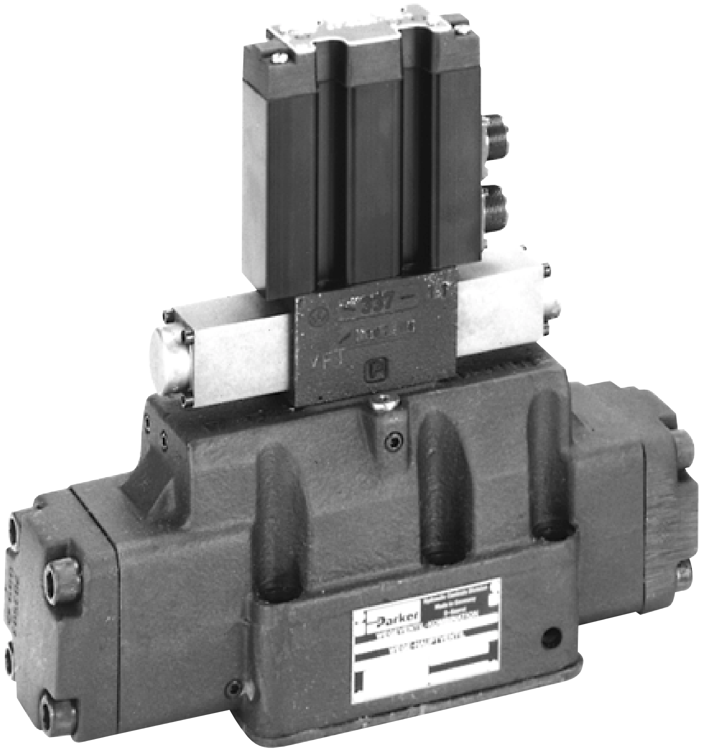
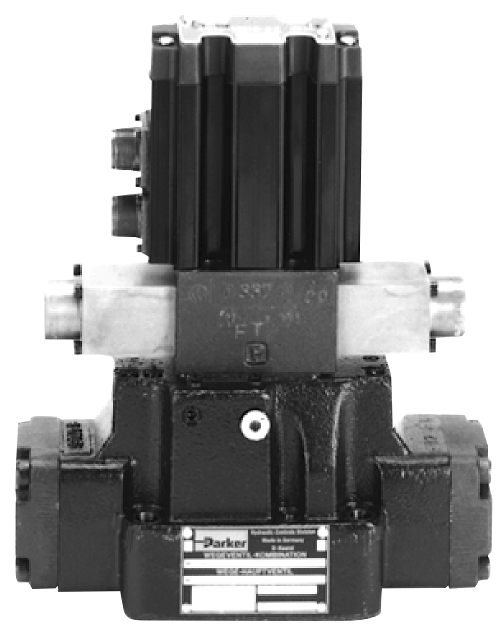
Parker
Hydraulics

Bulletin 2589-M1/USA
Installation Guide

Series D41FL and Series D91FL

Effective: June 1, 1999
Supersedes: August 12, 1996





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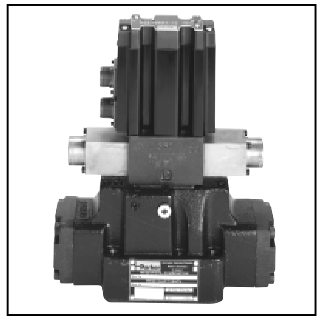
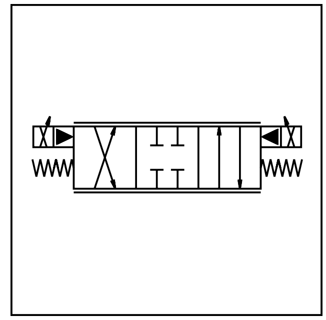
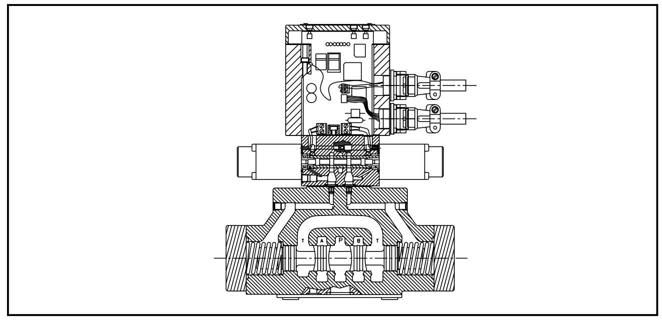
General Description

The Parker D41FL DigiValve is a pilot-operated four way proportional directional control valve that provides control of the acceleration, deceleration and velocity of an actuator using discrete input signals. An on-board microprocessor accepts input signals from 12 to 28 volts DC, or 100 to 130 volts AC. The digital electronic circuit processes the input signals and provides analog output to the coils that shift the control spool of the valve.







Features

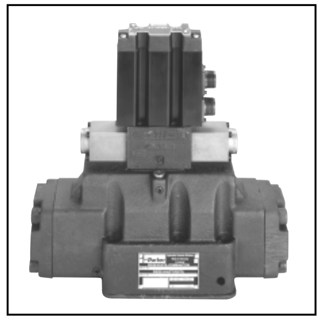
- **Digital Microprocessor Operation** — The digital control circuit provides repeatable performance and linear ramp control.
- **Discrete Input = Proportional Output** — The valve accepts discrete (on-off) signals and then provides proportional control of flow.
- **Ramp Control** — The valves have three ramp controls. Two ramps are adjustable from minimum response time up to 15 seconds for full spool stroke.
- **Dual Mode Operation** — The D41FL may be used as an electronic slow shift valve or a motion profiling valve. The mode is selected by the user.
- **High Speed/Low Speed Indication** — The indicator light is solid for high speed and flashing for low speed. In Soft Sheild mode, the indicator light will be solid only.
- **Diagnostics and Setup** — Each of the settings for ramp and velocity have a calibration point on the driver board. Once the user has the valve operating with the desired profile, the calibration numbers for each adjustment may be recorded. This data may be used to set up additional valves used in the same application.
- **Self Diagnostics** — The D41FL microprocessor runs through a self diagnosis of all circuits and D/A converters each time the valve is powered up with a 24 VDC power supply. LED signal lights provide an indication to the user that the valve is functional.

