travel Limit Hi Hi (Disabled)	The Travel is greater than the configured limit.	None	Check process loop	The actual valve position has exceeded the configurable travel limit (in %).
		Travel Limit Lo Lo (Disabled)	The Travel is lower than the configured limit.	None	Check process loop	
N/A (Travel)	User Config. (N/A)	Travel Limit Hi (Disabled)	The Travel is greater than the configured limit.	None	Check process loop	The actual valve position has exceeded the configurable travel limit (in %).
		Travel Limit Lo (Disabled)	The Travel is lower than the configured limit.	None	Check process loop	The actual valve position has exceeded the configurable ltravel limit (in %).
N/A (Proximity)	User Config. (N/A)	Travel Open (Disabled)	The Travel is greater than the Open Alert Point	None	Check process loop	The actual valve position is near the full open position.
		Travel Closed (Disabled)	The Travel is greater than the Closed Alert Point	None	Check process loop	The actual valve position is near the full closed position.
		Proximity Hi Hi (Disabled)	The Travel is within the configured band of the configured center point.	None	Check process loop	The actual valve position is near the configured center point.
		Proximity Hi (Disabled)		None		
		Proximity Lo (Disabled)		None		
		Proximity Lo Lo (Disabled)		None		
Cycle Counter (Travel History)	User Config. (Maintenance)	Cycle Counter (Disabled)	The number of travel reversals has exceeded the configured limit.	None	Perform periodic maintenance	The cycle count limit has been exceeded. Perform periodic maintenance. Check packing, linkages, diaphragms, seals, etc.
Travel Accumulator (Travel History)	User Config. (Maintenance)	Travel Accumulator (Disabled)	The accumulated travel has exceeded the configured limit.	None	Perform periodic maintenance	The travel accumulator limit has been exceeded. Perform periodic maintenance. Check packing, linkages, diaphragms, seals, etc.

–Continued–

Table 9-2. Using PlantWeb Alerts (Continued)

PlantWeb Alert and (Group)	Alert Category and (Default)	Alert Condition and (Default))	What the Alert is Detecting	Effect on Valve / Instrument	Recommended Action	Help
Performance Critical (Performance)	User Config. (Failed)	Performance Critical (Enabled)	Critical performance issues based on continuous PD tests internal to the instrument.	None – Indicates control has been lost or severely reduced.	Check I/P, Relay, Valve, Actuator or Ext. Tubing as indicated.	On-board diagnostics have detected a critical performance issue that may result in loss of control or severe reduction in control performance. Check or replace the component indicated in the possible cause detail.
Performance Reduced (Performance)	User Config. (Maintenance)	Performance Reduced (Enabled)	Reduced performance issues based on continuous PD tests internal to the instrument.	None – Indicates reduced performance.	Check I/P, Relay, Valve, Actuator or Ext. Tubing as indicated.	On-board diagnostics have detected a performance issue that has reduced control performance. Check or replace the component indicated in the possible cause detail.
Performance Information (Performance)	User Config. (Advisory)	Performance Information (Enabled)	Performance Information based on continuous PD tests internal to the instrument.	None – Indicates information that may pertain to control performance.	No action required.	On-board diagnostics have detected an abnormal performance condition. No immediate action required.

Table 9-3. Output Block PV Status

FEATURE_SEL PW Alarms Set PV Status	Transducer Mode, Actual	Active PlantWeb Alarms	AO / DO PV Status(2)	AO / DO PV Substatus	AO/DO PV Limit Substatus(1)
Enabled	OOS	X	Bad	Device Failure	Constant
	Man	X	Bad	Non-specific	Constant
	Auto	Fail	Uncertain	Subnormal	See table 9-4
	Auto	Maint, no Fail	Uncertain	Non-specific	See table 9-4
	Auto	Advisory, no Fail, no Maint	Good	Advisory	See table 9-4
	Auto	None	Good	Non-Specific	See table 9-4
Not Enabled	OOS	X	Bad	Device Failure	Constant
	Man	X	Bad	Non-Specific	Constant
	Auto	Fail	Good	Non-Specific	See table 9-4
	Auto	Maint, no Fail	Good	Non-Specific	See table 9-4
	Auto	Advisory, no Fail, no Maint	Good	Non-Specific	See table 9-4
	Auto	None	Good	Non-Specific	See table 9-4

NOTES:
X = No Effect
1. PV limit substatus reflects only READBACK limit substatus. SP limit substatus reflects only out block rate limits.
2. Firmware Revision 1.1 and earlier will set AO/DO PV Status to Bad if Feedback Sensor has failed, ie; Travel Sensor Fail. However, if the Travel Sensor fails, and the instrument falls back to pressure, PV Status will remain good.

Table 9-4. Limit Sub Status

Out Block	Transducer Mode	In Cutoff Region	Rate Limited	Limit Sub-Status
AO, DO	OOS	X	X	Constant
AO, DO	MAN	X	X	Constant
AO	AUTO	High	X	High Limited
AO	AUTO	Low	X	Low Limited
AO	AUTO	X	High	High Limited
AO	AUTO	X	Low	Low Limited
AO	AUTO	None	None	Not Limited
DO	AUTO	X	High	High Limited
DO	AUTO	X	Low	Low Limited
DO	AUTO	X	None	Not Limited

NOTE: X = No Effect

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Maintenance

The DVC6000f Series digital valve controller enclosure is rated NEMA 4X and IP66, therefore periodic cleaning of internal components is not required. If the DVC6000f is installed in an area where the exterior surfaces tend to get heavily coated or layered with industrial or atmospheric contaminants, however, it is recommended that the vent (key 52) be periodically inspected to ensure it is fully open. If the vent appears to be clogged, the vent can be removed, cleaned and replaced. Lightly brush the exterior of the vent to remove contaminant and run a mild water/detergent solution through the vent to ensure it is fully open.

WARNING

Personal injury or property damage can occur from cover failure due to overpressure.

Ensure that the housing vent opening is open and free of debris to prevent pressure buildup under the cover.

WARNING

Avoid personal injury or property damage from sudden release of process pressure or bursting of parts. Before performing any maintenance procedures on the DVC6000f Series digital valve controller:

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

Note

If the feedback arm or feedback arm assembly is removed from the digital valve controller, the travel sensor must be recalibrated.

Because of the diagnostic capability of the DVC6000f Series digital valve controllers, predictive maintenance is available through the use of AMS ValveLink Software. Using the digital valve controller, valve and instrument maintenance can be enhanced, thus avoiding unnecessary maintenance. For information on using AMS ValveLink Software, refer to the AMS ValveLink Software help.

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Module Base Maintenance

WARNING

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

The digital valve controller contains a module base consisting of the I/P converter, printed wiring board assembly, and pneumatic relay. The module base may be easily replaced in the field without disconnecting field wiring or tubing.

Tools Required

Table 10-1 lists the tools required for maintaining the DVC6000f Series digital valve controller.

Table 10-1. Tools Required

Tool	Size	Use
Phillips Screwdriver		Relay, printed wiring board assembly, and cover screws
Hex key	5 mm	Terminal box screw
Hex key	1.5 mm	Terminal box cover screw
Hex key	2.5 mm	I/P converter screws
Hex key	5 mm	Travel sensor screws
Hex key	6 mm	Module base screws
Open-end wrench	1/2-inch	Connector Arm screw (DVC6010f)
Hex key	9/64-inch	Feedback arm screw
Open-end wrench	7/16-inch	DVC6010f mounting bolts
Hex key	3/16-inch	DVC6020f mounting bolts

Removing the Module Base

WARNING

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

To remove the module base for DVC6010f, DVC6020f and DVC6030f digital valve controllers, perform the following steps. Refer to figures 11-2, 11-4 and 11-6, respectively, for key number locations.

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WARNING

To avoid personal injury or equipment damage from bursting of parts, turn off the supply pressure to the digital valve controller and bleed off any excess supply pressure before attempting to remove the module base assembly from the housing.

1. For sliding-stem applications only, a protective shield for the feedback linkage is attached to the side of the module base assembly (see figures 2-1 and 2-2). Remove this shield and keep for reuse on the replacement module. The replacement module will not have this protective shield.

2. Unscrew the four captive screws in the cover (key 43) and remove the cover from the module base (key 2).

3. Using a 6 mm hex socket wrench, loosen the three-socket head screws (key 38). These screws are captive in the module base by retaining rings (key 154).

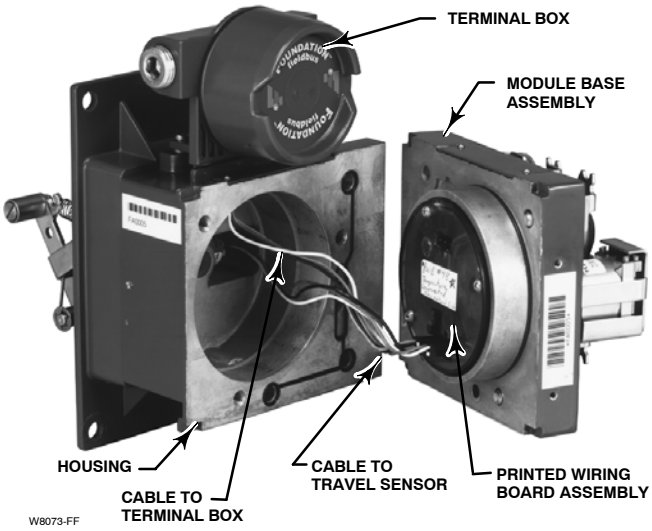


Figure 10-1. Printed Wiring Board Cable Connections

Note

The module base is linked to the housing by two cable assemblies. Disconnect these cable assemblies after you pull the module base out of the housing.

4. Pull the module base straight out of the housing (key 1). Once clear of the housing, swing the module base to the side of the housing to gain access to the cable assemblies.

5. The digital valve controller has two cable assemblies, shown in figure 10-1, which connect the module base, via the printed wiring board assembly, to the travel sensor and the terminal box. Disconnect these cable assemblies from the printed wiring board assembly on the back of the module base.

CAUTION

To avoid affecting performance of the instrument, take care not to damage the module base seal or guide surface. Do not bump or damage the bare connector pins on the PWB assembly.

Replacing the Module Base

To replace the module base, for DVC6010f, DVC6020f and DVC6030f digital valve controllers, perform the following steps. Refer to figures 11-2, 11-4 and 11-6, respectively, for key number locations. Refer to figure 10-2 for a view of the back of the PWB assembly sub-module.

CAUTION

Inspect the guide surface on the module and the corresponding seating area in the housing before installing the module base assembly. To avoid affecting performance of the instrument, these surfaces must be free of dust, dirt, scratches, and contamination.

Ensure the module base seal is in good condition. Do not reuse a damaged or worn seal.

1. Ensure the module base seal (key 237) is properly installed in the housing (key 1). Ensure the O-ring (key 12) is in place on the module base assembly.

2. Connect the terminal box connector to the PWB assembly (key 50). Orientation of the connector is required.

3. Connect the travel sensor connector to the PWB assembly (key 50). The connector is keyed, so proper orientation is required.

4. Insert the module base (key 2) into the housing (key 1).

5. Install three socket head screws (key 38) in the module base into the housing. If not already installed, press three retaining rings (key 154) into the module base. Evenly tighten the screws in a crisscross pattern to a final torque of 16 N•m (138 lbf•in).

6. Attach the cover (key 43) to the module base assembly.

7. For sliding-stem applications only, install the protective shield onto the side of the replacement module base assembly (see figures 2-1 and 2-2).

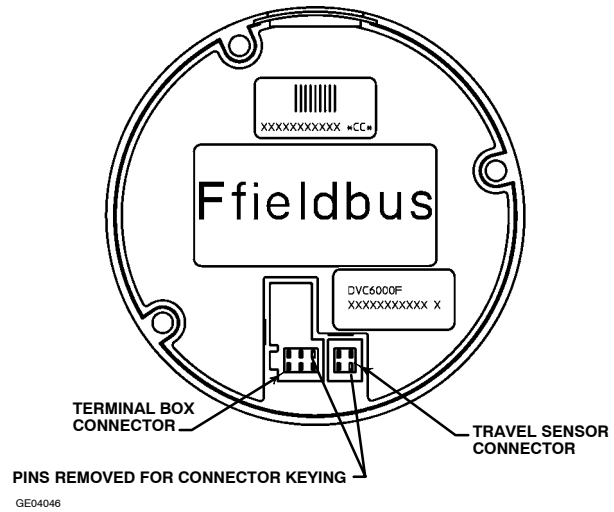


Figure 10-2. Back View of PWB Assembly Sub-Module

Submodule Maintenance

WARNING

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

The digital valve controller's module base contains the following submodules: I/P converter, PWB assembly, and pneumatic relay. If problems occur, these submodules may be removed from the module base and replaced with new submodules. After replacing a submodule, the module base is replaced in the instrument and calibrated prior to returning to service.

CAUTION

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

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

I/P Converter

WARNING

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

Refer to figures 11-1 through 11-8 for key number locations. The I/P converter (key 41) is located on the front of the module base.

Note

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

Replacing the I/P Filter

A screen in the supply port beneath the I/P converter serves as a secondary filter for the supply medium. To replace this filter, perform the following procedure:

1. Remove the I/P converter (key 41) and shroud (key 169) as described in the Removing the I/P Converter procedure.

2. Remove the screen (key 231) from the supply port.

3. Install a new screen in the supply port as shown in figure 10-3.

4. Inspect the O-ring (key 39) in the I/P output port. if necessary, replace it.

Figure 10-3. I/P Filter Location

5. Reinstall the I/P converter (key 41) and shroud (key 169) as described in the Replacing the I/P Converter procedure.

Removing the I/P Converter

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

2. Refer to figure 10-4. Using a 2.5 mm hex socket wrench, remove the four socket-head screws (key 23) that attach the shroud (key 169) and I/P converter (key 41) to the module base (key 2).

3. Remove the shroud (key 169); then pull the I/P converter (key 41) straight out of the module base (key 2). Be careful not to damage the two electrical leads that come out of the base of the I/P converter.

4. Ensure that the O-ring (key 39) and screen (key 231) stay in the module base and do not come out with the I/P converter (key 41).

Replacing the I/P Converter

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

2. Ensure the two boots (key 210) shown in figure 10-4 are properly installed on the electrical leads.

3. Install the I/P converter (key 41) straight into the module base (key 2), taking care that the two electrical leads feed into the guides in the module base. These guides route the leads to the printed wiring board assembly submodule.

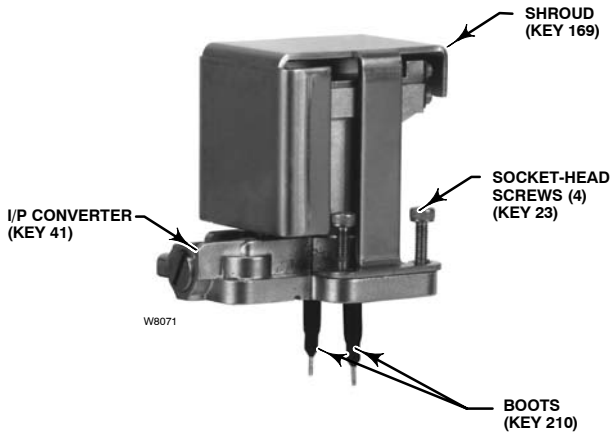


Figure 10-4. I/P Converter

4. Install the shroud (key 169) over the I/P converter (key 41).

5. Install the four socket-head screws (key 23) and evenly tighten them in a crisscross pattern to a final torque of 1.6 N•m (14 lbf•in).

6. After replacing the I/P converter, calibrate travel to maintain accuracy specifications.

PWB (Printed Wiring Board) Assembly

WARNING

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

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

Note

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

Removing the Printed Wiring Board Assembly

1. Separate the module base from the housing by performing the Removing the Module Base procedure.

2. Remove three screws (key 33).

3. Lift the PWB assembly (key 50) straight out of the module base (key 2).

4. Ensure that the O-rings (key 40) remain in the pressure sensor bosses on the module base assembly (key 2) after the PWB assembly (key 50) has been removed.

Replacing the PWB Assembly

1. Apply silicone lubricant to the pressure sensor O-rings (key 40) and install them on the pressure sensor bosses in the module base assembly.

2. Properly orient the PWB assembly (key 50) as you install it into the module base. The two electrical leads from the I/P converter (key 41) must guide into their receptacles in the PWB assembly and the pressure sensor bosses on the module base must fit into their receptacles in the PWB assembly.

3. Push the PWB assembly (key 50) into its cavity in the module base.

4. Install and tighten three screws (key 33) to a torque of 1 N•m (10.1 lbf•in).

5. Reassemble the module base to the housing by performing the Replacing the Module Base procedure.

6. Setup and calibrate the digital valve controller.

Note

Calibration is required for either Travel or Pressure Control after PWB Assembly replacement.

Note that only one calibration is needed, depending on control selection.

Pneumatic Relay

WARNING

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

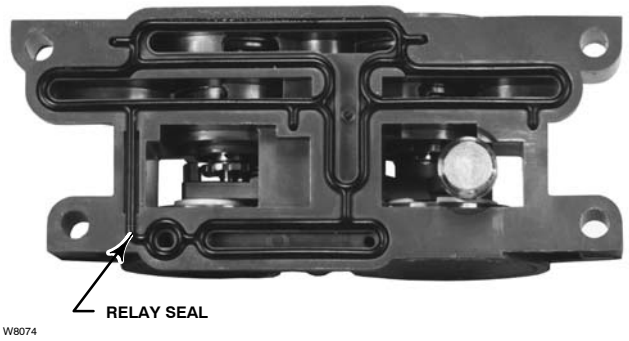


Figure 10-5. Pneumatic Relay Assembly

Refer to figures 11-1 through 11-8 for key number locations. The pneumatic relay (key 24) is located on the front of the module base.

Note

After relay submodule replacement, calibrate the digital valve controller to maintain accuracy specifications.

Removing the Pneumatic Relay

1. Loosen the four screws that attach the relay (key 24) to the module base. These screws are captive in the relay.

2. Remove the relay.

Replacing the Pneumatic Relay

1. Visually inspect the holes in the module base to ensure they are clean and free of obstructions. If cleaning is necessary, do not enlarge the holes.

2. Apply silicone lubricant to the relay seal and position it in the grooves on the bottom of the relay as shown in figure 10-5. Press small seal retaining tabs into retaining slots to hold relay seal in place.

3. Position the relay (with shroud) on the module base. Tighten the four screws, in a crisscross pattern, to a final torque of 2 N•m (20.7 lbf•in).

4. Using the Field Communicator, verify that the value for the relay type parameter matches the relay type installed.

5. After replacing the relay and verifying the relay type, calibrate travel to maintain accuracy specifications.

Gauges, Pipe Plugs, or Tire Valves

Depending on the options ordered, the DVC6000f Series digital valve controller will be equipped with either gauges (key 47), pipe plugs (key 66), or tire valves (key 67). Single-acting direct instruments will also have a screen (key 236, figure 11-8) These are located on the top of the module base next to the relay.

Perform the following procedure to replace the gauges, tire valves, or pipe plugs. Refer to figures 11-1 through 11-8 for key number locations.

1. Remove the front cover (key 43).

2. Remove the gauge, pipe plug, or tire valve as follows:

For gauges (key 47), the flats are on the gauge case. Use a wrench on the flats of the gauge to remove the gauge from the module base. To remove the supply gauge, remove one of the output gauges.

For pipe plugs (key 66) and tire valves (key 67), use a wrench to remove these from the module base.

3. Apply sealant (key 64) to the threads of the replacement gauges, pipe plugs, or tire valves.

4. Using a wrench, screw the gauges, pipe plugs, or tire valves into the module base.

Terminal Box

WARNING

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

Refer to figures 11-1 through 11-8 for key number locations.

The terminal box is located on the housing and contains the terminal strip assembly for field wiring connections.

Note

This procedure also applies to the DVC6005f remote terminal box.

Removing the Terminal Box

WARNING

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

1. Loosen the set screw (key 58) in the cap (key 4) so that the cap can be unscrewed from the terminal box.

2. After removing the cap (key 4), note the location of field wiring connections and disconnect the field wiring from the terminal box.

3. Separate the module base from the housing by performing the Removing the Module Base procedure.

4. Remove the screw (key 72). Pull the terminal box assembly straight out of the housing.

5. Remove two wire retainers (key 44), internal and external to the terminal box.

Replacing the Terminal Box

Note

Inspect all O-rings for wear and replace as necessary.

1. Install two wire retainers (key 44), internal and external to the terminal box.

2. Apply silicone lubricant to the O-ring (key 35) and install the O-ring over the stem of the terminal box.

3. Insert the terminal box assembly stem into the housing until it bottoms out. Position the terminal box assembly so that the hole for the screw (key 72) in the terminal box aligns with the threaded hole in the housing. Install the screw (key 72).

4. Connect the terminal box connector to the PWB assembly (key 50). Orientation of the connector is required.

5. Reassemble the module base to the housing by performing the Replacing the Module Base procedure.

6. Reconnect the field wiring as noted in step 2 in the Removing the Terminal Box procedure.

7. Apply silicone lubricant to the O-ring (key 36) and install the O-ring over the 2-5/8 inch threads of the terminal box. Use of a tool is recommended to prevent cutting the O-ring while installing it over the threads.

8. Apply lubricant (key 63) to the 2-5/8 inch threads on the terminal box to prevent seizing or galling when the cap is installed.

9. Screw the cap (key 4) onto the terminal box.

10. Install a set screw (key 58) into the cap (key 4). Loosen the cap (not more than 1 turn) to align the set screw over one of the recesses in the terminal box. Tighten the set screw (key 58).

11. Apply sealant (key 64) to the conduit entrance plug (key 62) and install it into the unused conduit entry of the terminal box.

Travel Sensor

WARNING

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

Replacing the travel sensor requires removing the digital valve controller from the actuator.

WARNING

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

Disassembly

Type DVC6010f Digital Valve Controller and Type DVC6015 Remote Feedback Unit

Refer to figure 11-2 for Type DVC6010f and 11-3 for Type DVC6015 key number locations.

1. Remove piping and fittings from the instrument.

2. Disconnect the adjustment arm from the connector arm and the feedback arm (see figures 2-1 and 2-2).

3. Remove the instrument from the actuator.

4. Loosen the screw (key 80) that secures the feedback arm (key 79) to the travel sensor shaft.

5. Remove the feedback arm (key 79) from the travel sensor shaft.

If disassembling a DVC6010f digital valve controller, use step 6a. If disassembling a DVC6015 remote feedback unit, use step 6b.

6. a. Separate the module base from the housing by performing the Removing the Module Base procedure.

b. Disconnect the three potentiometer assembly wires from the terminals.

7. Remove the screw (key 72) that fastens the travel sensor assembly to the housing.

8. Pull the travel sensor assembly (key 223) straight out of the housing.

Type DVC6020f Digital Valve Controller and Type DVC6025 Remote Feedback Unit

Refer to figure 11-4 for Type DVC6020f and 11-5 for Type DVC6025 key number locations.

1. Remove piping and fittings from the instrument.

2. Remove the digital valve controller from the actuator.

3. Disconnect the bias spring (key 82) from the feedback arm assembly (key 84) and the arm assembly (key 91). Remove the mounting bracket (key 74) from the back of the digital controller.

4. Loosen the screw (key 80) that secures the arm assembly to the travel sensor shaft.

5. Remove the arm assembly (key 91) from the travel sensor assembly (key 77) shaft.

If disassembling a DVC6020f digital valve controller, use step 6a. If disassembling a DVC6025 remote feedback unit use step 6b.

6. a. Separate the module base from the housing by performing the Removing the Module Base procedure.

b. Disconnect the three potentiometer assembly wires from the terminals.

7. Remove the screw (key 72) that fastens the travel sensor assembly to the housing.

8. Pull the travel sensor assembly (key 223) straight out of the housing.

Type DVC6030f Digital Valve Controller and Type DVC6035 Remote Feedback Unit

Refer to figure 11-6 for Type DVC6030f and 11-7 for Type DVC6035 key number locations.

1. Remove piping and fittings from the instrument.

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

If disassembling a DVC6030f digital valve controller use step 3a. If disassembling a DVC6035 remote feedback unit use step 3b.

3. a. Separate the module base from the housing by performing the Removing the Module Base procedure.

b. Disconnect the three potentiometer assembly wires from the terminals.

4. From within the housing, unscrew the travel sensor assembly (key 223) from the housing.

Assembly

Type DVC6010f Digital Valve Controller and Type DVC6015 Remote Feedback Unit

Refer to figure 11-2 for Type DVC6010f and 11-3 for Type DVC6015 key number locations.

1. Insert the travel sensor assembly (key 223) into the housing (key 1). Secure the travel sensor assembly with screw (key 72).

If assembling a DVC6010f digital valve controller, use step 2a. If assembling a DVC6015 remote feedback unit, use step 2b.

2. a. Connect the travel sensor connector to the PWB as described in the Replacing the Module Base procedure.

b. Connect the three travel sensor wires to the terminals.

Note

For the Type DVC6015 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3.

3. Loosely assemble the bias spring (key 78), screw (key 80), plain washer (key 163), and nut (key 81) to the feedback arm (key 79), if not already installed.

4. Attach the feedback arm (key 79) to the travel sensor shaft.

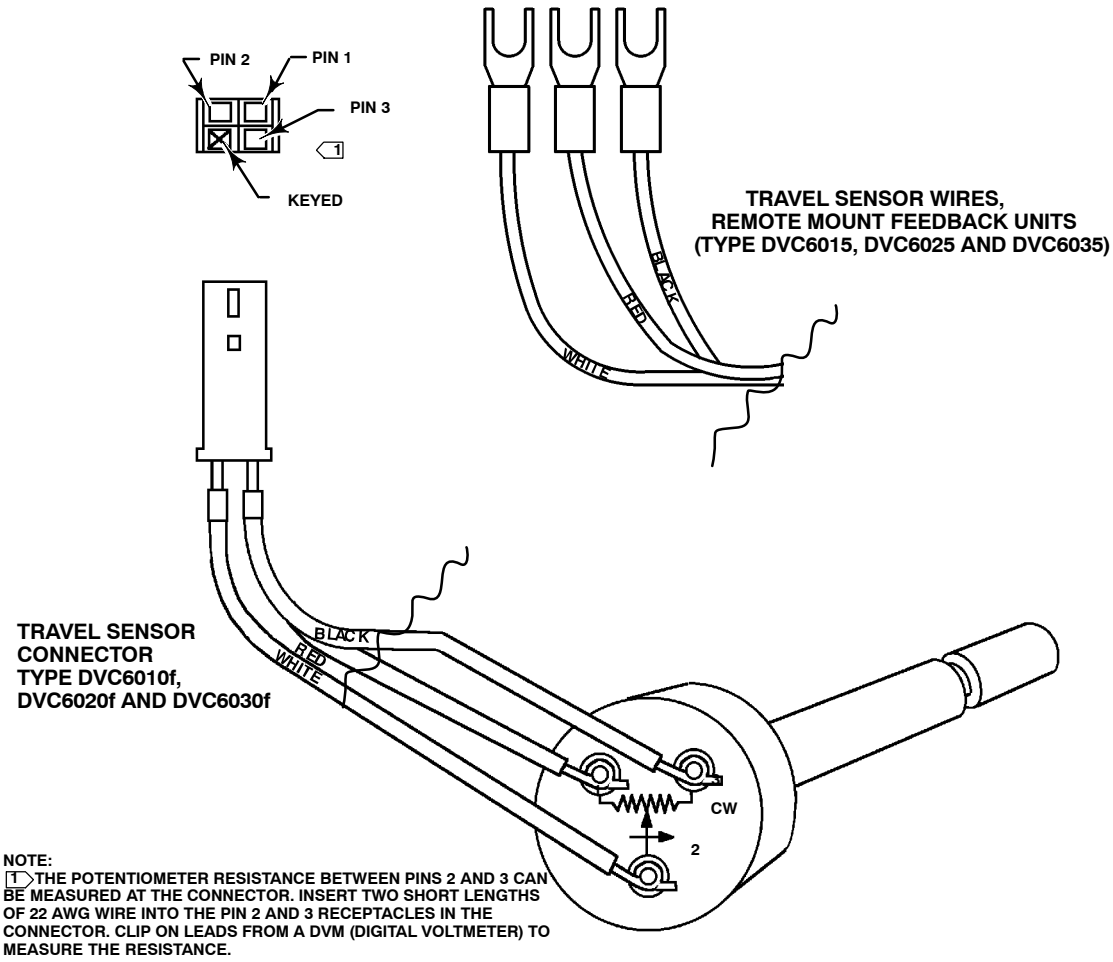


Figure 10-6. Potentiometer Resistance Measurement

10

Two methods are available for adjusting the travel sensor. You can use a multimeter to measure the potentiometer resistance, or if you have a Field Communicator, you can use the procedure in the Calibration section. To use the multimeter, perform steps 5 through 13. To use the Field Communicator, skip to step 14.

