80-4282-06

SUPPLEMENT TO MANUAL:
• 80-4280-02

GROUP 22
FOUNDATION FIELDBUS SUPPLEMENT

The instructions and procedures for the Installation, Operation, Calibration and Maintenance of Beck Group 22 Actuators are the same as listed in the above manual, except for the differences pertaining to the Foundation Fieldbus interface which are detailed herein.

FOUNDATION

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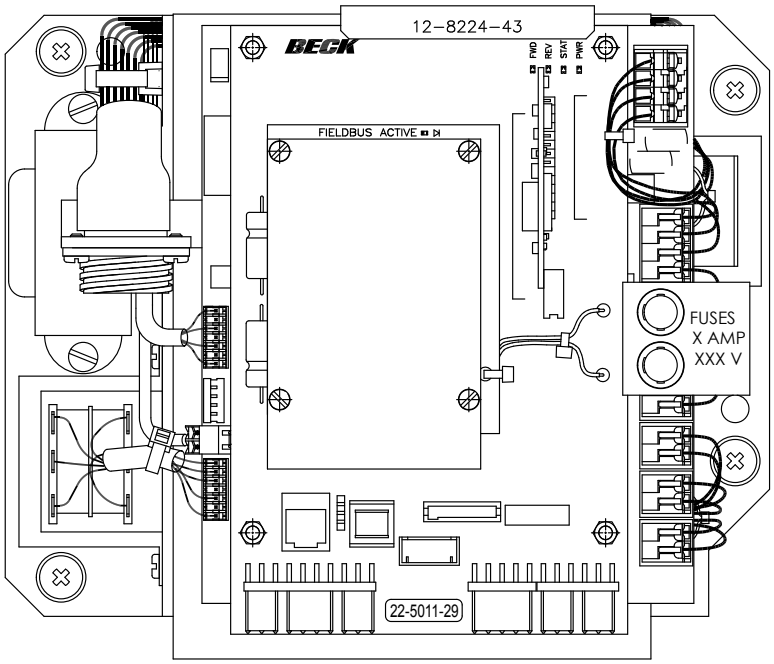
ELECTRIC ACTUATORS FOR INDUSTRIAL PROCESS CONTROL

DCM-2 FOR FOUNDATION FIELDBUS (P/N 22-5011-29)

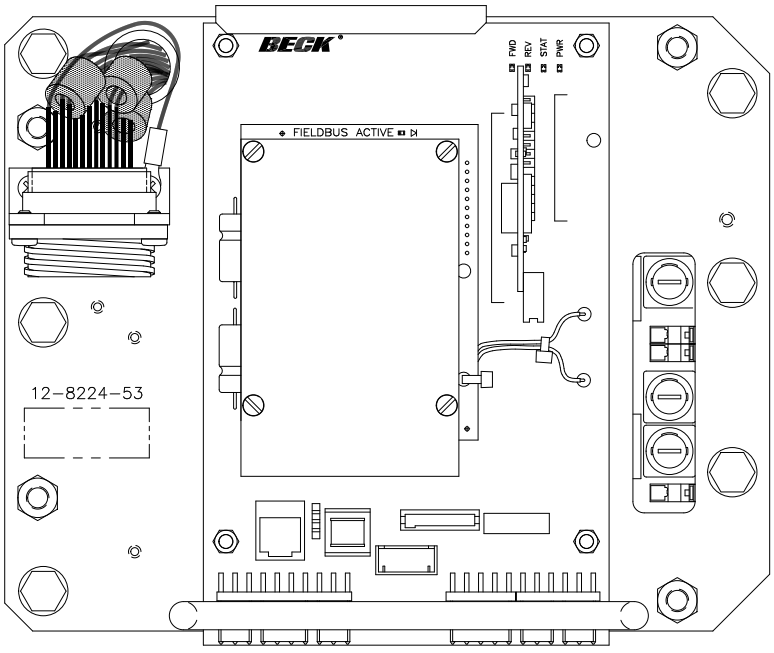
The Foundation Fieldbus version of the DCM-2 includes a fieldbus-powered interface to permit fieldbus access to the DCM-2 operational parameters.

Foundation Fieldbus compatible DCM-2's must be connected to a Foundation Fieldbus compatible control system. All configuration, setup and diagnostics should be made through the fieldbus interface. The Foundation Fieldbus DCM-2 does not have a local configuration pushbutton interface or the associated status LEDs; however, if necessary, the DCM Serial Command Interface is available (see manual 80-4280-02).