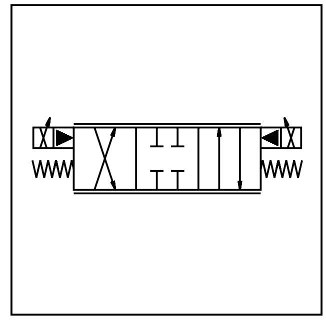
Specifications

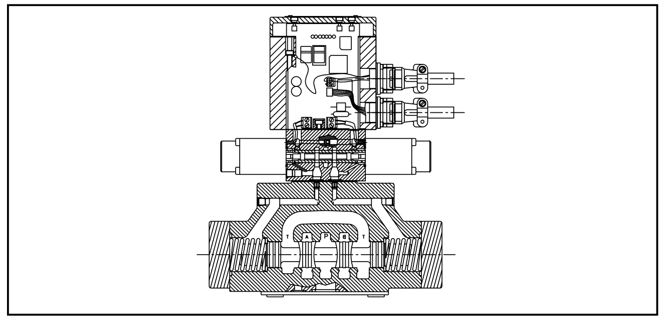
Interface	NFPA D07, CETOP 7
Max. Operating Pressure	345 Bar (5000 PSI) (see performance curves)
Max. Tank Line Pressure	10 Bar (150 PSI)
Min. Operating Pressure	30 Bar (450 PSI)
Optimum Perf. Pressure	>50 Bar (700 PSI)
Max. Pilot Press. Range	30-345 Bar (450-5000 PSI)
Max. Pilot Flow Required	2.2 LPM (0.58 GPM)
Step Response, Full Shift with min. Pilot Pressure 50 Bar (700 PSI)	75 ms
Max. Flow	Up to 166.5 LPM (44 GPM) (see performance curves)
Viscosity Range	75-600 SSU, mineral oil
Fluid Cleanliness Level	ISO Class 18/16/13, SAE Class 4
Protect. Rating IEC stds.	IP 65, NEMA 4
Power Requirements	24 VDC, 3.5 amps Range 12 to 28 VDC
Command Signal Input Range	AC Version, 100 to 130 VAC DC Version, 10 to 28 VDC Input impedance, >2K
Diagnostics	Red and Green LED signals
Operating Temperature	-29 to 60°C (-20 to 140°F)
Mounting	Horizontal preferred

General Description

The Parker D91FL DigiValve is a pilot-operated four way proportional directional control valve that provides control of the acceleration, deceleration and velocity of an actuator using discrete input signals. An on-board microprocessor accepts input signals from 12 to 28 volts DC, or 100 to 130 volts AC. The digital electronic circuit processes the input signals and provides analog output to the coils that shift the control spool of the valve.







Features

- **Digital Microprocessor Operation** — The digital control circuit provides repeatable performance and linear ramp control.
- **Discrete Input = Proportional Output** — The valve accepts discrete (on-off) signals and then provides proportional control of flow.
- **Ramp Control** — The valves have three ramp controls. Two ramps are adjustable from minimum response time up to 15 seconds for full spool stroke.
- **Dual Mode Operation** — The D91FL may be used as an electronic slow shift valve or a motion profiling valve. The mode is selected by the user.
- **High Speed/Low Speed Indication** — The indicator light is solid for high speed an dflashing for low speed. In Soft Shift mode, the indicator light will be solid only.
- **Diagnostics and Setup** — Each of the settings for ramp and velocity have a calibration point on the driver board. Once the user has the valve operating with the desired profile, the calibration numbers for each adjustment may be recorded. This data may be used to set up additional valves used in the same application.
- **Self Diagnostics** — The D91FL microprocessor runs through a self diagnosis of all circuits and D/A converters each time the valve is powered up with a 24 VDC power supply. LED signal lights provide an indication to the user that the valve is functional.

Specifications

Interface	NFPA D08, CETOP 8
Max. Operating Pressure	345 Bar (5000 PSI) (see performance curves)
Max. Tank Line Pressure	10 Bar (150 PSI)
Min. Operating Pressure	30 Bar (450 PSI)
Optimum Perf. Pressure	>50 Bar (700 PSI)
Max. Pilot Press. Range	30-345 Bar (450-5000 PSI)
Max. Pilot Flow Required	4.5 LPM (1.19 GPM)
Step Response, Full Shift with min. Pilot Pressure 50 Bar (700 PSI)	100 ms
Max. Flow	Up to 401.2 LPM (106 GPM) (see performance curves)
Viscosity Range	75-600 SSU, mineral oil
Fluid Cleanliness Level	ISO Class 18/16/13, SAE Class 4
Protect. Rating IEC stds.	IP 65, NEMA 4
Power Requirements	24 VDC, 3.5 amps Range 12 to 28 VDC
Command Signal Input Range	AC Version, 100 to 130 VAC DC Version, 10 to 28 VDC Input impedance, >2K
Diagnostics	Red and Green LED signals
Operating Temperature	-29 to 60°C (-20 to 140°F)
Mounting	Horizontal preferred

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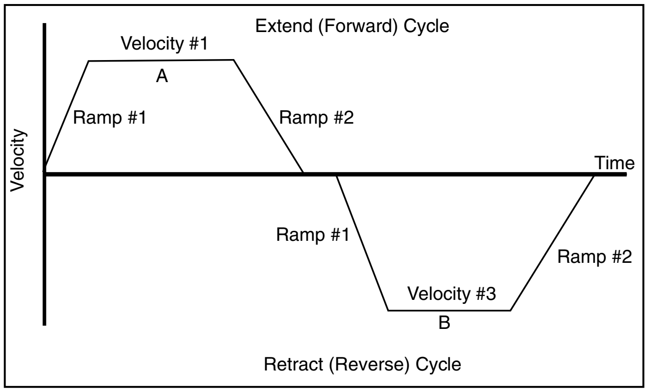


Figure 1a - Electronic Slow Shift

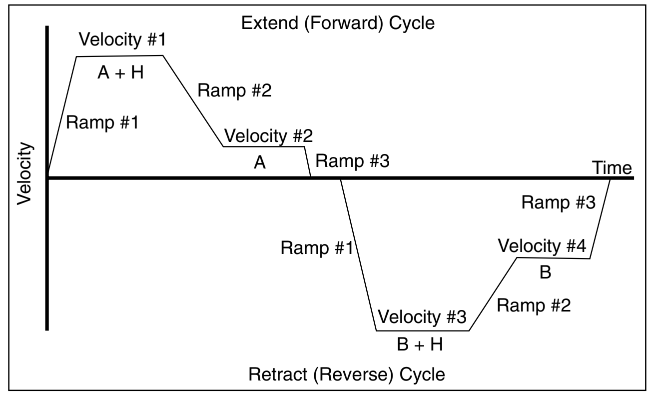
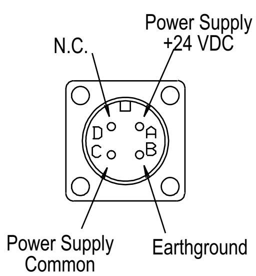


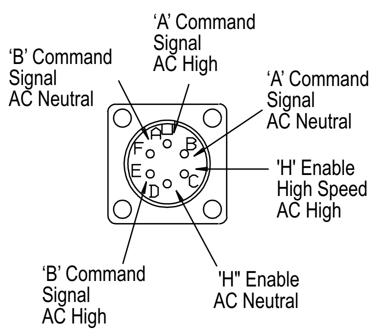
Figure 1b - Motion Profiling

Connectors

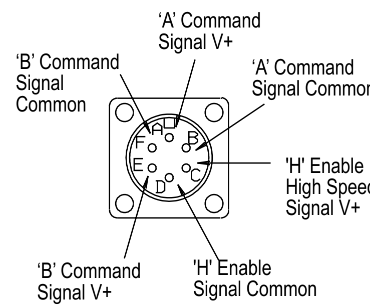
Model Code "T" and "W" Input Power



Model Code "T" Logic Inputs



Model Code "W" Logic Inputs



Electrical Specifications

Command Signal	
AC Version	100 to 130 VAC
Logic '1' Threshold Voltage	Typ. > 96 VAC
Logic '0' Threshold Voltage	Typ. < 51 VAC
Logic '1' Threshold Current	Typ. 2.5 mA, ± 0.68 mA
Logic '0' Threshold Current	Typ. 1.3 mA, ± 0.30 mA
DC Version	10 to 28 VDC
Logic '1' Threshold Voltage	Typ. > 9.6 VDC
Logic '0' Threshold Voltage	Typ. < 6.0 VDC
Logic '1' Threshold Current	Typ. 2.5 mA, ± 0.68 mA
Logic '0' Threshold Current	Typ. 1.3 mA, ± 0.30 mA