Travel Sensor Adjustment with a Multimeter

5. Align the feedback arm (key 79) to the housing (key 1) by inserting the alignment pin (key 46) through the hole marked “A” on the feedback arm. Fully engage the alignment pin into the tapped hole in the side of the housing. Position the feedback arm so that the surface is flush with the end of the travel sensor shaft.

6. Connect a multimeter set to a resistance range of 50,000 ohms. Measure the resistance between pins 1 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location. The resistance should be between 40,000 and 50,000 ohms.

7. Multiply the result in step 6 by 0.048 to get a calculated resistance. The calculated resistance should be in the range of 1920 to 2400 ohms.

8. Re-range the multimeter to a resistance of 3000 ohms between pins 2 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location.

9. Adjust the travel sensor shaft to obtain the calculated resistance determined in step 7, ±100 ohms.

Note

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

10. While observing the resistance, tighten the screw (key 80) to secure the feedback arm to the travel

sensor shaft. Be sure the resistance reading remains at the calculated resistance determined in step 7, ±100 ohms. Paint the screw to discourage tampering with the connection.

11. Disconnect the multimeter from the travel sensor connector.

12. For the DVC6010f, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

13. Travel sensor replacement is complete. Install the digital valve controller on the actuator.

Travel Sensor Adjustment with the Field Communicator

The next two steps do not apply if you used a multimeter to adjust the travel sensor. Perform these steps only if you elected to adjust the travel sensor using the Field Communicator.

14. For the DVC6010f, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

15. For both the DVC6010f and the DVC6015, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Type DVC6020f Digital Valve Controller and Type DVC6025 Remote Feedback Unit

Refer to figure 11-4 for Type DVC6020f and 11-5 for Type DVC6025 key number locations.

1. Insert the travel sensor assembly (key 223) into the housing. Secure the travel sensor assembly with screw (key 72).

If assembling a DVC6020f digital valve controller, use step 2a. If assembling a DVC6025 remote feedback unit, use step 2b.

2. a. Connect the travel sensor connector to the PWB as described in Replacing the Module Base.

b. Connect the three travel sensor wires to the terminals.

Note

For the Type DVC6025 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3.

3. Loosely assemble the screw (key 80), plain washer (key 163), and nut (key 81) to the arm assembly (key 91), if not already installed.

4. Attach the arm assembly (key 91) to the travel sensor assembly (key 223) shaft.

Two methods are available for adjusting the travel sensor. You can use a multimeter to measure the potentiometer resistance, or if you have a Field Communicator, you can use the procedure in the Calibration section. To use the multimeter, perform steps 5 through 17. To use the Field Communicator, skip to step 18.

Travel Sensor Adjustment with a Multimeter

5. Connect a multimeter set to a resistance range of 50,000 ohms. Measure the resistance between pins 1 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location. The resistance should be between 40,000 and 50,000 ohms.

6. Multiply the result in step 5 by 0.139 to get a calculated resistance. The calculated resistance should be in the range of 5560 to 6950 ohms.

7. Re-range the multimeter to a resistance of 7000 ohms between pins 2 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location.

8. Hold the arm assembly (key 91) in a fixed position so that the arm is parallel to the housing back plane and pointing toward the terminal box. Position the arm assembly so that the outer surface is flush with the end of the travel sensor shaft.

9. Adjust the travel sensor shaft to obtain the calculated resistance determined in step 6, ±100 ohms.

Note

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

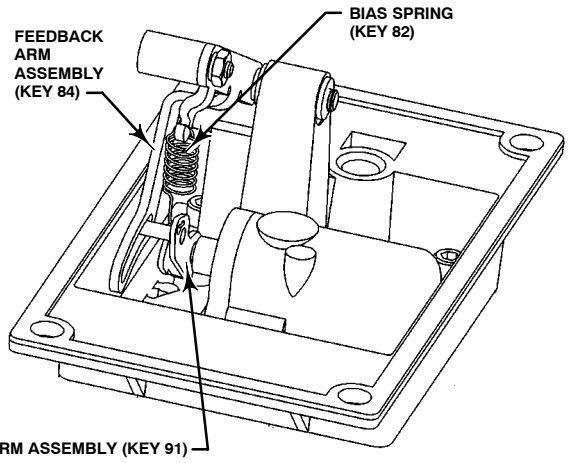


Figure 10-7. Type DVC6020f digital Valve Controller, bias Spring (key 82) Installation

10. While observing the resistance, tighten the screw (key 80) to secure the feedback arm to the travel sensor shaft. Be sure the resistance reading remains at the calculated resistance determined in step 6, ±100 ohms. Paint the screw to discourage tampering with the connection.

11. Disconnect the multimeter from the travel sensor connector.

12. Apply lubricant (key 63 or equivalent) to the pin portion of the arm assembly (key 91).

13. Position the mounting bracket over the back of the digital valve controller. Push the feedback arm assembly (key 84) toward the housing and engage the pin of the arm assembly into the slot in the feedback arm.

14. Install the mounting bracket (key 74).

15. Install the bias spring (key 82) as shown in figure 10-7.

16. For the DVC6020f only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

17. Travel sensor replacement is complete. Install the digital valve controller on the actuator.

Travel Sensor Adjustment with the Field Communicator

The next two steps do not apply if you used a multimeter to adjust the travel sensor. Perform these steps only if you elected to adjust the travel sensor using the Field Communicator.

18. For the DVC6020f only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

19. For both the DVC6020f and the DVC6025, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Type DVC6030f Digital Valve Controller and Type DVC6035 Remote Feedback Unit

Refer to figure 11-6 for Type DVC6030f and 11-7 for Type DVC6035 key number locations.

1. Apply lubricant (key 63) to the travel sensor assembly threads.

2. Screw the travel sensor assembly (key 223) into the housing until it is tight.

If assembling a DVC6030f digital valve controller, use step 3a. If assembling a DVC6035 remote feedback unit, use step 3b.

3. a. Connect the travel sensor connector to the PWB as described in the Replacing the Module Base procedure.

b. Connect the three travel sensor wires to the terminals.

Note

For the Type DVC6035 feedback unit, connect the potentiometer assembly (key 223) wires to the terminals as follows:
red → terminal 1
white → terminal 2
black → terminal 3.

4. Loosely assemble the bias spring (key 78), screw (key 80), plain washer (key 163), and nut (key 81) to the feedback arm (key 79), if not already installed.

5. Attach the feedback arm (key 79) to the travel sensor shaft.

Two methods are available for adjusting the travel sensor. You can use a multimeter to measure the potentiometer resistance, or if you have a Field Communicator, you can use the procedure in the Calibration section. To use the multimeter, perform steps 6 through 14. To use the Field Communicator, skip to step 15.

Travel Sensor Adjustment with a Multimeter

6. Align the feedback arm (key 79) to the housing (key 1) by inserting the alignment pin (key 46) through

the hole marked “A” on the feedback arm. Fully engage the alignment pin into the tapped hole in the housing. Position the feedback arm so that the outer surface is flush with the end of the travel sensor shaft.

7. Connect a multimeter set to a resistance range of 50,000 ohms. Measure the resistance between pins 1 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location. The resistance should be between 40,000 and 50,000 ohms.

8. Multiply the result in step 7 by 0.048 to get a calculated resistance. The calculated resistance should be in the range of 1920 to 2400 ohms.

9. Re-range the multimeter to a resistance of 3000 ohms between pins 2 and 3 of the travel sensor connector. Refer to figure 10-6 for pin location.

10. Adjust the travel sensor shaft to obtain the calculated resistance determined in step 8, ±100 ohms.

Note

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

11. While observing the resistance, tighten the screw (key 80) to secure the feedback arm to the travel sensor shaft. Be sure the resistance reading remains at the calculated resistance determined in step 8, ±100 ohms. Paint the screw to discourage tampering with the connection.

12. Disconnect the multimeter from the travel sensor connector.

13. For the DVC6030f only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

14. Travel sensor replacement is complete. Install the digital valve controller on the actuator as described in the Installation section.

Travel Sensor Adjustment with the Field Communicator

The next two steps do not apply if you used a multimeter to adjust the travel sensor. Perform these steps only if you elected to adjust the travel sensor using the Field Communicator.

15. For the DVC6030f only, connect the travel sensor connector to the PWB as described in Replacing the Module Base.

16. For both the DVC6030f and the DVC6035, perform the appropriate Travel Sensor Adjust procedure in the Calibration section.

Stroking the Digital Valve Controller Output

After completing maintenance procedures, confirm proper valve operation by stroking the digital valve controller output. Refer to page 5-39 of the transducer block section of Detailed Setup / Blocks.

Instrument Troubleshooting

What to Do First

When a problem occurs, check the following first:

Mounting

- Is the feedback linkage connected correctly? See the beginning of this section.

Utility Connections

- Are pneumatic connections correct? Are there any air leaks? See the Installation section.

- Is the air supply pressure sufficient to drive the valve?

- Is the digital valve controller correctly connected to the fieldbus? See the Installation section.

- Is there power to the device? Is the terminal voltage between 9 and 32 volts? See the Installation section.

- Is the segment terminated correctly? See host system documentation.

- Is the host system connected to the segment? See host system documentation.

If communication or output difficulties are experienced with the instrument, refer to the troubleshooting information provided in table 10-2.

Table 10-2. Instrument Troubleshooting

Symptom	Possible Cause	Action
1. Instrument will not communicate.	1.a No power to device	1.a1 Ensure device is connected to the segment (see host system documentation).
		1.a2 Measure the terminal voltage. Terminal voltage should be between 9 and 32 Vdc.
		1.a3 Check to be sure device is drawing current. There should be approximately 18mA.
	1.b Internal device wiring problems.	1.b1 Verify connectors are plugged into the printed wiring board correctly (see Printed Wiring Board Assembly on page 10-7).
		1.b2 Check continuity of cable between terminal box and printed wiring board. If necessary, replace the terminal box assembly (see Replacing the Terminal Box on page 10-9).
		1.b3 Check for damaged printed wiring board lands and terminals. If necessary, replace the terminal box assembly (see Replacing the Terminal Box on page 10-9).
	1.c Incompatible network settings	1.c Change host parameters. Refer to host documentation for procedure.
	1.d Defective printed wiring board (PWB) assembly.	1.d Replace printed wiring board (see Replacing the PWB Assembly on page 10-7).
	1.e Defective terminal box.	1.e Check continuity from each screw terminal to the corresponding PWB connector pin. If necessary, replace the terminal box assembly (see Replacing the Terminal Box on page 10-9).
	1.f Defective Field Communicator or ValveLink modem cable.	1.f If necessary, repair or replace cable.
	1.g Fieldbus card defective or not compatible with PC.	1.g Replace Fieldbus card.

–Continued–

Table 10-2. Instrument Troubleshooting (Continued)

Symptom	Possible Cause	Action
2. Device does not stay on segment.	2.a Incorrect signal level.	2.a1 Check that segment is properly terminated (see host system documentation).
		2.a2 Wrong cable type or segment length too long. See Site Planning Guide.
		2.a3 Bad power supply or conditioner.
	2.b Excess noise on segment.	2.b1 Check integrity of wiring connections. Make sure cable shield is grounded only at the control system.
		2.b2 Check for corrosion or moisture on terminals in terminal box (refer to page 10-8 for terminal box information).
		2.b3 Check for bad power supply.
	2.c Electronics failing.	2.c. Replace printed wiring board assembly (see Replacing the PWB Assembly on page 10-7).
3. A value cannot be written to a parameter.	3.a Resource block parameter Write Lock may be set to Locked.	3.a Change Write Lock to Not Locked (refer to page 5-4 of Detailed Setup / Blocks).
	3.b If a transducer block parameter, the mode may be incorrect or the parameter may be protected.	3.b1 Check table 5-85. If necessary change the transducer block target mode to Manual.
		3.b2 Check table 5-85. If necessary change data protection.
	3.c You have attempted to write a value that is outside the valid range.	3.c Check the range values listed for the parameter (refer to Detailed Setup / Blocks, Section 5).
	3.d Function block or in/out block mode may be incorrect.	3.d. Confirm that block is in correct mode for writing to any given parameter.
4. Function block actual mode does not change with target mode.	4.a Resource block actual mode is Out of Service.	4.a Change Resource block target mode to Auto (see page 5-4, Resource Block Mode, or host system documentation).
	4.b Transducer block actual mode is Out of Service	4.b Change transducer block target mode to Auto (see page 5-23, Transducer Block Mode or host system documentation).
	4.c Schedules that define when function blocks execute are not set correctly.	4.c Set the schedules using host system or configuration tool. All function blocks must be in a schedule that is downloaded to the device.
	4.d Configuration error	4.d Look for configuration error bit in BLOCK_ERR. By default, all enumerature type parameters are initialized to 0 (undefined). They must be configured before the block can be put into service.
5. Input or Output Block does not go to mode target	5.a Resource block actual mode is Out of Service	5.a Change Resource block target mode to Auto (see page 5-4, Resource Block Mode, or host system documentation).
	5.b Transducer block actual mode is Out of Service.	5.b Change transducer block target mode to Auto (see page 5-23, Transducer Block Mode or host system documentation).
	5.c Transducer has detected a hardware failure.	5.c A bad status is passed to the block's READBACK or FIELD_VAL parameter. See transducer section of Detailed Setup for repair information.
	5.d Out block not configure in RB.FEATURE_SEL.	5.d DO Control Bit must be set in RB.FEATURE_SEL to use DO block instead of AO block. The deselected block will have a bad status for READBACK. This will keep it in IMAN mode when target is other than OOS.
	5.e Schedules that define when function blocks execute are not set correctly.	5.e Set the schedules using host system or configuration tool. All function blocks must be in a schedule that is downloaded to the device.
	5.f Configuration error.	5.f Look for configuration error bit in BLOCK_ERR. By default, all enumerature type parameters are initialized to 0 (undefined). They must be configured before the block can be put into service.
6. Block dynamic parameters do not update	6.a Block actual mode is Out of Service	6.a Change the block target mode to an operational mode (see FOUNDATION fieldbus Communication, Appendix A and host system documentation).

–Continued–

Table 10-2. Instrument Troubleshooting (Continued)

Symptom	Possible Cause	Action
7. Transducer block Setpoint (FINAL_VALUE [13]) is not being automatically updated from the AO block.	7.a Transducer block mode in not Auto.	7.a Change transducer block mode to Auto.
	7.b AO block is not active.	7.b Change resource block parameter FEATURE_SEL to de-selected DO Control.
8. Transducer block setpoint Setpoint(D) (SETPOINT_D [32]) is not being automatically updated from the DO block.	8.a Transducer block mode is not Auto.	8.a Change transducer block mode to Auto.
	8.b DO block is not active.	8.b Change resource block parameter FEATURE_SEL to selected DO Control.
9. Valve does not move when the set point is changed	9.a A function block actual mode is Out of Service or Transducer Block Actual mode is Out of Service or Manual.	9.a1 Change the target mode to an operational mode (see FOUNDATION fieldbus Communication, Appendix A and host system documentation).
		9.a2 Verify that the correct block (AO or DO) is configured in Feature Select in the resource block. Only the selected out block is able to set the transducer setpoint and move the valve.
	9.b Pneumatic connections are incorrect or supply pressure is incorrect	9.b Check pneumatic connections and supply pressure. Be sure supply pressure regulator is set correctly (see Pressure Connections on page 2-16 of the Installation Section).
	9.c Instrument is in fault state.	9.c Set Clear FState to Clear (Refer to Fault State on page 5-5 of the Detailed Setup / Blocks Section, or host system documentation).
	9.d The valve has failed.	9.d Apply a pneumatic pressure to the valve actuator and check valve action.
	9.e The I/P converter or relay has failed.	9.e Replace the I/P converter or relay (see Replacing the I/P Converter on page 10-6).
10. Valve does not stroke from 0 to 100% with set point change	10.a Insufficient supply pressure or leak in pneumatic connections.	10.a Check supply pressure and supply pressure regulator setting. Check for leaks around pneumatic connections.
	10.b Setpoint may be limited.	10.b Check the AO Block values of SP_HI_LIMIT and SP_LO_LIMIT (see page 5-74 of the Detailed Setup / Blocks Section or host system documentation).
11. Deviation between set point and actual valve position remains.	11.a Digital valve controller output is in cutoff.	11.a Check values for Travel Cutoff High and Travel Cutoff Low (see page 5-28 of the Detailed Setup / Blocks Section or host system documentation).
	11.b Digital valve controller is not calibrated correctly	11.b Perform Auto or Manual Travel Calibration (see page 4-6 of the Basic Setup and Tuning Section or Travel Calibration on page 6-2.)
	11.c Incorrect turning. Tuning that is too conservative will result in excess error.	11.c Perform Stabilizing/Optimize Valve Response procedure to adjust tuning and stabilize/optimize valve response (see Stabilize/Optimize on page 4-7).
12. The valve cycles, does not stay on set point.	12.a Large amount of packing friction.	12.a1 Perform Stabilizing/Optimize Valve Response procedure to adjust tuning and stabilize/optimize valve response (see Stabilize/Optimize on page 4-7).
		12.a2 Use a larger size actuator.
13. Valve responds too slowly.	13.a Insufficient instrument gain.	13.a Perform Stabilize/Optimize Valve Response procedure to adjust tuning and stabilize valve response (see Stabilize/Optimize on page 4-7).
	13.b I/P converter input filter clogged or air blockage in I/P ass'y nozzle block.	13.b1 Replace I/P converter filter (see Replacing the I/P Filter on page 10-6).
		13.b2 Replace I/P converter (see Replacing the I/P Converter on page 10-6).
	13.c O-ring(s) between I/P converter missing or hard and flattened losing seal.	13.c Replace O-ring(s) (refer to the I/P Converter section on page 10-6).
	13.d I/P ass'y out of spec.	13.d I/P ass'y nozzle may have been adjusted. Verify drive signal (55% to 80%) (refer to Elect and Config on page 5-30 of Detailed Setup / Blocks or host system documentation). Replace I/P ass'y if drive signal is continuously high or low (see Replacing the I/P Converter on page 10-6).

–Continued–

Table 10-2. Instrument Troubleshooting (Continued)

Symptom	Possible Cause	Action
13. Valve responds too slowly.	13.e Defective gasket.	13.e Check gasket for closed holes, excessive deformation due to overtightening or “oozing”. If necessary, replace gasket (see the beginning of this section).
	13.f Defective relay.	13.f Remove relay, inspect for missing Belleville washer, missing valve spring, missing valve plug. Inspect “lip” under top O-ring for breakage due to relay removal. Inspect O-rings and replace if hard or damaged. Replace parts or relay if I/P ass’y good and air passages not blocked (see Replacing the Pneumatic Relay on page 10-8).
	13.g If responds slowly only upon air demand, there may be a restriction in the air line, the supply run may be excessively long, or the supply regulator may be defective or capacity not large enough.	13.g1 Check supply line to ensure it is not clogged or damaged. Replace if necessary.
		13.g2 If supply run is excessively long, a volume tank may need to be installed on the the supply side of the pressure regulator
		13.g3 Replace supply regulator
14. Instrument will not calibrate, has sluggish performance or oscillates.	14.a Travel sensor seized, will not turn.	14.a Rotate feedback arm to ensure it moves freely. If not, replace the pot/bushing ass’y.
	14.b Broken travel sensor wire(s).	14.b Inspect wires for broken solder joint at pot or broken wire. Replace pot/bushing ass’y.
	14.c Travel sensor misadjusted.	14.c Perform Travel Sensor Adjust procedure on page 6-7 of the Calibration section.
	14.d Open travel sensor.	14.d Check for continuity in electrical travel range. If necessary, replace pot/bushing ass’y.
	14.e Cables not plugged into PWB correctly.	14.e Inspect connections and correct.
	14.f Feedback arm loose on pot.	14.f Perform Travel Sensor Adjust procedure on page 6-7 of the Calibration section.
	14.g Feedback arm bent/damaged or bias spring missing/damaged.	14.g Replace feedback arm and bias spring.
	14.h Configuration errors.	14.h Verify configuration. See Initial Setup on page 5-23 or use Setup Wizard on page 4-2.
	14.j Restricted pneumatic passages in I/P converter	14.j Check screen in I/P converter supply port of the module base. Replace if necessary. If passages in I/P converter restricted, replace I/P converter (see Replacing the I/P Converter on page 10-6).
	14.k O-ring(s) between I/P converter ass’y missing or hard and flattened losing seal.	14.k Replace O-ring(s) (refer to the I/P Converter section on page 10-6).
	14.l I/P converter ass’y damaged/corroded/clogged.	14.l Check for bent flapper, open coil (continuity), contamination, staining, or dirty air supply. Coil resistance should be between 1680 - 1860 ohms. Replace I/P ass’y if damaged, corroded, clogged, or open coil (see Replacing the I/P Converter on page 10-6).
	14.m I/P converter ass’y out of spec.	14.m I/P converter ass’y nozzle may have been adjusted. Verify drive signal (55 to 80% for double-acting; 60 to 85% for single-acting) with the valve off the stops. Replace I/P converter ass’y if drive signal is continuously high or low (see Replacing the I/P Converter on page 10-6).
	14.n Defective module base seal.	14.n Check module base seal for condition and position. If necessary, replace seal. Refer to Module Base Maintenance on page 10-3.
	14.p Defective relay.	14.p Depress relay beam at adjustment location in shroud, look for increase in output pressure. Remove relay, inspect relay seal. Replace relay seal or relay if I/P converter ass’y good and air passages not blocked (refer to Replacing the Pneumatic Relay on page 10-8). Check relay adjustment (refer to page 6-5 of the Calibration Section).
	14.q Defective 67CFR regulator, supply pressure gauge jumps around.	14.q Replace 67CFR regulator.

–Continued–

Table 10-2. Instrument Troubleshooting (Continued)

Symptom	Possible Cause	Action
15. Instrument will not calibrate.	15.a Configuration errors.	15.a Verify configuration.
	15.b Feedback arm bent/damaged or bias spring missing/damaged.	15.b Replace feedback arm and bias spring (see the Maintenance section). Perform Setup Wizard (see page 4-2 of the Basic Setup and Tuning Section).
	15.c Feedback arm loose on travel sensor.	15.c Perform Travel Sensor Calibration procedure (refer to the Travel Sensor section on page 10-9).
	15.d Travel sensor mis-adjusted.	15.d Perform Travel Sensor calibration procedure (refer to the Travel Sensor section on page 10-9).
	15.e Cables not plugged into PWB correctly.	15.e Inspect connections and correct.
	15.f Broken travel sensor wire(s).	15.f Inspect wires for broken solder joint at pot or broken wire. Replace travel sensor (refer to the Travel Sensor section on page 10-9).
	15.g Open travel sensor.	15.g Check for continuity in electrical travel range. If necessary, replace travel sensor (refer to the Travel Sensor section on page 10-9).
	15.h Travel sensor “frozen”, will not turn.	15.h Rotate feedback arm to ensure it moves freely. If not, replace the travel sensor (refer to the Travel Sensor section on page 10-9).
16. ValveLink diagnostic tests provide erroneous results.	16.a Defective pressure sensor(s).	16.a Replace PWB (see Replacing the PWB Assembly on page 10-7).
	16.b Pressure sensor O-ring(s) missing.	16.b Replace O-ring(s).
17. Cannot perform advanced diagnostics.	17.a Instrument does not have proper tiering.	17.a Upgrade tiering.
18. Field Communicator does not turn on.	18.a Battery pack not charged.	18.a Charge battery pack. Note: Battery pack can be charged while attached to the Field communicator or separately. The 375 Field Communicator is fully operable while the battery pack is charging. Do not attempt to charge the battery pack in a hazardous area.

Section 11 Parts

Parts Ordering 11-2

Parts Kits 11-2

Parts List 11-3

Common Parts 11-3

I/P Assembly 11-3

Module Base 11-3

Terminal Box 11-4

Relay 11-4

PWB Assembly 11-4

Pressure Gauges, Pipe Plugs, or Tire Valve Assemblies 11-4

Feedback Parts 11-4

Parts Ordering

Whenever corresponding with your Emerson Process Management sales office about this equipment, always mention the controller serial number. When ordering replacement parts, refer to the 11-character part number of each required part as found in the following parts list. Parts which do not show part numbers are not orderable.

Note

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson Process Management will void your warranty, might adversely affect the performance of the valve, and might jeopardize worker and workplace safety.

Note

Neither Emerson, Emerson Process Management, Fisher, nor any of their affiliated entities assumes responsibility for the selection, use, and maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains with the purchaser and end-user.

Note

All part numbers are for both aluminum and stainless steel constructions, unless otherwise indicated.

Parts Kits

Conversion kit 6 listed below provides the parts required to convert a DVC6010f to a DVC6020f. Conversion kit 7 provides the parts required to convert a DVC6020f to a DVC6010f.

