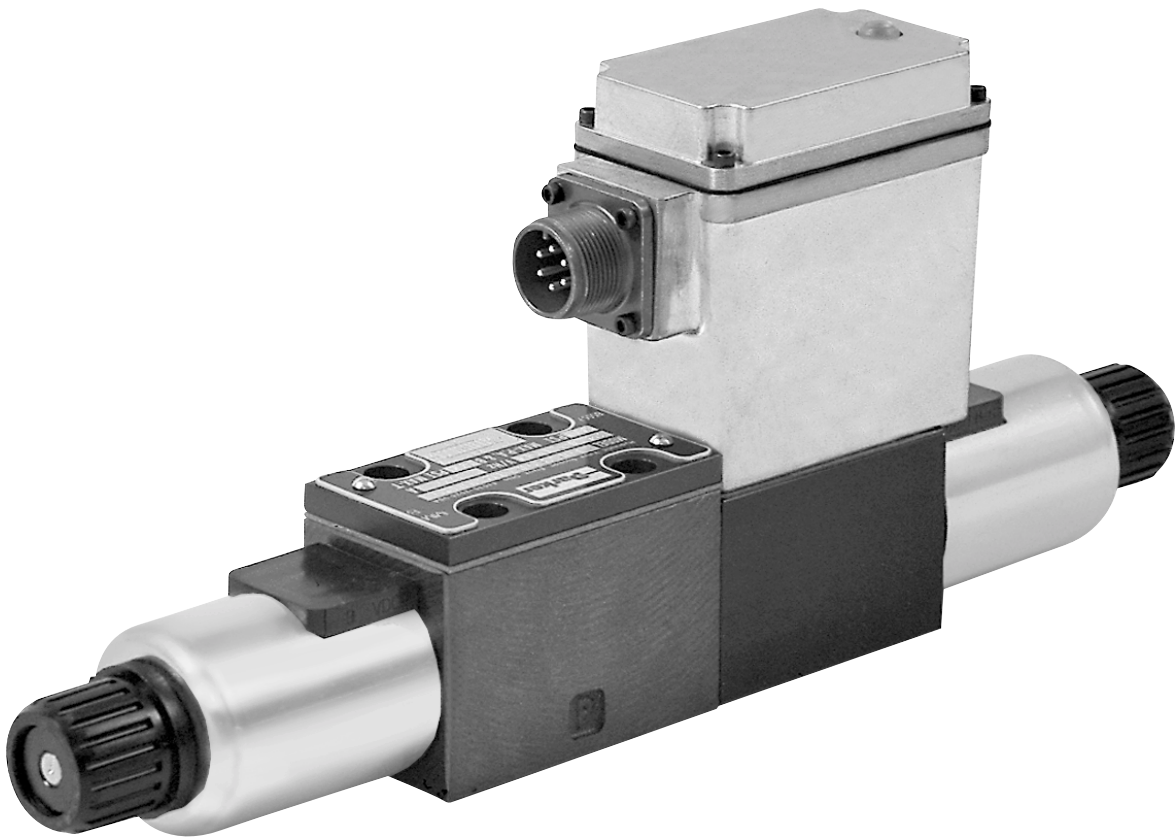




**Bulletin 2583-M1/USA
Installation Guide**

**Series D1FX
30 Design**

Effective: December 11, 1995



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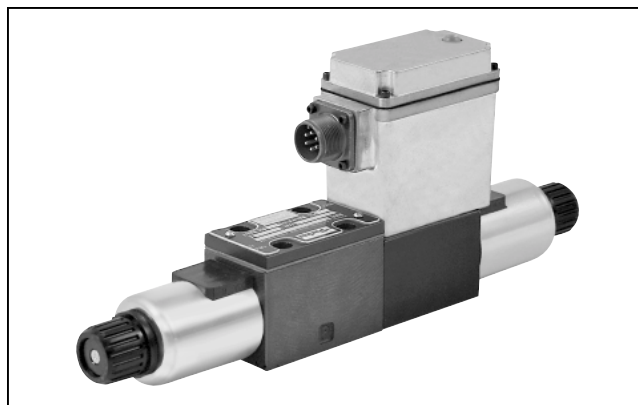
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General Description

The D1FX Series of proportional directional control valves provide variable output flow in response to voltage or current command signals. The valves are fully integrated units with on-board electronics and a spool position feedback device.

Features

- **Integral Electronics** $\frac{3}{4}$ Eliminates the time consuming and often costly electrical wiring between valve and driver card. Provides a fully factory tested valve/driver package.
- **LVDT** $\frac{3}{4}$ The spool position feedback is located between the valve body and coil thus allowing access to the manual overrides.
- **Electronic LVDT Null** $\frac{3}{4}$ Factory preset. No nulling required.
- **Diagnostic Indicator** $\frac{3}{4}$ Bi-color LED indicates the spool position.
- **Rugged Construction** $\frac{3}{4}$ Integral electronics packaged in a rugged die cast aluminum enclosure for protection from the harsh environments typical in many industrial applications.
- **Electrical Interface** $\frac{3}{4}$ Standard MS style connector for interface to computers and PLC's.



Operation

The D1FX spool shifts proportionally in either direction in response to variable command signals; thus providing the desired output flow. Once the spool reaches the desired position, the internal LVDT sends a feedback signal to the drive amplifier to maintain that position. The closing of the inner control loop in this manner results in lower hysteresis and improved repeatability of the valve. The high dynamic amplifier gives this valve a frequency response of greater than 20 Hz.

Installation note: Valve should be mounted horizontally. (See Installation Information.)

Specifications

Interface	NFPA D03, CETOP 3		
Maximum Pressure	315 Bar (4500 PSI)		
Max. Tank Line Pressure	35 Bar (500 PSI)		
Flow	Up to 38 LPM (10 GPM)		
Frequency Response	> 20 Hz with 10% CMD at 50% spool stroke		
Step Response	Versions AJ, BJ, CJ, DJ: Full Shift, <60 mS Versions CK, DK: Full Shift, <70 mS		
Repeatability	< 0.5% of spool stroke		
Hysteresis	< 1.5%		
Nominal Deadband	10%		
Operating Temp. Range (Ambient)	24 volt model: -20° to 60°C (-4° to 140°F) 12 volt model: -29° to 60°C (-20° to 140°F)		
Power Requirements	24 VDC @ 3 amps nom. (AJ, BJ, CJ, DJ) Range 21 to 30 VDC regulated 12 VDC @ 3 amps nom. (CK, DK) Range 11.5 to 15 VDC regulated **4 amp regulated power supply recommended		
		Command Signal	Input Impedance
		Version AJ, BJ, CJ, DJ	0 to ± 10 VDC Dbl. Coil 100 k ohms 0 to + 10 VDC Sgl. Coil 100 k ohms
		Version CK, DK	0 to ± 5 VDC Dbl. Coil 100 k ohms 0 to + 5 VDC Sgl. Coil 100 k ohms
		Version AJ, BJ, CJ, DJ	4 to 20 mA Command 499 ohms
		Version CK, DK	4 to 20 mA Command 249 ohms
		Spool Position Voltage	Version AJ, BJ, CJ, DJ: ±10 VDC Version CK, DK: ±5 VDC
		Reference Supply	±10 VDC @ 10 mA (AJ, BJ, CJ, DJ) ±5 VDC @ 10 mA (CK, DK)
		Low Power Fault Protection	20 VDC (AJ, BJ, CJ, DJ) 11 VDC (CK, DK)
		Diagnostics	Red/Green LEDs for spool position
		Viscosity Range	75 - 600 SSU
		Fluid Cleanliness	ISO Class 16/13, SAE Class 4 or better
		Protection Class	Nema 4 (IP65)

Configuration Definition

The D1FX is supplied in two basic configurations — non-feedback and feedback. Non-feedback refers to valves having only a command input with any feedback loop closures made external to the valve. Feedback refers to valves having input terminals for both command and feedback and electronics for proportional loop closure. All the D1FX versions incorporate an internal spool position feedback.