Power Supply Connector	
Pin A	Power Supply (+24 VDC @ 3.5 Amps 12-28 volt range)
Pin B	Earth GND
Pin C	Power Supply Common
Pin D	No Connection

Logic Input Connector	
AC Version — Model "T"	
Pin A	A Command Signal (AC High)...P→A, B→T
Pin B	A Command Signal (AC Neutral)
Pin C	High Speed Enable (AC High) "H"
Pin D	High Speed Enable (AC Neutral)
Pin E	B Command Signal (AC High)...P→B, A→T
Pin F	B Command Signal (AC Neutral)
DC Version — Model "W"	
Pin A	A Command Signal (V+)...P→A, B→T
Pin B	A Command Signal (Common)
Pin C	High Speed Enable (V+) "H"
Pin D	High Speed Enable (Common)
Pin E	B Command Signal (V+)...P→B, A→T
Pin F	B Command Signal (Common)

Diagnostics

LED Status	**Condition**
All LEDs "OFF"	Valve OK for operation
Any LEDs "ON"	Electronic failure - check manual

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Operation

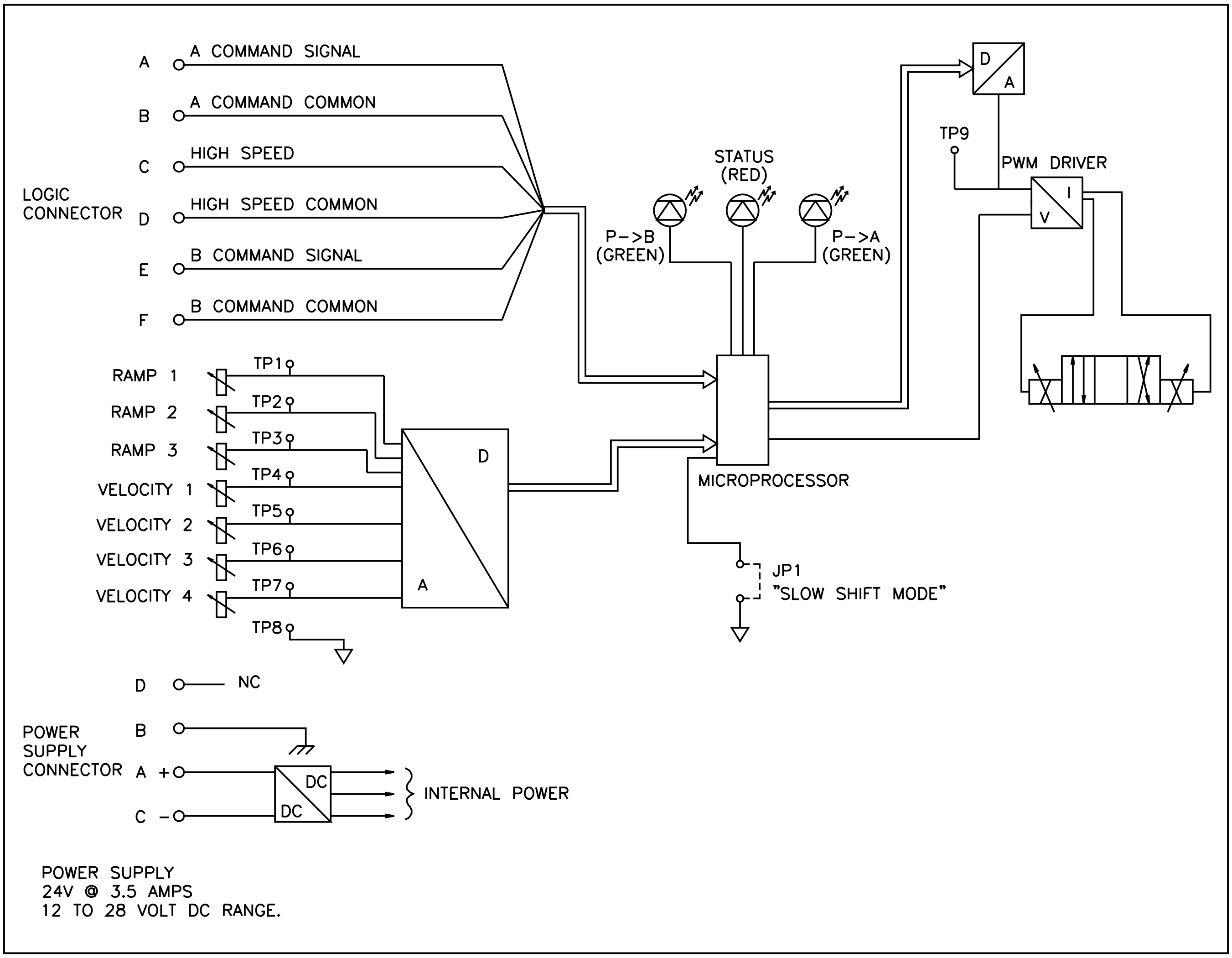


Figure 2 - Block Diagram D**FL

The valve operates in one of two control modes as selected by the user.

In the ***"Electronic Slow Shift"*** mode, the logic input signals trigger the valve to move the actuator in one direction. The acceleration rate, the maximum velocity, and the deceleration rate of the actuator are adjustable with simple potentiometer adjustments located under the top cover of the valve. The acceleration and deceleration adjustment range is from 25 milliseconds up to 15 seconds for full spool travel. Velocity potentiometer V1 is used for the forward direction and V3 is used for the reverse direction (See Figure 1a).

In the ***"Motion Profiling"*** mode, the valve will provide two speed velocity control typically used in rapid traverse and feed circuits. Traditional two speed circuits use solenoid operated valves that require two input signals for each direction. The D**FL accepts the same signals and provides control of two speeds for each direction of actuator movement (See Figure 1b).

The D**FL has adjustments for the acceleration rate to the first velocity (R1), control of the first velocity (V1), control of the deceleration to the second speed (R2), control of the second speed (V2), and finally control of the deceleration rate to the end of travel (R3). Separate velocity adjustments for reverse direction are also provided (V3 and V4).