Kit	Description	Part Number
1*	Elastomer Spare Parts Kit (kit contains parts to service one digital valve controller)	
	Standard	19B5402X012
	Extreme Temperature Option (fluorosilicone elastomers)	19B5402X022
2*	Small Hardware Spare Parts Kit (kit contains parts to service one digital valve controller)	19B5403X012
3	Conversion Kit (DVC6010f to DVC6020f or DVC6015 to DVC6025)	
	Also see note below	19B5405X012
	Note	
	For pipe-away construction, also order pipe-away bracket kit, item 6.	
4	Conversion Kit (DVC6020f to DVC6010f or DVC6015 to DVC6025)	14B5072X112
5	Alignment Pin Kit [kit contains 15 alignment pins (key 46)]	14B5072X092
6	Pipe-Away Bracket Kit (DVC6020) [kit contains mounting bracket (key 74) and O-ring (key 75)]	
	Standard	19B5404X012
	Extreme Temperature option (fluorosilicone elastomers)	19B5404X022
7*	Seal Screen Kit [kit contains 25 seal screens (key 231) and 25 O-rings (key 39)]	
	Standard	14B5072X152
	Extreme Temperature option (fluorosilicone elastomers)	14B5072X182
8	Terminal Box Kit,	
	Aluminum	
	Standard	GE22787X012
	Extreme Temperature option (fluorosilicone elastomers)	GE22788X012
	Stainless Steel	
	Standard	GE22789X012
	Extreme Temperature option (fluorosilicone elastomers)	GE22790X012
9	I/P Converter Kit	
	Standard	38B6041X052
	For Extreme Temperature option (fluorosilicone elastomers)	38B6041X062
10	Vent with extension	
	For a DVC6020f replacing a DVC5020f on an existing mounting	19B3407X012
11	Adjustment Arm Kit (includes washer, nut and adjustment arm)	14B5072X132

* Recommended spare

Key	Description	Part Number
12	PTFE Sleeve Kit [For pot bushing assembly (kit includes 10 sleeves and lubricant)]	
	DVC6010f and DVC6020f	GE08726X012
	DVC6030f	GE08727X012
13	Spare Module Base Assembly Kit, aluminum [kit contains module base assy (key 2); drive screws, qty 2, (key 11); shield/label (key 19); hex socket cap screw, qty 3, (key 38); self tapping screw, qty 2 (key 49); pipe plug, qty 3 (key 61); retaining ring, qty 3 (key 154); screen (key 236); and flame arrestors, qty 3 (key 243)]	GE18654X012
14	Spare Housing Assembly Kit, aluminum [kit contains housing (key 1); drive screw, qty 2 (key 11); shield (key 20); and screen (key 71)]	
	DVC6010/DVC6020	GE18652X012
	DVC6030	GE18653X012
Remote Mount Kits		
	Remote Terminal Box Kit	GE00418X012
	Feedback Unit	
	DVC6015	49B7986X012
	DVC6025 long arm	49B7987X012
	DVC6025 Short Arm	49B7987X022
	DVC6035	49B7988X012
	Feedback Unit Termination Strip Kit	GE00419X012
	Pipestand/Wall Mounting Kit	GE00420X012

Parts List

Parts which do not show part numbers are not orderable as individual parts. In most cases, they are available in one of the parts kits listed under Parts Kits.

Note

Parts with footnote numbers shown are available in parts kits. Also see footnote information at the bottom of the page.

Key	Description	Part Number

Common Parts

1	Housing	
	Aluminum	
	DVC6010f and DVC6020f	48B7709X012
	DVC6030f	48B9604X012
	316 SST	
	DVC6010f and DVC6020f	GB0113X0012
	DVC6030f	GB0114X0012
43	Cover Assembly (includes cover screws)	
	Aluminum	
	Standard	38B9580X012
	Extreme termperature option (fluorosilicone elastomers)	38B9580X032
	Stainless Steel	
	Standard	38B9580X022
	Extreme termperature option (fluorosilicone elastomers)	38B9580X042
48	Nameplate	
52	Vent, plastic(2)	
63	Lubricant, lithium grease (not furnished with the instrument)	
64	Anti-Seize compound (not furnished with the instrument)	
65	Lubricant, silicone sealant (not furnished with the instrument)	
74	Mounting Bracket	
	DVC60005 and DVC6020 only	
	Std(3) or pipe-away(6)	
75*	O-Ring, nitrile(6)	
	DVC6020 Vent-away only	
128	Pipe Plug, pl stl(6)	
	DVC6020 Vent-away only	
237	Module Base Seal(1)	

Module Base

The following parts are included in the module base.

2	Module Base Assembly
12*	O-ring, nitrile(1)
16*	O-ring, nitrile(1) (3 req'd)
24	Relay Module (See Relay listing)
33	Mach Screw, pan hd, SST(2) (3 req'd)
38	Cap Screw, hex socket, SST(2) (3 req'd)
41	I/P Assembly (See I/P Assembly listing)
154	Retaining Ring(2) (3 req'd)

I/P Converter Assembly

23	Cap Screw, hex socket, SST(2) (4 req'd)
39*	O-ring nitrile(1,9)
41	I/P Converter(9)
169	Shroud(9)
210*	Boot, nitrile(1,9) (2 req'd)
231*	Seal Screen(1,7,9)

* Recommended spare

1. Available in the Elastomer Spare Parts Kit
2. Available in the Small Hardware Spare Parts Kit
3. Available in the DVC6010 to DVC6020 Conversion Kit
6. Available in the Pipe-Away Bracket Kit
7. Available in the Seal Screen Kit
9. Available in the I/P Converter Kit

Key	Description	Part Number
Relay		
24	Relay Assembly, includes shroud, relay seal, and mounting screws	
	Standard	
	Double-acting and single-acting direct	38B5786X052
	Single-acting reverse	38B5786X062
	Double-acting and single-acting direct (low bleed)	38B5786X072
	Extreme Temperature option (fluorosilicone elastomers)	
	Double-acting and single-acting direct	38B5786X032
	Single-acting reverse	38B5786X042
Terminal Box		
4	Terminal Box Cap,	
	Aluminum	38B7714X012
	Stainless Steel	GB0108X0012
34*	O-ring (1,8)	
36*	O-ring (1,8)	
44	Wire Retainer, pl stl(2) (6 req'd) (not shown)	
58	Set Screw, hex socket, SST(2)	
62	Pipe Plug, hex hd,	
	Aluminum	1H5137X0012
	Stainless Steel	1H5137X0032
72	Cap Screw, hex socket, SST(2)	
164	Terminal Box Assembly(8)	
268	FIELDBUS Label	
PWB Assembly		

Note

Contact your Emerson Process Management sales office for PWB Assembly FS Numbers.

50*	PWB Assembly	
	Standard Control	
	Fieldbus Diagnostics	
	Advanced Diagnostics	
	Performance DIagnostic	
	Fieldbus Control	
	Fieldbus Diagnostics	
	Advanced Diagnostics	
	Performance Diagnostics	
	Fieldbus Logic	
	Fieldbus Diagnostics	
	Advanced Diagnostics	
	Performance Diagnostics	

Key	Description	Part Number
Pressure Gauges, Pipe Plugs, or Tire Valve Assemblies		
47*	Pressure Gauge, nickel-plated brass case, brass connection	
	Double-acting (3 req'd); Single-acting (2 req'd)	
	PSI/MPA Gauge Scale	
	To 60 PSI, 0.4 MPa	18B7713X042
	To 160 PSI, 1.1 MPa	18B7713X022
	PSI/bar Gauge Scale	
	To 60 PSI, 4 bar	18B7713X032
	To 160 PSI, 11 bar	18B7713X012
66	Pipe Plug, hex hd	
	For Double-acting and single acting direct w/gauges (none req'd)	
	For Single-acting reverse w/gauges (1 req'd)	
	Plated steel	1D829328982
	SST	1D8293X0012
	For all units w/o gauges (3 req'd)	
	Plated steel	1D829328982
	SST	1D8293X0012
67	Tire Valve Assembly (3 req'd)	1N908899012
236	Screen	
	For single-acting direct units only	18B9610X012
Feedback Parts		
Common Feedback Parts		
80	Cap Screw, hex socket, SST(2)	
81	Square Nut, SST(2)	
223*	Potentiometer/Bushing Assy	
	Standard	
	For DVC6010f, DVC6010fS, DVC6020f, and DVC6020fS	18B9576X012
	For DVC6030f and DVC6030fS	17B4030X032
	For DVC6015 and DVC6025	19B6834X012
	For DVC6035	19B6835X012
	Extreme Temperature option (fluorosilicone elastomers)	
	For DVC6010f, DVC6010fS, DVC6020f and DVC6020fS	GE01028X012
	For DVC6030f & DVC6030fS	GE01027X012
163	Plain Washer, SST(2)	

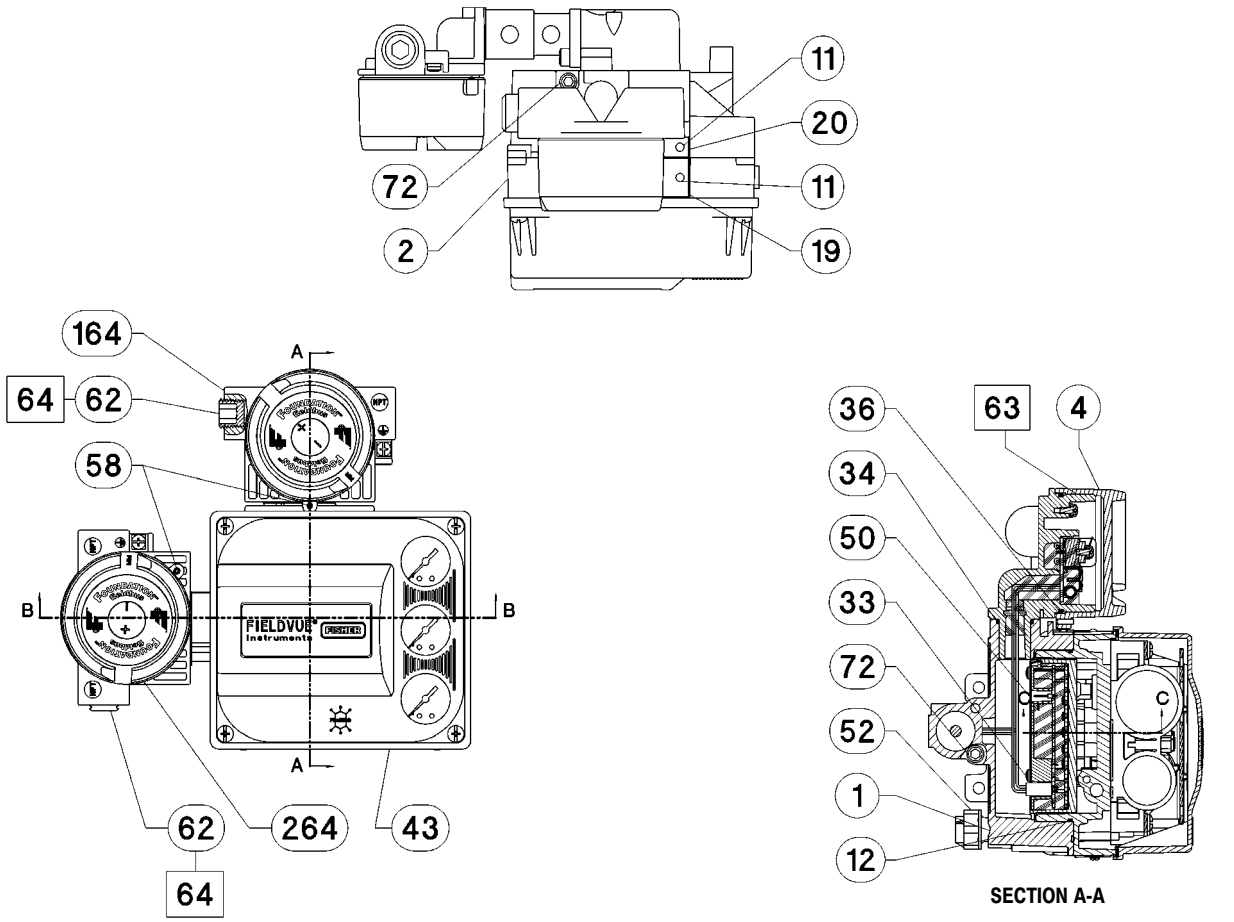
* Recommended spare

1. Available in the Elastomer Spare Parts Kit
2. Available in the Small Hardware Spare Parts Kit
8. Available in the Terminal Box Kit

Key	Description	Part Number
	For DVC6010f, DVC6015, DVC6030f, and DVC6035	
46	Alignment Pin(5)	
78	Bias Spring, SST(2)	
79	Feedback Arm,	
	304 SST	
	For DVC6010 and DVC6015	37B5270X042
	For DVC6030 and DVC6035	34B2179X022
	316 SST	
	For DVC6010S	37B5270X052
	For DVC6030S	34B2179X042
104	Cap Screw, hex hd (4 req'd)	
	DVC6010 and DVC6015 only	1A3917X0072
	Not for mounting on 1250 and 1250R actuators.	
	Mounting parts for 1250 and 1250R actuators are included in the mounting kit for these actuators.	
	DVC6010S only, SST (oversized) (4 req'd)	1A4116X0012
	Not for mounting on 1250 and 1250R actuators.	
107	Mounting Bracket DVC6010 and DVC6015 only(4)	
	Not for mounting on 1250 and 1250R actuators.	
	Mounting parts for 1250 and 1250R actuators are included in the mounting kit for these actuators.	
- - -	Feedback Linkage Shield, see figures 2-1 and 2-2	
	Up to 50.4 mm (2-inch) travel	
	All sliding-stem actuators except 585C size 60	39B2268X012
	50.4 mm (2-inch) to 104mm (4-inch) travel	
	All sliding-stem actuators except 585C size 60	49B2267X012
	Type 585C size 60, 19 mm (3/4-inch) to 104mm (4-inch) travel	49B3844X012

Key	Description	Part Number
	For DVC6020f and DVC6025	
82	Bias Spring, SST(3)	
83	Flange Bearing, Rulon(3) (2 req'd)	
84	Feedback Arm Assy, SST(3)	
85	E-ring, pl stl(3) (2 req'd)	
86	Plain Washer, pl stl(3) (2 req'd)	
87	Follower Post, SST(3)	
88	Roller, SST/PTFE(3)	
89	Spring Lock Washer, pl stl(3)	
90	Hex Nut, pl stl(3)	
91	Arm Assy, SST(3)	
92	Cap Screw, hex socket(3) (4 req'd)	
93	Torsion Spring, Feedback Arm(3)	

2. Available in the Small Hardware Spare Parts Kit
3. Available in the DVC6010f to DVC6020f Conversion Kit
4. Available in the DVC6020f to DVC6010f Conversion Kit
5. Available in the Alignment Pin Kit



11

☐ APPLY LUB, SEALANT

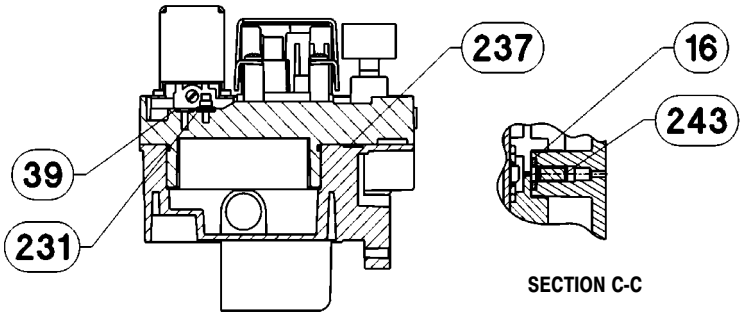
NOTES:

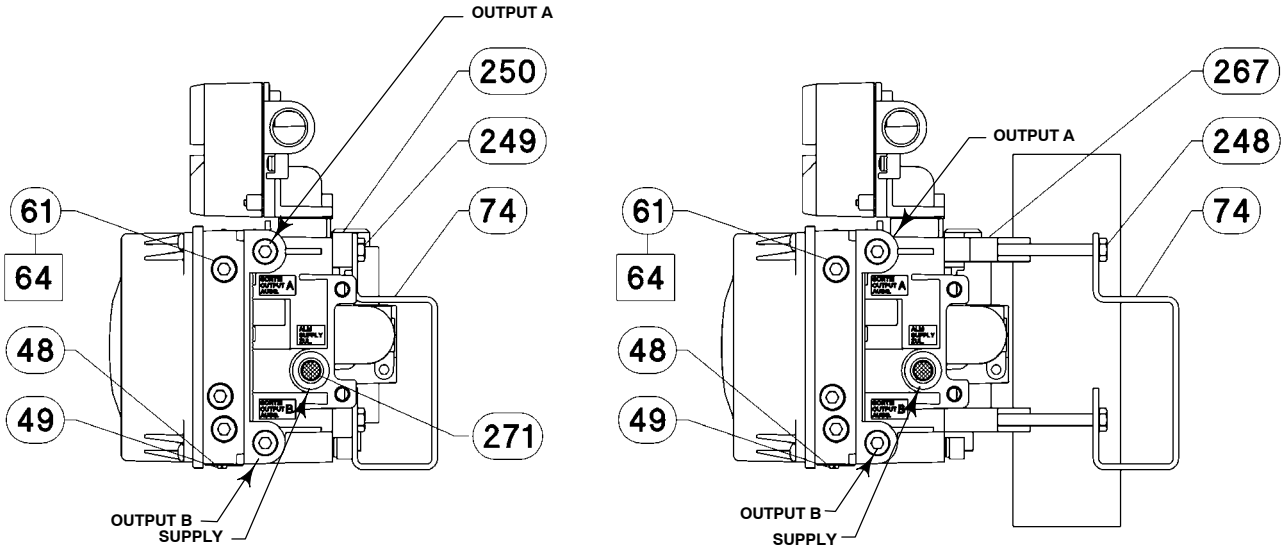
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS

2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B3261-B SHT 1, 2 & 3
29B3403-A

Figure 11-1. Type DVC6005f Base Unit

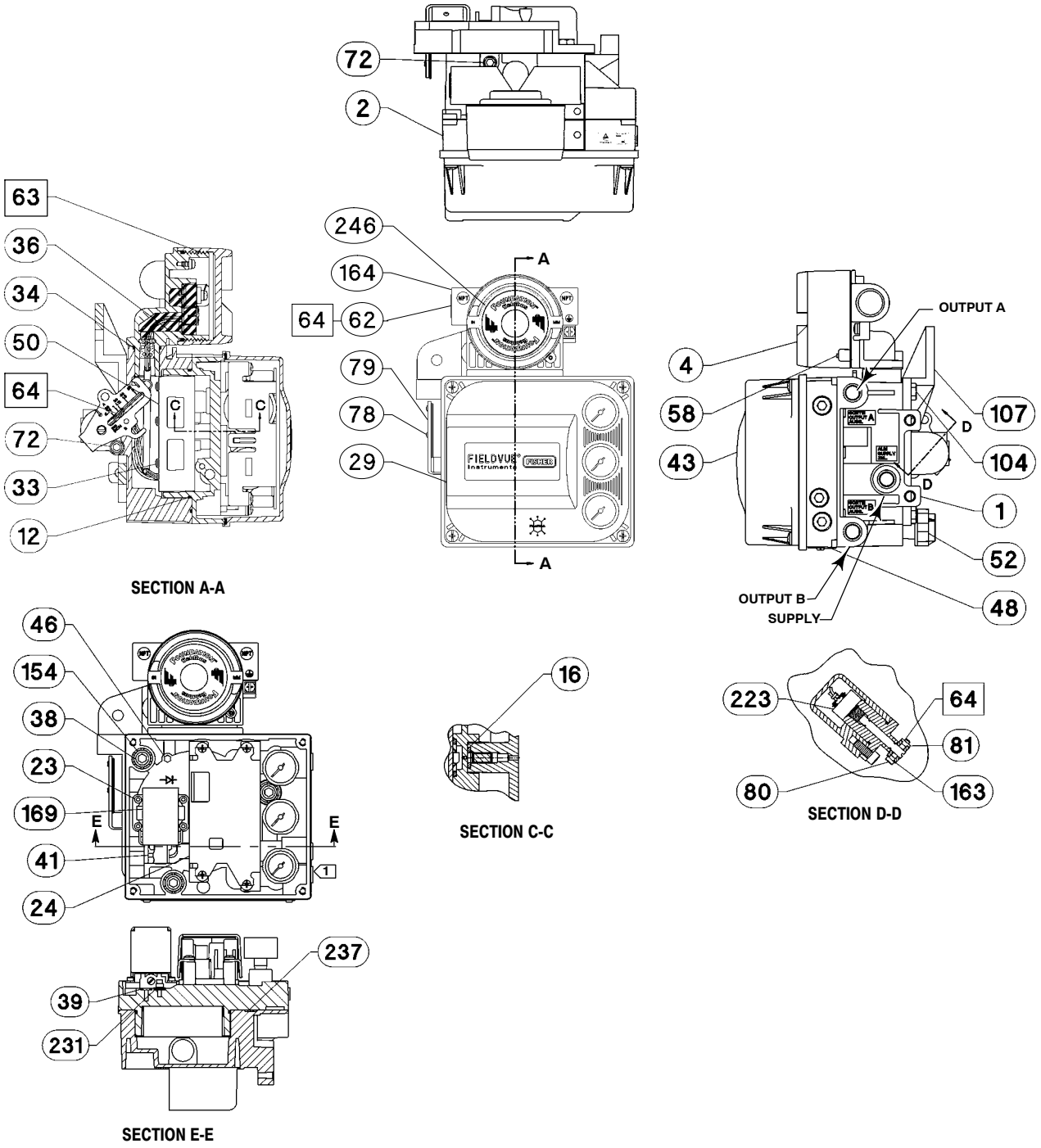




☐ APPLY LUB, SEALANT
NOTES:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

49B2361 SHT 3 / DOC

Figure 11-1. Type DVC6005f Base Unit (continued)

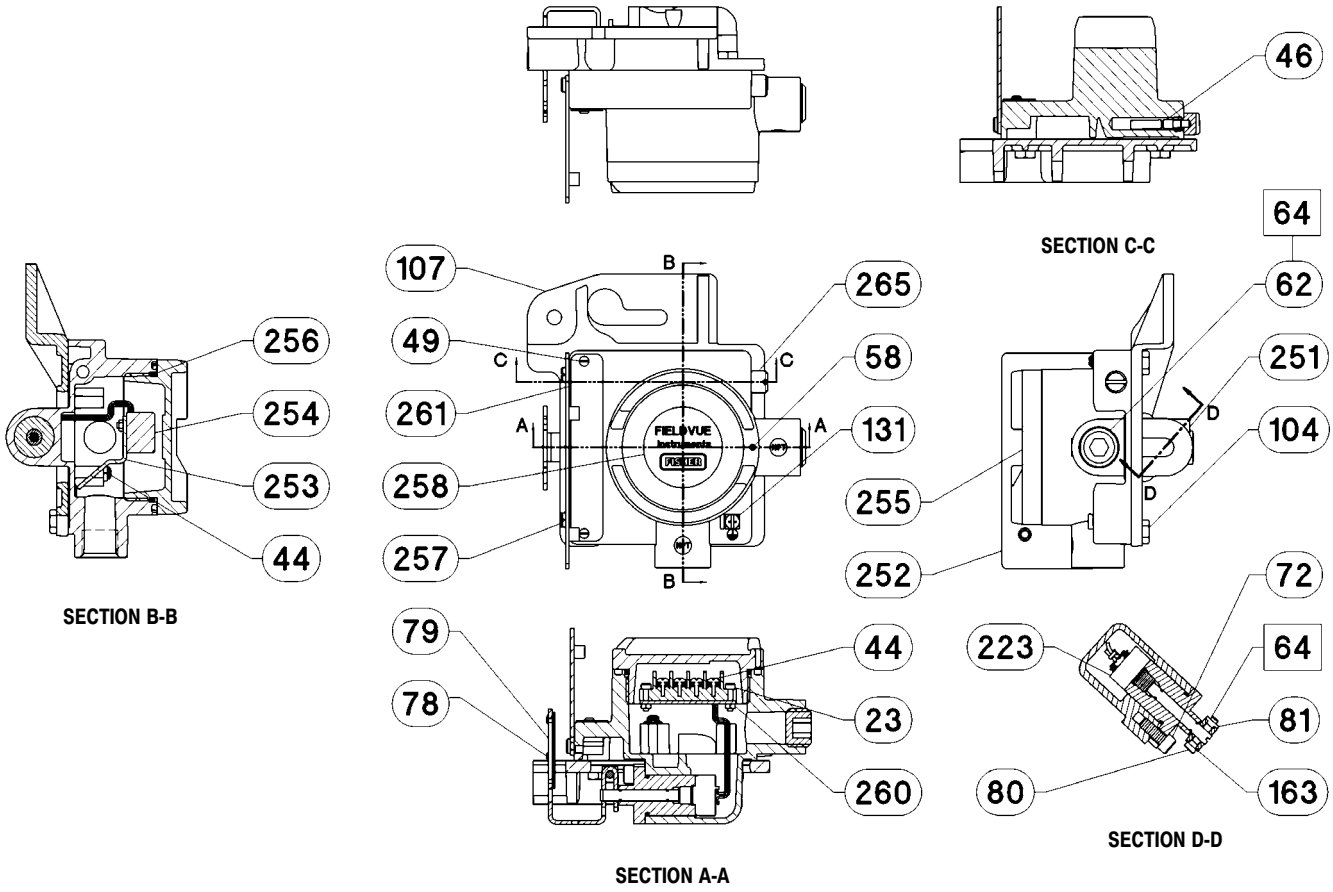


□ APPLY LUB, SEALANT
NOTES:
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B7710-E/G SHT 1 & 2 / DOC
29B3403-A

Figure 11-2. Type DVC6010f Digital Valve Controller Assembly

11



☐ APPLY LUB, SEALANT
NOTE:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B7986-A