The non-feedback versions include the Standard driver (AJ), a European version (BJ), and deadband versions (DJ & DK).

Feedback versions (CJ & CK) provide for external proportional feedback.

Detailed setup instructions can be found in the

Options and Adjustments section. Not all jumpers and potentiometers are functional on every version.

Installation

Refer to the back of the manual for fluid recommendations, mounting restrictions, and other general installation instructions.

Standard Driver — Version AJ

Refer to the Functional Block diagram in figure 1. This is the standard 24 VDC version which accepts either a voltage or current command input. Output flow is proportional to the spool position which follows the Adjusted Command signal. ± 10 V reference voltages are available on Pins A and F of the I/O connector for a command potentiometer.

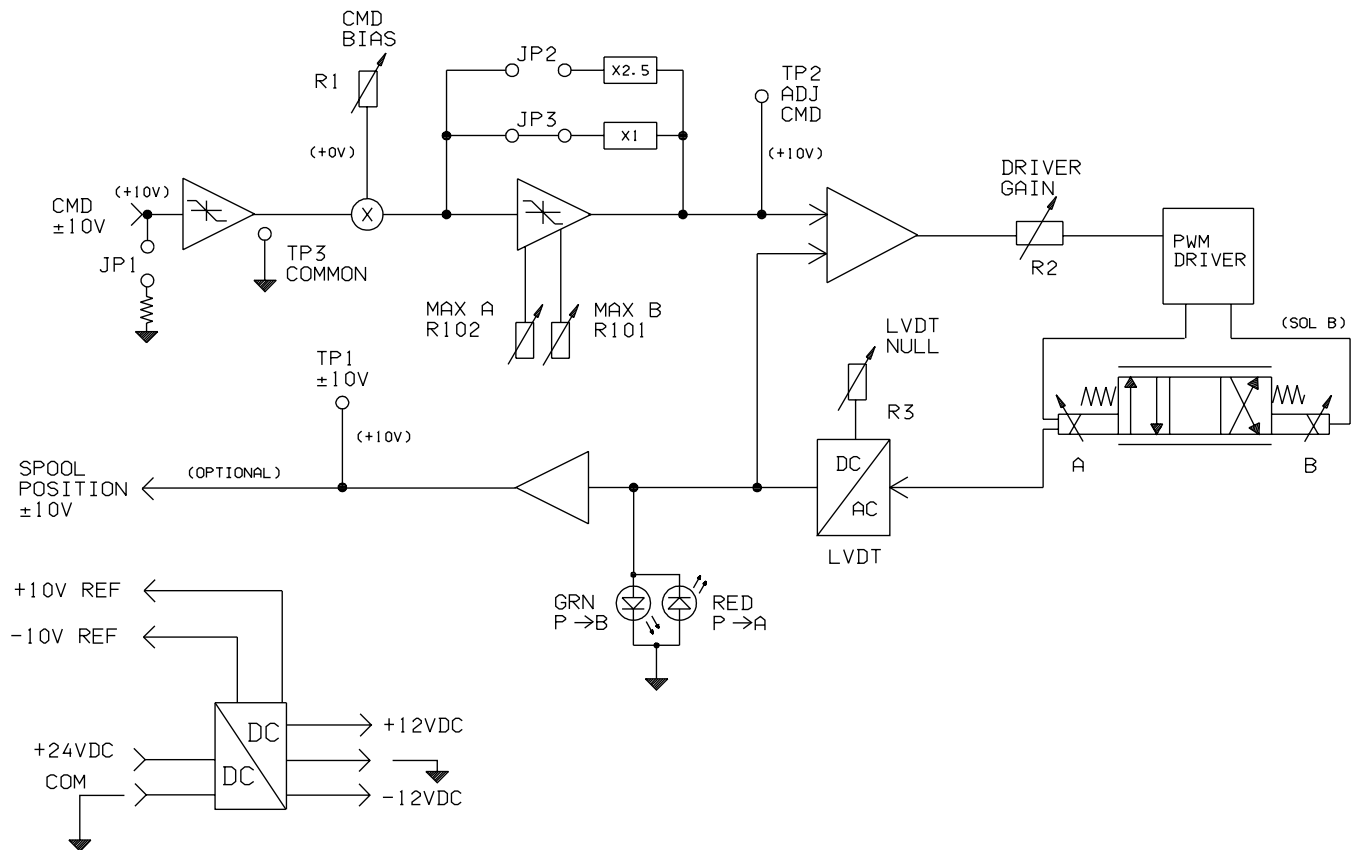


Figure 1 — Version AJ Functional Block Diagram

Diagnostic Chart

CMD	TP2 Adj Cmd	FLOW	LED	TP1 Spool
+10V	+10V	P Ò B	Grn	+10V
-10V	-10V	P Ò A	Red	-10V

Initial Startup

Factory Settings:

- LVDT hydraulically nulled (R3)
- Max A and Max B adjusted fully CW
- JP3 inserted: X1 Cmd gain
- Bias set for 0 V (R1)

Initial Startup:

- Turn on the DC power supply.
- Apply the Command input
- Slowly increase the system pressure
- Cycle the command and verify that the flow is proportional to the input.

Options: (Refer to Options/Adjustments section)

- Spool position monitoring (TP1 or Pin C)
- Max flow adjustments
- Reference voltages
- Current Cmd
- Bias

Interface Wiring, 6 Pin I/O Connector

Function	Description	EHC** 8 Cable	
		Pin	Wire Color
Power Supply	24VDC Nom. + Power Supply Common	E D	Red Grn & Yel
Command	±10 VDC signal 4-20 mA, ±20 mA	B	Blue
Reference Voltages	+10 VDC -10 VDC	A F	Orn Wht
Spool	±10 VDC	C	Blk