Electronic Slow Shift Mode

Connection Diagram

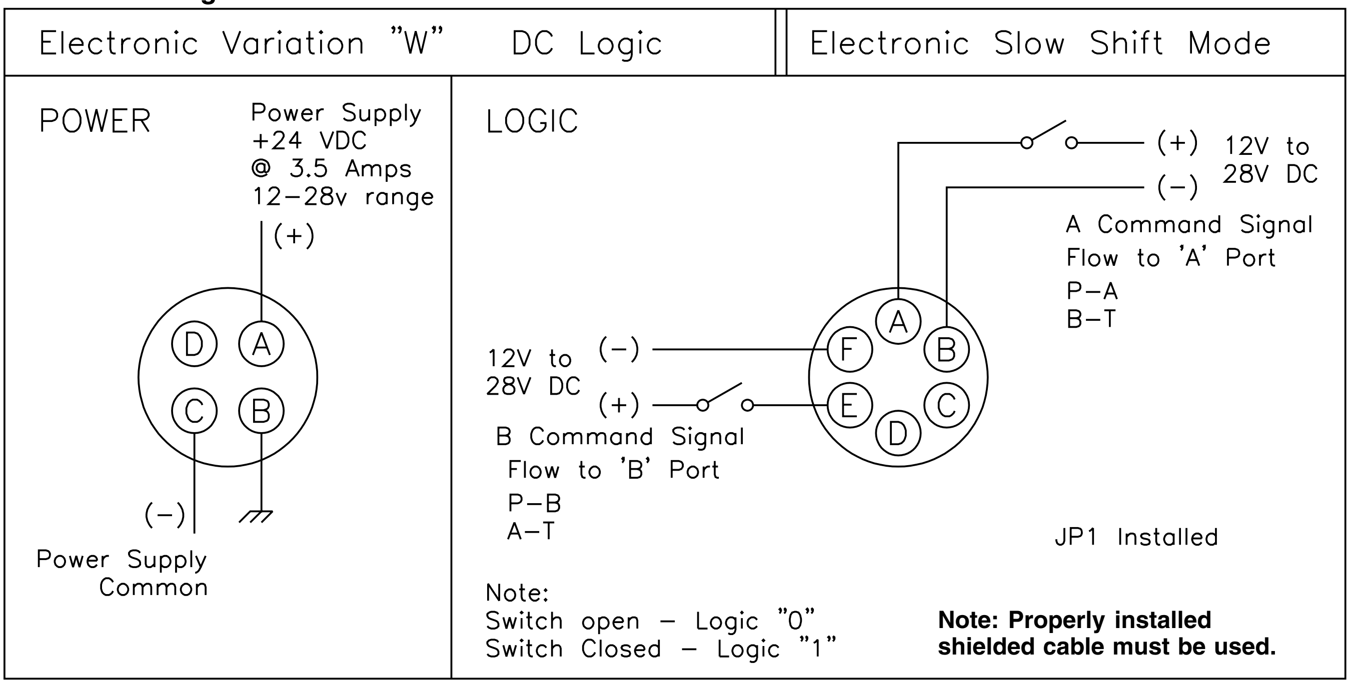


Figure 3 - Connection Diagram (Variation W) Electronic Slow Shift Mode

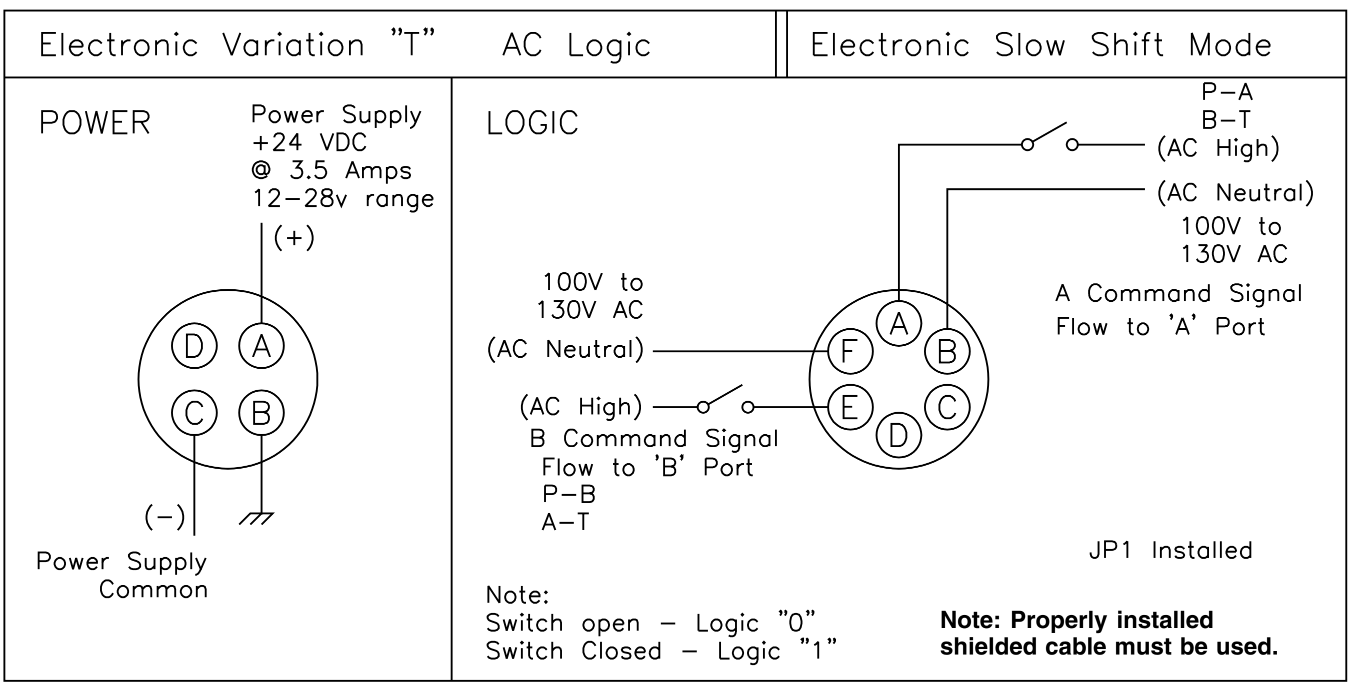


Figure 4 - Connection Diagram (Variation T) Electronic Slow Shift Mode

Figures 3 and 4 show typical connections for the ***"Electronic Slow Shift"*** mode for both *DC* and *AC* logic versions respectively. Jumper JP1 must be installed for this mode.

The D**FL has two connectors. One for power, and the other for logic.

A 24 volt DC power supply @ 3.5 amps is recommended for operation. The allowable input range is 12 volts to 28 volts DC. The power connector mates with a Parker P/N 1210292 (*connector only)* or an EHC**4LR cable assembly. Use 18 AWG, shielded cable for custom made cables. For applications requiring CE compliance, use cable assembly EHC**4LRE.

The logic inputs are either DC or AC, variation “W” or “T”. The valves are shipped in either variation and are not interchangeable. Please verify that you have the correct variation before powering the logic inputs. **Irreparable damage will occur if AC is applied to the DC variation**.

The logic connector mates with a Parker P/N MS3106E-14S-6S (*connector only*) or an EHC**6 cable assembly. Use 18 AWG, shielded cable for custom made cables. For applications requiring CE compliance use cable assembly EHC**6RE.

Setup Procedures

Velocity Control

Four potentiometers control the velocities (flow) for both directions of actuator movement. V1 and V2 control the velocities in one direction. V3 and V4 control the velocities in the other direction of travel. V2 and V4 velocity controls ***must*** be turned fully CCW in the ***Slow Shift Mode*** to achieve centering of the spool.

Velocity Setup Procedure:

1) Insert Jumper JP1 and remove JP2 if inserted. JP2 must be removed before power is applied.

2) Turn velocity controls V2 and V4 fully CCW. The voltage at *testpoints* V2 and V4 should read 0.0 VDC.