DCM-2 W/ FOUNDATION FIELDBUS



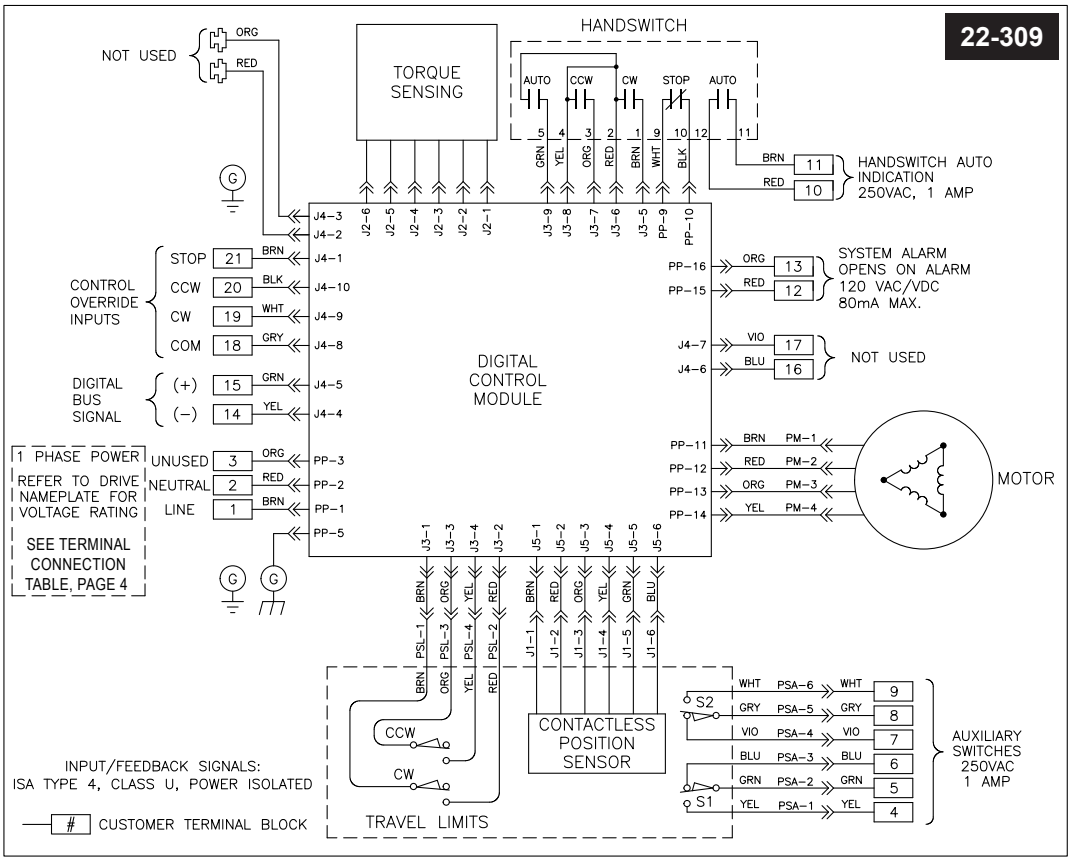
22-309

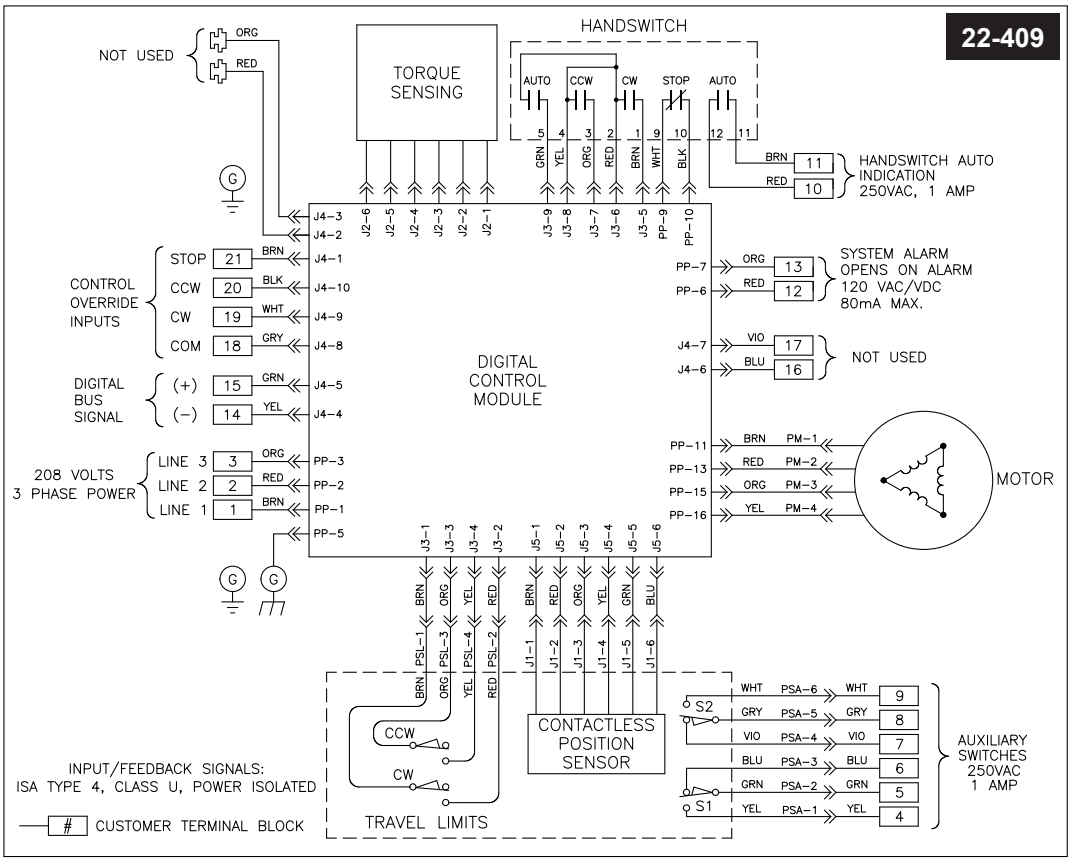


22-409/-809

TYPICAL WIRING SCHEMATICS (22-309 & 22-409)

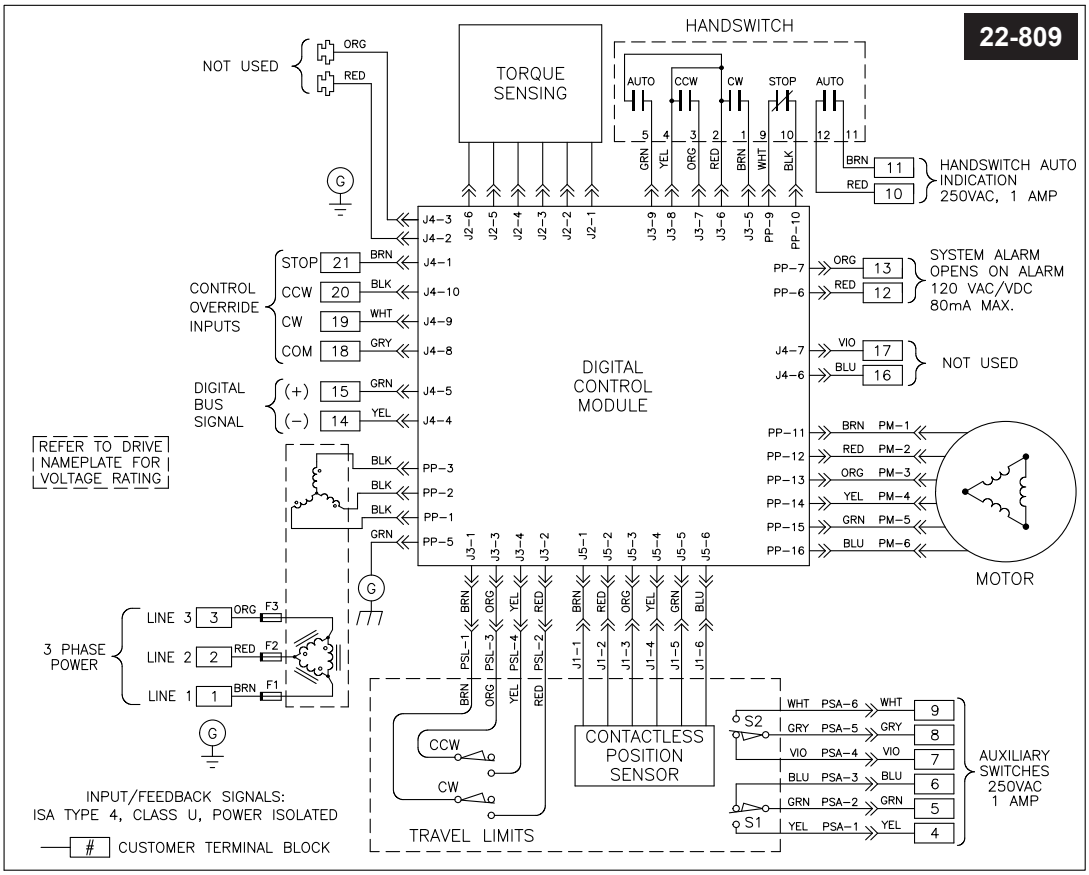
(a wiring schematic specific to each actuator is located under the terminal block cover)