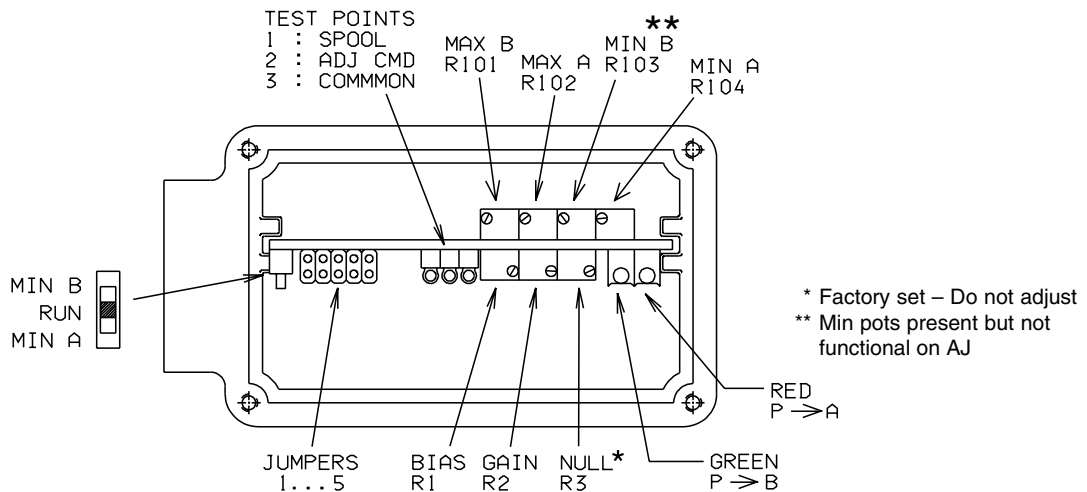


Figure 2 — Version AJ Board Setup

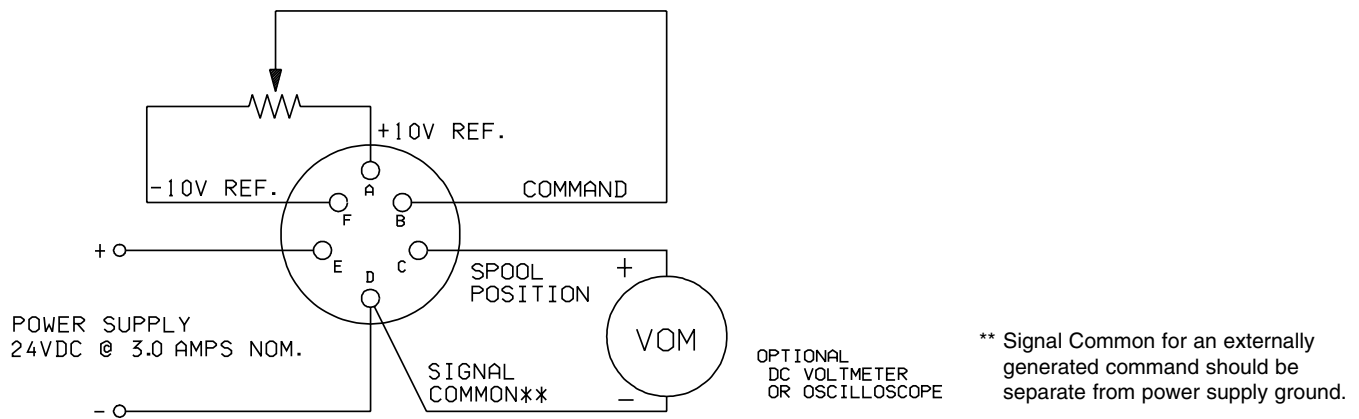


Figure 3 — Interface Wiring Diagram, Version AJ

European Version BJ

Refer to the Functional Block diagram in Figure 4. The basic logic is the same as version AJ.

The power supply requirement is still +24 VDC but a separate wire has been added for chassis grounding. Pin E of the 7 pin connector is connected internally to the valve body but isolated from the electronics. An Enable signal is required at Pin C or the solenoids will remain de-energized.

The command input accepts either voltage or current inputs and has differential input capability for noise immunity and easy reversal of phasing. Output flow is proportional to the spool position which follows the adjusted command signal. The spool position may be observed at TP1 or at Pin F. Reference voltages are not available.

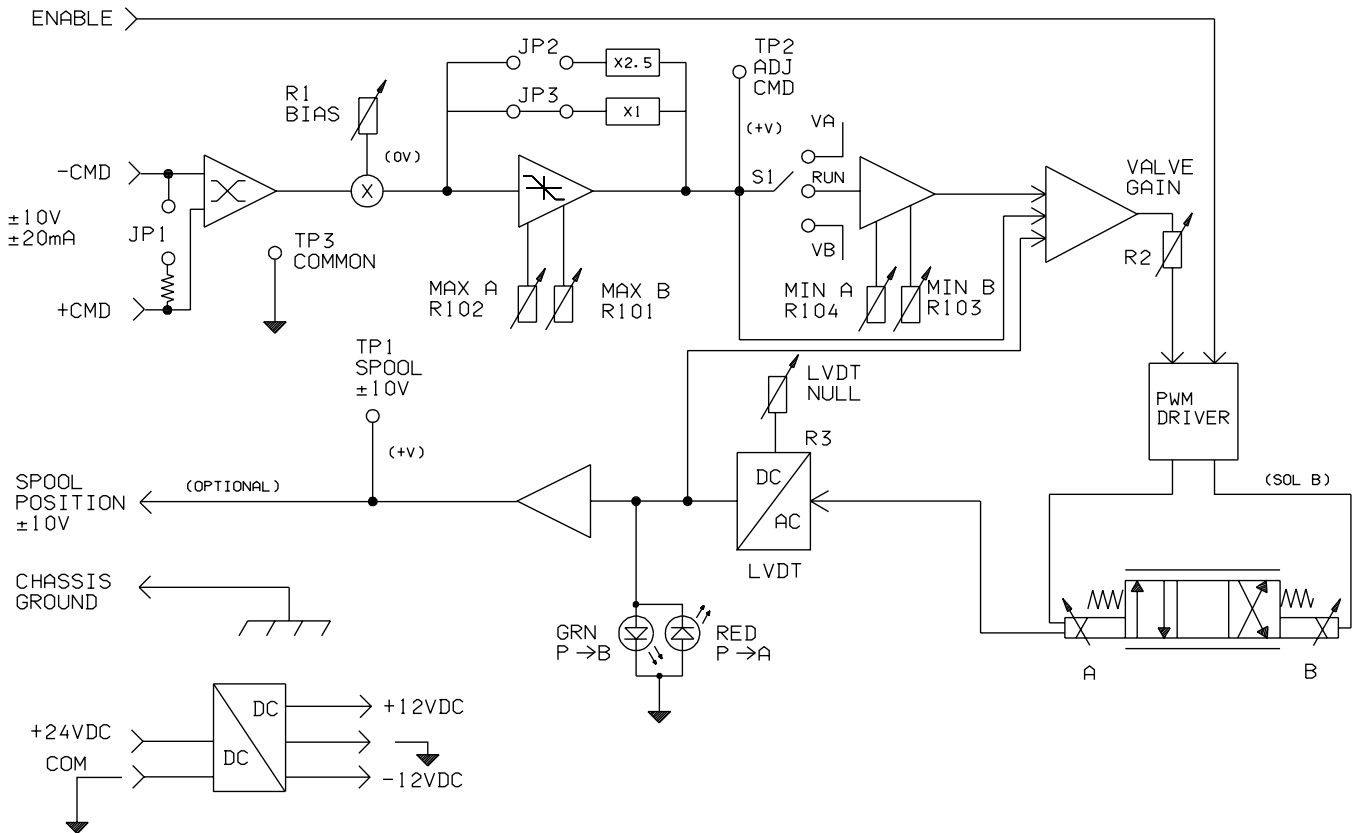


Figure 4 — Version BJ Functional Block Diagram

Diagnostic Chart

-CMD/ +CMD	TP2 Adj Cmd	FLOW	LED	TP1 Spool
+/-10V	+10V	P \hat{O} B	Grn	+10V
-/+10V	-10V	P \hat{O} A	Red	-10V