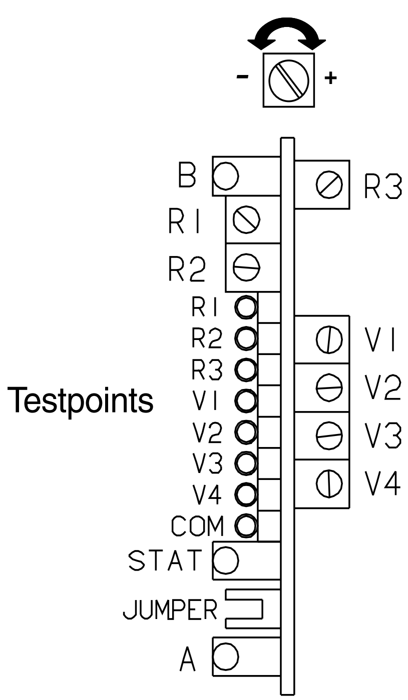
3) Turn velocity control V1 CCW until *testpoint* V1 is approximately 0.0 VDC. Adjust ramp controls R1 and R2 so that testpoints R1 and R2 is 0.0 VDC. Flow may be needed in the reverse direction during step 4 of this setup, initially adjust velocity control V3 to 2.5 VDC, measured at testpoint V3.

4) Apply the required power to the ‘A’ Command Signal (‘A’ port flow). Adjust velocity control V1 CW until required spool stroke (flow, velocity) is achieved. Max flow occurs when testpoint V1 reads 5.0 VDC. Multiple cycles may be needed to properly adjust the required spool stroke, especially with short stroke cylinders. In this case remove power from the ‘A’ Command Signal and apply the required power to the ‘B’ Command Signal to reverse the actuator. Once retracted, remove the ‘B’ command signal and repeat this step.

5) Adjust velocity control V3 CCW until testpoint V3 is approximately 0.0 VDC.

6) Apply the required power to the ‘B’ Command Signal (‘B’ port flow). Adjust velocity control V3 CW until required spool stroke (flow, velocity) is achieved. Max flow occurs when testpoint V3 reads 5.0 VDC. Multiple cycles may again be needed.

7) See Figure 5.



Control	Affects Port
R1	
R2	A
R3	
V1	
V2	
R1	
R2	B
R3	
V3	
V4	

Figure 5 - Adjustment Diagram (Slow Shift Mode)

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Acceleration and Deceleration Control

The digital electronics provides control of acceleration and deceleration. Accel and decel times can be adjusted from 25 milliseconds to 15 seconds for full spool travel. Two Potentiometers control the accel and decel rate for both directions of actuator movement. R1 controls the accel time and R2 the decel time.

Accel and Decel Setup Procedure:

1) Ramp control R1 and R2 should previously be set to the minimum ramp time in step #3 above (fully CCW).

2a) To decrease the acceleration rate, thus increase the accel ramp time, adjust R1 CW until the desired acceleration is achieved. The maximum ramp time occurs when testpoint R1 reads 5.00 VDC. Multiple cycles of the machine may again be needed to adjust the acceleration rate.

To decrease the deceleration rate, thus increase the decel ramp time, adjust R2 CW until the desired deceleration is achieved. The maximum ramp time occurs when testpoint R2 reads 5.00 VDC. Multiple cycles of the machine may again be needed to adjust the acceleration rate.

2b) ***(Optional)*** To calculate a close approximation of the accel or decel ramp time, use the formulas below.

$Time_{accel} = (R1_{rate} \times V1) - (R1 \times 1.875)$

$Time_{decel} = (R2_{rate} \times V1) - (R2 \times 1.875)$

Where:

$R1_{rate}$ = ***Seconds / Volt*** reading taken from Figure 6

To get this value, measure testpoint R1. Find this value on the horizontal axis (R1 or R2 testpoint voltage) of Figure 6. Then find the corresponding value from the Vertical axis (Seconds / Volt). This value then is $R1_{rate}$.

Example:

If the Voltage at testpoint R1 is 3.0 volts, then $R1_{rate} \cong 2$

$R2_{rate}$ = ***Seconds / Volt*** reading taken from Figure 6

To get this value, measure testpoint R2. Find this value on the horizontal axis (R1 or R2 testpoint voltage) of Figure 6. Then find the corresponding value from the Vertical axis (Seconds / Volt). This value then is $R2_{rate}$.

Example:

If the Voltage at testpoint R2 is 2.0 volts, then $R2_{rate} \cong 1$

V1 = ***Voltage*** reading taken from testpoint V1

Example:

If velocity control V1 is set to 4.0 Volts and ramp control R1 is set to 1.8 Volts.

Then $R1_{rate} \cong 0.9$, from Figure 6

Then $Time_{accel} = (0.9 \times 4.0) - (0.9 \times 1.875)$
$= 1.9125$ Seconds

To calculate the accel and decel times in the reverse direction, substitute V3 in the place of V1, where V3 is the voltage reading at testpoint V3.

3) See Figure 5 and Figure 6.

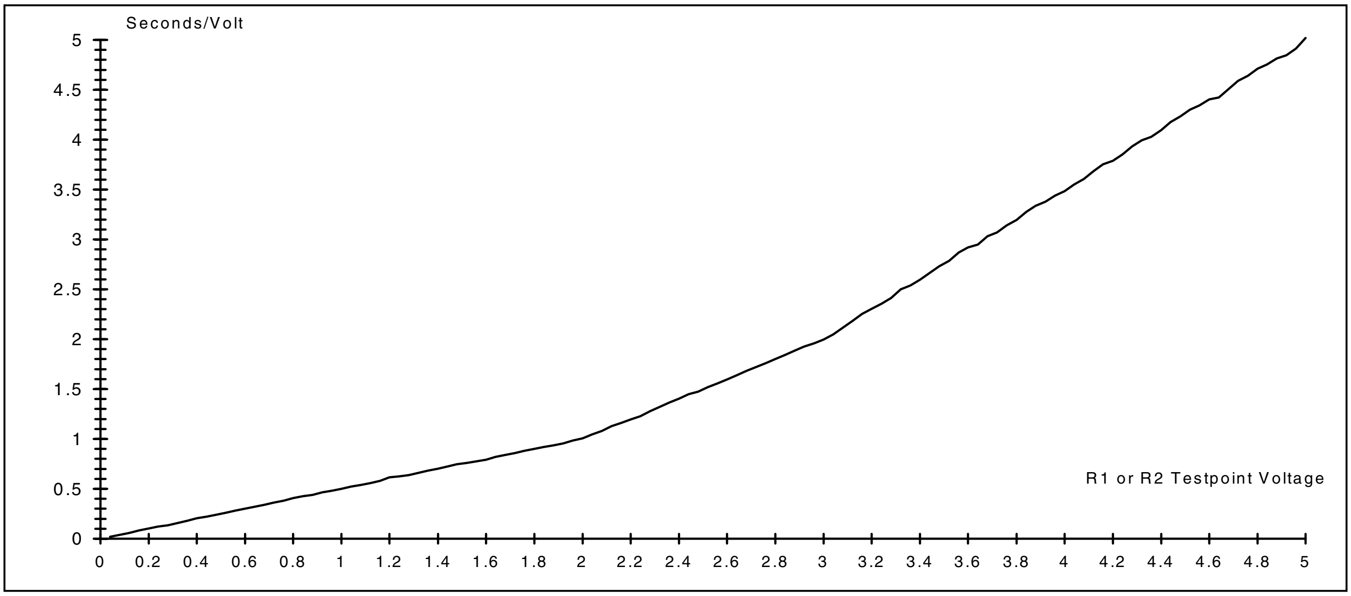

***Figure 6 - Ramp Voltage to Ramp**$_{rate}$*

Recording for Future Use

Record the voltage readings at testpoints 1-6. These recordings can be useful in setting up a replacement valve in the future or for similar system settings.