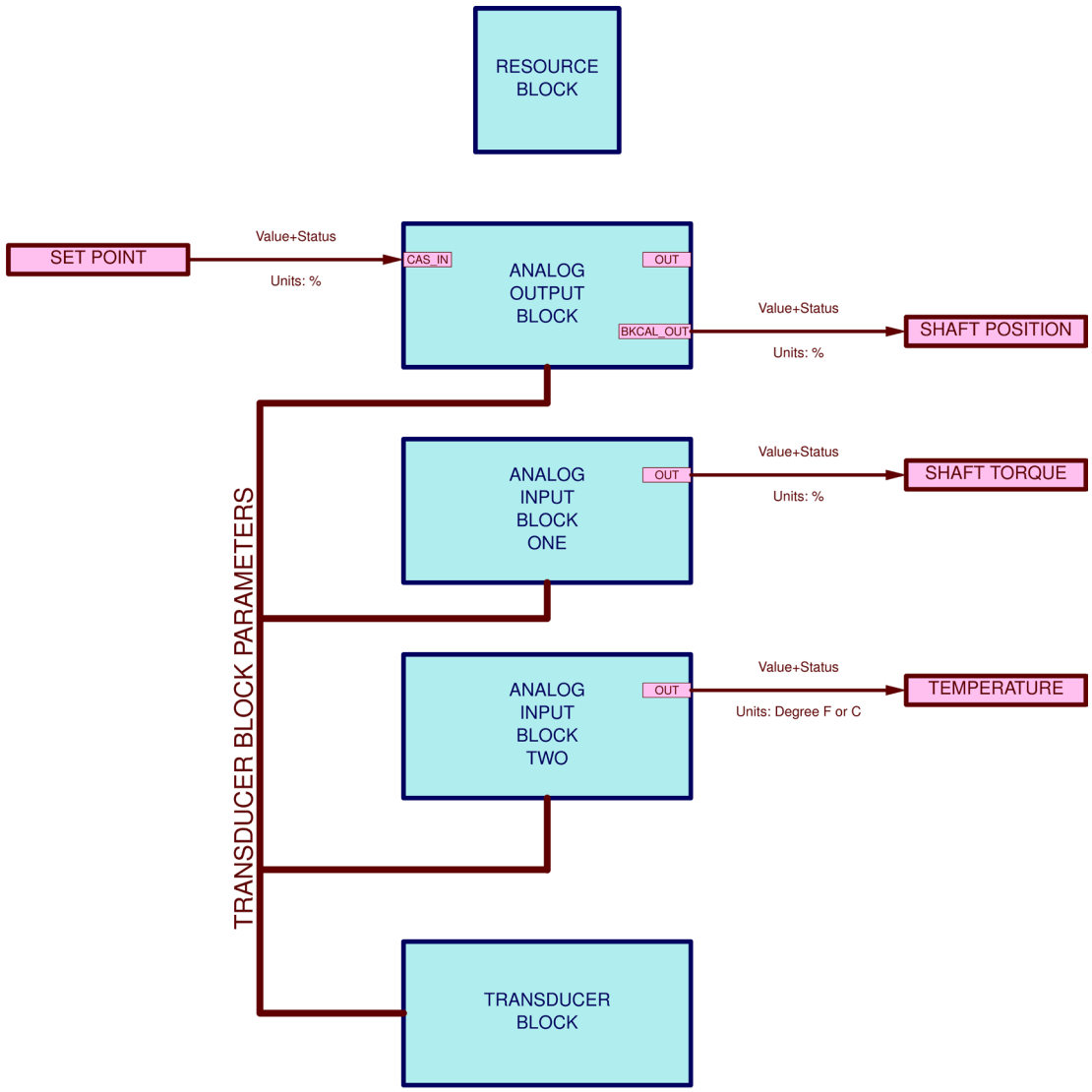




TYPICAL WIRING SCHEMATIC (22-809)

(a wiring schematic specific to each actuator is located under the terminal block cover)





Beck Actuator Foundation Fieldbus Blocks

FOUNDATION FIELDBUS COMMUNICATION OVERVIEW

Foundation Fieldbus defines a large list of predefined "blocks" and the methods for using them. The Beck DCM-2 includes five blocks: One Resource Block, one Transducer Block and three Function Blocks.

1. Resource Block

This block is a Fieldbus requirement, and is not directly used to control the Beck actuator. This block is defined by Foundation Fieldbus and resembles all other standard Resource blocks.

For typical automatic operation, this block must be in Auto mode.

2. Transducer Block

The Transducer Block is used to configure the Beck actuator. It is never used to control the actuator. Like other Foundation Fieldbus blocks, the Transducer Block has a “mode” parameter. The Transducer Block mode controls how the other function blocks in the system can be set. Specifically, the Transducer Block must be set to AUTO, or none of the other blocks in the actuator can be set to AUTO. Before any change can be made to the Transducer Block, the mode must be set to Out of Service (OOS); otherwise, the Transducer Block will reject any attempts to change any other parameters.

Some of the uses of the Transducer Block are:

• To change operating parameters such as stroke direction for an increasing set point, actuator timing, etc.

2. Transducer Block (cont'd)

• To change calibration parameters such as the CPS signal 0% positon and span, feedback current at 0% and 100% limits.

• To read actuator statistics such as the total number of starts and reversals.

• To examine the torque profile (maximum torque values in 10 travel segments).

One of the most important Transducer Block parameters is "Drive Dir" (Index 50-8). This parameter configures the direction of actuator movement in response to an increasing actuator set point.

3. Analog Output (designated Channel 1)

This is a standard Analog Output function block as defined by Fieldbus Foundation, and it is used to control the Beck actuator.

Apply the actuator set point (positioning Demand) and associated status value to CAS_IN. The actuator set point units are "percent". The set point is scaled as a percentage of full travel. The CAS _IN status must be a Foundation Fieldbus value that indicates "good" status for the set point to be accepted by the actuator.

The output shaft position, scaled as percent of full travel, is available at the BKCAL_OUT parameter along with associated status only if the IO_OPTS parameter is set to "Use PV for BKCAL_OUT". Any status other than "good" at the BKCAL_OUT parameter may indicate travel beyond configured limits of a possible position sensor problem.

For typical modulating automatic operation, set Channel to 1, set SHED_OPT to NormalShed_NormalReturn, and set the mode to Cas|Auto.

4. Analog Input (designated Channel 2)

This is a standard Analog Input function block as defined by Fieldbus Foundation, with the value transmitted using the OUT parameter. This parameter is used to transmit the output shaft torque (as percent of rated load) along with the associated status onto the Fieldbus network. Any status other than "good" may indicate a possible overtorque condition or sensor problem.

The measurement units are percent. Calibration of the torque sensor is established by the Transducer block.

For typical operation, set Channel to 2, and set L_TYPE to Indirect.

5. Analog Input (designated Channel 3)

This is a standard Analog Input function block as defined by Fieldbus Foundation, with the value transmitted using the OUT parameter. This parameter is used to transmit the internal temperature, stated in terms of the configured temperature units (degrees C or F) along with the associated status onto the Fieldbus network. Any status other than "good" may indicate a possible overtemperature condition or sensor problem.

The temperature units can be set to degrees C or F using Transducer block parameter "Temp Unit" (Index 21). Minimum and maximum recorded temperatures can also be viewed in the Transducer Block. For typical operation, set Channel to 3, and set L_TYPE to Indirect.

CHANGING PARAMETER VALUES

The Beck DCM-2 contains both standard Foundation Fieldbus parameters defined by the protocol specification (see WARNING below) and modifiable Beck DCM-2 operational parameters that control, configure or display actuator-related parameters.

WARNING

Unless instructed otherwise in this manual, standard Foundation Fieldbus parameters should not be modified from the default values. Misconfiguration of standard Foundation Fieldbus parameters can render the actuator inoperable.