Initial Startup

Factory Settings:

- LVDT hydraulically nulled (R3)
- Max A and Max B adjusted fully CW
- Min A and Min B adjusted fully CCW
- JP3 inserted: X1 Cmd gain
- Bias set for 0 V (R1)

Initial Startup:

- Turn on the DC power supply
- Adjust Min A and Min B
- Apply the command input
- Slowly increase the system pressure
- Cycle the command and verify that the flow is proportional to the input
- Adjust Max A and Max B

Options: (Refer to Options/Adjustments section)

- Spool position monitoring (TP1 or Pin F)
- Min adjustments
- Max flow adjustments
- Current Cmd
- Bias

Interface Wiring, 7 Pin I/O Connector

Function	Description	EHC** 8G Cable	
		Pin	Wire Color
Power Supply	24VDC Nom. + Power Suply Common	A	Red
		B	Blk
Enable	5 to 30 VDC	C	Yel
Command	±10 VDC signal 4-20 mA, ±20mA +CMD -CMD	D	Blue
		E	Orn
Spool	±10 VDC	F	Wht
Chassis Ground	To valve body	G	Grn

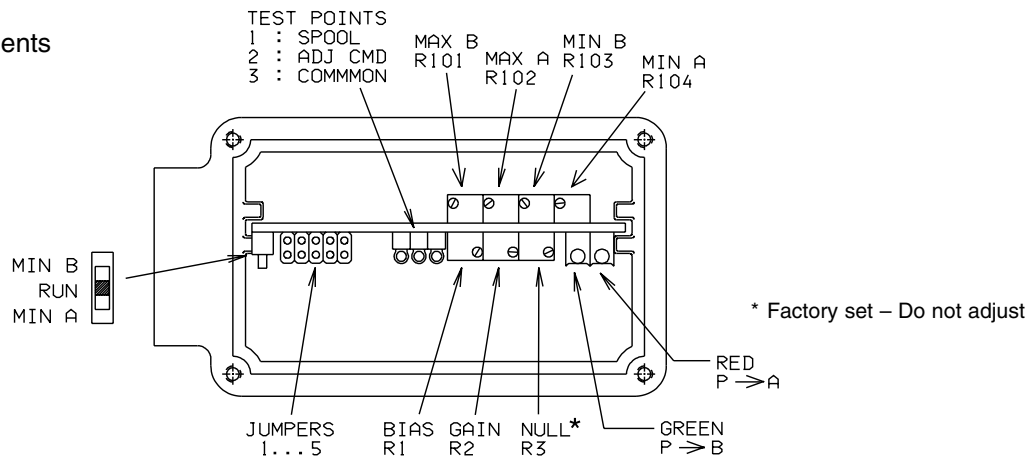


Figure 5 — Version BJ Board Setup

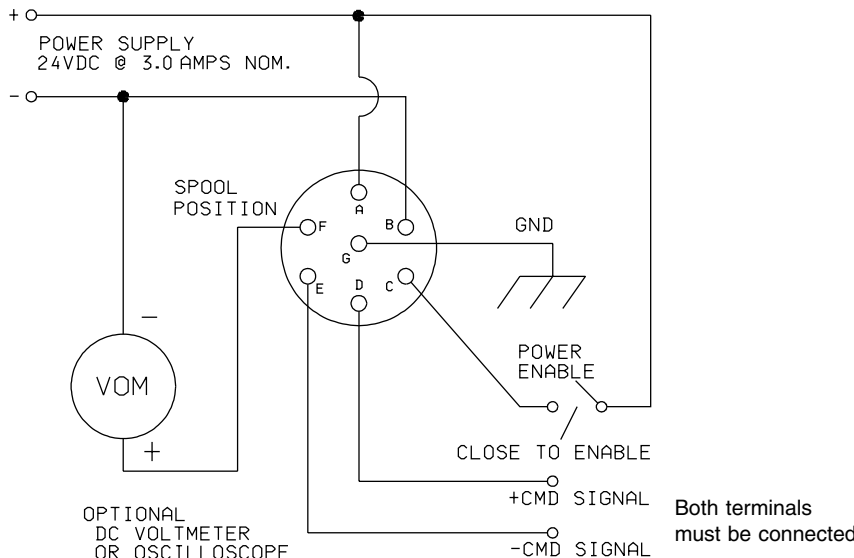


Figure 6 — Interface Wiring Diagram, Version BJ

**External Closed Loop Feedback —
Versions CJ and CK**

Special Note: The successful design and startup of either a closed loop positioning or velocity control system requires considerable forethought and a good understanding of the dynamics of the system and the load one is attempting to control. Closed loop feedback control is a broad topic and far exceeds the scope of this instruction set. It is the intention of the following instruction sheet to provide the necessary information to set-up the D1FX for use in typical closed loop applications. It is the responsibility of the user to understand the limitations, hazards, and implications of closed loop feedback control systems, as well as detailed tuning procedures required by some control schemes.

The feedback version is available in both a 24 VDC and 12 VDC nominal power supply. It has the option of either a voltage or current command signal. The feedback signal must be a voltage signal and can not exceed ± 10 VDC (± 5 VDC for CK). The feedback signal may have the same or opposite polarity to the command signal but **must** be the same magnitude as the command signal as there are no scaling adjustments provided. Reference voltages are available on pins A & F of the I/O connector for the command or feedback potentiometer.

The outer loop has proportional feedback. There are adjustable gains for both flow directions. Minimum threshold adjustments are available to optimally tune closed loop positioning systems.