Figure 11-3. Type DVC6015 Digital Valve Controller Assembly

11

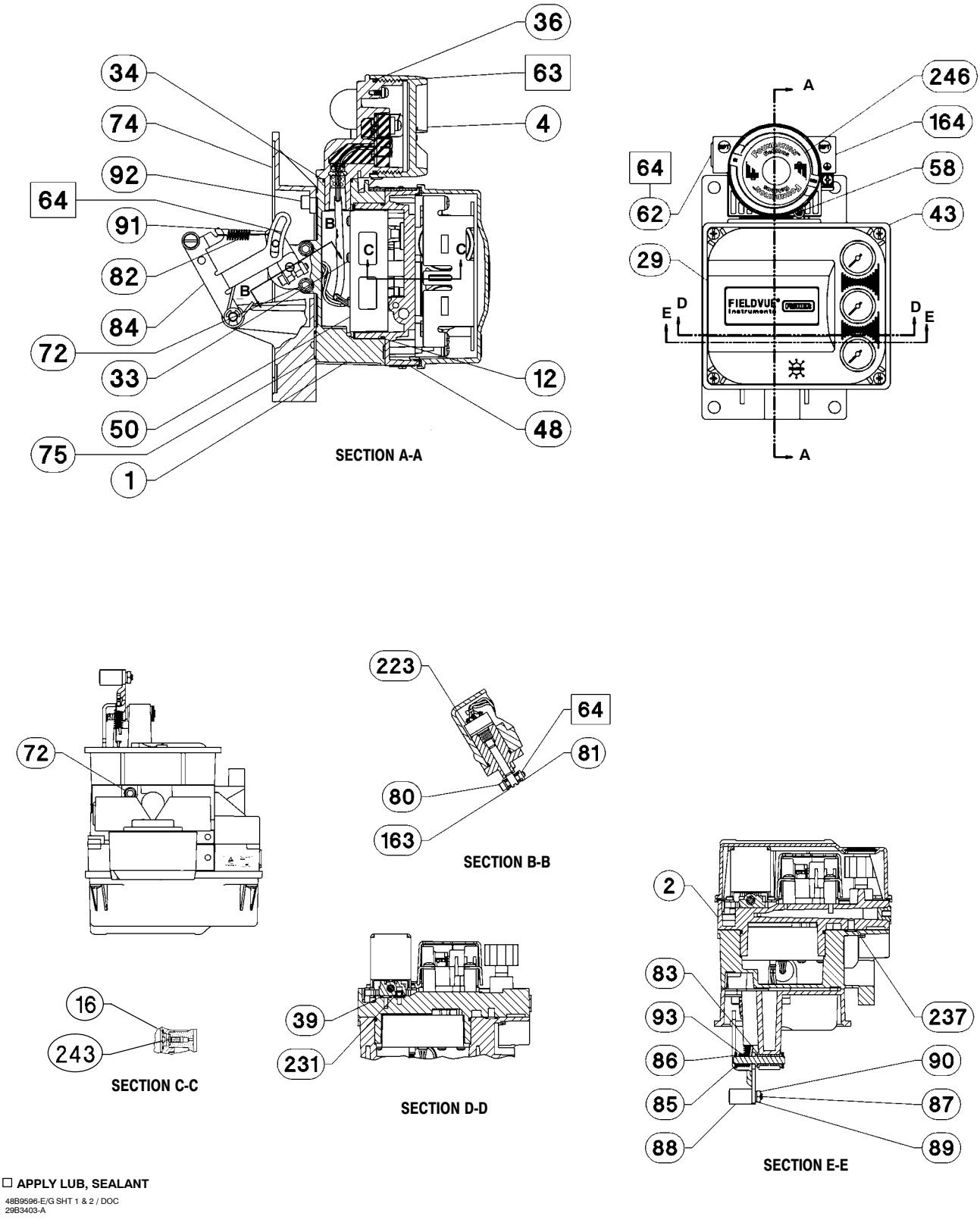
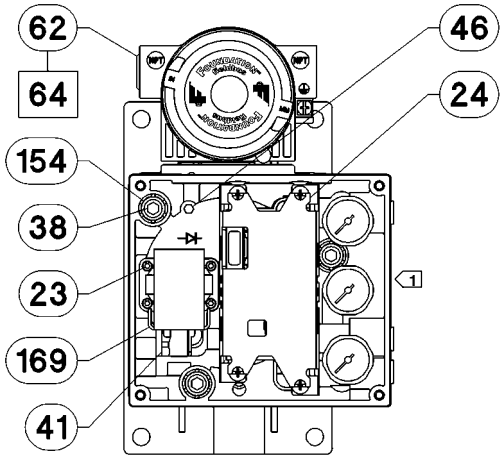
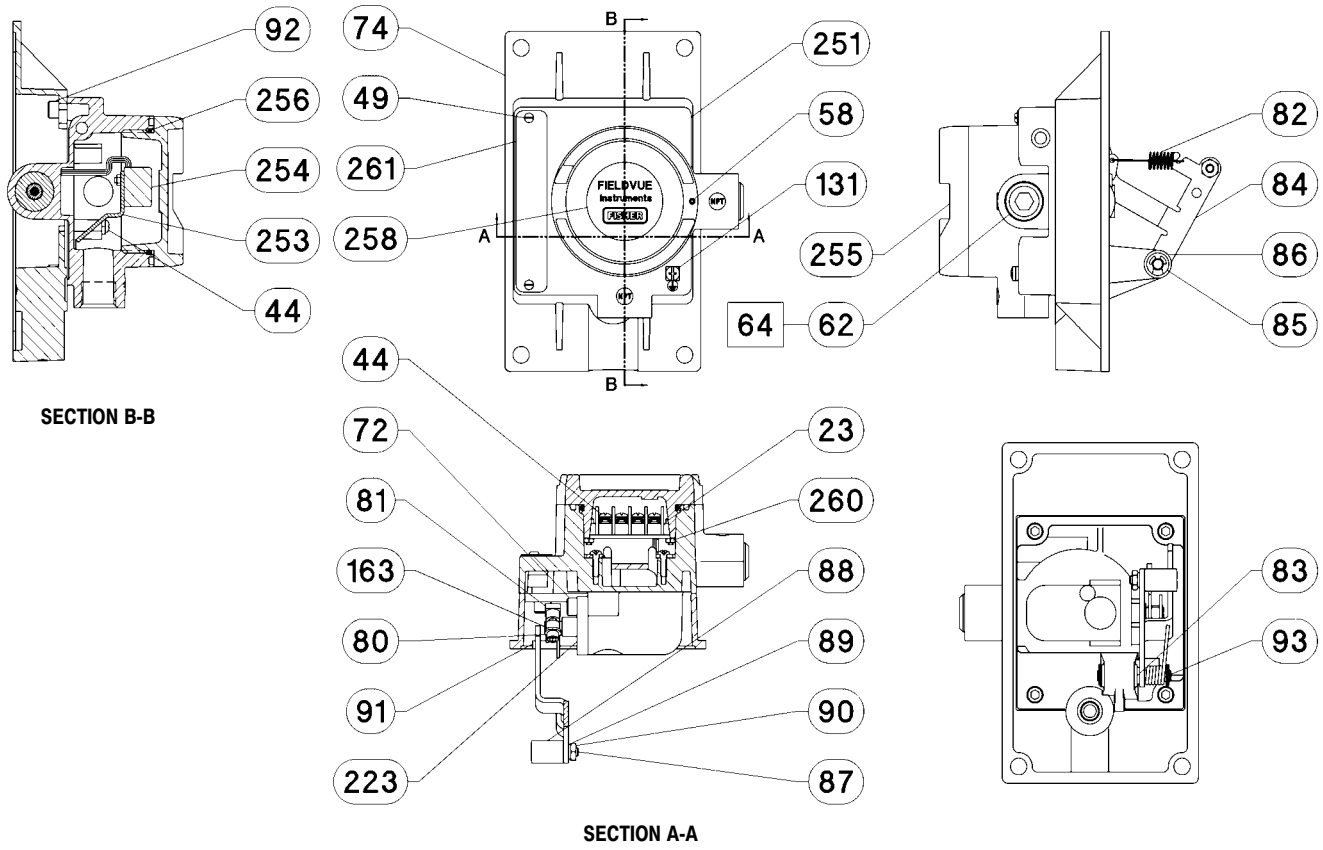


Figure 11-4. Type DVC6020f Digital Valve Controller Assembly



□ APPLY LUB, SEALANT
NOTES:
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED
48B9596-E SHT 3 / DOC

Figure 11-4. Type DVC6020f Digital Valve Controller Assembly (continued)

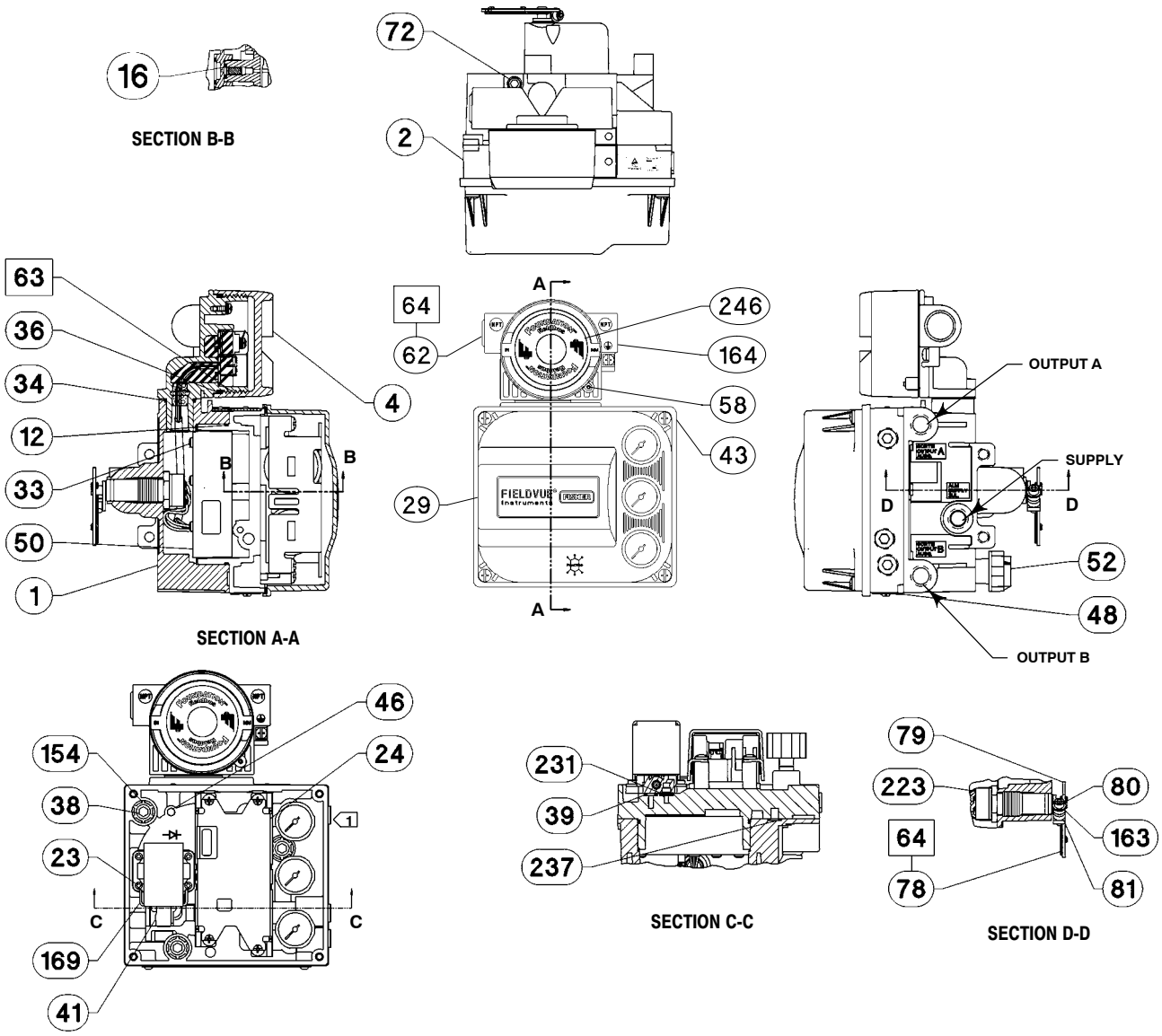


☐ APPLY LUB, SEALANT, THREAD LOCK
NOTE:
1. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

11

48B7987-A

Figure 11-5. Type DVC6025 Digital Valve Controller Assembly



☐ APPLY LUB, SEALANT, THREAD LOCK
NOTES:
1 SEE FIGURE 11-8 FOR GAUGE CONFIGURATIONS
2. APPLY LUBRICANT KEY 65 TO ALL O-RINGS UNLESS OTHERWISE SPECIFIED

48B9597-E/G SHT 1 & 2 / DOC
29B3403-A

Figure 11-6. Type DVC6030f Digital Valve Controller Assembly

11

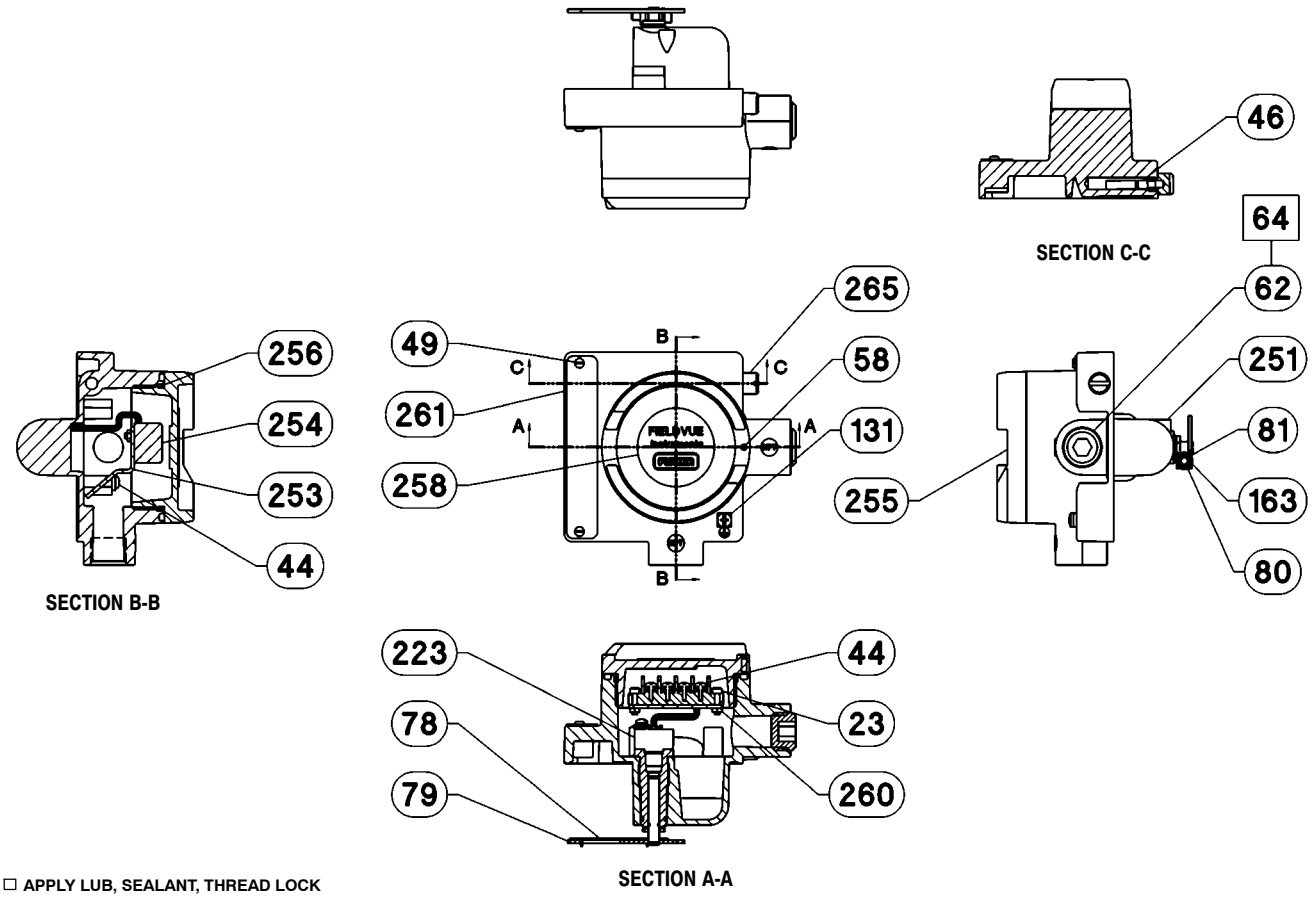
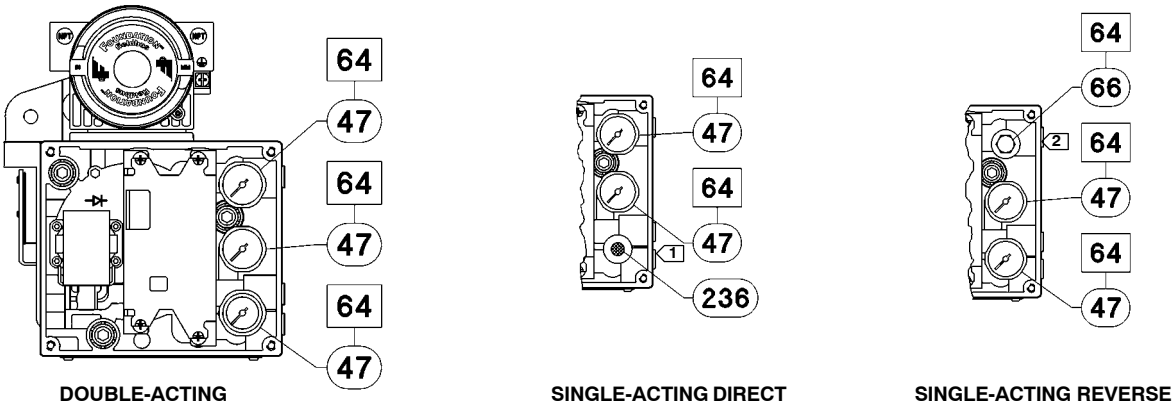


Figure 11-7. Type DVC6035 Digital Valve Controller Assembly



☐ APPLY LUB, SEALANT

NOTE:
1 FOR SINGLE-ACTING DIRECT, OUTPUT B IS PLUGGED.
2 FOR SINGLE-ACTING REVERSE, OUTPUT A IS PLUGGED.

48B7710-G SHT 2 / DOC

Figure 11-8. Typical DVC6000f Series Digital Valve Controller Gauge Configuration

Appendix A FOUNDATION™ fieldbus Communication

FOUNDATION™ Fieldbus Communication A-2

Function Block Overview A-2

Function Blocks A-2

Instrument Specific Blocks A-2

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Limit Propagation A-6

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Unscheduled Transfers A-8

Function Block Scheduling A-8

Network Management A-9

A

FOUNDATION™ Fieldbus Communication

The DVC6000f Series digital valve controllers use the FOUNDATION fieldbus to communicate with other fieldbus instruments and the control system. Fieldbus is an all digital, serial, two-way communication system which interconnects “field” equipment such as transmitters, digital valve controllers, and process controllers. Fieldbus is a local-area network (LAN) for instruments used in both process and manufacturing automation with built-in capability to distribute the control application across the network.

Function Block Overview

A fieldbus system is a distributed system composed of field devices and control and monitoring equipment integrated into the physical environment of a plant or factory. Fieldbus devices work together to provide I/O and control for automated processes and operations. The Fieldbus FOUNDATION provides a framework for describing these systems as a collection of physical devices interconnected by a fieldbus network. One of the ways that the physical devices are used is to perform their portion of the total system operation by implementing one or more function blocks.

Function Blocks

Function blocks within the fieldbus device perform the various functions required for process control. Because each system is different, the mix and configuration of functions are different. Therefore, the Fieldbus FOUNDATION has designed a range of function blocks, each addressing a different need: Analog Input Block (AI), Multiple Analog Input (MAI), Discrete Input Block (DI), Manual Loader Block (ML), Bias/Gain Station Block (BG), Control Selector Block (CS), P, PD Controller Block (PD), PID, PI, I Controller Block (PID), Ratio Station Block (RA), Analog Output Block (AO) and Discrete Output Block (DO).

Function blocks perform process control functions, such as analog input (AI) and analog output (AO) functions as well as proportional-integral-derivative (PID) functions. The standard function blocks provide a common structure for defining function block inputs, outputs, control parameters, events, alarms, and modes, and combining them into a process that can be implemented within a single device or over the fieldbus network. This simplifies the identification of characteristics that are common to function blocks.

The Fieldbus FOUNDATION has established the function blocks by defining a set of parameters used in all function blocks called universal parameters. The Fieldbus FOUNDATION has also defined a standard set of function block classes, such as input, output, control, and calculation blocks. Each of these classes have a set of parameters established for it. Additionally, they have published definitions for transducer blocks commonly used with standard function blocks. Examples include temperature, pressure, level, and flow transducer blocks.

The Fieldbus FOUNDATION specifications and definitions allow vendors to add their own, extended parameters, as well as their own algorithms. This approach permits extending function block definitions as new requirements are discovered and as technology advances.

Each block has a tag name. Service personnel need only know the tag name of the block to access or change the appropriate block parameters.

Input events may affect the operation of the algorithm. An execution control function regulates the receipt of input events and the generation of output events during execution of the algorithm. Upon completion of the algorithm, the data internal to the block is saved for use in the next execution, and the output data is snapped, releasing it for use by other function blocks.

Once the inputs are snapped, the algorithm operates on them, generating outputs as it progresses. Algorithm executions are controlled through the setting of internal parameters. Internal parameters do not appear as normal input and output parameters. However, they may be accessed and modified remotely, as specified by the function block.

Figure A-1 illustrates the internal structure of a function block. When execution begins, input parameter values from other blocks are snapped-in by the block. The input snap process ensures that these values do not change during the block execution. New values received for these parameters do not affect the snapped values and will not be used by the function block during the current execution.

Function blocks are also capable of performing short-term data collection and storage for reviewing their behavior.

Instrument-Specific Blocks

In addition to function blocks, fieldbus devices contain two other block types to support the function blocks. These are the resource block and the transducer block. The resource block contains the hardware specific characteristics associated with a device. Transducer blocks couple the function blocks to local input/output functions.

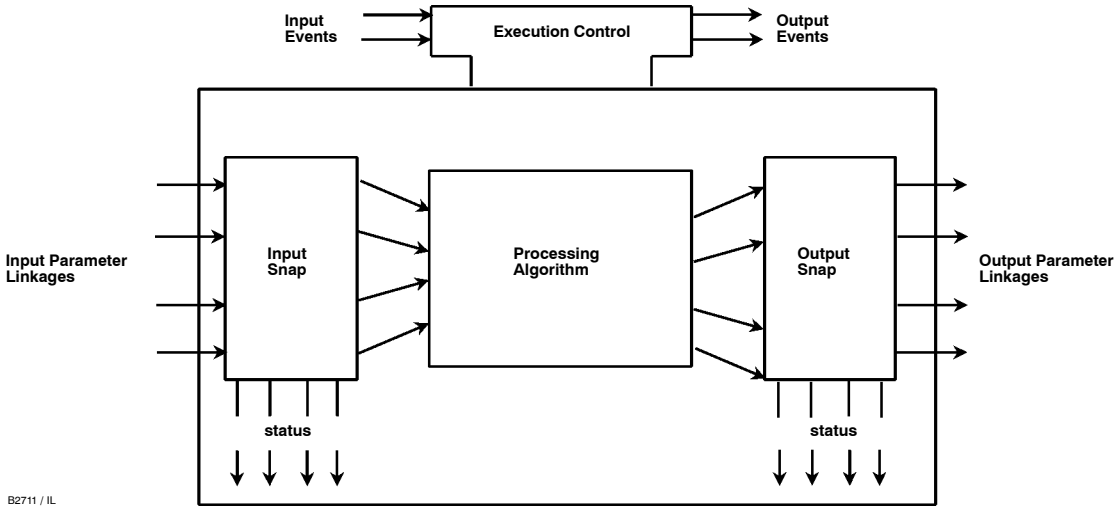


Figure A-1. Function Block Internal Structure

Resource Blocks

The resource block contains hardware specific characteristics associated with the device; it has no input or output parameters. The algorithm within a resource block monitors and controls the general operation of the physical device hardware. The execution of this algorithm is dependent on the characteristics of the physical device, as defined by the manufacturer. As a result of this activity, the algorithm may cause the generation of events. There is only one resource block defined for a device. For example, placing the resource block in Out of Service mode stops all function block execution, by setting their modes to Out of Service as well. The actual mode of the function blocks is changed to Out of Service, but the function block target modes will not change. Placing the resource block in the Out of Service mode does not affect the mode of the transducer block.

Transducer Blocks

Transducer blocks connect function blocks to local input/output functions. They read sensor hardware and write to effector (actuator) hardware. This permits the transducer block to execute as frequently as necessary to obtain good data from sensors and ensure proper writes to the actuator without burdening the function blocks that use the data. The transducer block also isolates the function block from the specific characteristics of the physical I/O.

Block Modes

All blocks have modes. The mode determines the source of the set point, the destination of the output, how the block executes, and the relationship between setpoint and output. The block mode is determined by the Block Mode parameter. It is a structured parameter composed of the attributes actual, target, permitted, and normal. The following defines each of the attributes.

- **Target mode**— The Target mode is the mode requested by the user or host system. Only one mode is allowed to be set and it must be a permitted mode as defined by the permitted attribute of the mode parameter.

- **Actual mode**— This is the current mode of the block. The actual mode may differ from the target mode due to operating conditions of the block.

- **Permitted mode**— The permitted mode defines the modes allowed for the block. This is set by the user or host system but is restricted by the instrument to modes supported by the instrument for the particular block. Any change request to the Target or Normal attribute is checked against the permitted attribute to ensure the requested mode is permitted.

When setting the Permitted mode, there is no check against any of the other attributes (Normal or Target modes). Therefore, the normal or target mode attributes may have a value that is not permitted because the permitted attribute was modified after the Normal or Target mode was set. This will have no effect on the instrument until the user attempts to

Table A-1. Block Modes

Block	Supported Mode Values
Resource	Auto and OOS
Transducer	Auto, Manual, and OOS
AO	RCas, Cas, Auto, Man, LO(1), IMan(1), and OOS
PID	ROut, RCas, Cas, Auto, Man, LO(1), IMan(1), and OOS
ISEL	Auto, Man and OOS
OS	IMan, Auto, Cas and OOS
AI	Man, Auto, and OOS
MAI	Man, Auto, and OOS
DO	RCas, Cas, Auto, Man, LO(1), IMan(1), and OOS
DI	Auto, Man, and OOS

1. This mode cannot be specified as a target mode.

modify the Target or Normal mode. At this time these attributes are tested against the Permitted modes, thus the user cannot change the Normal or Target modes to what was formerly permitted.

- **Normal mode**— The normal mode is the mode the block should be in during normal operating conditions. The normal mode is set by the user or host system and can only be set to a permitted mode (see permitted mode). The user or host system can compare the actual mode to the normal mode and, based on the results, determine if the block is operating normally.

Table A-1 lists the modes supported by each block contained in the digital valve controller.

Changing the block mode requires accessing the Block Mode parameter. For information on using the host system to change the block mode via this parameter, see the appropriate host documentation.

A

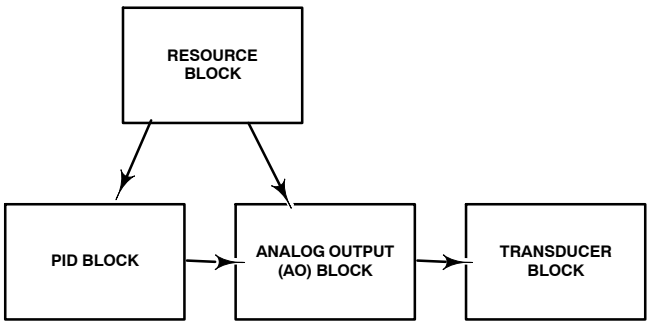
Note

A downstream block changing to Out of Service impacts the mode of the upstream block. Refer to the block hierarchy in figure A-2.

Explanation of Modes

Out of Service (OOS)—The functions performed by the block are not executed. If the block has any outputs, these typically do not update and the status of any values passed to downstream blocks will be "BAD". To make changes to some of the parameters in a block requires that the block be Out of Service.

Initialization Manual (IMan)—Only the AO, DO and PID blocks support this mode. When one of these blocks detects a loss of a correct path to the downstream block (such as when the downstream block is in the OOS, Man, or LO mode), it enters the IMan mode. For example, when the transducer block enters the OOS mode, the AO block enters the IMan mode.



NOTES:
1. CHANGING THE RESOURCE BLOCK TO OUT OF SERVICE CHANGES ALL FUNCTION BLOCKS TO OUT OF SERVICE, BUT DOES NOT AFFECT THE TRANSDUCER BLOCK.
2. CHANGING A DOWNSTREAM BLOCK TO OUT OF SERVICE AFFECTS THE UP STREAM BLOCK. FOR EXAMPLE: WHEN THE TRANSDUCER BLOCK IS OUT OF SERVICE, THE AO BLOCK MODE WILL CHANGE TO IMAN (INITIALIZE MANUAL).