Parameters that are read-only cannot be written at any time. Foundation Fieldbus communications to *devices* can only be initiated by the *Link Active Scheduler (LAS)* which is typically part of the control system. The Beck DCM-2 is not an LAS and cannot initiate communications by itself. Consequently, DCM-2 transmission of information is dependant on the LAS as implemented in Foundation Fieldbus interface software which should normally periodically communicate with the DCM-2. The DCM-2 is always ready to fulfill any message request transmitted to it.

Some parameters are restricted to only allow the value to be displayed (read only). Other parameters allow modification within certain limits. An illegal value transmitted to the DCM-2 will be rejected. The configuration software normally will display the error code transmitted by the DCM-2 to provide an explanation as to why the value was rejected.

Some Fieldbus access tools may apply restrictions based on user names or passwords. The Beck DCM-2 does not implement restrictions of this sort.

Foundation Fieldbus allows most changes to be blocked unless the mode of the block is set to OOS (Out of Service). The Beck DD uses this OOS requirement to protect the system from changes during loop operation. Therefore, parameter writes are blocked unless the mode is set to OOS.

FOUNDATION FIELDBUS Transducer Block

COMMONLY USED ACTUATOR SETTINGS & VALUES AVAILABLE THROUGH THE FOUNDATION FIELDBUS TRANSDUCER BLOCK

ACTUATOR SETTINGS & VALUES	TRANSDUCER BLOCK PARAMETER
RESTORE FACTORY CONFIGURATION	Reset Settings & Select Recall Factory Settings
SET THE ACTUATOR MINIMUM STEP SIZE	StepSize
TEMPERATURE SENSING INFORMATION	
Present temperature	Ambient Temp
Temperature extremes	High and Low under Ambient Extreme
Select unit of measure	Temp Unit
STOP/LIMIT ALARMING	
Observe status of the alarm	DCM BIST
Change alarm behavior	LimitSwitch
STALL PROTECTION SETTINGS	
Enable or disable stall protection	StallProtect
Select stall time setting	Stall Time
Read number of stalls logged	Stalls
Reset actuator that is in a "stall" condition	Reset Stall
TORQUE SENSING SETTINGS	
Enable or disable the torque setting feature	Trq/Thr
Read present torque value	Trq/Thr %
Enter 0% torque	Trq/Thr Null
Enter span value	Trq/Thr Const
TORQUE ALARM SETTINGS	
Set alarm threshold in % of span	Trq/Thr AlarmLevel
Set protection threshold in % of span	Trq/Thr Sht Dn Level
Enable or disable torque protection	Trq/Thr Protect
TORQUE STATISTICS INFORMATION	
Read peak torque history	Peak Trq/Thr
Read torque profile vs. position history	CW Trq/Thr or CCW Trq/Thr
ALARM (RELAY) OUTPUT HISTORY CONFIGURATION SETTINGS	
Set alarm polarity (i.e., energize or de-energize on alarm)	Polarity
Select the alarms annunciated at terminal "E"	Mask 1 and Mask 2
DEMAND VS. POSITION CHARACTERIZATION MODE SELECTION	Demand Curve
DEMAND OPERATING MODE (can be set to): "Hold" (correct mode for modulating control with Foundation Fieldbus) "RunCW" (diagnostic mode - should only be used for testing) "RunCCW" (diagnostic mode - should only be used for testing) "Stop" (removes power from the motor)	Op Mode
SETTING A CUSTOM DEMAND CHARACTERIZATION CURVE	DemNode 1 through DemNode 21
OUTPUT SHAFT POSITION SENSING	
Confirm DCM-2 is set for correct Maximum Travel	MaxTravel
Confirm DCM-2 expects CPS-4 signal to increase as shaft rotates CW	Snsr Dir
Confirm correct signal ranges	CPS RngLwr and CPS RngUpr
TRAVEL OF ACTUATOR SHAFT PER 100% DEMAND SETTING	Travel
SET OUTPUT SHAFT 0% POSITION	CPS Zero %
SET DIRECTION OF OUTPUT SHAFT ROTATION FOR INCREASING DEMAND (CCW VS. CW)	Drive Dir
OUTPUT SHAFT POSITION FEEDBACK VALUE	Position or PV (in Analog Output Block)

TRANSDUCER BLOCK PARAMETER LISTING

Transducer Block parameters are listed in two separate tables. The first table (page 9) lists Foundation Fieldbus parameters in the order they are presented in the Device Description file (DD). The second table (page 15) is a cross-reference indexed by parameter name to allow locating a parameter by its screen identifier.

The Relative Index is an internal identifier used within the DD and does not indicate any specific data order or value.

Some parameters are grouped into records. These parameters are identified by the record index followed by the parameter label.

ANALOG OUTPUT FUNCTION BLOCK: ACTUATOR CONTROL POINT

The Analog Out (AO) Function Block is the interface for controlling the actuator. The AO Function Block contains standard Foundation Fieldbus parameters for configuring input and output scaling, block alarm handling and other functions.

The AO parameters used in a control loop are CAS_IN and BKCAL_OUT. CAS_IN is read by the DCM as the Demand signal (Set Point). BKCAL_OUT is where the actual position of the output shaft is transmitted.

Additional AO parameters and their required values are:

- Channel: Must be set to One.
- SHED OPT: Must be set to Normal-Shed_NormalReturn.
- IO OPTS: Must be set to Use PV for BKCAL_OUT for the position value to be transmitted at BKCAL_OUT.
- Mode: Must be set to CAS/AUTO for normal control.

The Transducer Block contains parameters that affect the operation of the AO Block. One of the most important of these parameters is the “Info 2: Drive Dir” parameter. This parameter determines the rotation direction of the output shaft in response to an increasing Demand signal.

Transducer Block Parameter Table

Transducer Block ID	Parameter Name	Description
1	ST_REV	Standard Foundation Fieldbus parameter. See FF specification for details.
2	TAG_DESC	Standard Foundation Fieldbus parameter. See FF specification for details.
3	STRATEGY	Standard Foundation Fieldbus parameter. See FF specification for details.
4	ALERT_KEY	Standard Foundation Fieldbus parameter. See FF specification for details.
5	MODE_BLK	Typically Auto or CASCADE.
6	BLOCK_ERR	Standard Foundation Fieldbus parameter. See FF specification for details.
7	EVENT_UPDATE	Standard Foundation Fieldbus parameter. See FF specification for details.
8	BLOCK_ALM	Standard Foundation Fieldbus parameter. See FF specification for details.
9	TRANSDUCER_DIRECTORY	Standard Foundation Fieldbus parameter. See FF specification for details.
10	TRANSDUCER_TYPE	Standard Foundation Fieldbus parameter. See FF specification for details.
11	XD_ERROR	Standard Foundation Fieldbus parameter. See FF specification for details.
12	COLLECTION_DIRECTORY	Standard Foundation Fieldbus parameter. See FF specification for details.
13	Position %	Present actuator position.
14	Position Unit	Unit of measure for Position %.
15	Demand %	Present actuator Demand.
16	Demand Unit	Unit of measure for Demand %.
17	Op Mode	Demand Operating Mode.
18	Trq/Thr %	Present output shaft Torque load.
19	Trq/Thr Unit	Unit of measure for output shaft Torque.
20	Ambient Temp	Present DCM-2 temperature.
21	Temp Unit	Unit of measure for Ambient temperature.
22-1	Inhibits: CCW 2 Inhibitor	Not used in Group 22.
22-2	Inhibits: CCW 1 Inhibitor	Reason motor is not rotating output shaft CCW.
22-3	Inhibits: CW 2 Inhibitor	Not used in Group 22.
22-4	Inhibits: CW 1 Inhibitor	Reason motor is not rotating output shaft CW.
22-5	Inhibits: LED Status	Allows remote checking of which LED's on the DCM-2 are illuminated.
22-6	Inhibits: Switch Status	Not used in Group 22.
23-1	DCM BIST: Operating Status	Summary of process-related conditions.
23-2	DCM BIST: BIST 1	Built-in self-test results.
23-3	DCM BIST: BIST 2	Built-in self-test results.
23-4	DCM BIST: BIST 3	Built-in self-test results.
23-5	DCM BIST: analog_output_fixed1	Not used in Group 22.
23-6	DCM BIST: Analog Sig Saturated	Analog signals are out of measurement range.
24-1	SigDif: DemPosDiff Unit	Unit of measure for DemPosDiff.
24-2	SigDif: DemPosDiff	The difference between the Demand and the Position.
25-1	Statistics: TotalRunTm	Total amount of time the motor has been powered.
25-2	Statistics: OverTrqs/Thrusts	Total number of times the first level of alarm has been reached.