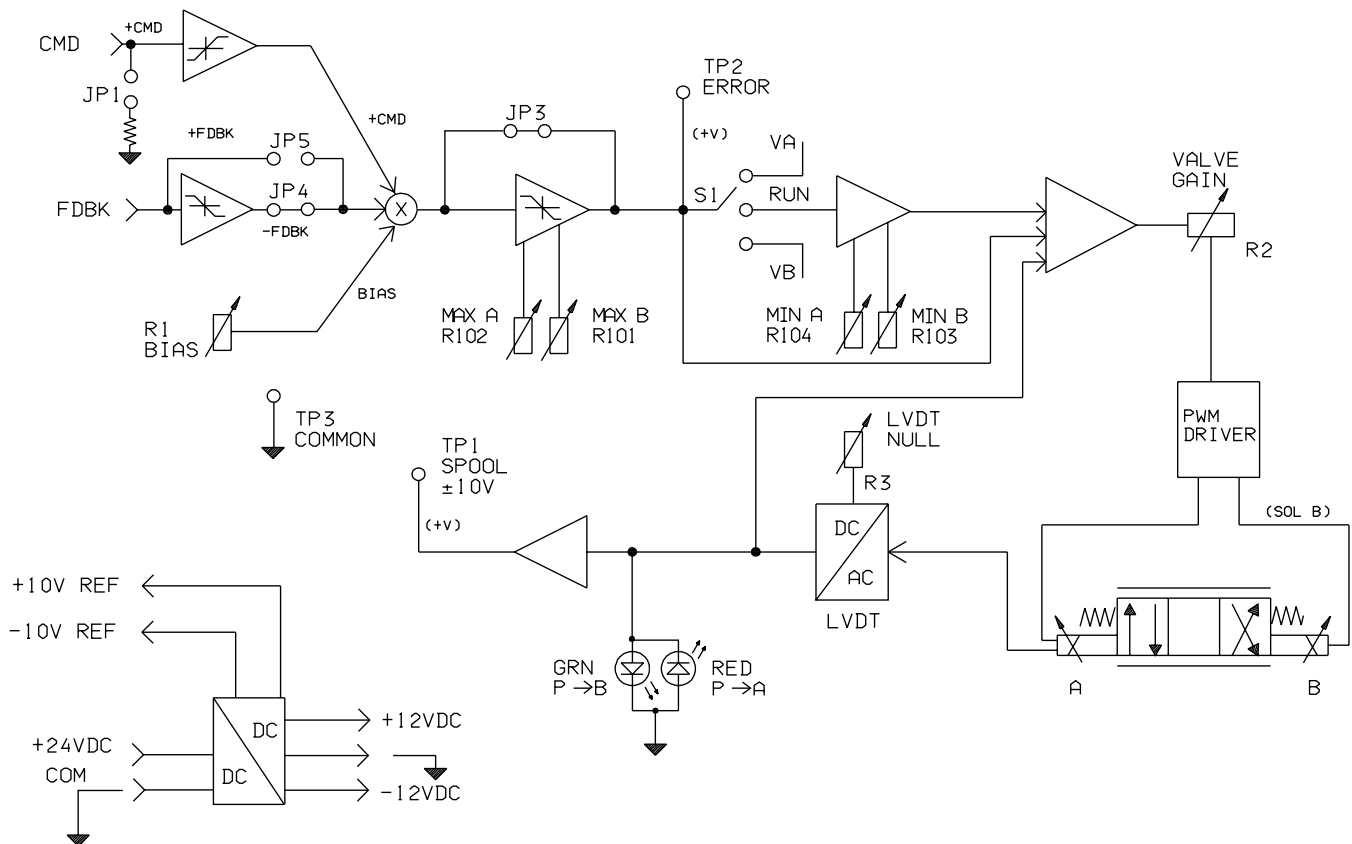


Figure 7 — Version CJ Functional Block Diagram

Diagnostic Chart

INPUTS	TP2 Error	FLOW	LED	TP1 Spool
CMD > FDBK	-V	P → A	Red	-V
CMD < FDBK	+V	P → B	Grn	+V

Initial Startup

Factory Settings:

- LVDT hydraulically nulled (R3)
- Max A and Max B adjusted approx half way
- Min A and Min B adjusted fully CCW
- JP3 inserted-proportional gain
- JP4 inserted-(Invert Fdbk)
- Bias set for 0 V (R1)

Initial Startup:

- Turn on the DC power supply
- Adjust Min A and Min B
- Connect the command input
- Connect the feedback input (Insert JP4 if the Fdbk and Cmd have the same polarity. Remove JP4 and insert JP5 for opposite polarity.)
- Slowly increase the system pressure
- Cycle the command and verify that the Fdbk follows the Cmd
- Adjust Max A and Max B

Options: (Refer to Options/Adjustments section)

- Spool position monitoring (TP1)
- Min adjustments
- Max gain adjustments
- Reference voltages
- Current Cmd
- Bias

Interface Wiring, 6 Pin I/O Connector

Function	Description	EHC** 8 Cable	
		Pin	Wire Color
*Power Supply	24VDC Nom. +Power Supply Common	E D	Red Grn & Yel
*Command	±10 VDC signal 0 to 20 mA	B	Blue
Reference Voltages	+10 VDC -10 VDC	A F	Orn Wht
*FDBK	±10 VDC	C	Blk

* "CK" version requires 12 VDC power supply and ±5 VDC input signals. Reference voltages are ±5 VDC.

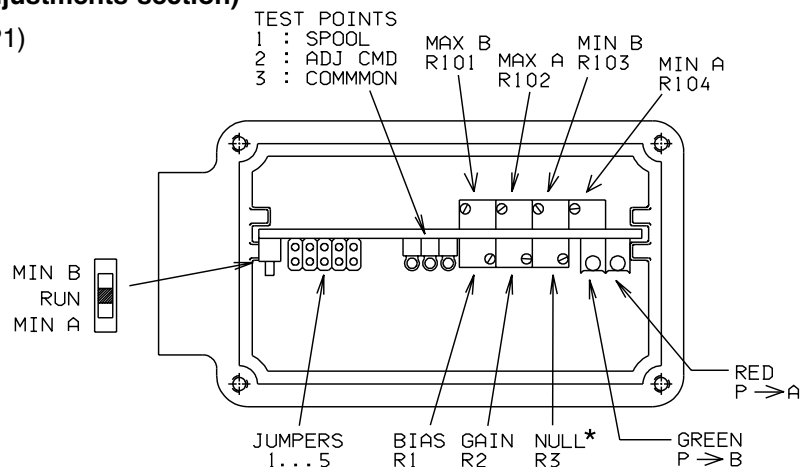


Figure 8 — Version CJ Board Setup

* Factory set – Do not adjust

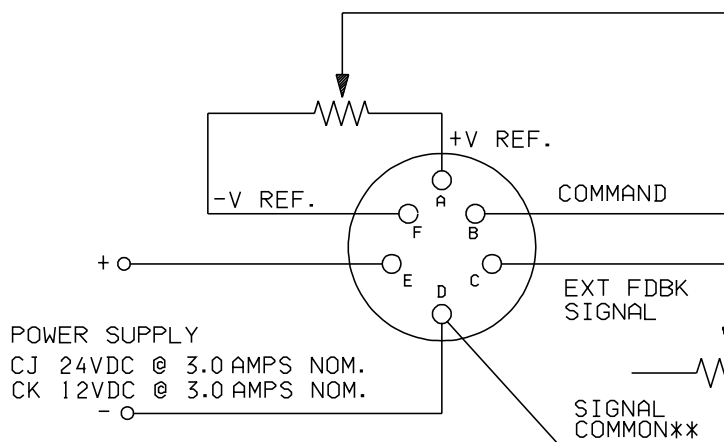


Figure 9 — Interface Wiring Diagram, Version CJ

** Signal Common for CMD or FDBK should be separate from power supply ground.

Standard Driver with Deadband Eliminators — Versions DJ and DK

The standard D1FX valve may not, depending on the load, be electrically symmetrical about the no-flow condition. Occasionally, (such as when using a PLC generated signal) it is desirable to equalize the signal needed for similar flow from P to A and P to B. Deadband or minimum threshold adjustments are designed to make the D1FX electrically symmetrical about the no-flow condition. This is a means of more easily hydraulically nulling and reducing the no-flow deadband at the same time.

Should this valve be used in a closed loop positioning system, deadband adjustments are an effective method of achieving higher repeatability and accuracy with a relatively low position loop gain.

This valve is available in both a 24 VDC and 12 VDC nominal power supply. It has the option of either voltage or current command signal. Reference voltages are available on the MS connector for the command or feedback potentiometer.