Operation

After following the setup procedures in the previous section, the valve is now ready for operation.

See Figure 7 for the operation diagram.

To move the actuator in the forward ('A' port flow) direction at the desired velocity (flow), apply the required power to the 'A' Command Logic Input. The actuator will accel at the rate set by the R1 ramp control to a velocity set by the V1 velocity control.

At this point, to stop the actuator, remove the power from the 'A' Command Logic Input. The actuator will decel at the rate set by the R2 ramp control to a stop.

To move the actuator in the reverse ('B' port flow) direction at the desired velocity (flow), apply the required power to the 'B' Command Logic Input. The actuator will accel at the rate set by the R1 ramp control to a velocity set by the V3 velocity control.

At this point, to stop the actuator, remove the power from the 'B' Command Logic Input. The actuator will decel at the rate set by the R2 ramp control to a stop.

Slow Shift Mode

	A	B	H
Extend (Forward)	ON	OFF	N/C
Retract (Reverse)	OFF	ON	N/C
Stop	OFF	OFF	N/C

N/C - No Connection

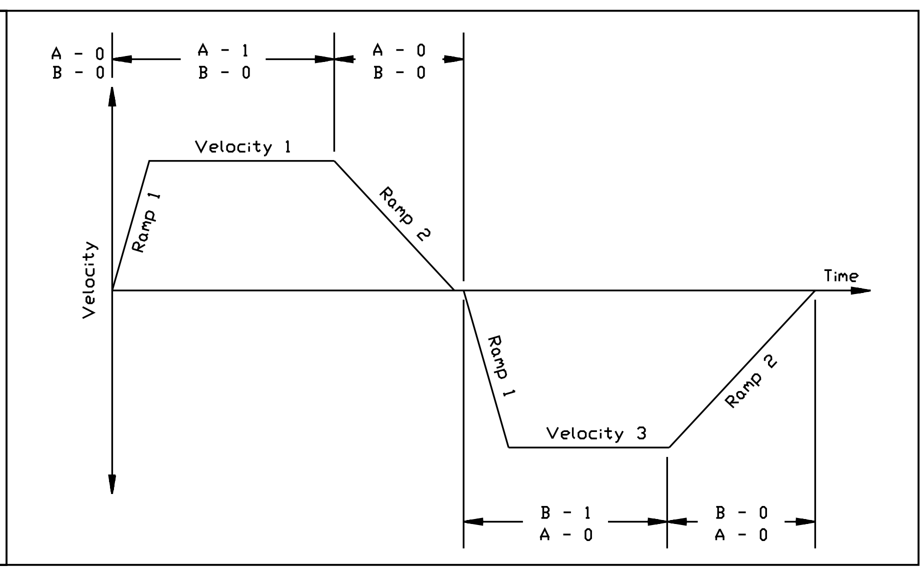

Figure 7 - Operation Diagram - Electronic Slow Shift Mode (Jumper JP1 installed)