Figure A-2. Digital Valve Controller Block Hierarchy Example

Local Override (LO)—Only the AO, DO and PID blocks support this mode. If the PID block enters the LO mode, the block output follows the tracking value (TRK_VAL), if external tracking is enabled by TRK_IN_D. In the AO and DO block, the block enters LO mode when the block detects that fault state is active. In this case, the output is determined by the selection for I/O_OPTS.

Manual (Man)—If the data status of a function block's input is bad or its target mode is Man, the block enters the manual mode. In this mode, the function block does not update its OUT value. If the target is Man, the user may write a desired value to the output.

Automatic (Auto)—The block performs the specified calculations based on the local set point and outputs the result, independently without interfacing with another block. The user can write to the set point of a block in this mode. Any block outputs continue to update.

Cascade (Cas)—The block performs the specified calculations based on the set point from another block via the cascade input parameter and outputs the result. Any block outputs continue to update.

Remote Output (ROut)—The block outputs are set to the value of the remote output parameter that is written by a host computer or others. To prevent a sudden change in output, the block's calculations are initialized when a change in mode occurs.

Table A-2. Examples of Block Mode Combinations and Operational statuses for an Instrument with Standard Control

Operational Status	Blocks		
	PID	AO	TB(1)
Initial Setup and calibration	– – –	OOS	OOS
Modification of some transducer block parameters	– – –	IMan	Manual
Constant valve position control	– – –	Auto	Auto
PID Single-loop control	Auto	Cas	Auto
PID Cascade-loop control	Primary PID, Auto Secondary PID, Cas	Cas	Auto

1. TB=Transducer Block

Remote Cascade (RCas)—The block performs the specified calculations based on a set point from a host computer or others via the remote cascade input and outputs the result. If the block has any outputs, these continue to update.

Examples of Modes for Various Operational Statuses

Table A-2 shows examples of block mode combinations in a digital valve controller (however it does not show all combinations). When a block changes mode or the data status signal changes for some reason, the other blocks connected to that block identify the change by detecting the change in status of an input signal, and change their modes too. For example, when the data status of BKCAL_IN in a PID block changes to bad, the PID block automatically changes its mode to Iman to initialize the control of its downstream block.

The respective modes to which each block should enter upon occurrence of a communication error and at a restart, and the handling of signals in each mode may be defined in the block's option parameters such as IO_OPTS and STATUS_OPTS. For details, see the detailed descriptions of each function block.

Device Descriptions

Device Descriptions are specified definitions that are associated with blocks. Device descriptions provide for the definition and description of blocks and their parameters.

Device descriptions may also include a set of processing routines called Methods. Methods provide a procedure for accessing and manipulating a series of parameters within a device, such as for setup and calibration. Methods are used for a variety of functions including automatic calibration, setting protection and setting up the instrument. These Methods are a predetermined sequence of steps for information required to setup, calibrate, and perform other functions on the instrument.

Table A-3. Status Attribute Quality and Substatus Components

Quality	Substatus
Good (NC)	Non-specific
Good (NC)	Active Block Alarm
Good (NC)	Active Advisory Alarm
Good (NC)	Active Critical Alarm
Good (NC)	Unack Block Alarm
Good (NC)	Unack Advisory Alarm
Good (NC)	Unack Critical Alarm
Uncertain	Non-specific
Uncertain	Last Usable Value
Uncertain	Substitute/Manual Entry
Uncertain	Initial Value
Uncertain	Sensor Conversion not Accurate
Uncertain	Engineering Unit Range Violation
Uncertain	Sub-normal
Good (C)	Non-specific
Good (C)	Initialization Acknowledge
Good (C)	Initialization Request
Good (C)	Not Invited
Good (C)	Not Selected
Good (C)	Local Override
Good (C)	Fault State Active
Good (C)	Initiate Fault State
Bad	Non-specific
Bad	Configuration Error
Bad	Not Connected
Bad	Device Failure
Bad	Sensor Failure
Bad	No Comm, with LUV
Bad	No Comm, no LUV
Bad	Out of Service

(NC)=(Non-cascade) (C)= (Cascade)

Transducer Block Status and Limit Propagation

Every FOUNDATION fieldbus parameter has a value and a status. The status attribute is divided into three components: Quality, Quality substatus, and a Limit. The Quality can be Good (Cascade), Good (Non-Cascade), Uncertain, and Bad. Each quality can have a substatus as shown in table A-3. Each status attribute also has four possible limit states: Not limited, Low limited, High limited, and Constant. Refer to the

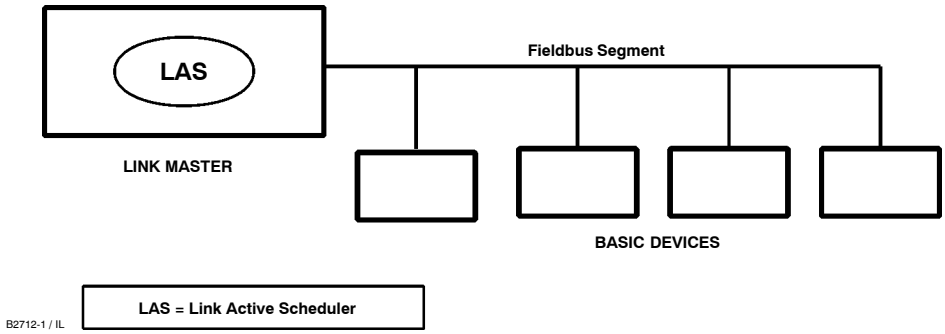


Figure A-3. Simple Single-Link Fieldbus Network

Fieldbus Foundation specifications for a more detailed description. The following describes how the transducer block passes status information to the AO block. For information on status handling by the function blocks within the digital valve controller, refer to the Detailed Setup section.

Status Propagation

The transducer block accepts the output from the AO block or DO block if the output parameter status is Good (Non-cascade) or Good (Cascade). When the AO or DO block is Out of Service the output parameter status is Bad. In this case, the transducer block holds the last value.

If the transducer block actual mode is Out of Service, the AO block READBACK parameter status is Bad−Out of Service. This could be caused by a Failed Alert. If a Failed Alert is active, the block error parameter (parameter name BLOCK_ERR) for the Resource block will indicate Device Needs Maintenance Now. For more information on the Resource and Transducer block error indications, refer to the Viewing Device Information section of this manual.

If the transducer block is functioning correctly the AO block READBACK parameter status is Good (Non-cascade)−Non-specific. If a Maintenance or Advisory alert is active the substatus will reflect a Unacknowledged or Active advisory alert. When a Maintenance or Advisory alert is active, the block error for the resource block indicates Device Needs Maintenance Soon.

Limit Propagation

The following describes limit propagation:

AO Block

- If the valve position is below the low cutoff value, the AO block READBACK status limit is LOW_LIMITED.
- If the valve position is above the high cutoff value, the AO block READBACK status limit is HIGH_LIMITED.
- If the transducer block actual mode is Auto and the above conditions are not true, the AO block READBACK status limit is NOT_LIMITED.
- If the transducer block actual mode is Out of Service, the AO block READBACK status limit is CONSTANT.

DO Block

- If the transducer block actual mode is Auto, the DO block READBACK_D status is NOT_LIMITED.
- If the transducer block actual mode is Out of Service, the DO block READBACK_D status is CONSTANT.

The control strategy should be configured to monitor the Analog Output block status and take action where appropriate when the status is no longer Good.

Network Communication

Figure A-3 illustrates a simple fieldbus network consisting of a single segment.

Device Addressing

Fieldbus uses addresses between 0 and 255. Addresses 0 through 15 are typically reserved for

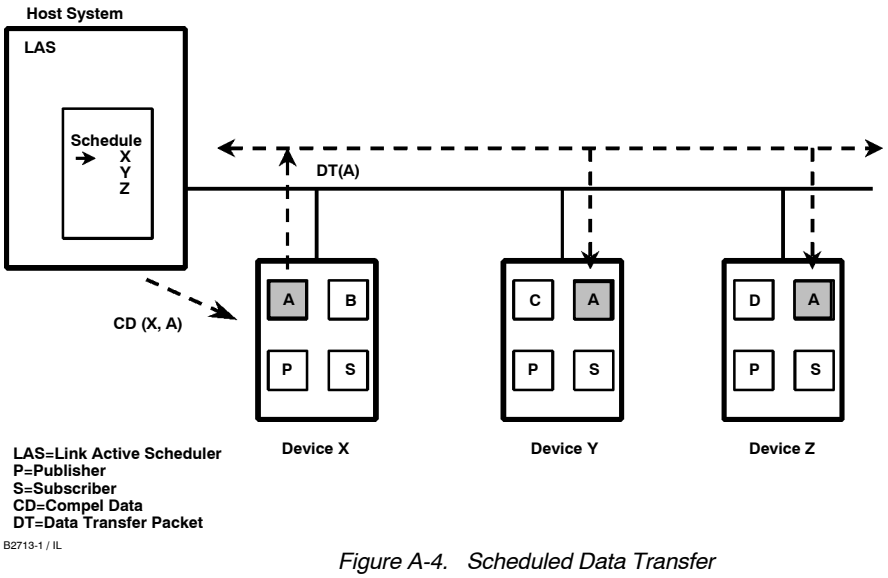


Figure A-4. Scheduled Data Transfer

group addressing and for use by the data link layer. If there are two or more devices with the same address, the first device to start will use its programmed address. Each of the other devices will be given one of four temporary addresses between 248 and 251. If a temporary address is not available, the device will be unavailable until a temporary address becomes available. Commission devices use addresses 20–35, and standby devices use addresses 232-247.

Link Active Scheduler (LAS)

There is only one active Link Active Scheduler (LAS) for the entire fieldbus control system. The digital valve controller does not include an LAS. The Link Active Scheduler operates as the bus arbiter for the link, and

- recognizes and adds new devices to the link.
- removes non-responsive devices from the link.
- distributes Data Link (DL) and Link Scheduling (LS) time on the link. Data Link Time is a network-wide time periodically distributed by the LAS to synchronize all device clocks on the bus. Link Scheduling time is a link-specific time represented as an offset from Data Link Time. It is used to indicate when the LAS on each link begins and repeats its schedule. It is used by system management to synchronize function block execution with the data transfers scheduled by the LAS.
- polls devices for process loop data at scheduled transmission times.
- distributes a priority-driven token to devices between scheduled transmissions.

Other devices may have the capability to act as a backup LAS, if for some reason the current active LAS fails or is removed from the segment.

Only one device can communicate at a time. Permission to communicate on the bus is controlled by a centralized token passed between devices by the LAS. Only the device with the token can communicate. The LAS maintains a list of all devices are a member of the bus. This list is called the “Live List”.

Two types of tokens are used by the LAS. A time-critical token, compel data (CD), is sent by the LAS according to a schedule. A non-time critical token, pass token (PT), is sent by the LAS to each device in numerical order according to address.

A

Device Communication

Scheduled Transfers

Information is transferred between devices over the fieldbus using three different types of communication:

- **Publisher/Subscriber:** This type of communication is used to transfer critical process loop data, such as the process variable. The data producers (publishers) post the data in a buffer that is transmitted to the subscriber (S), when the publisher is issued the Compel Data (CD) message from the LAS. The buffer contains only one copy of the data. New data completely overwrites previous data. Updates to published data are transferred simultaneously to all subscribers in a single broadcast. Transfers of this type are scheduled on a precisely periodic basis.

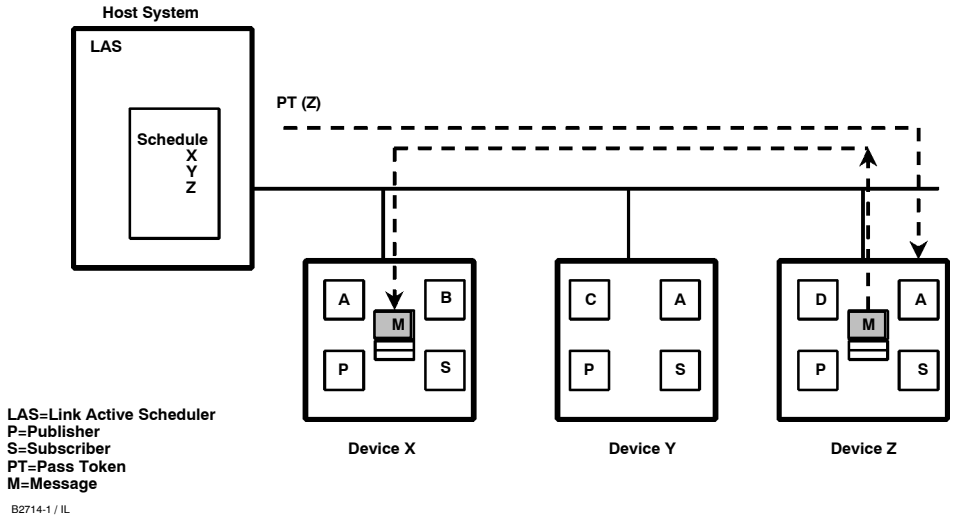


Figure A-5. Unscheduled Data Transfer

Figure A-4 diagrams the method of scheduled data transfer. Scheduled data transfers are typically used for the regular cyclic transfer of process loop data between devices on the fieldbus. Scheduled transfers use publisher/subscriber type of reporting for data transfer. The Link Active Scheduler maintains a list of transmit times for all publishers in all devices that need to be cyclically transmitted. When it is time for a device to publish data, the LAS issues a Compel Data (CD) message to the device. Upon receipt of the CD, the device broadcasts or "publishes" the data to all devices on the fieldbus. Any device that is configured to receive the data is called a "subscriber".

A

- **Client/Server:** This type of communication is used for request/ response exchanges between pairs of devices, such as a set point change. Like Report Distribution reporting, the transfers are queued, unscheduled, and prioritized. Queued means the messages are sent and received in the order submitted for transmission, according to their priority, without overwriting previous messages.

Unscheduled Transfers

Figure A-5 diagrams an unscheduled transfer. Unscheduled transfers are used for things like user-initiated changes, including set point changes, mode changes, tuning changes, and upload/download. Unscheduled transfers use either report distribution or client/server type of reporting for transferring data.

All of the devices on the fieldbus are given a chance to send unscheduled messages between transmissions of scheduled data. The LAS grants permission to a device to use the fieldbus by issuing a pass token (PT) message to the device. When the device receives the PT, it is allowed to send messages until it has finished or until the "maximum token hold time" has expired, whichever is the shorter time. The message may be sent to a single destination or to multiple destinations.

- **Report Distribution:** This type of communication is used to broadcast and multicast event and trend reports.

Function Block Scheduling

Figure A-6 shows an example of a link schedule. A single iteration of the link-wide schedule is called the macrocycle. When the system is configured and the function blocks are linked, a master link-wide schedule is created for the LAS. Each device maintains its portion of the link-wide schedule, known as the Function Block Schedule. The Function Block Schedule indicates when the function blocks for the device are to be executed. The scheduled execution time for each function block is represented as an offset from the beginning of the macrocycle start time.

To support synchronization of schedules, periodically Link Scheduling (LS) time is distributed. The beginning of the macrocycle represents a common starting time for all Function Block schedules on a link and for the LAS link-wide schedule. This permits function block executions and their corresponding data transfers to be synchronized in time.

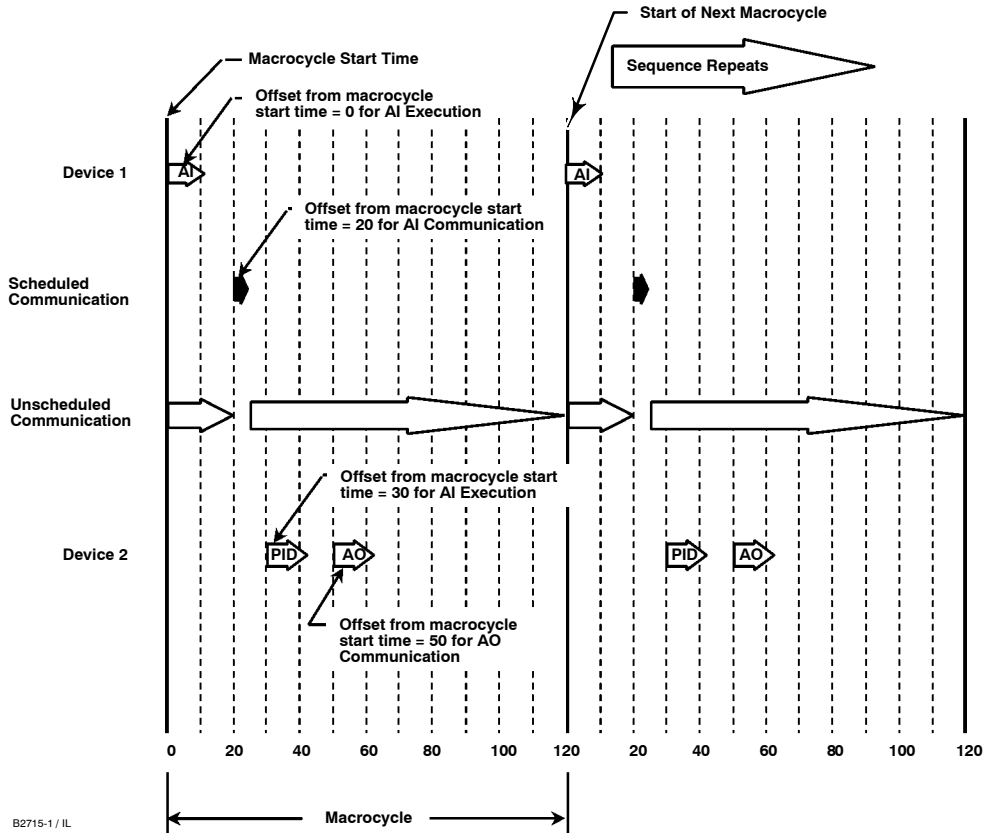


Figure A-6. Example Link Schedule Showing Scheduled and Unscheduled Communication

Network Management

Information for setting up network communications, including Virtual Communication Relationships (VCRs), host timer recommendations, and other network parameters, can be found in the capabilities file (.cff) available from the website www.FIELDVUE.com or from the Fieldbus Foundation website.

A

A

Appendix B Device Description (DD) Installation

Overview B-2

Device Descriptions and Methods B-3

Installing DDs on a DeltaV™ ProfessionalPLUS Workstation B-3

Installing DDs on Other Fieldbus Host Systems B-4

Displaying the Device Description Revision B-5

Overview

Several support files are required for the DVC6000f Series digital valve controller. They are:

- **Device Description (DD) files**—These files define the data interface to the digital valve controller (file extensions .sym and .ffo).

- **Capabilities File**—These files allow a host to configure the control system off-line (e.g., without having a device physically attached to the host) (file extension .cff).

- **DeltaV™ Registry File**—This file is used by DeltaV to define the device interface (file extension .reg)

- **DeltaV™ fhx File**—This file is used by DeltaV to define the device and the data interface to the device (file extension .fhx).

- **DeltaV™ Windows Resource File**—These files define the user interface for the device for DeltaV and include the definitions for the transducer block interface and the resource block interface (file extension .dll).

The directory structure defined by the Fieldbus Foundation for device descriptions is as follows:

....\xxxxxx\yyyy\rrddcc.eee

where:

....\ is the path to the DD structure as implemented by the host system. This is typically defined as the base path to the DD since access to the specific device DD is predefined from the base folder. For a DeltaV system, the DDs are included with the support files and are located in a folder named “amsdevices.” For other hosts, the Fieldbus Foundation defines a folder named “release” that is included with the CD-ROM, however, you do not need to retain this folder name.

xxxxxx is the 6-digit hexadecimal equivalent of the manufacturer’s identification number as defined by the Fieldbus Foundation. Fisher Controls’ ID number is 5100 (or in the folder format 005100). This number is also stored in the instrument Resource Block in the parameter Mfg ID (parameter name MANUFAC_ID).

yyyy is the 4-digit hexadecimal equivalent of the device type, as defined by the manufacturer. For example, the device type for the DVC6000f Series digital valve controller is **4601**. This number is stored in the instrument Resource Block in the parameter Device Type (parameter name DEV_TYPE).

rr is the 2-digit hexadecimal equivalent of the device revision, as defined by the manufacturer. It is stored in the instrument Resource Block in the parameter Device Revision (parameter name DEV_REV).

dd is the 2-digit hexadecimal equivalent of the device description (DD) revision that applies to the device, as defined by the manufacturer. The host will always use the latest version of the DD that it finds for a particular device revision. When part of the name of a capabilities file, this value is always the same as the value of the DD_REV parameter stored in the Resource Block of the instrument. The value of the DD_REV parameter represents the earliest version of the DD that is compatible with the device revision of the instrument.

cc is a 2-digit hexadecimal equivalent for the capabilities files (.cff) revision, as defined by the manufacturer. The latest revision of the capabilities files, for a particular device revision, is the file with the largest value for this number.

eee is the file extension. At this time, five extensions exist for files, they are:

- .sym—This extension denotes a device description (DD) symbol file as defined by the Fieldbus Foundation.

- .ffo—This extension denotes a complete, tokenized, device description for the instrument as defined by the Fieldbus Foundation.

- .cff—This extension denotes a capabilities file for the instrument as defined by the FOUNDATION Fieldbus Common File Format specification.

- .fhx—This extension denotes a DeltaV device definition file.

- .dll—This extension denotes a windows resource file used by DeltaV.

- .reg—This extension denotes a DeltaV registry file.

- .alm—This extension denotes a DeltaV alarm file (DeltaV version 6 only).

B

Device Description and Methods

FOUNDATION fieldbus technology uses Device Descriptions (DD) and function blocks to achieve interoperability between instruments and control systems or hosts from various manufacturers. The DD provides information to describe the data interface to the device.

For fieldbus devices, in addition to providing parameter definitions and other information required by the control system to communicate with the fieldbus device, the DD may also include methods. Methods can be used for a variety of functions including automatic calibration, setting protection, setting up the instrument, etc. These methods are a predetermined sequence of steps for information required to setup, calibrate, and perform other functions on the instrument. How the method prompts the user, and how messages appear is determined by the host system. For information on using methods on the host system see the appropriate host system documentation.

Table B-1 contains the methods available in the DVC6000f, the block it is found in, and the page number where it is described.

Table B-1. Methods

Method	Block	Description Location
Auto Travel Calibration	Transducer	page 4-6, 6-3
Block Error Reporting	Transducer	page 5-39
Block Mode	Transducer	page 4-2
	Resource	page 5-4
Display DD Version	Resource	page B-5
Instrument Alerts	Transducer	page 5-29
Manual Travel Calibration	Transducer	page 6-4
Output A Sensor Calibration	Transducer	page 6-10
Output B Sensor Calibration	Transducer	page 6-10
PlantWeb Alerts	Transducer	page 5-29
Relay Adjust	Transducer	page 6-5
Master Reset	Resource	page 5-7
Setup Wizard	Transducer	page 4-2
Stabilize/Optimize	Transducer	page 4-7
Stroke Valve	Transducer	page 5-39
Supply Sensor Calibration	Transducer	page 6-9
Travel Sensor Adjust	Transducer	page 6-7

Installing DDs on a DeltaV™ ProfessionalPLUS Workstation

The following is general information that may apply when installing the DD on a DeltaV system during the Add Device Definition procedure. This procedure is

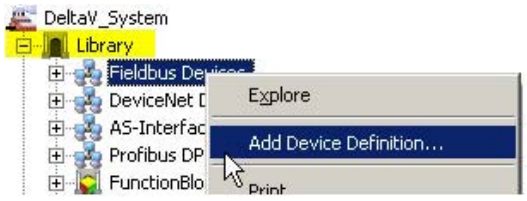


Figure B-1. Add Device Definition

accessed from the DeltaV/Library, as shown in figure B-1. For complete information, refer to the DeltaV documentation.

Note

Before beginning the Add Device Definition procedure, it is recommended that the Add Device Utility be installed on DeltaV. This may help prevent installation errors from occurring.

Note

Be sure to select the correct DD for the correct revision of DeltaV. The resource files are different for each revision of DeltaV.

- Device descriptions furnished by Fisher contain only those files applicable to Fisher. All the files are located in the manufacturer ID Folder (005100 for xxxxxx in directory structure above). A readme file is included at the top level. Read this file for any additional information regarding DD installation.

- Device descriptions furnished by the Fieldbus Foundation (on CD-ROM or diskette) contain the files for each registered manufacturer and their associated device(s). It is placed on the media starting with the release folder, which then contains a folder (xxxxxx) for each manufacturer as defined above. For Fisher this folder is 005100. A readme file may be included at the top level. Read this file for any additional information regarding the DD.

- **For the DVC6000f SC Digital Valve Controller**—The device type parameter for this unit is

B

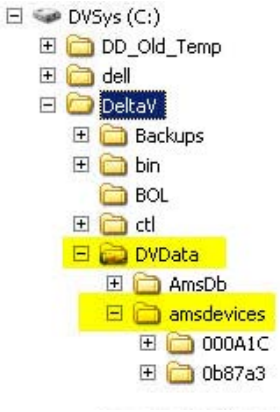


Figure B-2. amsdevices folder

4601. This device includes the AO, PID, ISEL, OS, AI, MAI, DO and DI function blocks. From DeltaV Explorer, select the amsdevices\005100\4601 folder (refer to figure B-2).

- The most recent device description for Fisher devices can be downloaded from the internet at www.FIELDVUE.com. If you are downloading from the internet, the file on the website will be compressed (zipped) and must be decompressed (unzipped) before proceeding. Refer to the website download and installation procedures for setting up the DD on your system. Note the folder where the decompressed files are placed. This information will be required later in the installation procedure.

Note

Record any warning/error messages from the message window in DeltaV Explorer so that it can be communicated to the DeltaV Technical Support Group.

Installing DDs on Other Fieldbus Host Systems

The following is a generic procedure for installing the device descriptions on a host system. Refer to your host system documentation for specific information. In general the following may apply:

- Device descriptions furnished by Fisher contain only those files applicable to Fisher. All the files are located in the manufacturer ID Folder (005100 for xxxxxx in directory structure above). A readme file is included at the top level. Read this file for any additional information regarding DD installation.

- Device descriptions furnished by the Fieldbus Foundation (on CD-ROM or diskette) contain the files for each registered manufacturer and their associated device(s). It is placed on the media starting with the release folder, which then contains a folder (xxxxxx) for each manufacturer as defined above. For Fisher this folder is 005100. A readme file may be included at the top level. Read this file for any additional information regarding the DD.

- **For the DVC6000f SC Digital Valve Controller**—The device type parameter for this unit is 4601. This device includes the AO, PID, ISEL, OS, AI, MAI, DO and DI function blocks. From Windows Explorer, select the release\005100\4601 folder.

- The most recent device description for Fisher devices can be downloaded from the internet at www.FIELDVUE.com. If you are downloading from the internet, the file on the website will be compressed (zipped) and must be decompressed (unzipped) before proceeding. Refer to the website download and installation procedures for setting up the DD on your system. Note the folder where the decompressed files are placed. This information will be required later in the installation procedure.