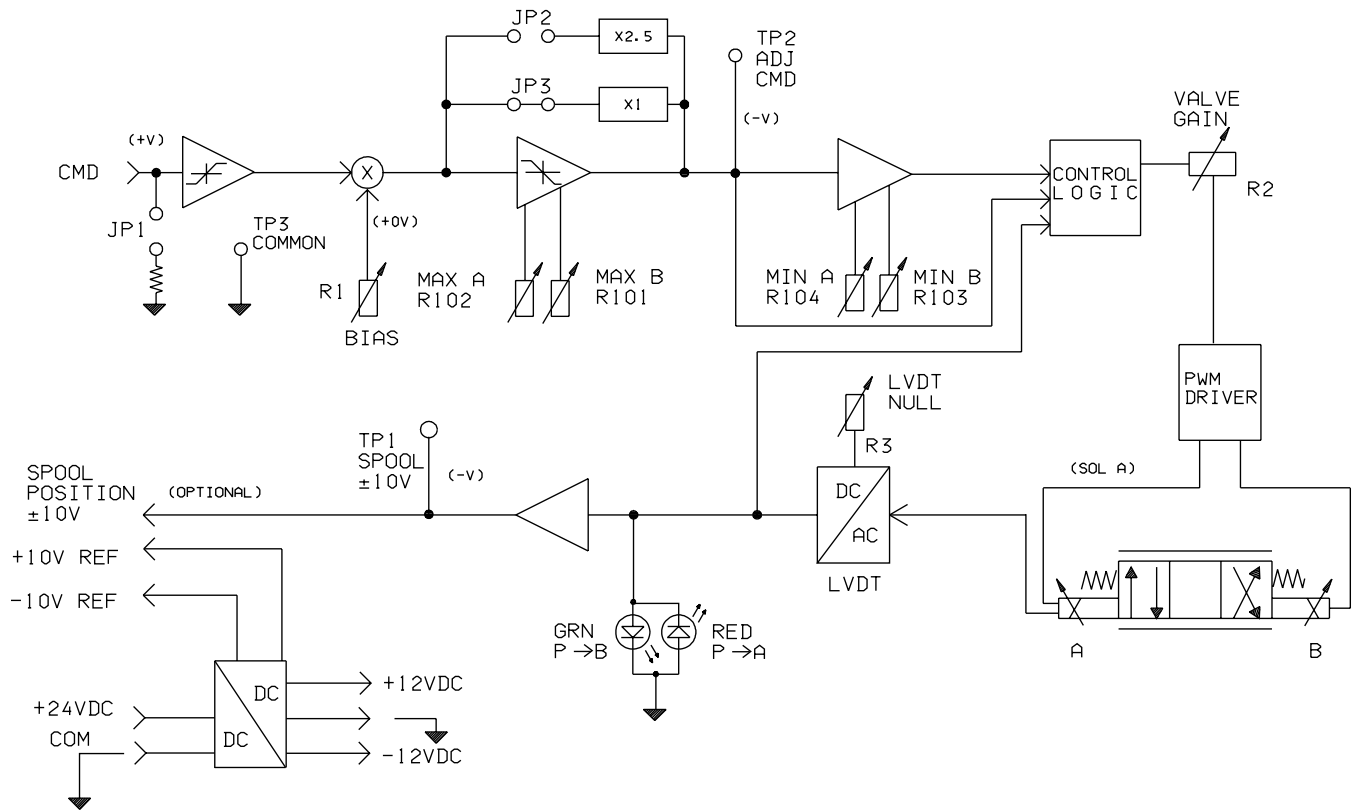


Figure 10 — Version DJ Functional Block Diagram

Diagnostic Chart

CMD	TP2 Adj Cmd	FLOW	LED	TP1 Spool
+10V	-10V	P → A	Red	-10V
-10V	+10V	P → B	Grn	+10V

Initial Startup

Factory Settings:

- LVDT hydraulically nulled (R3)
- Max A and Max B adjusted fully CW
- Min A and Min B adjusted fully CCW
- JP3 inserted: X 1 Cmd gain
- Bias set for 0 V (R1)

Initial Startup:

- Turn on the DC power supply
- Adjust Min A and Min B
- Connect the command input
- Slowly increase the system pressure
- Cycle the command and verify that the flow is proportional to the input
- Adjust Max A and Max B

Options: (Refer to Options/Adjustments section)

- Spool position monitoring (TP1 or PIN C)
- Min adjustments
- Max flow adjustments
- Reference voltages
- Current Cmd
- Bias

Interface Wiring, 6 Pin I/O Connector

Function	Description	EHC** 8 Cable	
		Pin	Wire Color
*Power Supply	24VDC Nom. +Power Supply Common	E D	Red Grn & Yel
*Command	±10 VDC signal 4-20 mA, ±20 mA	B	Blue
*Reference Voltages	+10 VDC -10 VDC	A F	Orn Wht
*Spool	±10 VDC	C	Blk

* "DK" version requires 12 VDC power supply and ±5 VDC input signal. Reference voltages are ±5 VDC.