FOUNDATION FIELDBUS Transducer Block

Transducer Block ID	Parameter Name	Description
25-3	Statistics: Peak Trq/Thr	The highest recorded torque on the output shaft.
25-4	Statistics: Reversals	The total number of times the motor has started in the direction opposite to the previous start.
25-5	Statistics: Stalls	The total number of times the stall timer has timed out.
25-6	Statistics: Starts	The total number of motor starts.
25-7	Statistics: LastRun	The duration of the last motor movement.
25-8	Statistics: Set up OverTrqs/Thrusts	The number of over-torques during the installation period.
25-9	Statistics: Set up Peak Trq/Thr	The peak torque during the installation period.
26-1	Ambient Extreme: High	Highest temperature recorded in the DCM-2 compartment.
26-2	Ambient Extreme: Low	Lowest temperature recorded in the DCM-2 compartment.
27-1	Ambient Rating: Temp Lwr Lim	Temperature allowed before alarm asserted.
27-2	Ambient Rating: Temp Upr Lim	Temperature allowed before alarm asserted.
28	Position(deg/in/mm)	Position % (Relative Index 13) expressed in engineering units of degrees.
29	Unit Select(deg/in/mm)	Unit of measure for Position (Relative Index 28).
30-1	Position Sense: Unit	Unit of measure for DCM-2 sensing circuit that receives the signal from the CPS-4, always volts.
30-2	Position Sense: Pres V	Displays the output shaft position voltage signal at the DCM-2 from the CPS-4.
31-1	CPS Ranges: CPS Output Unit	Unit of measure for CPS-4 output signal to the DCM-2, always volts.
31-2	CPS Ranges: CPS Zero%	This is the voltage from the CPS-4 to the DCM-2 that the DCM-2 will interpret as 0% output shaft position.
31-3	CPS Ranges: CPS Span	The voltage span from the CPS-4 for the maximum rotation of the output shaft—this is simply the upper range voltage minus the lower range voltage.
31-4	CPS Ranges: CPS RngLwr	The CPS-4 voltage signal corresponding to the CCW end of rotation when Travel is set to the maximum rotation.
31-5	CPS Ranges: CPS RngUpr	The CPS-4 voltage signal corresponding to the CW end of rotation when Travel is set to the maximum rotation.
32-1	Position Limits: PosLwrLim	Position Lower Limit, the signal in percent allowed before an alarm is asserted.
32-2	Position Limits: PosUprLim	Position Upper Limit, the signal in percent allowed before an alarm is asserted.
33	Snsr Dir	The direction of output shaft rotation that causes the CPS-4 signal to increase—should always be CW except in some custom configurations.
.34	MaxTravel(deg/in/mm)	The maximum output shaft rotation for this model of actuator
35	Travel(deg/in/mm)	Amount of output shaft rotation for 100% signal change.
36-1	CW Trq/Thr: 1	Max torque, output shaft rotating CW, seg 1.
36-2	CW Trq/Thr: 2	Max torque, output shaft rotating CW, seg 2.
36-3	CW Trq/Thr: 3	Max torque, output shaft rotating CW, seg 3.
36-4	CW Trq/Thr: 4	Max torque, output shaft rotating CW, seg 4.
36-5	CW Trq/Thr: 5	Max torque, output shaft rotating CW, seg 5.
36-6	CW Trq/Thr: 6	Max torque, output shaft rotating CW, seg 6.
36-7	CW Trq/Thr: 7	Max torque, output shaft rotating CW, seg 7.
36-8	CW Trq/Thr: 8	Max torque, output shaft rotating CW, seg 8.
36-9	CW Trq/Thr: 9	Max torque, output shaft rotating CW, seg 9 .
36-10	CW Trq/Thr: 10	Max torque, output shaft rotating CW, seg 10.
37-1	CW Trq/Thr Pos: 1	Position in seg 1 where max torque was measured.