Note

This procedure will install the necessary Device Description files (*.ffo and *.sym), and Capabilities file (*.cff) for the device.

1. Locate or create the folder on the host system to contain all the DD and capabilities files.

If you are creating a folder, you can name this new folder whatever you would like and it can have any path you define. For this installation procedure, this folder will be referred to as the base folder.

2. On the CD-ROM or in the website download files, locate the folder with the new support files. This folder is called \RELEASE.

3. Open this folder and select the folder named 005100.

4. Copy the 005100 folder (and all its subfolders) from the CD-ROM or website download location to the base folder.

If this is an update (the folders already exist), the system informs you that the folders already exist and asks if they should be replaced. Answer Yes or OK so the folders are properly updated.

5. The new support files are now installed. You may have to restart applications and drivers in order for the new files to become active.

DD installation is complete. Consult the system documentation for commissioning new devices or updating existing devices.

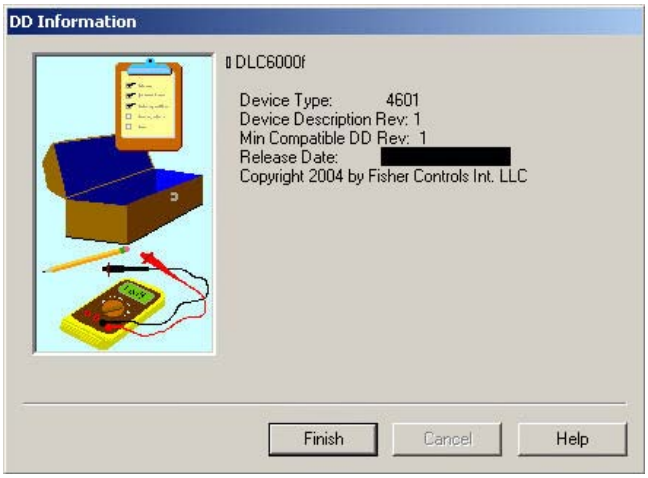


Figure B-3. DD Version Method Display on a DeltaV Host System

Displaying the Device Description Version

You can use the DD In Use method to display version information for the device descriptions installed on the system. The DD in Use method is included with the device description (DD) software. For information on using methods, see the host system documentation.

This method is available via the resource block.

Start DD Version. Figure B-3 is an example of the DD Version display on a DeltaV host system. DD in Use displays:

- The version number. The version number is displayed in the format: device type.device revision.DD revision. In the example shown in figure B-3 the device type is 4601, the device revision is 1, and the DD revision is 1. The DD revision displayed is the latest device description revision that is compatible with the displayed device revision.

B

Appendix C Operating with DeltaV™

Getting Started C-2

Transducer Block Parameter – Configuration Index C-3

Resource Block Parameter – Configuration Index C-4

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Resource Block C-7

Bringing the Device On-Line C-8

C

Process Systems DeltaV™ System

Getting Started with DeltaV™ Host Systems

- ☐ Appropriate Device Descriptions (DDs) installed. For example, working with a device revision 2 digital valve controller requires DDs that support device revision 2 be installed. For DD installation information see Appendix B.
- ☐ Digital valve controller correctly mounted on actuator. For mounting information see the Installation section of this manual and the instructions included with the mounting kit.
- ☐ Utilities connected. For information on making pneumatic and electrical connections, see the Installation section of this manual. For information on applying power to the segment, see DeltaV books online.
- ☐ Instrument in standby. For information on placing the instrument in standby, see DeltaV books online.
- ☐ Perform the initial setup. See the Basic Setup and Tuning section of this manual. If the valve is shipped from the factory mounted on an actuator, perform basic setup only to verify setup is correct and valve operation is satisfactory.
- ☐ Device Commissioned. For information on commissioning a device, see DeltaV books online.
- ☐ Additional configuration required, such as setting alarms, cutoffs, and other resource block and transducer block parameters. See the Detailed Setup section of this manual.
- ☐ Control strategy defined. For information on defining a control strategy, see DeltaV books online.
- ☐ Associate I/O with device. See DeltaV books online.
- ☐ Download device. See DeltaV books online.

Table C-1. Transducer Block Parameter – Configuration Index (also refer to figure C-4)

PARAMETER LABEL	TAB	PARAMETER LABEL	TAB	PARAMETER LABEL	TAB
Act Fail Action	Actuator	Port Diameter	Trim	Travel	Travel Alerts
Act Manufacturer	Actuator	Port Type	Trim	Travel Accum Alert Pt	Travel History Alerts
Act Model Number	Actuator	Press Cutoff Hi	Travel/Press Control	Travel Accum DB	Travel History Alerts
Act Serial Number	Actuator	Press Cutoff Lo	Travel/Press Control	Travel Accumulator	Travel History Alerts
Act Size	Actuator	Press Integ DeadZone	Tuning	Travel Cal Trigger	Initial Setup
Actual Mode	Initial Setup	Press Integ Gain	Tuning	Travel Closed	Prox Alerts
Actual Travel	Valve	Press Integ Lim Hi	Tuning	Travel Closed Alert Pt	Prox Alerts
Act Style	Initial Setup	Press Integ Lim Lo	Tuning	Travel Closed DB	Prox Alerts
Air	Actuator	Press MLFB Gain	Tuning	Travel Cutoff Hi	Travel / Press Control
Alert Key	Config Alert	Press Prop Gain	Tuning	Travel Cutoff Lo	Travel / Press Control
Area Units	Instrument	Press Range Hi	Travel / Press Control	Travel D	Overview
Blocks Set to Defaults	Config Alerts	Press Range Lo	Travel / Press Control	Travel DeChar	Overview
Calibration Date	Instrument	Press Tuning Set	Tuning	Travel Deviation	Travel Alerts
Calibration Location	Instrument	Pressure A	Overview	Travel Deviation Alert Pt	Travel Alerts
Calibration Person	Instrument	Pressure B	Overview	Travel Integ DeadZone	Tuning
Class	Valve	Pressure Units	Instrument	Travel Integ Enable	Tuning
Cycle Count	Travel History Alerts	Processor	Elect Alerts	Travel Integ Gain	Tuning
Cycle Count Alert Pt	Travel History Alerts	Program Memory	Elect Alerts	Travel Integ Lim Hi	Tuning
Cycle Count DB	Travel History Alerts	Protection	Overview	Travel Integ Lim Lo	Tuning
Drive Current Alert	Elect Alerts	Proximity Hi	Prox Alerts	Travel Limit Hi	Travel Alerts
Drive Current Alert Pt	Elect Alerts	Proximity Hi Hi	Prox Alerts	Travel Limit Hi Alert Pt	Travel Alerts
Drive Current Alert Time	Elect Alerts	Proximity Lo	Prox Alerts	Travel Limit Hi Hi	Travel Alerts
Drive Signal	Overview	Proximity Lo Lo	Prox Alerts	Travel Limit Hi Hi Alert Pt	Travel Alerts
Drive Signal Alert	Elect Alerts	Push Down To	Trim	Travel Limit Lo	Travel Alerts
Effective Area	Actuator	Rated Travel	Valve	Travel Limit Lo Alert Pt	Travel Alerts
Feedback Connection	Actuator	Relay Type	Initial Setup	Travel Limit Lo Lo	Travel Alerts
Flow Direction	Trim	Seat Type	Trim	Travel Limit Lo Lo Alert Pt	Travel Alerts
Flow Tends To	Trim	Self Test Shutdown	See Individual Alarms	Travel MLFB Gain	Tuning
Inlet Pressure	Valve	Set Point	Travel Alerts	Travel Open	Prox Alerts
Input Characterization	Input Char	Set Point D	Overview	Travel Open Alert Pt	Prox Alerts
I/O Processor	Elect Alerts	Shutdown Recovery	See Individual Alarms	Travel Open DB	Prox Alerts
Leak Class	Trim	Spring Rate	Actuator	Travel / Press Select	Travel / Press Control
Length Units	Instrument	Spring Rate Units	Instrument	Travel Press State	Overview
Lever Style	Actuator	Static Memory	Elect Alerts	Travel Prop Gain	Tuning
Lower Bench Set	Actuator	Stem Diameter	Valve	Travel Sensor Alert	Sensor Alerts
Max Supply Press	Instrument	Stroking Time Closed	Reference	Travel Sensor Motion	Actuator
Moment Arm	Actuator	Stroking Time Open	Reference	Travel Status	Overview
Nominal Supply Pressure	Actuator	Supply Pressure	Overview	Travel Tuning Set	Tuning
Normal Mode	Initial Setup	Supply Pressure Hi	Enviro Alert1	Travel Units	Instrument
Outlet Pressure	Valve	Supply Pressure Hi Alert Pt	Enviro Alerts	Travel Velocity Gain	Tuning
Output Block Timeout	Config Alerts	Supply Pressure Lo	Enviro Alerts	Trim Style 1	Reference
Packing Type	Valve	Supply Pressure Lo Alert Pt	Enviro Alerts	Trim Style 2	Reference
Performance Critical	Perf Alerts	Supply Pressure Sensor	Sensor Alerts	Unbalanced Area	Trim
Performance Information	Perf Alerts	Tag Description	Instrument	Upper Bench Set	Actuator
Performance Reduced	Perf Alerts	Target Mode	Initial Setup	Valve Manufacturer	Valve
Permitted Mode	Initial Setup	Temperature	Overview	Valve Model Number	Valve
Plant Web Alarm	See Individual Alarms	Temperature Hi	Enviro Alerts	Valve Serial Number	Valve
Plant Web Alarm Simulate	Simulate Alarms	Temperature Hi Alert Pt	Enviro Alerts	Valve Size	Valve
Plant Web Reporting	See Individual Alarms	Temperature Lo	Enviro Alerts	Valve Style	Valve
Port A Pressure Sensor	Sensor Alerts	Temperature Lo Alert Pt	Enviro Alerts	Zero Power Cond	Initial Setup
Port B Pressure Sensor	Sensor Alerts	Temperature Units	Instrument		

C

Table C-2. Resource Block Parameter – Configuration Index (also refer to figure C-5)

PARAMETER LABEL	TAB
Actual Mode	Mode
Alert Key	Alarm Handling
Block Alarm	Alarm Handling
Confirm Time	Alarm Handling
DD Revision	Instrument
Device Revision	Instrument
Device Type	Instrument
Diagnostic Options	Options
Features	Options
Feature Select	Options
Field Serial Number	Instrument
Function Block Options	Options
Hardware Revision	Instrument
ITK Version	Instrument
Manufacturer	Instrument
Max Alerts Allowed	Alarm Handling
Max Alerts Possible	Alarm Handling
Misc Options	Options
Normal Mode	Mode
Permitted Mode	Mode
RCas Timeout	Comm Time Out
ROut Timeout	Comm Time Out
Software Revision	Instrument
Strategy	Instrument
Tag Description	Instrument
Target Mode	Mode
Write Alarm	Alarm Handling
Write Lock	Write Lock
Write Lock Priority	Write Lock

Introduction

Note

This appendix does not necessarily provide the latest information on the DeltaV system. For the latest information on using the DeltaV system, refer to the on-line help or documentation supplied with the system.

This appendix provides specific instructions for performing basic setup operations on the DVC6000f Series DeltaV host system. It is not a comprehensive resource, rather a starting point. For more information, refer to the following sources:

Section 4: Basic Setup and Tuning for detailed information regarding initial setup, and stabilizing and optimizing valve response.

Section 5: Detailed Setup / **Blocks** for detailed information on configuring all of the blocks in the instrument, and an overview of the function blocks.

Section 6: Calibration for complete calibration information.

Section 8: Principle of Operation for information on how digital valve controller operation.

Appendix A: FOUNDATION Fieldbus Communication for an overview of function block and block modes, as well as additional information pertaining to fieldbus communication.

Appendix B: DD Installation for information on installing the device description (DD) software on your host system.

DeltaV On-Line Help or Documentation for complete and current information about navigating in the DeltaV system.

Software Functionality/System Requirements

DVC6000f Series digital valve controllers are designed to permit remote setup, calibration, and testing using Process Systems DeltaV system as the host system.

To use the methods, accessed as described in this appendix, requires that the device description (DD) for the DVC6000f Series digital valve controller be installed on the host system. For information on installing the device description, refer to Appendix B, DD Installation and the host system documentation.

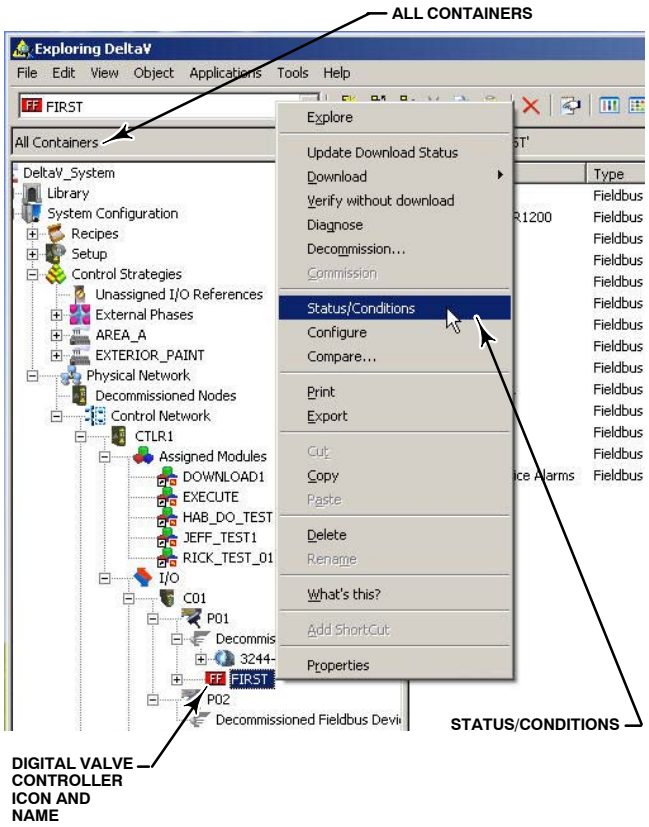

Figure C-1. Navigating in DeltaV

Accessing Status Page

Refer to figure C-1 and the following steps to access the Status/Conditions screen. For detailed information on Status/Conditions refer to the Detailed Setup and Principle of Operation sections of this manual.

1. Start DeltaV Explorer by selecting DeltaV > Engineering > DeltaV Explorer from the Start menu.

2. Locate the digital valve controller icon in the All Containers pane (the left panel) and right-click once on the digital valve controller icon or name.

3. Locate Status/Conditions in the context menu and left-click to access Status/Conditions.

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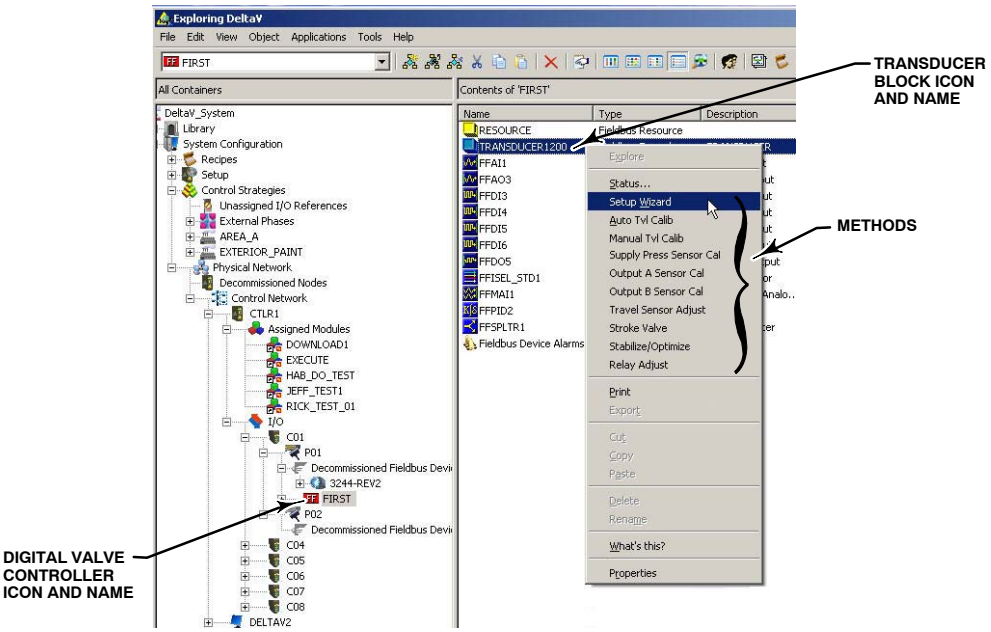

Figure C-2. Accessing Transducer Block Methods

Starting Methods

Transducer Block

The following methods are accessed via the transducer block: Setup Wizard, Auto Travel Calibration, Manual Travel Calibration, Supply Sensor Travel Calibration, Output A Sensor Calibration, Output B Sensor Calibration, Travel Sensor Adjust, Stroke Valve, Stabilize/Optimize and Relay Adjust.

Refer to figure C-2 and the following steps to access these methods.

1. Start DeltaV Explorer by selecting DeltaV > Engineering > DeltaV Explorer from the Start menu.

2. Locate the digital valve controller icon in the All Containers pane (the left panel) and left-click once on the digital valve controller icon or name.

3. Locate the transducer block icon in the Contents of... pane and right click once on the block icon or name to bring up the context menu.

4. Select the desired method from the the context menu and left-click to start the method.

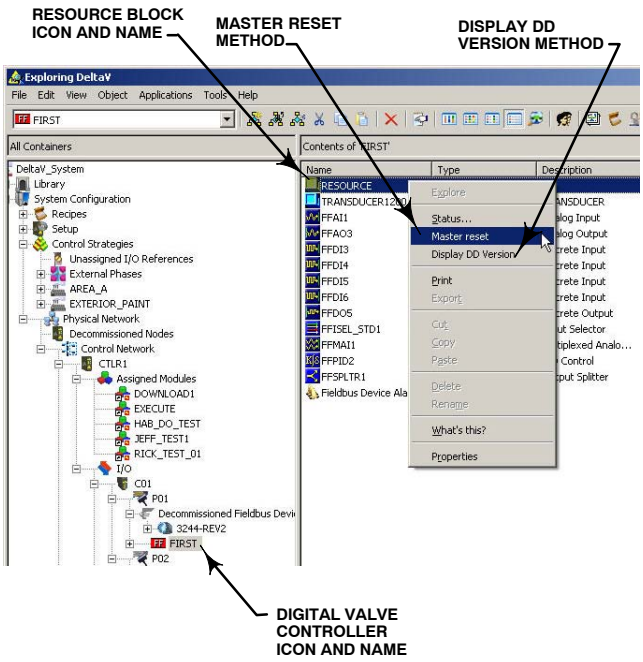

Figure C-3. Accessing Resource Block Methods

Resource Block

The Master Reset method and the Display DD Version method are available via the resource block. Refer to figure C-3 and the following steps to access these methods.

1. Start DeltaV Explorer by selecting DeltaV > Engineering > DeltaV Explorer from the Start menu.

2. Locate the digital valve controller icon in the All Containers pane and left-click once on the digital valve controller icon or name.

C

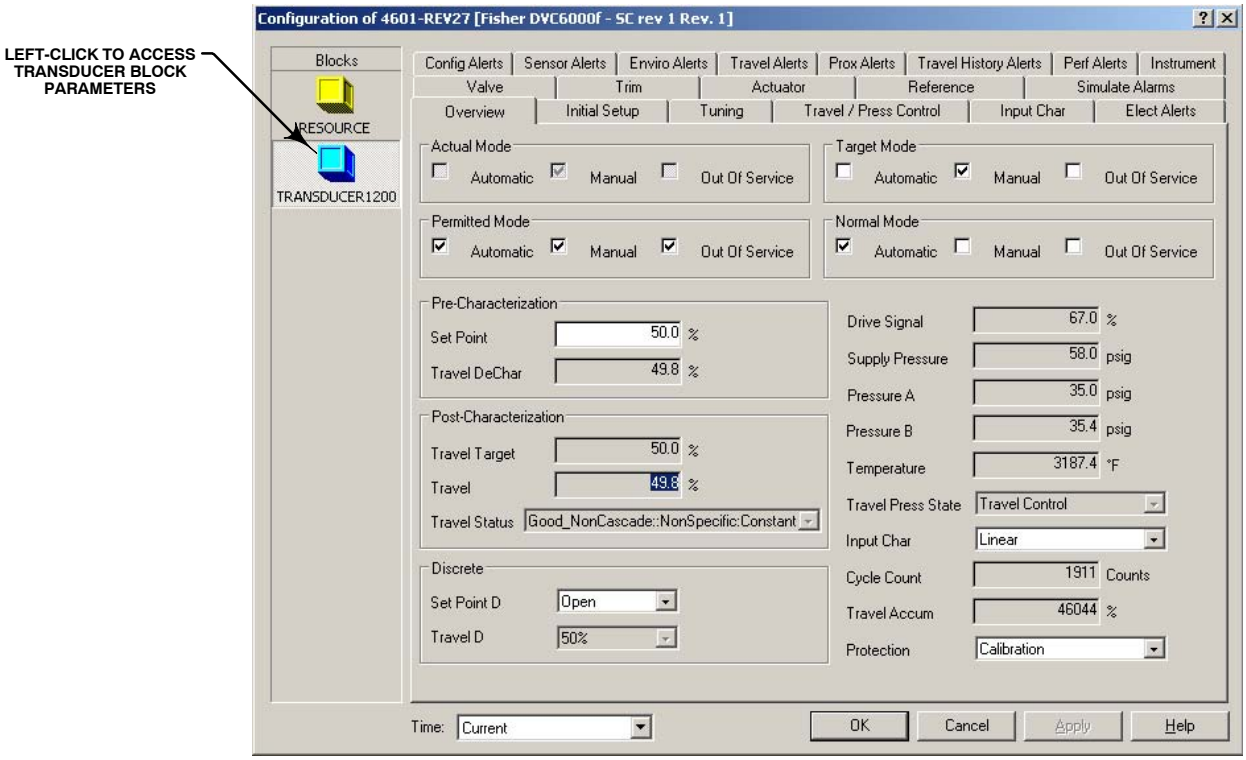

Figure C-4. Accessing Transducer Block Parameters

3. Highlight the resource block icon in the Contents of... pane and right-click once on the block icon or name.

4. Highlight the desired method from the context menu and left-click.

Accessing Parameters

Transducer Block

For detailed information on the parameters that are changed via the transducer block, refer to the Detailed Setup section of this manual. Refer to figures C-1 and C-4 for information on accessing the transducer block.

1. Start DeltaV Explorer by selecting DeltaV > Engineering > DeltaV Explorer from the Start menu.

2. Locate the digital valve controller icon in the All Containers pane and right-click once on the digital valve controller icon or name.

3. Locate Configure in the context menu and left-click.

4. Left-click on the transducer block to access the transducer block tabs. Refer to table C-1 for the transducer block configuration menu.

Resource Block

For detailed information on the parameters that are changed via the resource block, refer to the Detailed Setup section of this manual, and figures C-1 and C-5.

1. Start DeltaV Explorer by selecting DeltaV > Engineering > DeltaV Explorer from the Start menu.

2. Locate the digital valve controller icon in the All Containers pane and right-click once on the block icon or name.

3. Locate Configure in the context menu and left-click.

4. Left-click on the resource block to access the resource block tabs. Refer to table C-2 for the resource block configuration menu.

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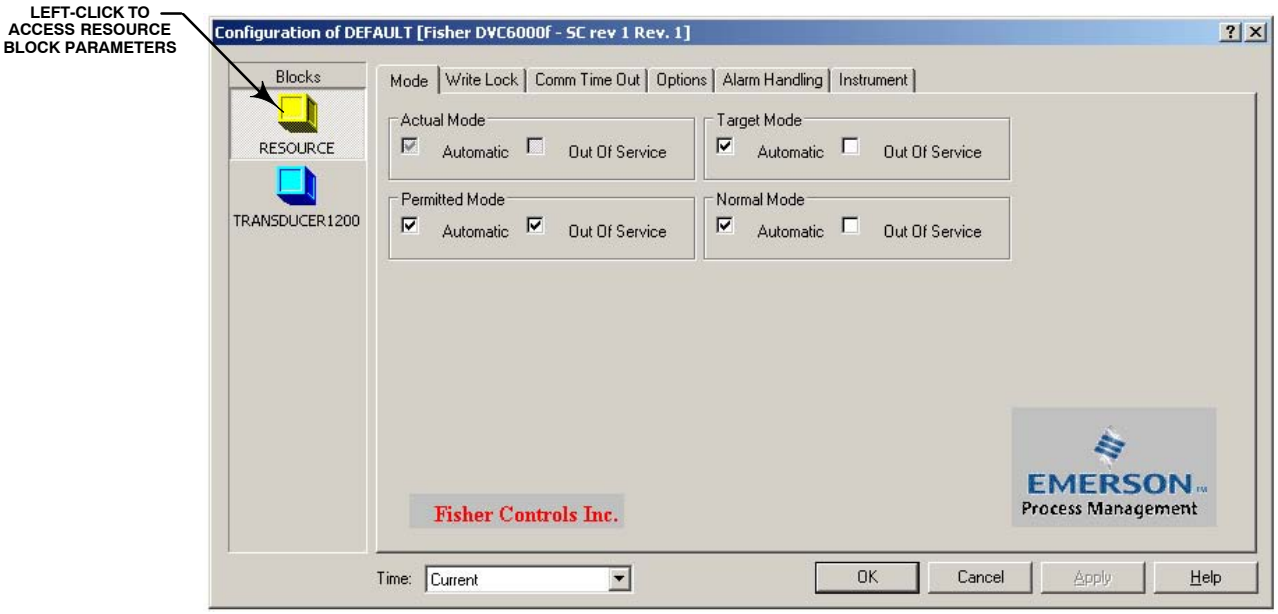

Figure C-5. Accessing Resource Block Parameters

Simulate PlantWeb® Alarms

For information on PlantWeb Alarms, refer to page 5-38 of the Transducer Block section of Detailed Setup.

Transducer Block

Simulate Plant Web Alarms permits simulating an active Failed, Maintenance or Advisory alarm. Refer to figures C-1 and C-6.

1. Start DeltaV Explorer by selecting DeltaV > Engineering > DeltaV Explorer from the Start menu.

2. Locate the digital valve controller icon in the All Containers pane and right-click once on the digital valve controller icon or name.

3. Locate Configure in the context menu and left-click.

4. Left-click on the transducer block to access the transducer block tabs.

5. Click on the Simulate Alarms tab.

Bringing the Device On-Line

To completely configure the digital valve controller for use in a fieldbus loop, the following conditions must be met. Refer to DeltaV On-Line-Help or documentation for detailed information on accomplishing these steps.

1. A place holder must be created – a place holder is an electronic representation of the digital valve controller that exists in the DeltaV database with no associated physical device.

2. Device must be commissioned – Commissioning the device involves downloading applicable parameters from the device place holder to the physical device.

3. Any additional configuration that is required, such as setting alarms, cutoffs, and other resource block and transducer block parameters. See the Detailed Setup section of this manual.