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Motion Profiling Mode

Connection Diagram

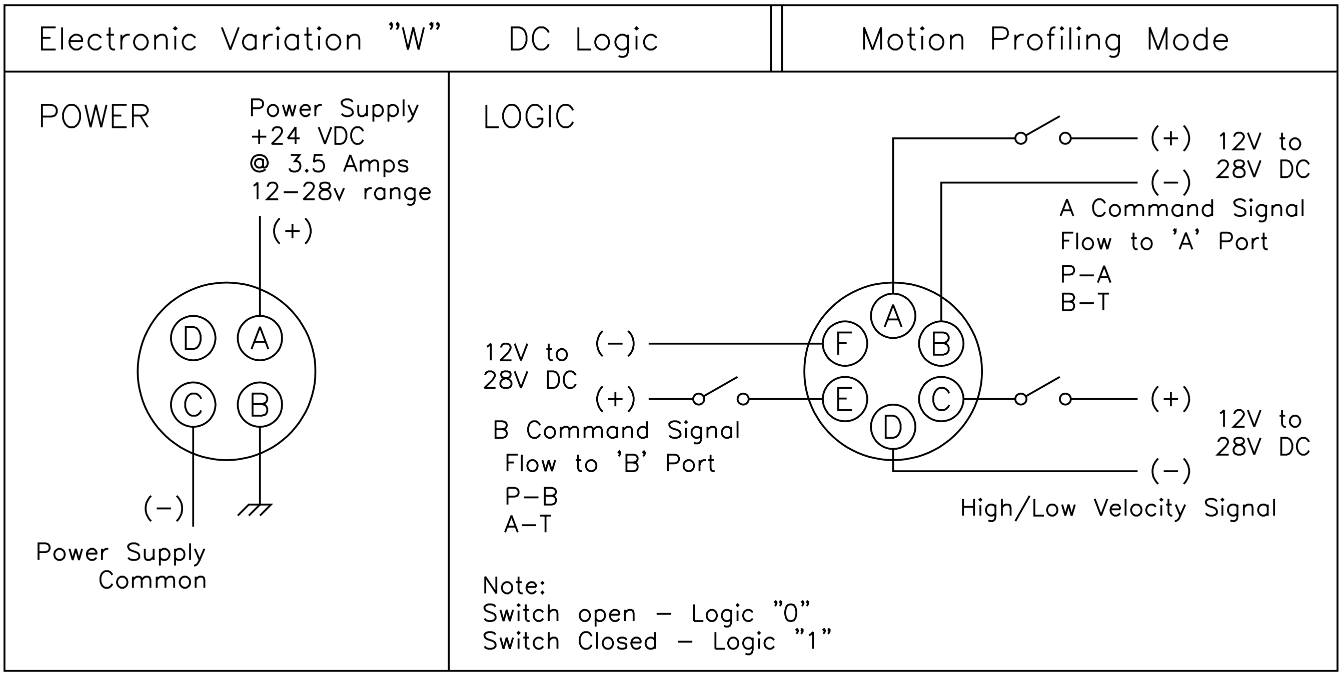


Figure 8 - Connection Diagram (Variation W) Motion Profiling Mode

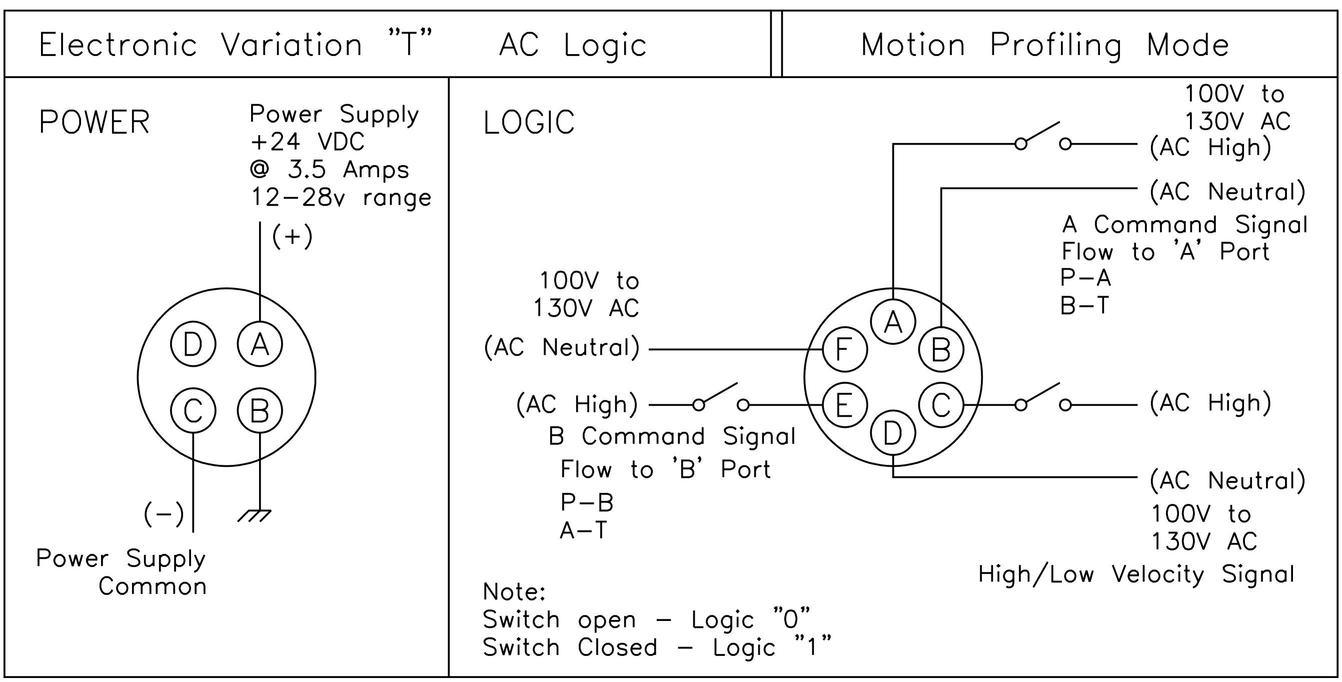


Figure 9 - Connection Diagram (Variation T) Motion Profiling Mode

Note: Properly installed shielded cable must be used.

Figures 8 and 9 show typical connections for the "***Motion Profiling***" mode for both *DC* and *AC* logic versions respectively. Jumper JP1 must be removed for this mode.

The D**FL has two connectors. One for power, and the other for logic.

A 24 volt DC power supply @ 3.5 amps is recommended for operation. The allowable input range is 12 volts to 28 volts DC. The power connector mates with a Parker P/N 1210292 (*connector only)* or an EHC**4LR cable assembly. Use 18 AWG, shielded cable for custom made cables. For applications requiring CE compliance use cable assembly EHC**4LRE.

The logic inputs are either DC or AC, variation "W" or "T". The valves are shipped in either variation and are not alterable. Please verify that you have the correct variation before powering the logic inputs. **Irreparable damage will occur if AC is applied to the DC variation.** The logic connector mates with a Parker P/N MS3106E-14S-6S (*connector only*) or an EHC**6 cable assembly. Use 18 AWG, shielded cable for custom made cables. For applications requiring CE compliance use cable assembly EHC**6RE.

Setup Procedure

Velocity Control

Four potentiometers control the velocities (flow) for both directions of actuator movement. V1 and V2 control the velocities in one direction. V3 and V4 control the velocities in the other direction of travel.

Velocity Setup Procedure:

1) Remove Jumper JP1 and JP2 if inserted. JP2 must be removed before power is applied.

2) Turn velocity controls V1 and V2 CCW until *testpoints* V1 and V2 are approximately 0.0 VDC. Adjust ramp controls R1, R2 and R3 so that testpoints R1, R2 and R3 are 0.0 VDC. Flow may be needed in the reverse direction during step 3 of this setup, initially adjust velocity control V3 and V4 to 2.5 VDC, measured at testpoint V3 and V4.

3) To set velocity (V1) in the forward ('A' port flow) cycle of the profile, apply the required power to the 'A' Command Signal and the 'High/Low' Signal. Adjust velocity control V1 CW until required spool stroke (flow, velocity) is achieved. Max flow occurs when testpoint V1 reads 5.0 VDC. Multiple cycles may be needed to properly adjust the required spool stroke, especially with short stroke cylinders. In this case remove power from the and 'A' Command Signal and apply the required power to the 'B' Command Signal Signal to reverse the actuator. Once retracted, remove the 'B' Command Signal and repeat this step.

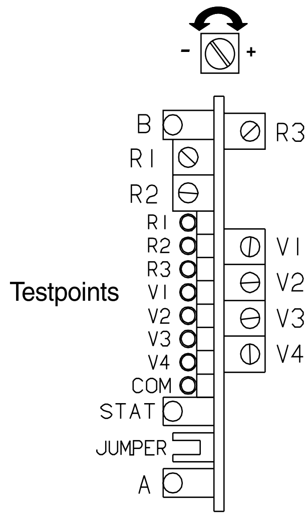
4) To set velocity (V2) in the forward ('A' port flow) cycle of the profile, remove power from the 'High/Low' Command Signal and apply the required power to the 'A' Command Signal. Adjust velocity control V2 CW until the required spool stroke (flow, velocity) is achieved. Max flow occurs when testpoint V2 reads 5.0 VDC or when Velocity (V2) exceeds the setting of Velocity V1 (V2 can never be set higher than V1). Multiple Cycles may again be needed.

5) Adjust velocity controls V3 and V4 CCW until testpoints V3 and V4 are approximately 0.0 VDC.

6) To set velocity (V3) in the reverse ('B' port flow) cycle of the profile, position the actuator in the extended position and apply the required power to the 'B' Command Signal and the 'High/low' Signal. Adjust velocity control V3 CW until the required spool stroke (flow, velocity) is achieved. Max flow occurs when testpoint V3 reads 5.0 VDC. Multiple cycles may be needed to properly adjust the required spool stroke, especially with short stroke cylinders. In this case remove power from the 'High/low' and 'B' Command Signals and apply the required power to the 'A' Command Signal to extend the actuator at the V2 setting (Low Speed). Once extended, remove the 'A' Command Signal and repeat this step.

7) To set the second velocity (V4) in the reverse (B' port flow) cycle of the profile, position the actuator in the extended position , remove power from the 'High/Low' Command signal and apply the required power to the 'B' Command Signal. Adjust velocity control V4 CW until the required spool stroke (flow, velocity) is achieved. Max flow occurs when testpoint V4 reads 5.0 VDC or when Velocity V4 exceeds the setting of Velocity V3 (V4 can never be set higher than V3). Multiple cycles may again be needed.

8) See Figure 10.



Control	Affects Port
R1 R2 V1 V2	A
R1 R2 V3 V4	B

Figure 10 - Adjustment Diagram (Profiling Mode)

Acceleration and Deceleration Control

The digital electronics provides control of acceleration and deceleration. Accel and decel times can be adjusted from 25 milliseconds to 15 seconds for full spool travel. Three Potentiometers control the accel and decel rate for both directions of actuator movement. R1 controls the accel rate and R2 controls the decel rate, and R3 controls the deceleration rate to end of travel.