Transducer Block ID	Parameter Name	Description
37-2	CW Trq/Thr Pos: 2	Position in seg 2 where max torque was measured.
37-3	CW Trq/Thr Pos: 3	Position in seg 3 where max torque was measured.
37-4	CW Trq/Thr Pos: 4	Position in seg 4 where max torque was measured.
37-5	CW Trq/Thr Pos: 5	Position in seg 5 where max torque was measured.
37-6	CW Trq/Thr Pos: 6	Position in seg 6 where max torque was measured.
37-7	CW Trq/Thr Pos: 7	Position in seg 7 where max torque was measured.
37-8	CW Trq/Thr Pos: 8	Position in seg 8 where max torque was measured.
37-9	CW Trq/Thr Pos: 9	Position in seg 9 where max torque was measured.
37-10	CW Trq/Thr Pos: 10	Position in seg 10 where max torque was measured.
38-1	CCW Trq/Thr: 1	Max torque, output shaft rotating CCW, seg 1.
38-2	CCW Trq/Thr: 2	Max torque, output shaft rotating CCW, seg 2.
38-3	CCW Trq/Thr: 3	Max torque, output shaft rotating CCW, seg 3.
38-4	CCW Trq/Thr: 4	Max torque, output shaft rotating CCW, seg 4.
38-5	CCW Trq/Thr: 5	Max torque, output shaft rotating CCW, seg 5.
38-6	CCW Trq/Thr: 6	Max torque, output shaft rotating CCW, seg 6.
38-7	CCW Trq/Thr: 7	Max torque, output shaft rotating CCW, seg 7.
38-8	CCW Trq/Thr: 8	Max torque, output shaft rotating CCW, seg 8.
38-9	CCW Trq/Thr: 9	Max torque, output shaft rotating CCW, seg 9.
38-10	CCW Trq/Thr: 10	Max torque, output shaft rotating CCW, seg 10.
39-1	CCW Trq/Thr Pos: 1	Position in seg 1 where max torque was measured.
39-2	CCW Trq/Thr Pos: 2	Position in seg 2 where max torque was measured.
39-3	CCW Trq/Thr Pos: 3	Position in seg 3 where max torque was measured.
39-4	CCW Trq/Thr Pos: 4	Position in seg 4 where max torque was measured.
39-5	CCW Trq/Thr Pos: 5	Position in seg 5 where max torque was measured.
39-6	CCW Trq/Thr Pos: 6	Position in seg 6 where max torque was measured.
39-7	CCW Trq/Thr Pos: 7	Position in seg 7 where max torque was measured.
39-8	CCW Trq/Thr Pos: 8	Position in seg 8 where max torque was measured.
39-9	CCW Trq/Thr Pos: 9	Position in seg 9 where max torque was measured.
39-10	CCW Trq/Thr Pos: 10	Position in seg 10 where max torque was measured.
40	Trq/Thr	Whether the torque sensing function is enabled.
41	Trq/Thr AlarmLevel	The output shaft thrust that is interpreted as an over-thrust.
42	Trq/Thr Shut Dn Level	The output shaft torque that is interpreted as a severe over-torque.
43	Trq/Thr Sensor Unit	Unit of measure for torque alarm levels, always percent.
44-1	Trq/Thr Range: Trq/Thr Null	The internal DCM-2 signal associated with 0% output shaft torque.
44-2	Trq/Thr Range: Trq/Thr Const	The internal DCM-2 signal span associated with the output shaft torque.
45	Trq/Thr Cal Unit	A custom unit defined for the DCM-2 internal torque signal.
46	Drive S/N	The serial number as shown on the actuator nameplate.
47	Model#	A field that is created within the DCM-2 by examining Drive S/N—if this does not match the model of the actuator, change Drive S/N.
48	Type	A broad classification of DCM-2 type based on Drive S/N.
49-1	Info 1: Shaft Dir	Not used on Group 22.
49-2	Info 1: Geometry	Classification of output shaft movement: linear or rotary.
49-3	Info 1: Embed Mem	Not used on Group 22.
49-4	Info 1: groupNumber	Beck Group number based on Drive S/N.

FOUNDATION FIELDBUS Transducer Block

Transducer Block ID	Parameter Name	Description
49-5	Info 1: HandSwType	Identifies whether Handswitch is a full power bypass of the DCM-2 or a low voltage input to the DCM-2.
49-6	Info 1: LimSwType	Identifies whether the over-travel limit switches act to block motor power or are low voltage inputs to the DCM-2.
49-7	Info 1: modelNumber	Model number based on Drive S/N.
49-8	Info 1: Gear Ratio	Not used on Group 22.
49-9	Info 1: Gear Units	Not used on Group 22.
49-10	Info 1: Motor Poles	Not used on Group 22.
49-11	Info 1: Pole Units	Not used on Group 22.
49-12	Info 1: OutRating	Not used on Group 22.
49-13	Info 1: Output Units	Not used on Group 22.
49-14	Info 1: StrainGage	Not used on Group 22.
49-15	Info 1: StrainUnits	Not used on Group 22.
49-16	Info 1: ScrewTrav	Not used on Group 22.
49-17	Info 1: ScrewTravUnits	Not used on Group 22.
50-1	Info 2: LocalCntrl	Not used on Group 22 for Foundation Fieldbus.
50-2	Info 2: LOS Mode	Not used on Group 22 for Foundation Fieldbus.
50-3	Info 2: LOS Pos	Not used on Group 22 for Foundation Fieldbus.
50-4	Info 2: LimitSwitch	Modifies the behavior of Stop/Limit alarm.
50-5	Info 2: Trq/Thr Protect	Whether the actuator motor will be turned off on severe overtorque conditions.
50-6	Info 2: StepSize	The typical smallest Demand change that will cause an output shaft movement.
50-7	Info 2: Max Error	If the Demand signal doesn't change and a technician moves the Handwheel back and forth, this is the theoretical maximum movement translated to the output shaft.
50-8	Info 2: Drive Dir	The direction the output shaft moves in response to an increasing Demand signal.
50-9	Info 2: Stall Time	The amount of time the motor will run before Stall Protection.
50-10	Info 2: Handswitch	The Handswitch is always enabled.
51	StallProtect	Whether actuator motor will be turned off if the Stall Time counter expires.
52-1	Info 3: Flag Status	A copy of some data from the DCM BIST parameters.
52-2	Info 3: Operating Status Alt	A copy of some data from the DCM BIST parameters.
52-3	Info 3: Present Freq	Not used on Group 22.
52-4	Info 3: DC Volts	Not used on Group 22.
52-5	Info 3: Line Freq	The power line frequency as measured by the DCM-2.
53	Power	The Group 22 is designed for 1-phase power.
54	Max Freq	Not used on Group 22.
55	MaxTravelTm	Not used on Group 22.
56	Feedback	With fieldbus, only used for special retrofit applications.
57-1	Alarm Contact: Polarity	Whether the solid state relay opens on alarm or closes on alarm.
57-2	Alarm Contact: Mask 1	Which alarms cause the solid state relay to change state.
57-3	Alarm Contact: Mask 2	Which alarms cause the solid state relay to change state.
58	Demand Source	In Group 22 fieldbus applications, should read HART/FF.
59	Demand Curve	Whether Demand is interpreted as linear or a curve.
60-1	DemNode1: DemNode1X	Allows setting the Demand characterization node.
60-2	DemNode1: DemNode1Y	Allows setting the Demand characterization node.
61-1	DemNode2: DemNode2X	Allows setting the Demand characterization node.
61-2	DemNode2: DemNode2Y	Allows setting the Demand characterization node.
62-1	DemNode3: DemNode3X	Allows setting the Demand characterization node