4. Define the control strategy

5. Associate I/O to the digital valve controller.

6. The device is now ready to be downloaded.

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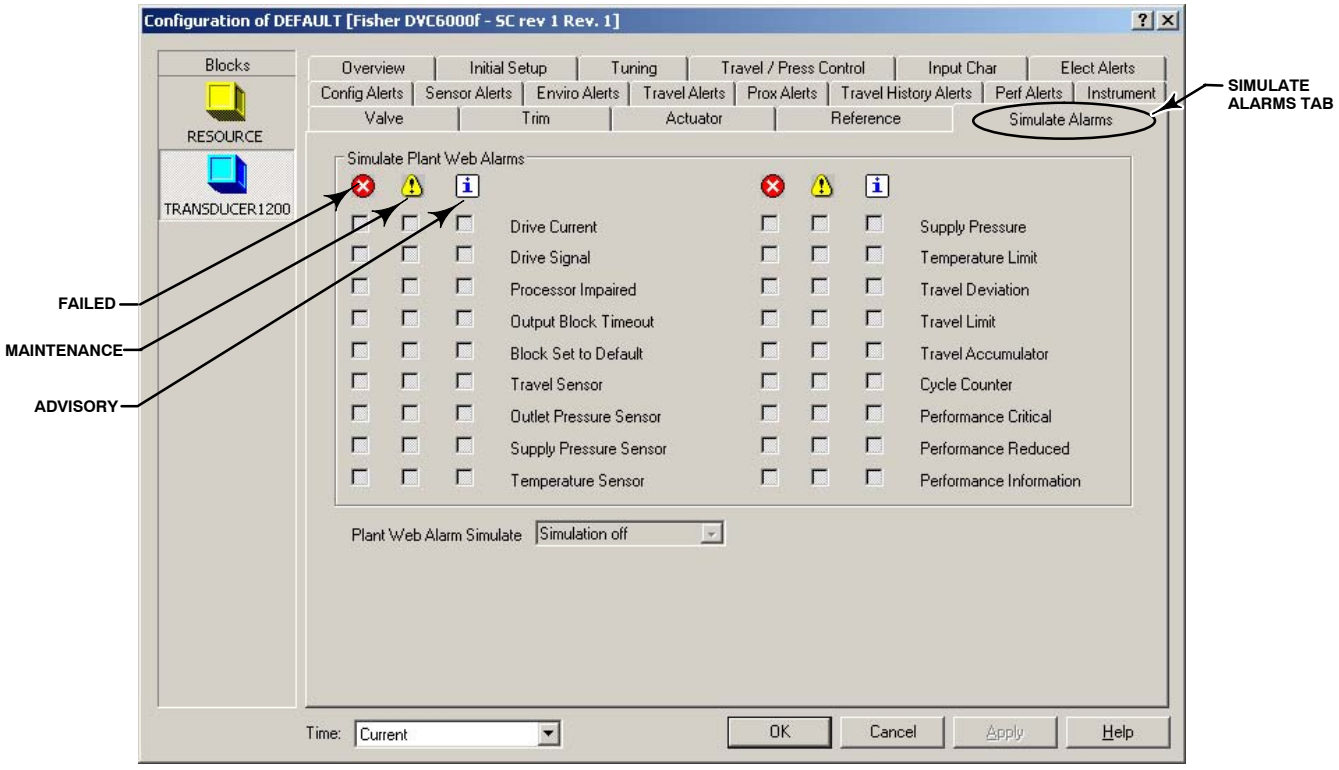

Figure C-6. Accessing Simulate Plant Web Alarms

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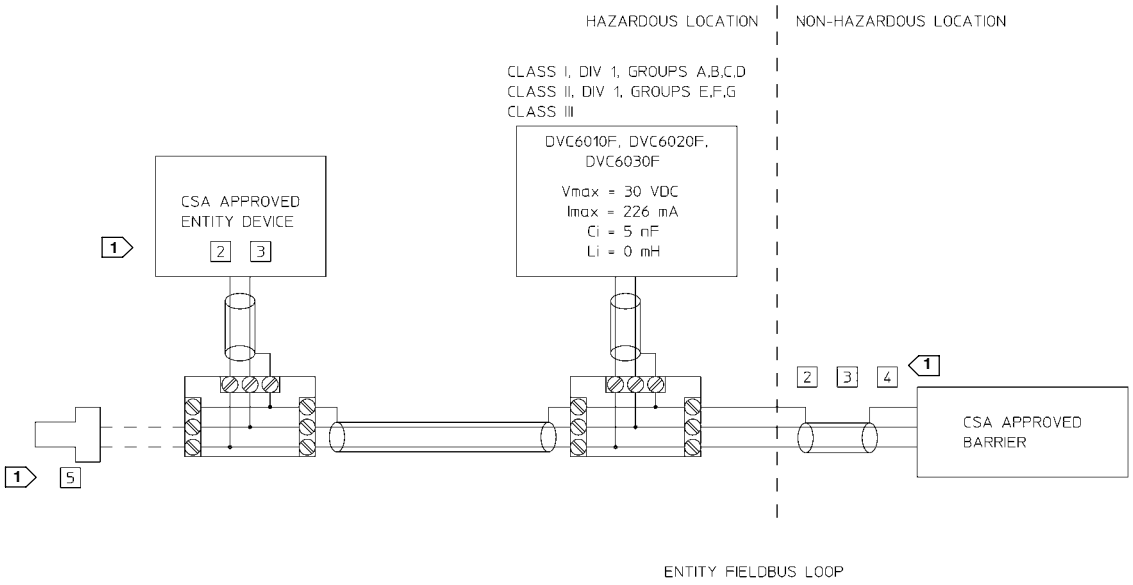
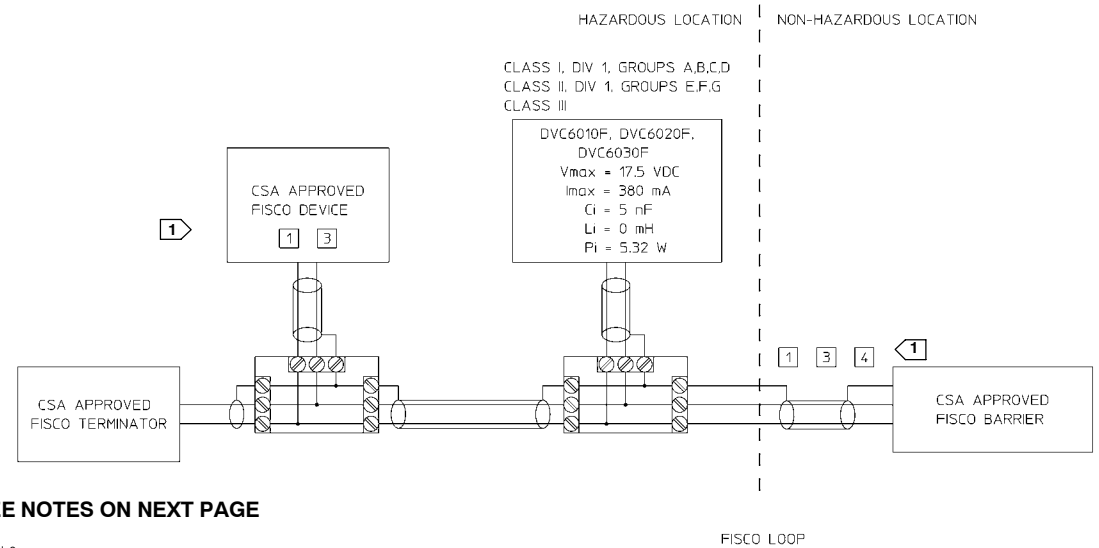
Appendix D Loop Schematics/Nameplates

This section includes loop schematics required for wiring of intrinsically safe installations. It also includes the approvals nameplates. If you have any questions, contact your Emerson Process Management sales office.





1 **SEE NOTES ON NEXT PAGE**

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SHEETS 1 and 2

Figure D-1. CSA Schematics for Type DVC6000f Series

D

NOTES

1 THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR THE INTERCONNECTION IS THAT THE VOLTAGE (Vmax), CURRENT (Imax), AND POWER (Pi), WHICH INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE, CONSIDERING FAULTS, MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc), CURRENT (Isc), AND POWER (Po) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS, CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 uH RESPECTIVELY.

IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE (Uo OR Voc OR Vt) OF THE ASSOCIATED APPARATUS HAS TO BE LIMITED TO THE RANGE OF 9 V TO 17.5 VDC. ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT FOR A LEAKAGE CURRENT OF 50 uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS A GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.

THE CABLE USED TO CONNECT THE DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

LOOP RESISTANCE R':	15 TO 150 ohms/km
INDUCTANCE PER UNIT LENGTH L:	0.4 TO 1 mH/km
CAPACITANCE PER UNIT LENGTH C':	80 TO 200 nF/km
C' = C' LINE/LINE + 0.5' LINE/SCREEN, IF BOTH LINES ARE FLOATING OR	
C' = C' LINE/LINE + C' LINE/SCREEN, IF THE SCREEN IS CONNECTED TO ONE LINE.	
LENGTH OF SPLICE:	<1 m (T-BOX MUST ONLY CONTAIN TERMINAL CONNECTIONS WITH NO ENERGY STORAGE CAPABILITY)
LENGTH OF SPUR CABLE:	<30 m
LENGTH OF TRUNK CABLE:	<1 km

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE: R= 90 TO 100 ohms AND C = 0 TO 2.2 uF
NOTE, A BUILT-IN TERMINATOR IS INCLUDED ON THE FIELD SIDE AND A SELECTABLE TERMINATOR IS AVAILABLE ON THE HOST SIDE.

THE NUMBER OF PASSIVE DEVICES CONNECTED TO THE BUS SEGMENT IS NOT LIMITED IN THE FISCO CONCEPT FOR INTRINSICALLY SAFE REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF THE LENGTH OF THE TRUNK CABLE AND ALL SPUR CABLES), THE INDUCTANCE AND CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

2 THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS, NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (Vmax) AND THE CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc) AND CURRENT (Isc) DEFINED BY THE ASSOCIATED APPARATUS. IN ADDITION, THE SUM OF THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH INTRINSICALLY SAFE APPARATUS, AND THE INTERCONNECTING WIRING, MUST BE LESS THAN THE ALLOWABLE CAPACITANCE (Ca) AND INDUCTANCE (La) DEFINED BY THE ASSOCIATED APPARATUS. IF THESE CRITERIA ARE MET, THEN THE COMBINATION MAY BE CONNECTED.

3 INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC) PART 1 AND ANSI/ISA RP12.6.

4 LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.

5 IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE CSA APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING.

GE04331-A
SHEET 3

Figure D-1. CSA Schematics for Type DVC6000f Series (continued)

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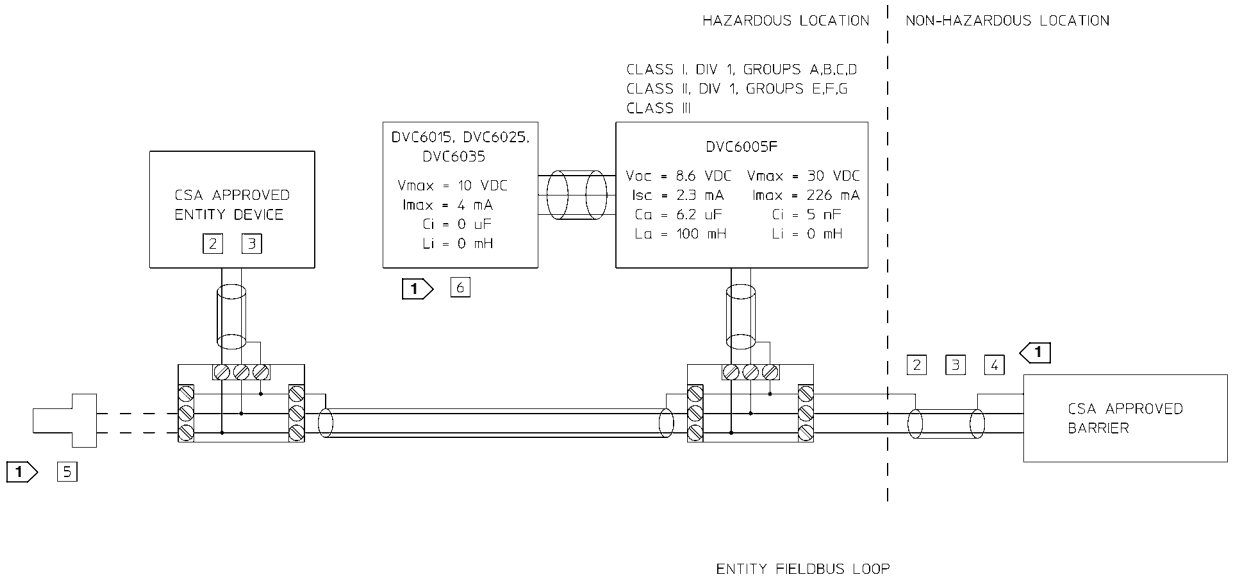

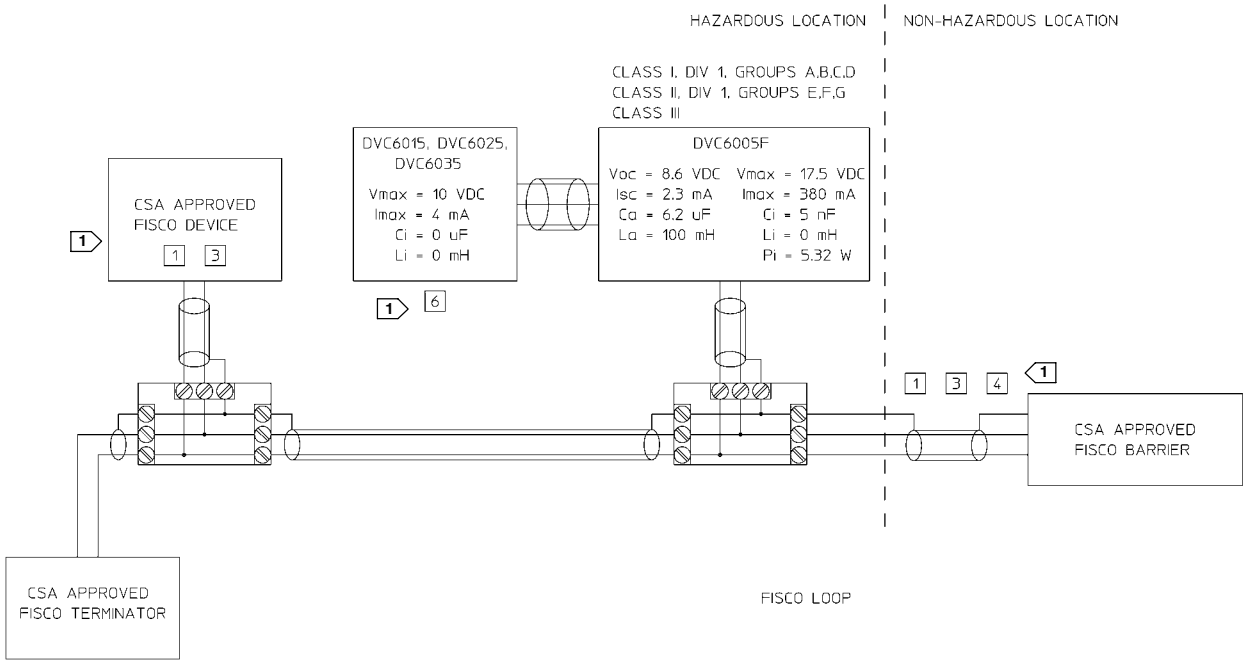

1 **SEE NOTES ON NEXT PAGE**

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SHEETS 1 and 2

Figure D-2. CSA Schematics for Type DVC6005f

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NOTES

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THE CABLE USED TO CONNECT THE DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

LOOP RESISTANCE R':	15 TO 150 ohms/km
INDUCTANCE PER UNIT LENGTH L:	0.4 TO 1 mH/km
CAPACITANCE PER UNIT LENGTH C':	80 TO 200 nF/km
C' = C' LINE/LINE + 0.5' LINE/SCREEN, IF BOTH LINES ARE FLOATING OR	
C' = C' LINE/LINE + C' LINE/SCREEN, IF THE SCREEN IS CONNECTED TO ONE LINE.	
LENGTH OF SPLICE:	<1 m (T-BOX MUST ONLY CONTAIN TERMINAL CONNECTIONS WITH NO ENERGY STORAGE CAPABILITY)
LENGTH OF SPUR CABLE:	<30 m
LENGTH OF TRUNK CABLE:	<1 km

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE: R= 90 TO 100 ohms AND C = 0 TO 2.2 uF
NOTE, A BUILT-IN TERMINATOR IS INCLUDED ON THE FIELD SIDE AND A SELECTABLE TERMINATOR IS AVAILABLE ON THE HOST SIDE.

THE NUMBER OF PASSIVE DEVICES CONNECTED TO THE BUS SEGMENT IS NOT LIMITED IN THE FISCO CONCEPT FOR INTRINSICALLY SAFE REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF THE LENGTH OF THE TRUNK CABLE AND ALL SPUR CABLES), THE INDUCTANCE AND CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

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3 INSTALLATION MUST BE IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE (CEC) PART 1 AND ANSI/ISA RP12.6.

4 LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.

5 IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE CSA APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING.

6 DVC6015, DVC6025, DVC6035 MAY BE CONNECTED TO DVC6005 OR OTHER CSA APPROVED EQUIPMENT WHEN THE FOLLOWING CONDITIONS ARE MET: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La

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SHEET 3

Figure D-2. CSA Schematics for Type DVC6005f (continued)

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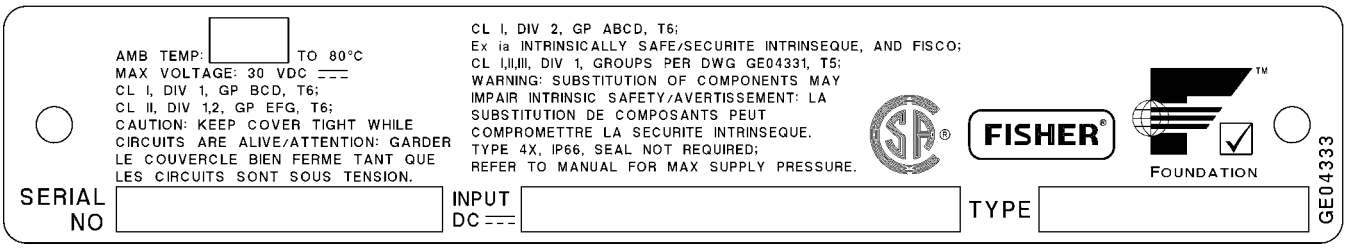
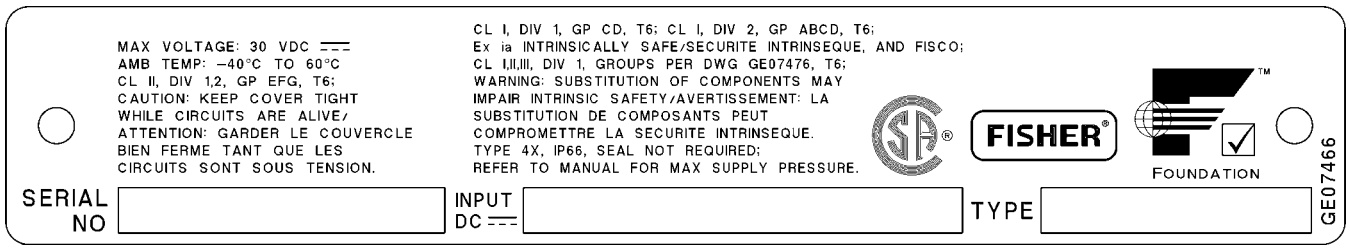
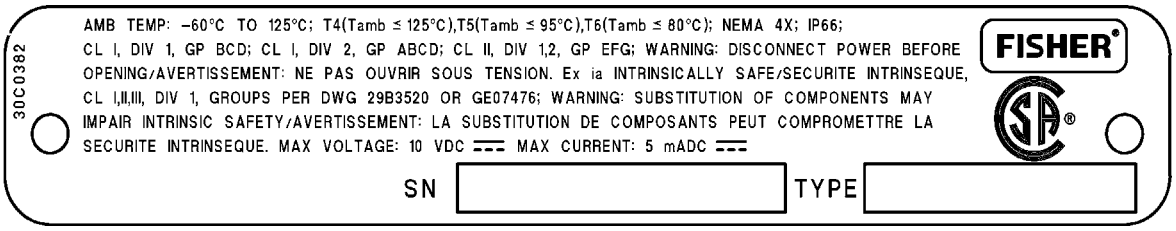


TYPES DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS



TYPE DVC6005F



TYPES DVC6015, DVC6025, DVC6035

Figure D-3. CSA Nameplates

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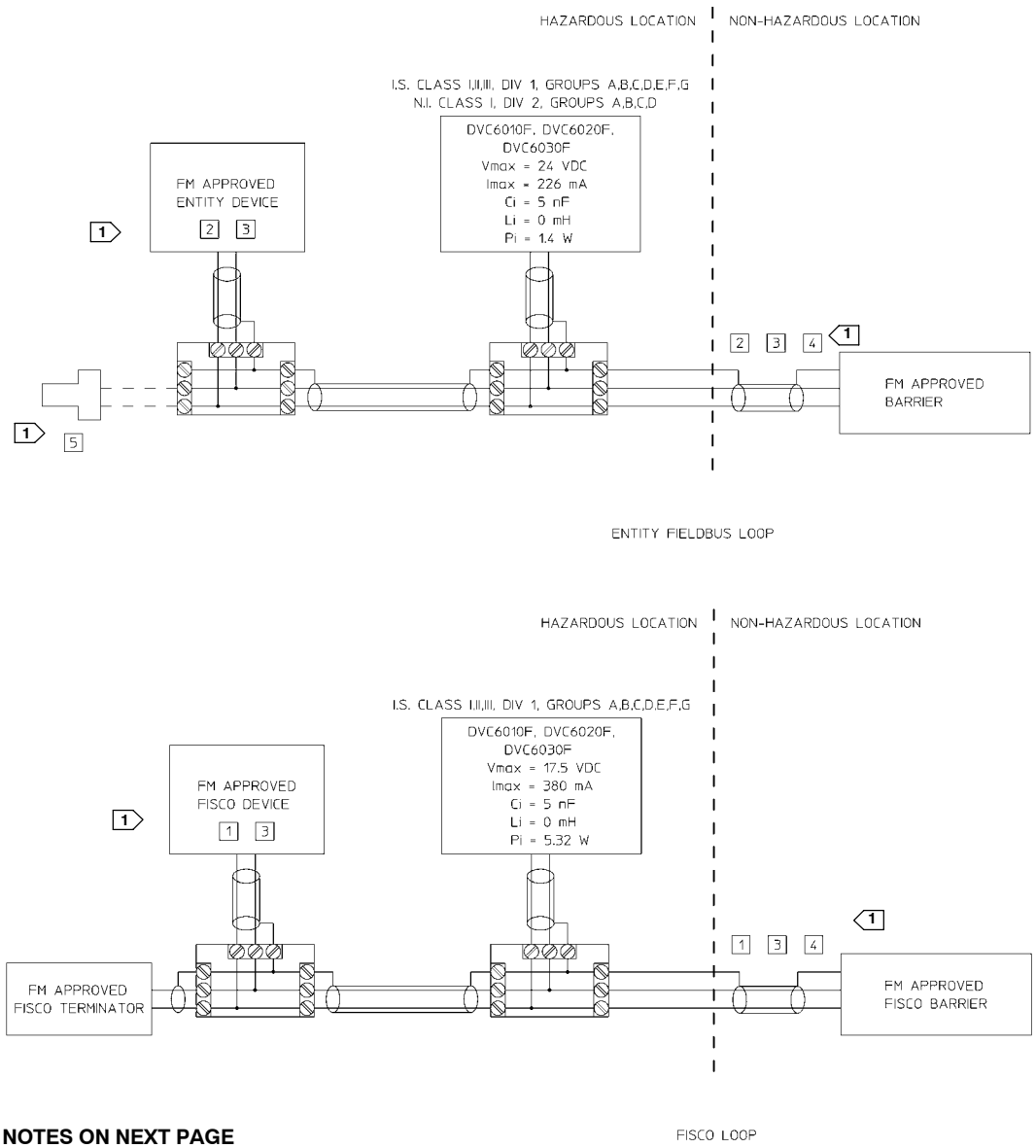

1 **SEE NOTES ON NEXT PAGE**

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SHEETS 1 and 2

Figure D-4. FM Schematics for Type DVC6000f Series

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NOTES

1 THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR THE INTERCONNECTION IS THAT THE VOLTAGE (Vmax), CURRENT (Imax), AND POWER (Pi), WHICH INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE, CONSIDERING FAULTS, MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc), CURRENT (Isc), AND POWER (Po) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS. CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 uH RESPECTIVELY.

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THE CABLE USED TO CONNECT THE DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

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C' = C' LINE/LINE + 0.5' LINE/SCREEN, IF BOTH LINES ARE FLOATING OR	
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LENGTH OF SPLICE:	<1 m (T-BOX MUST ONLY CONTAIN TERMINAL CONNECTIONS WITH NO ENERGY STORAGE CAPABILITY)
LENGTH OF SPUR CABLE:	<30 m
LENGTH OF TRUNK CABLE:	<1 km

AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE: R= 90 TO 100 ohms AND C = 0 TO 2.2 uF
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THE NUMBER OF PASSIVE DEVICES CONNECTED TO THE BUS SEGMENT IS NOT LIMITED IN THE FISCO CONCEPT FOR INTRINSICALLY SAFE REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF THE LENGTH OF THE TRUNK CABLE AND ALL SPUR CABLES), THE INDUCTANCE AND CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

2 THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS, NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (Vmax) AND THE CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc) AND CURRENT (Isc) DEFINED BY THE ASSOCIATED APPARATUS. IN ADDITION, THE SUM OF THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH INTRINSICALLY SAFE APPARATUS, AND THE INTERCONNECTING WIRING, MUST BE LESS THAN THE ALLOWABLE CAPACITANCE (Ca) AND INDUCTANCE (La) DEFINED BY THE ASSOCIATED APPARATUS. IF THESE CRITERIA ARE MET, THEN THE COMBINATION MAY BE CONNECTED.