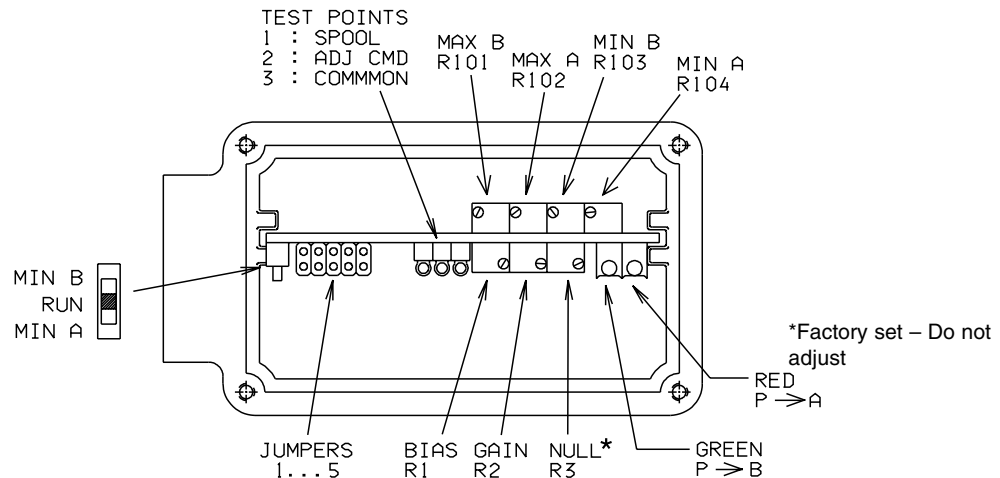


Figure 11 — Version DJ Board Setup

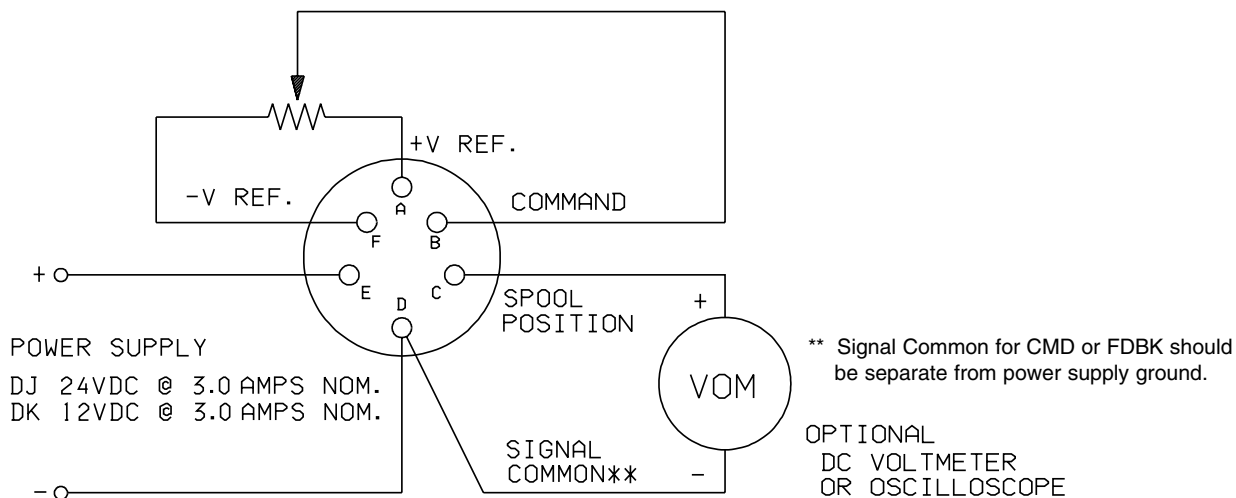


Figure 12 — Interface Wiring Diagram, Version DJ

Spool Position Monitoring

The spool position relative to its zero starting point can be observed at TP1.

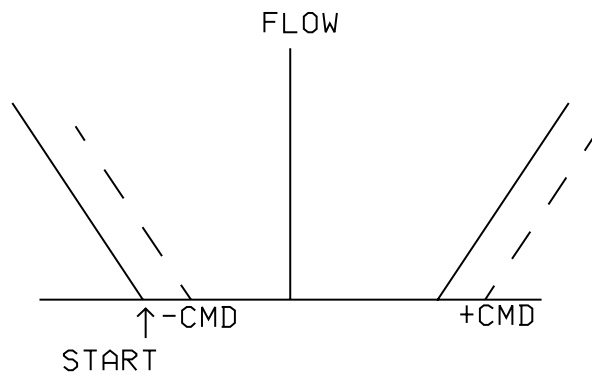
The spool voltage follows the command input after all adjustments have been made.

LVDT Null

The D1FX valves are hydraulically nulled to a double rod cylinder. The null should not need adjustment.

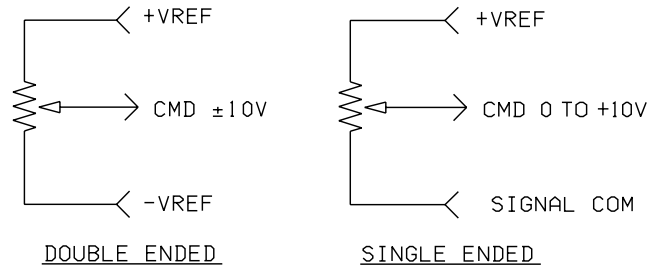
If it appears necessary to null the valve :

- Adjust Min A and Min B fully CCW.
- On the C version Max A and Max B should be adjusted approx halfway with the fdbk input disconnected.
- With pressure at 500 psi, set command input to approximately 0 volts.
- Slowly increase the command until flow just begins. Record this setting (+Cmd).
- Slowly decrease the command until flow just begins with a negative input (-Cmd).
- Add the magnitude of the two values and then divide by 2. This is the value at which flow should start in either direction (Start).
- If the magnitude of -Cmd was less than +Cmd, set the input to -Start. Otherwise set the input to +Start.
- Slowly adjust R3 (NULL) until flow just begins.



Reference Voltages (AJ,CJ,CK,DJ,DK)

Reference voltages are available for wiring to potentiometers for Cmd or Fdbk inputs. Up to 10 mA current is available but a 10 K ohm pot is recommended. The potentiometer can be wired for either a \pm voltage or for a single polarity as shown below. Check wiring before applying power. Incorrect wiring can result in damage to the electronics.

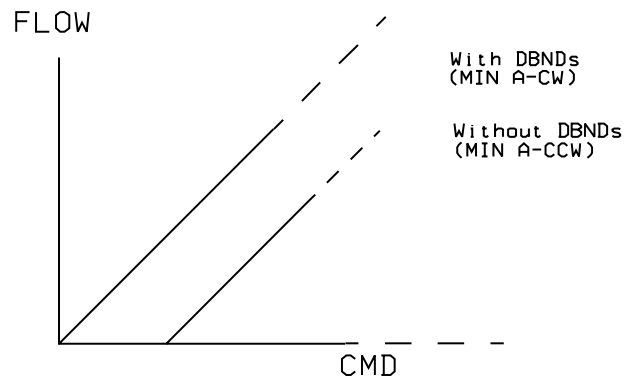


Manual Overrides

Manual overrides are a design feature which allow the user to shift the valve in a system without electrical power. In the center of each coil there is a brass pin. Pushing on one of these pins with an allen wrench will result in flow.

Min Adjustments (BJ,CJ,CK,DJ,DK)

Min A and Min B can be adjusted to reduce the mechanical deadband in the valve.



Min Adjustments (cont.)

To adjust:

- Remove Cmd and Fdbk inputs. Bias should be set for 0 V.
- Apply low hydraulic pressure
- Move the switch down to A
- Adjust Min A CW until flow just begins
- Turn back CCW until flow ceases
- Move the switch up to B and repeat with Min B
- Move switch to center for Run

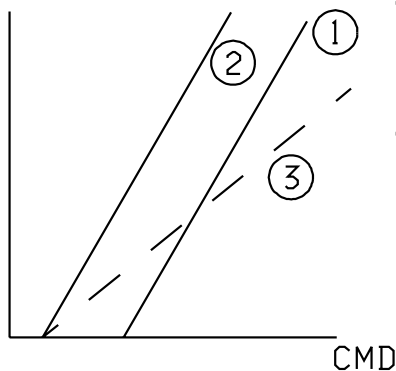
Max Flow Adjustments (AJ,BJ,DJ,DK)

Max A and Max B can be used to limit or scale flow on the open loop versions. Potentiometers fully CW results in maximum spool travel. Fully CCW reduces spool travel by 30% with JP3 gain and 10% with JP2 gain.

- Set the Cmd for maximum input
- Adjust the Max pot for the desired flow
- Repeat for the opposite flow direction

Adjust Min A and Min B before Max A and Max B.

FLOW



NOTE :

- ① MAX A-CW
(MIN A-CCW)
- ② MAX A-CW
(MIN A-CW)
- ③ MAX A-CCW
(MIN A-CW)

Max Gain Adjustments (CJ,CK)

The CJ & CK versions provide for proportional feedback with adjustable gains for the A and B solenoids.

- Adjust Max A and Max B to approx center (15 out of 30 turns).
- Connect the inputs. Apply low pressure and verify phasing is correct.
- Disconnect the inputs. Add the Min thresholds.
- Once the basic system is operational, the gain can be adjusted for optimum performance. When the error signal at TP2 is positive (green LED), adjust Max B (R101). When the error signal is negative (red LED), adjust Max A (R102).

Bias (All versions)

The command bias is factory set to 0 VDC. It can be used with a current input or PLC to provide bidirectional flow.

To reset the bias to zero:

- Disconnect any inputs.
- Adjust Max A and Max B about midpoint.
- Adjust bias (R1) until TP2 reads zero volts.