Transducer Block ID	Parameter Name	Description
62-2	DemNode3: DemNode3Y	Allows setting the Demand characterization node.
63-1	DemNode4: DemNode4X	Allows setting the Demand characterization node.
63-2	DemNode4: DemNode4Y	Allows setting the Demand characterization node.
64-1	DemNode5: DemNode5X	Allows setting the Demand characterization node.
64-2	DemNode5: DemNode5Y	Allows setting the Demand characterization node.
65-1	DemNode6: DemNode6X	Allows setting the Demand characterization node.
65-2	DemNode6: DemNode6Y	Allows setting the Demand characterization node.
66-1	DemNode7: DemNode7X	Allows setting the Demand characterization node.
66-2	DemNode7: DemNode7Y	Allows setting the Demand characterization node.
67-1	DemNode8: DemNode8X	Allows setting the Demand characterization node.
67-2	DemNode8: DemNode8Y	Allows setting the Demand characterization node.
68-1	DemNode9: DemNode9X	Allows setting the Demand characterization node.
68-2	DemNode9: DemNode9Y	Allows setting the Demand characterization node.
69-1	DemNode10: DemNode10X	Allows setting the Demand characterization node.
69-2	DemNode10: DemNode10Y	Allows setting the Demand characterization node.
70-1	DemNode11: DemNode11X	Allows setting the Demand characterization node.
70-2	DemNode11: DemNode11Y	Allows setting the Demand characterization node.
71-1	DemNode12: DemNode12X	Allows setting the Demand characterization node.
71-2	DemNode12: DemNode12Y	Allows setting the Demand characterization node.
72-1	DemNode13: DemNode13X	Allows setting the Demand characterization node.
72-2	DemNode13: DemNode13Y	Allows setting the Demand characterization node.
73-1	DemNode14: DemNode14X	Allows setting the Demand characterization node.
73-2	DemNode14: DemNode14Y	Allows setting the Demand characterization node.
74-1	DemNode15: DemNode15X	Allows setting the Demand characterization node.
74-2	DemNode15: DemNode15Y	Allows setting the Demand characterization node.
75-1	DemNode16: DemNode16X	Allows setting the Demand characterization node.
75-2	DemNode16: DemNode16Y	Allows setting the Demand characterization node.
76-1	DemNode17: DemNode17X	Allows setting the Demand characterization node.
76-2	DemNode17: DemNode17Y	Allows setting the Demand characterization node.
77-1	DemNode18: DemNode18X	Allows setting the Demand characterization node.
77-2	DemNode18: DemNode18Y	Allows setting the Demand characterization node.
78-1	DemNode19: DemNode19X	Allows setting the Demand characterization node.
78-2	DemNode19: DemNode19Y	Allows setting the Demand characterization node.
79-1	DemNode20: DemNode20X	Allows setting the Demand characterization node.
79-2	DemNode20: DemNode20Y	Allows setting the Demand characterization node.
80-1	DemNode21: DemNode21X	Allows setting the Demand characterization node.
80-2	DemNode21: DemNode21Y	Allows setting the Demand characterization node.
81	Device Status	A copy of some date from the DCM BIST parameters.
82-1	Misc Status: analog_output_fixed2	Not used on Group 22 for Foundation Fieldbus.
82-2	Misc Status: analog_output_fixed3	Not used on Group 22 for Foundation Fieldbus.
82-3	Misc Status: analog_output_ saturated2	Not used on Group 22 for Foundation Fieldbus.
82-4	Misc Status: analog_output_ saturated3	Not used on Group 22 for Foundation Fieldbus.
82-5	Misc Status: xmtr_specific_status_4	Not used on Group 22 for Foundation Fieldbus.
82-6	Misc Status: xmtr_specific_status_5	Not used on Group 22 for Foundation Fieldbus.
83-1	Installed Features: Pot Supply	Not used on Group 22 for Foundation Fieldbus.
83-2	Installed Features: FB Out	Not used on Group 22 for Foundation Fieldbus.
83-3	Installed Features: Trq/Thr Snsr	Not used on Group 22 for Foundation Fieldbus.
84	Board Mfd	A reference manufacture date entered by Beck, has no affect on actuator operation.

FOUNDATION FIELDBUS Transducer Block

Transducer Block ID	Parameter Name	Description
85	Calbrtd	The calibration date has no affect on actuator operation.
86	Setup	The setup date has no affect on actuator operation.
87-1	RT Clock: Day	Real time clock, day of month, has no affect on actuator operation.
87-2	RT Clock: Month	Real time clock, month, has no affect on actuator operation.
87-3	RT Clock: Year	Real time clock, year, has no affect on actuator operation.
87-4	RT Clock: Hour (24)	Real time clock, hour (24 hour format), has no affect on actuator operation.
87-5	RT Clock: Minute	Real time clock, minute, has no affect on actuator operation.
87-6	RT Clock: Second	Real time clock, second, has no affect on actuator operation.
87-7	RT Clock: rtc_status	Not used on Group 22 for Foundation Fieldbus.
88-1	Beck Software Info: DCM Software Rev	Number used by Beck for version tracking purposes.
88-2	Beck Software Info: Checksum	Number used by Beck for version tracking purposes.
89	Device ID	Number used by Beck for DCM-2 tracking purposes.
90	Status	A text message sent from the DCM-2 to summarize DCM-2 status.
91	Reset Settings	Reset the DCM-2 microcomputer.
92	Write Protect	Allows or prevents changes to the DCM-2 configuration.
93	Reset Changed Flag	Resets the “configuration changed” flag in Device Status, has no effect on actuator performance.
94	Perform Test	Instructs the DCM-2 to check various power and sensing circuits—this test should not be run unless sudden output shaft movements are allowable.
95	Reset	This reset simulates switching the power off and back on.
96	Identify	Causes an LED on the DCM-2 to flash to indicate the DCM-2 has received the command.
97	Reset Stall	A method for resetting the Stall alarm.

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FOUNDATION FIELDBUS *Transducer Block*

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TROUBLESHOOTING THE FOUNDATION FIELDBUS INTERFACE

This section concerns the steps involved in troubleshooting the Foundation Fieldbus interface only. For general Group 22 actuator troubleshooting refer to Manual 80-4280-02.

FOUNDATION FIELDBUS NETWORK REFERENCE

A summary of proper Foundation Fieldbus network wiring and installation practice is available from the Foundation Fieldbus standards organization. The document is:

FOUNDATION Fieldbus Technical Specifications
Application Guides
31.25 kbit/s Wiring and Installation
AG-140 Revision 1.0 Fieldbus Foundation

9430 Research Boulevard
Suite 1-120
Austin, TX 78759
USA
Voice: 512 792-2300
Web: www.fieldcommgroup.org

BASIC 3-STEP FF CHECK

There is a basic 3-step process to check that the Group 22 is able to communicate over the Foundation Fieldbus network:

1. Verify the Foundation Fieldbus Bus Voltage is above 10 VDC.
2. Verify AC Power to the Actuator is on.
3. Verify the FIELDBUS ACTIVE LED is blinking.

The Foundation Fieldbus version of the DCM-2 includes a galvanically-isolated fieldbus-powered interface to the DCM-2 core processor. This interface requires adequate FF bus voltage to function. Foundation Fieldbus bus voltage is nominally 24 VDC with a minimum voltage of 10 VDC. So the very first test should be to measure the Foundation Fieldbus bus voltage (in the customer wiring terminal block) across terminals 14 and 15 and verify it is above 10 VDC.

While the Foundation Fieldbus interface may have adequate bus voltage, it cannot communicate with the DCM processor unless the Group 22 has AC power. If there is no AC Power, the Foundation Fieldbus module will report all Foundation Fieldbus signals have a status of “bad” with all blocks' modes reported as “Out of Service”. The next step is to verify that the actuator has AC power. The DCM “PWR” LED should be illuminated and will continuously pulse brightly for one second and dimly for one second.

When both bus power and AC power are correct, the DCM will indicate that FF module—DCM intercommunications are functioning by blinking the FIELDBUS ACTIVE LED on the DCM. So the next step is to verify that the FIELDBUS ACTIVE LED is blinking.

If the FIELDBUS ACTIVE LED is not blinking, but Foundation Fieldbus bus power and actuator AC power has been verified, the following step should be taken:

- Verify that the correct FF bus voltage is present across the connector on the Foundation Fieldbus Module.
- Using the DCM serial command interface, verify that the network command reports a value of 2 (this should not change). If the network reports a different number, enter the serial command “network 2” to correct the DCM configuration.
- Verify that the FF module is properly installed on the DCM.

ADDITIONAL FOUNDATION FIELDBUS TROUBLESHOOTING STEPS

Additional tests for troubleshooting Foundation Fieldbus network problems may require specialized test equipment.