3 INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ANSI/ISA RP12.6.

4 LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.

5 IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE FM APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING.

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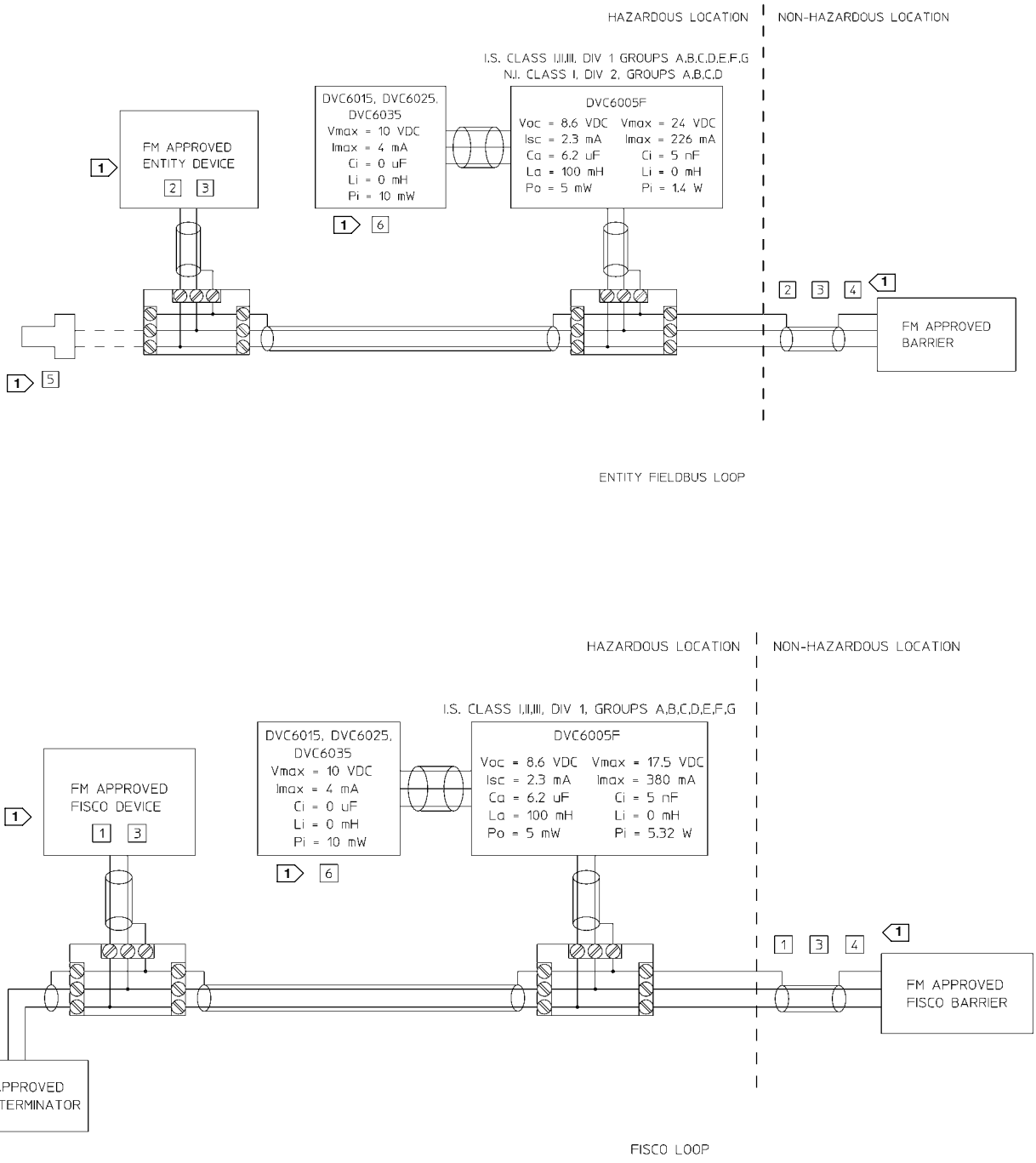
Figure D-4. FM Schematics for Type DVC6000f Series (continued)

D



1 SEE NOTES ON NEXT PAGE

GE07475A
SHEETS 1 and 2

Figure D-5. FM Schematics for Type DVC6005f

NOTES

1. THE FISCO CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR THE INTERCONNECTION IS THAT THE VOLTAGE (Vmax), CURRENT (Imax), AND POWER (Pi), WHICH INTRINSICALLY SAFE APPARATUS CAN RECEIVE AND REMAIN INTRINSICALLY SAFE, CONSIDERING FAULTS, MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc), CURRENT (Isc), AND POWER (Po) LEVELS WHICH CAN BE DELIVERED BY THE ASSOCIATED APPARATUS. CONSIDERING FAULTS AND APPLICABLE FACTORS. IN ADDITION THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH APPARATUS (OTHER THAN THE TERMINATION) CONNECTED TO THE FIELDBUS MUST BE LESS THAN OR EQUAL TO 5 nF AND 10 uH RESPECTIVELY.

   IN EACH SEGMENT ONLY ONE ACTIVE DEVICE, NORMALLY THE ASSOCIATED APPARATUS, IS ALLOWED TO PROVIDE THE NECESSARY ENERGY FOR THE FIELDBUS SYSTEM. THE VOLTAGE (Ua OR Voc OR Vt) OF THE ASSOCIATED APPARATUS HAS TO BE LIMITED TO THE RANGE OF 9 V TO 17.5 VDC. ALL OTHER EQUIPMENT CONNECTED TO THE BUS CABLE HAS TO BE PASSIVE, MEANING THAT THEY ARE NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM, EXCEPT FOR A LEAKAGE CURRENT OF 50 uA FOR EACH CONNECTED DEVICE. SEPARATELY POWERED EQUIPMENT NEEDS A GALVANIC ISOLATION TO ASSURE THAT THE INTRINSICALLY SAFE FIELDBUS CIRCUIT REMAINS PASSIVE.

   THE CABLE USED TO CONNECT THE DEVICES NEEDS TO HAVE THE PARAMETERS IN THE FOLLOWING RANGE:

LOOP RESISTANCE R':	15 TO 150 ohms/km
INDUCTANCE PER UNIT LENGTH L:	0.4 TO 1 mH/km
CAPACITANCE PER UNIT LENGTH C':	80 TO 200 nF/km
C' = C' LINE/LINE + 0.5' LINE/SCREEN, IF BOTH LINES ARE FLOATING OR	
C' = C' LINE/LINE + C' LINE/SCREEN, IF THE SCREEN IS CONNECTED TO ONE LINE.	
LENGTH OF SPLICE:	<1 m (T-BOX MUST ONLY CONTAIN TERMINAL CONNECTIONS WITH NO ENERGY STORAGE CAPABILITY)
LENGTH OF SPUR CABLE:	<30 m
LENGTH OF TRUNK CABLE:	<1 km

   AT EACH END OF THE TRUNK CABLE AN APPROVED INFALLIBLE TERMINATION WITH THE FOLLOWING PARAMETERS IS SUITABLE: R= 90 TO 100 ohms AND C = 0 TO 2.2 uF
   NOTE, A BUILT-IN TERMINATOR IS INCLUDED ON THE FIELD SIDE AND A SELECTABLE TERMINATOR IS AVAILABLE ON THE HOST SIDE.

   THE NUMBER OF PASSIVE DEVICES CONNECTED TO THE BUS SEGMENT IS NOT LIMITED IN THE FISCO CONCEPT FOR INTRINSICALLY SAFE REASONS. IF THE ABOVE RULES ARE RESPECTED, UP TO A TOTAL LENGTH OF 1000 m (SUM OF THE LENGTH OF THE TRUNK CABLE AND ALL SPUR CABLES), THE INDUCTANCE AND CAPACITANCE OF THE CABLE WILL NOT IMPAIR THE INTRINSIC SAFETY OF THE INSTALLATION.

2. THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS, NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION. THE CRITERIA FOR INTERCONNECTION IS THAT THE VOLTAGE (Vmax) AND THE CURRENT (Imax) OF THE INTRINSICALLY SAFE APPARATUS MUST BE EQUAL TO OR GREATER THAN THE VOLTAGE (Voc) AND CURRENT (Isc) DEFINED BY THE ASSOCIATED APPARATUS. IN ADDITION, THE SUM OF THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF EACH INTRINSICALLY SAFE APPARATUS, AND THE INTERCONNECTING WIRING, MUST BE LESS THAN THE ALLOWABLE CAPACITANCE (Ca) AND INDUCTANCE (La) DEFINED BY THE ASSOCIATED APPARATUS. IF THESE CRITERIA ARE MET, THEN THE COMBINATION MAY BE CONNECTED.

3. INSTALLATION MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ANSI/ISA RP12.6.

4. LOOPS MUST BE CONNECTED ACCORDING TO THE BARRIER MANUFACTURER'S INSTRUCTIONS.

5. IF HAND-HELD COMMUNICATOR OR MULTIPLEXER IS USED, IT MUST BE FM APPROVED WITH ENTITY PARAMETERS AND INSTALLED PER THE MANUFACTURER'S CONTROL DRAWING.

6. DVC6015, DVC6025, DVC6035 MAY BE CONNECTED TO DVC6005 OR OTHER FM APPROVED EQUIPMENT WHEN THE FOLLOWING CONDITIONS ARE MET: Vmax > Voc, Imax > Isc, Ci + Ccable < Ca, Li + Lcable < La

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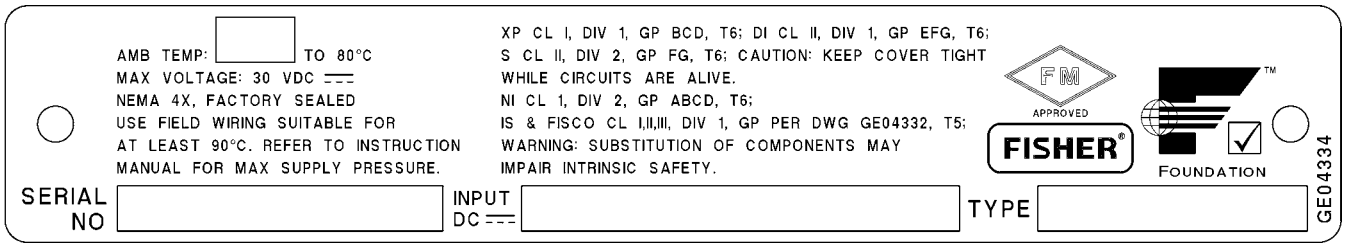
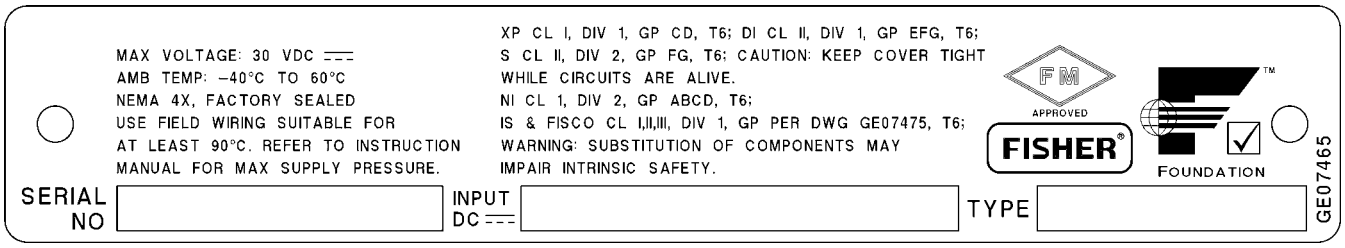
SHEET 3

Figure D-5. FM Schematics for Type DVC6005f (continued)

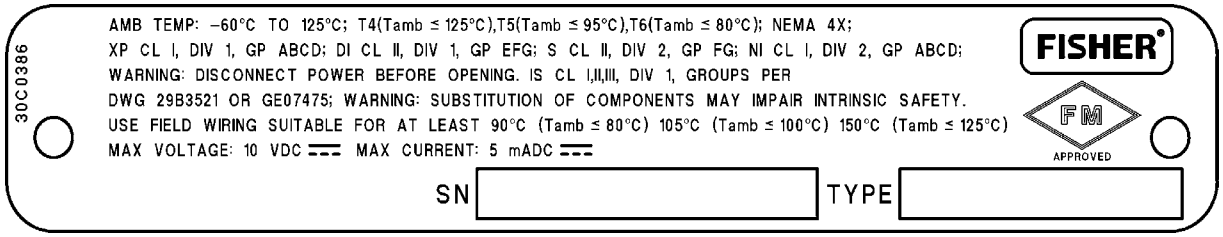
D



TYPES DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS



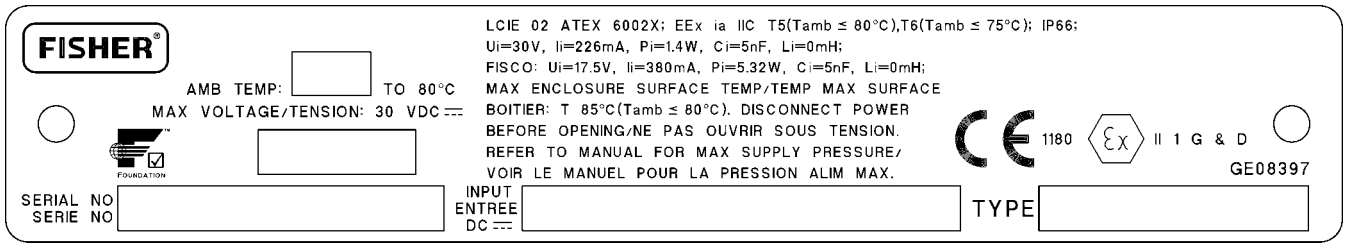
TYPE DVC6005F



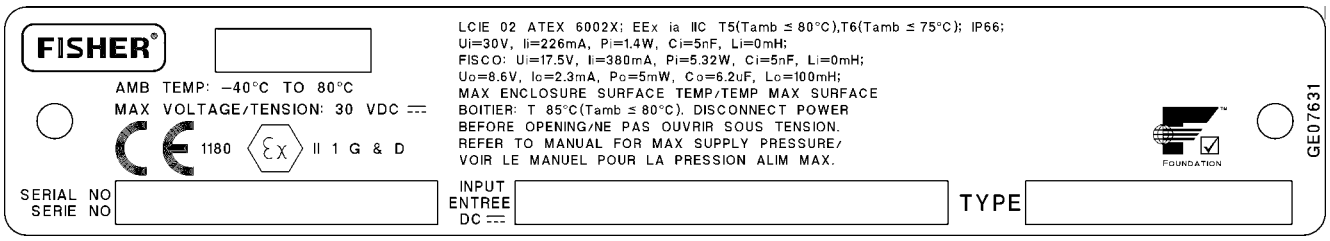
TYPES DVC6015, DVC6025, DVC6035

Figure D-6. FM Nameplates

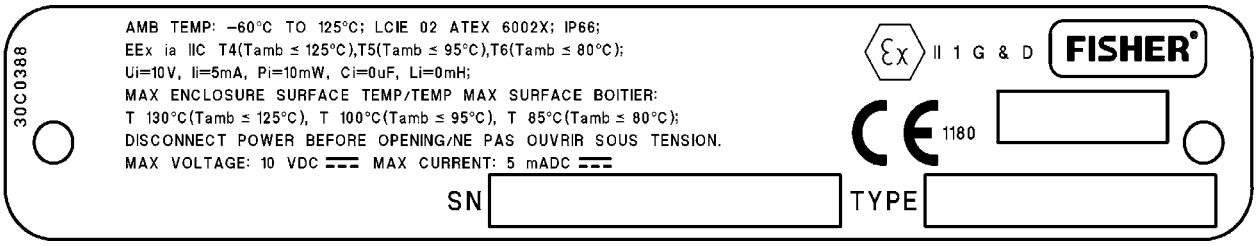
D



TYPES DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS



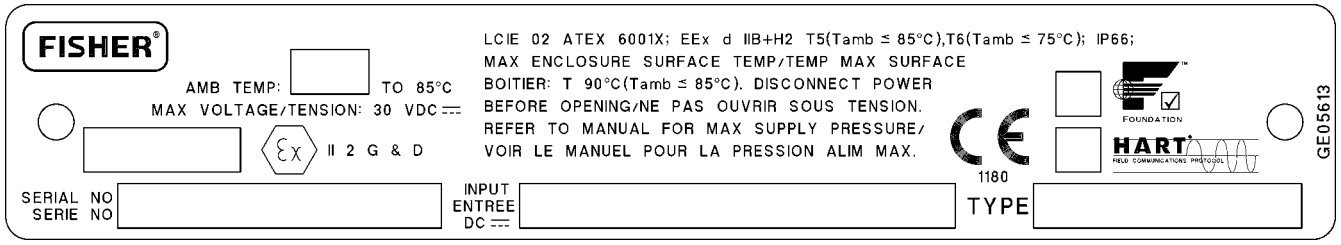
TYPE DVC6005F



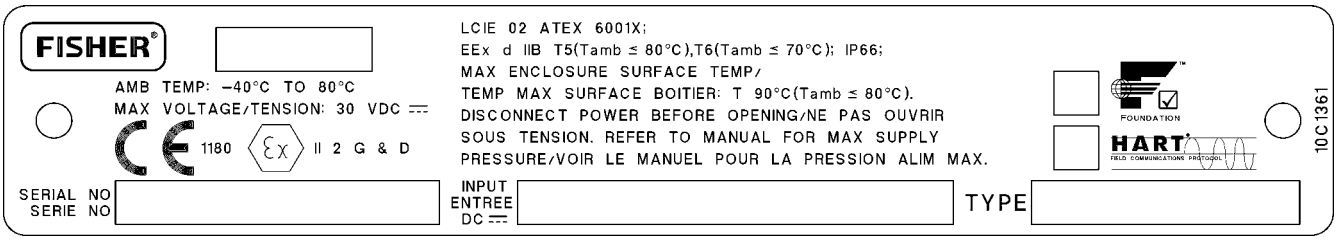
TYPES DVC6015, DVC6025, DVC6035

Figure D-7. ATEX Nameplates; Intrinsic Safety, Dust-Tight

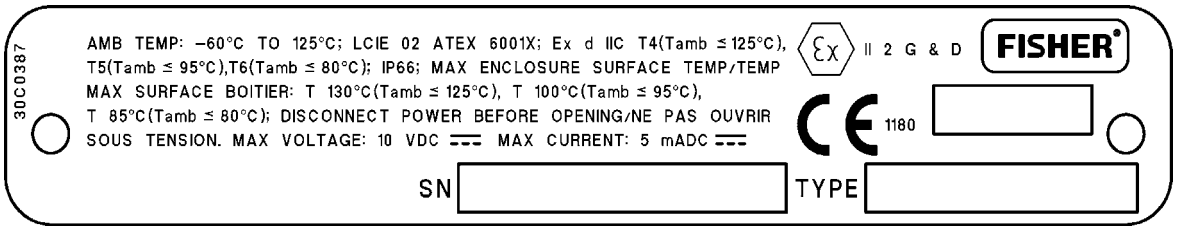
D



TYPES DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS



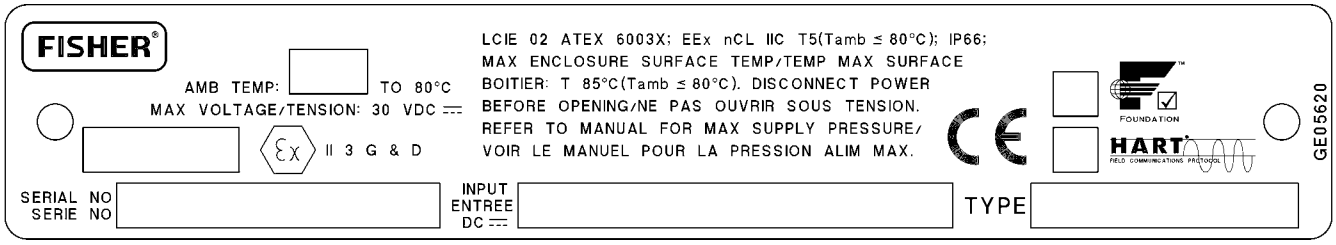
TYPE DVC6005F



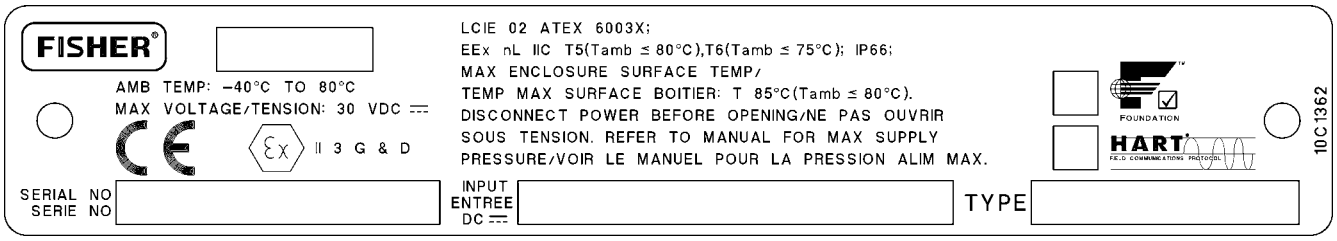
TYPE DVC6015, DVC6025, DVC6035

Figure D-8. ATEX Nameplates; Flameproof, Dust-Tight

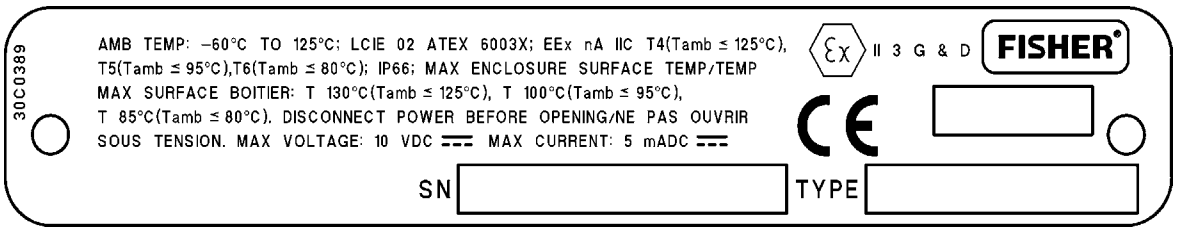
D



TYPES DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS



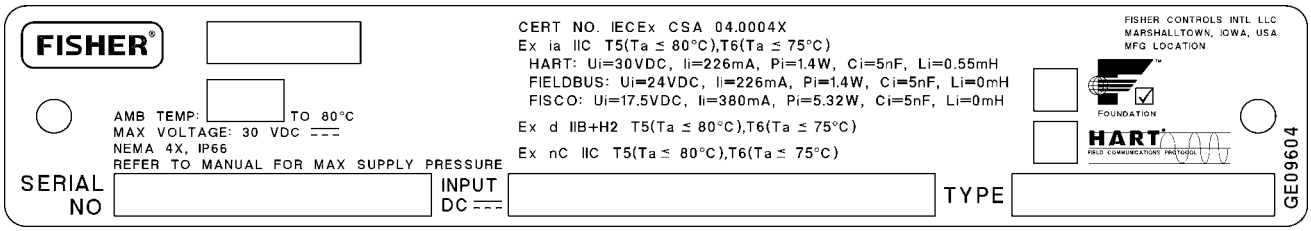
TYPE DVC6005F



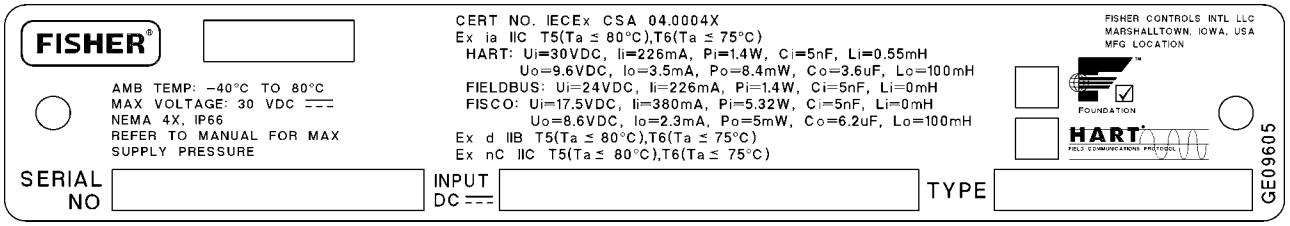
TYPES DVC6015, DVC6025, DVC6035

Figure D-9. ATEX Nameplates; Type n, Dust-Tight

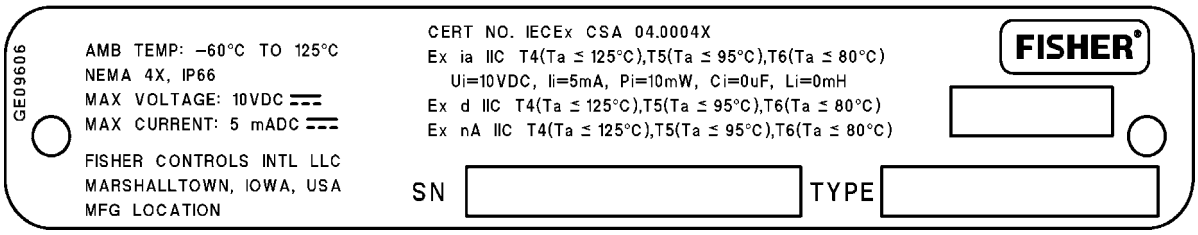
D



TYPES DVC6010F, DVC6020F, DVC6030F, DVC6010FS, DVC6020FS, DVC6030FS



TYPE DVC6005F



TYPES DVC6015, DVC6025, DVC6035

Figure D-10. IECEx Nameplates; Intrinsic Safety, Type n, Flameproof

D

Glossary

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.

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.

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

Crossover Point
The mid-point of the stroking range of a sliding-stem actuator. A visual indication of the crossover point is found when the slot in the instrument feedback arm forms a 90-degree angle with the valve stem.

Deadband
Region around a reference point that must be exceeded before a new event occurs.

Deviation
Usually, the difference between set point and process variable. More generally, any departure from a desired or expected value or pattern.

Device ID
Unique identifier embedded in the instrument at the factory.

Drive Signal
The signal to the I/P converter from the printed wiring board. It is the percentage of the total microprocessor effort needed to drive the valve fully open. In most applications, drive signal ranges from 55% to 75%.

Feedback Arm
The mechanical connection between the valve stem linkage and the FIELDVUE Instrument travel sensor.

Feedback Signal
Indicates to the instrument the actual position of the valve. The travel sensor provides the feedback signal to the instrument printed wiring board assembly. A mechanical linkage connects the travel sensor to the valve stem or shaft.

Firmware
The combination of a hardware device and computer instructions and data that reside as read-only software on that device.

Note

1. This term (firmware) is sometimes used to refer only to the hardware device or only to the computer instructions or data, but these meanings are deprecated.

2. The confusion surrounding this term has led some to suggest that it be avoided altogether. The term is included here because of its use in older documentation and culture.

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.

Instrument Level
Determines the functions available for the instrument.

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.

Linearity, dynamic
Linearity (independent) is the maximum deviation from a straight line best fit to the opening and closing curves and a line representing the average value of those curves.

Memory
A type of semiconductor used for storing programs or data. FIELDVUE instruments use three types of memory: Random Access Memory (RAM), Read Only Memory (ROM), and Non-Volatile Memory (NVM).

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.

Octet
See byte

Parallel
Simultaneous: said of data transmission on two or more channels at the same time.

Pressure Sensor
A FIELDVUE instrument internal device that senses the output pressure from the pneumatic relay.

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.

Software
Computer programs, procedures, and possibly associated documentation and data pertaining to the operation of a computer system.

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 Sensor
A device within the FIELDVUE instrument that senses valve stem or shaft movement. The travel sensor is mechanically connected to the valve stem or shaft.

Tuning
The adjustment of control terms or parameter values to produce a desired control effect.

Tuning Set
Preset values that identify gain and rate settings for a FIELDVUE instrument. The tuning set and supply pressure together determine an instrument's response to input signal changes.

Watch Dog Timer
A timer that the microprocessor must pulse periodically. If the microprocessor is unable to pulse the timer, the instrument shuts down.

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