Current or PLC Command (All versions)

The 24 V versions have a 499 ohm current resistor which converts 0 to 20 mA \hat{O} 0 to 10 V signal.

(4 to 20 mA \hat{O} 2 to 10 V)

The 12 V versions have a 249 ohm resistor which converts 0 to 20 mA \hat{O} 0 to 5 V signal.

(4 to 20 mA \hat{O} 1 to 5 V)

4-20 mA or 0-10V inputs can be biased and amplified for full range on non-feedback versions.

- Adjust Max A and B fully CW. Connect Cmd required for “no flow” (5 volts for 0-10V input, 12 mA for 4-20 mA input)
- Adjust bias pot R1 until TP2 equals 0 V.
- For a gain of X2.5 insert jumper JP2
0-10 V \hat{O} \pm 12.5V
4-20 mA \hat{O} \pm 10V on 24 V versions
4-20 mA \hat{O} \pm 5V on 12 V versions
- For a gain of X1 insert JP3
0-10 V \hat{O} \pm 5V

Warning: Adding bias will result in flow when the command signal is removed. Use the Enable to remove the drive signal.

Symptom	Cause	Solution
Instability	<i>Power supply?</i>	Select a power supply not current limited below 4.0 Amps. Use a separate power supply for each valve. The power supply should be chassis grounded.
	<i>Noise on inputs?</i>	To verify, disconnect input signals to D1FX. Jumper Cmd and Fdbk terminals to common. For best results use a separate ground wire for signal inputs and power supply.
Actuator Drifting	<i>Min adjustments?</i>	Min adjustments can be adjusted such that the spool cannot stop flow and there will be no stable operating point. Remove the Min adjustments and start over.
	<i>System variations?</i>	The valve was hydraulically nulled for a double rod cylinder. In a closed loop system drift may occur with no inputs connected. Connect the feedback and make external loop gain adjustment.
Low Flow	<i>Flow limited?</i>	Adjust Max CW for more flow on versions A, B, and D. Correct gain jumper inserted (JP2 or JP3)? Verify that the command input is correct.
	<i>Floating input?</i>	Both inputs must be connected on B versions.
	<i>System pressure?</i>	Verify that the system pressure is set as required and there are no other flow paths.
No Flow	<i>Power?</i>	Verify there is power to the board and it is wired with the correct polarity. Verify that the ENABLE signal is present on Version B. Verify that the connections to the valve subplate are correct. Verify the hydraulic pump is on.
No Proportional Control	<i>Phasing?</i>	If Version A, B, or D is connected to an external feedback system, verify open loop operation of valve with a potentiometer. If Version C, make sure proper feedback jumper (JP4 or JP5) is installed. Improper system phasing would result in maximum flow output.

FOR MAXIMUM VALVE RELIABILITY,
ADHERE TO THE FOLLOWING
INSTALLATION INFORMATION

Fluid Recommendations

Premium quality mineral based hydraulic oil with a viscosity range between 150-250 SSU (32-54 cst.) at 38°C (100°F) is recommended. The absolute operation viscosity range is from 75-600 SSU (15-130 cst.). Oil should have maximum anti-wear properties and rust and oxidation treatment.

Filtration

For maximum valve and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid. (SAE Class 4 or better / ISO Code 16/13).

Silting

Silting can cause any sliding spool valve to stick, and not spring return, if held shifted under pressure for long periods of time. The valve should be cycled periodically to prevent sticking.

Special Installations

Consult your Parker representative for any application requiring the following :

- Pressure above rated.
- Fluid other than those specified.
- Synthetic or fire-resistant fluids.
- Oil temperature above 71.1°C (160°F).
- Flow path other than normal.
- Non-standard power supply grounding.

Torque Specifications

The recommended torque values are for the bolts which mount the valve to the manifold or subplate are as follows:

NFPA Size	Bolt Thread Size		Torque
	Metric	English	
D03	M5 x 0.8	10-24 UNC	5.6 N.m. (50 in.-lbs.)

Mounting Restriction

In order to ensure proper operation, the D1FX must be mounted horizontally. If the valve is mounted vertically, a check valve with a minimum rating of 1.4 Bar (20 PSI) should be placed in the tank line to maintain back pressure to the valve.

Tank Line Surges

If several valves are piped with a common tank line, flow surges in the line may cause an unexpected spool shift. Separate tank lines should be used when line surges are expected.

Subplate Specifications

Subplate	Port Size	Location	Max. Pressure	
			PSI	Bar
SPD23	3/8" NPTF	Bottom	3,000	210
SPD2330	3/8" NPTF	Bottom	5,000	345
SPD23S	9/16-18 NPTF	Bottom	3,000	210
SPD23SA	9/16-18 NPTF	Side	3,000	210

Ordering Information

**Proportional Directional Control Valves
Series D1FX, 30 Design**

D1F	X	E							0	0	30
D03 Electrohydraulic Directional Flow Control Valve	Control Option	Equal Metering	Spool	Flow Code	Style	Seal Option	Electronic Variations	Power Supply	Electronics Accessory	Valve Accessory	Design Series

Code	Description
N	Nitrile
V	Viton

Code	Description
A	Standard Driver w/ 6 pin MS
B	Euro Driver (7 pin MS) w/ external shutdown
C	External Close Loop Pos. Driver w/ 6 pin MS
D	Standard Driver w/ deadband eliminator & 6 pin MS

Code	Description
0	Standard

Code	Description
0	Standard

Code	Description
J	24 VDC
*K	12 VDC

* Only available in versions C & D

Code	Description	Symbol
C	Bi-Directional	
K	Uni-Directional Flow P → A & B → T	

Code	Nominal Flow @ ΔP=10 Bar (145 PSI)	
C	7.5 LPM (2.0 GPM)	
F	15 LPM (4.0 GPM)	

Code	Spool
01	
02	

Weight: Single Solenoid 3.2 kg (7.0 lbs.);
Double Solenoid 3.4 kg (7.5 lbs.)

Bolt Kit No. — BK209

Mounting Bolt Torque: 5.6 N.m. (50 in.-lbs.)

Weight: Single Solenoid 3.2 kg (7.0 lbs.);
Double Solenoid 3.4 kg (7.5 lbs.)

Bolt Kit No. — BK209

Mounting Bolt Torque: 5.6 N.m. (50 in.-lbs.)

Cables

EHC		8		
Electrohydraulic Cable for D1FX Valve	Length	Cable Type	Connector Type	

Code	Length	Code	Description	Code	Description
3	Length in Feet	8	8-wire, 18 awg. shielded (Alpha 5388)	Omit	Standard Connector 6 Pin for D1FX
6				G	7 Pin Connector for Euro, D1FX "B" variation
9					
12					
15					

Subplate	Port Size	Location	Max. Pressure PSI	Max. Pressure Bar
SPD23	3/8" NPTF	Bottom	3,000	210
SPD2330	3/8" NPTF	Bottom	5,000	345
SPD23S	9/16-18 NPTF	Bottom	3,000	210
SPD23SA	9/16-18 NPTF	Side	3,000	210

Note: For D1FX connector only, order part #697561 (6-pin)
For D1FX, Variation "B" connector only, order part #697323 (7-pin)

Use Power Supply #PS24, 24 VDC

Offer of Sale

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7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the notwithstanding any charges paid by Buyer. Unless otherwise agreed,

Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

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