Isolated Network Segment Check: The quickest way to verify proper operation of the Foundation Fieldbus Group 22 actuator is to replace the control system connection with a direct connection to a configuration tool such as the Emerson® 475 Field Communicator. Note that some tools require a separate Fieldbus power hub such as the Relcom® F11 Power Hub.

Signal Level Check: The Foundation Fieldbus signal is a small, encoded digital signal that modulates the DC bus voltage. The amplitude of this signal must be adequate for FF communications to take place. Many FF communicators have a built-in signal level measurement utility. An oscilloscope can also be used to check signal level.

Network Termination Check: All Foundation Fieldbus networks require proper termination. Unlike analog demand (which uses a single 250 ohm resistor), Foundation Fieldbus termination is a complex circuit consisting of a series capacitor with a resistor. Verification of proper FF network termination can involve:

- Physical location and verification of FF termination modules.
- Measurement of FF network impedance using appropriate test equipment.

CHECKING DEMAND

In Foundation Fieldbus systems, Demand is communicated to the DCM-2 as a percentage value through the CAS_IN input of the Analog Output function block. Using a communicator, the Demand should be readable as the process applied to that signal line. Also, the status of the CAS_IN signal should be Good.

For the CAS_IN signal line to be accepted by the Analog Output function block, the Analog Output Function Block must be in Cascade mode. Make certain the Beck Resource Block and Transducer Block modes are both Auto.

With the proper signal applied to the Analog Output block and the proper modes, the Demand value should be readable in the Transducer Block as Demand %. Also, the OpMode parameter in the Transducer Block should read Hold.

If these conditions are not as described, the DCM-2 is not accepting the correct Demand signal. Refer to Foundation Fieldbus Communication Overview (page 5).

CHECKING SHAFT POSITION

The output shaft position can be read as the PV parameter of the Analog Output Block, and can be read as Position % in the Transducer Block.

Does Position % match Demand %? The exactness of the match is controlled by the parameter Step Size. If they match, the DCM-2 is not running the motor because the signals appear to match.

If the signals match, the next question is whether Position % is correct for the actual output shaft position. Refer to Instruction Manual 80-4280-02. The CPS-4 signal voltage as measured by the DCM-2 is available in the Transducer Block as parameter Position Sense. The actual voltage can be measured with a voltage meter between test points TP4(+) and TP1(-). Refer to Instruction Manual 80-4280-02.

POSITION AND DEMAND MISMATCH

If the shaft position and the Demand do not match and the motor is not running, then some factor is preventing the DCM-2 from running the motor. The fieldbus interface provides extensive information for finding this factor.

The Transducer Block contains two parameters that summarize why the motor is not running: one parameter for CW and one for CCW. The parameter names are CW Inhibitor and CCW Inhibitor. If the parameter is 0 (has no bits set), the motor should run in that direction. If the parameter is not 0, the DCM-2 will not try to run the motor in that direction. The bits that show in the parameter are the reasons the motor is not running in that direction.

INHIBITORS

Label	Cause of Motor Not Running
OverTrq/Thrust	Excessive torque load on output shaft
Balance	Demand indicates motor should not run this direction
Stall	Stall
Supervisory	The DCM-2 is initializing
Switch Block	Not used on Group 22 actuators
Bad Pos Sig	The Position signal from the CPS-4 is not acceptable
Bad Dem Sig	Not used on fieldbus systems
Local Cal	Not used on fieldbus systems

If the inhibitor parameter is 0 but the motor is not running, power to the motor is being blocked by something over which the DCM-2 microcomputer has no control. Possibility 1 (listed below) should lead to a Stall alarm. The other possibilities should create a Stop/Limit alarm.

1. The motor is stalled, and cannot rotate. This condition is unlikely if the motor operates properly with the Handswitch.
2. Ensure the wiring is correct according to the wiring diagram specific to your actuator (attached to the inside of the cover).
3. The output section of the DCM-2 is not delivering power to the motor.
4. A DCM-2 fuse has cleared. Refer to the Maintenance section of instruction manual 80-4280-02 for fuse locations and descriptions.

BUILT-IN SELF-TEST (BIST)

The DCM-2 microcomputer continuously runs diagnostic routines in the background. These routines look for situations that could indicate the DCM-2 is not working reliably. Examples of tests are:

- has a power failure has occurred?
- is torque sensing functioning properly?
- does the temperature sensor appear to be functioning properly?

There are many built-in self-test routines. To simplify identifying test results, the tests are separated into the following five categories.

BIST: OPERATING STATUS

The Operating Status parameter is a summary of whether process-related conditions are inside or outside of anticipated limits.

9 **Position**: caused by the CPS-4 signal being outside the range anticipated by the DCM-2.

10 **Temperature**: the ambient temperature of the DCM-2 is outside of the rating.

11 **Torque**: the first alarm level of torque is being exceeded.

12 **Over-Torque Stop**: over-torque protection is preventing the DCM-2 from running the motor.

13 **Stalled**: a Stall alarm is active.

14 **Feedback Open**: the Feedback signal is enabled, but cannot flow the proper current.

15 **Switch Block**: the DCM-2 cannot power the motor due to an electro-mechanical switch. Check the Handswitch and over-travel limit switches.

BIST: BIST 1

Real Time Clock hardware failure
The data in the Real Time Clock appears invalid.

Torque/Thrust sensing error
The DCM-2 circuitry for measuring the Torque signal does not appear to be functioning properly. Check the Torque sensing cable.

Position sensing error
The DCM-2 circuitry for measuring the CPS-4 signal does not appear to be functioning properly.

Demand processing error
The Demand signal appears to have a data format error.

FRAM Memory has failed
The continuous built-in self-test cannot verify the memory for statistics information is operating properly.

Position signal in LOS
The DCM-2 is reading a CPS-4 signal that is outside of the range associated with a functional CPS-4.

Temperature A/D Fail
The DCM-2 circuitry for measuring the ambient temperature does not appear to be functioning properly.

Memory failure
The continuous built-in self-test cannot verify the microcomputer is operating properly.

BIST: BIST 2

Local control activity detected
Not applicable to the fieldbus DCM-2.

Demand Setting is out of limit
The Demand signal appears too high and probably has a data format error.

Current Overlimit
Not used in Group 22.

Power Source Not Nominal
Not used in Group 22.

BIST: BIST 3

Loop Current Detected while under HART/FF Control
The microcomputer configuration does not appear valid for Foundation Fieldbus.

BIST: ANALOG SIG SATURATED

Position out of accurate measurement range
The DCM-2 is reading a CPS-4 signal that is outside of the range for accurate measurements.

Demand out of accurate measurement range
The Demand signal appears too low or too high, and probably has a data format error.

Temperature out of accurate measurement range
The DCM-2 ambient temperature reading is extreme to the point of uncertainty.

Torque/Thrust out of accurate measurement range
The DCM-2 is not able to read a valid signal from the Torque sensor. Check the Torque sensing cable.

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HAROLD BECK & SONS, INC.

Made in USA

11 TERRY DRIVE • NEWTOWN, PENNSYLVANIA 18940 • USA
PHONE: 215-968-4600 • FAX: 215-860-6383 • E-MAIL: sales@haroldbeck.com
www.haroldbeck.com

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