Accel and Decel Setup Procedure:

1) Ramp controls R1 and R2 should previously be set to the minimum ramp time in step #2 above (fully CCW).

2a) To decrease the acceleration rate, thus increase the accel ramp time, adjust R1 CW until the desired acceleration is achieved. The maximum ramp time occurs when testpoint R1 reads 5.00 VDC. Multiple cycles of the machine may again be needed to adjust the acceleration rate.

To decrease the decel rate from velocity V1 or V3 to velocity V2 or V4 respectively, thus increase the decel ramp time, adjust R2 CW until the desired deceleration is achieved. To decel from Velocity V1 or V3 to Veloctiy V2 or V4, remove the ‘High/Low’ Command Signal while the actuator is in motion. The maximum ramp time occurs when testpoint R2 reads 5.00 VDC. Multiple cycles of the machine may again be needed to adjust the decel rate for R2. To decrease the decel rate to end of travel, adjust R3 CW until the desired deceleration is achieved**.

**** To adjust R3 to equal a ramp time of (1) second (same as older models) set R3 to 0.6 volts.**

2b) (***Optional***) To calculate a close approximation of the accel ramp time from cycle start to velocity V1, use the formula below.

$Time_{accel} = (R1_{rate} \times V1) - (R1 \times 1.875)$

Where:

$R1_{rate}$ = ***Seconds / Volt*** reading taken from Figure 11

To get this value, measure testpoint R1. Find this value on the horizontal axis (R1 or R2 testpoint voltage) of Figure 11. Then find the corresponding value from the Vertical axis (Seconds / Volt). This value then is $R1_{rate}$.

Example:

If the Voltage at testpoint R1 is 3.0 volts, then $R1_{rate} \cong 2$

V1 = ***Voltage*** reading taken from testpoint V1

Example:

If velocity control V1 is set to 4.0 Volts and ramp control R1 is set to 1.8 Volts.

Then $R1_{rate} \cong 0.9$, from Figure 11

Then $Time_{accel} = (0.9 \times 4.0) - (0.9 \times 1.875)$
$= 1.9125$ Seconds

To calculate the accel time in the reverse direction, substitute V3 in the place of V1, where V3 is the voltage reading at testpoint V3.

To calculate a close approximation of the decel time from velocity V1 to velocity V2, use the formulas below.

$\text{Time(V1 to V2)}_{decel} = R2_{rate}(V1 - V2)$

Where:

$R2_{rate}$ = ***Seconds / Volt*** reading taken from Figure 11

To get this value, measure testpoint R2. Find this value on the horizontal axis (R1 or R2 testpoint voltage) of Figure 11. Then find the corresponding value from the Vertical axis (Seconds / Volt). This value then is $R2_{rate}$.

Example:

If the Voltage at testpoint R2 is 2.0 volts, then $R2_{rate} \cong 1$

V1 = ***Voltage*** reading taken from testpoint V1

V2 = ***Voltage*** reading taken from testpoint V2

Example:

If velocity control V1 is set to 4.0 Volts, velocity control V2 is set to 2.5 Volts and ramp control R2 is set to 2.5 Volts.

Then $R2_{rate} \cong 1.5$, from Figure 11

Then $\text{Time(V1 to V2)}_{decel} = 1.5(4.0 - 2.5) = 2.25$ Seconds

To calculate the decel time in the reverse direction, substitute V3 and V4 in the place of V1 and V2 respectively, where V3 and V4 are the voltage readings at testpoints V3 and V4.

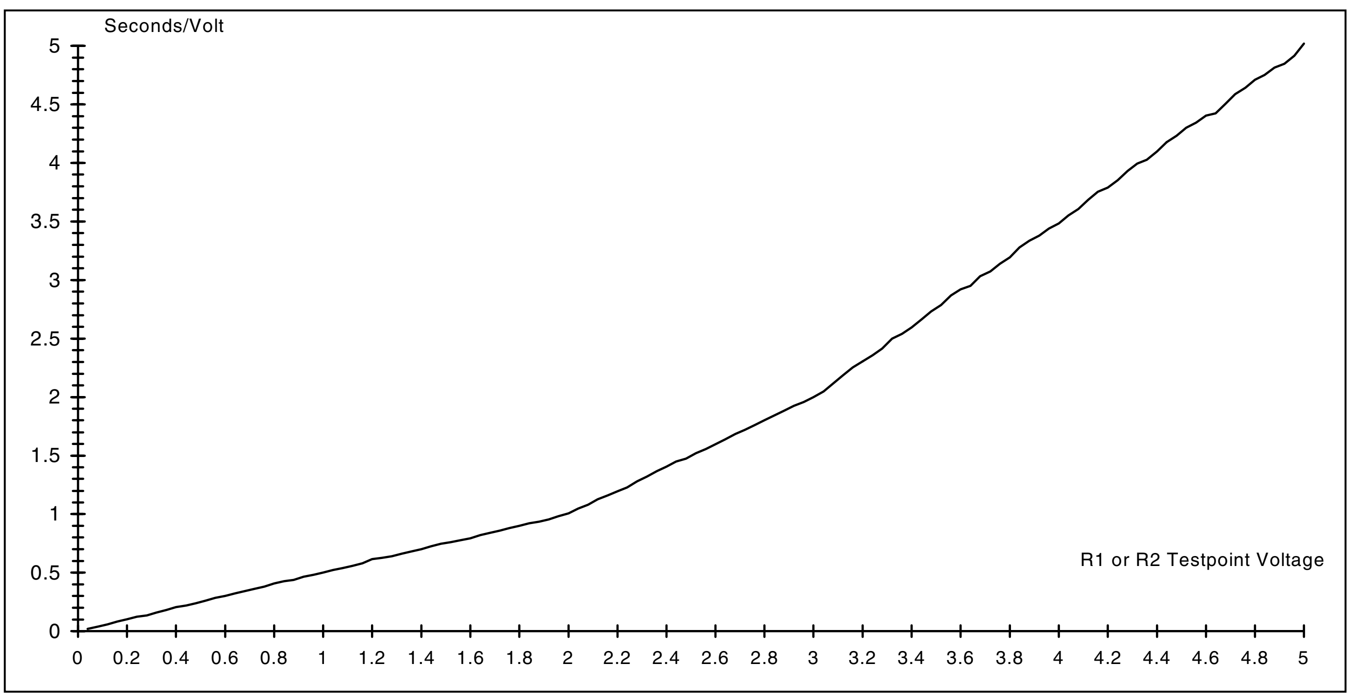


Figure 11 - Ramp Voltage to $Ramp_{rate}$

MOTION PROFILE MODE

Extend V1	**A**	**B**	**H**
(Forward)	ON	OFF	ON
Extend V2	**A**	**B**	**H**
(Forward)	ON	OFF	OFF
Retract V3	**A**	**B**	**H**
(Reverse)	OFF	ON	ON
Retract V4	**A**	**B**	**H**
(Reverse)	OFF	ON	OFF
Stop	**A**	**B**	**H**
	OFF	OFF	OFF

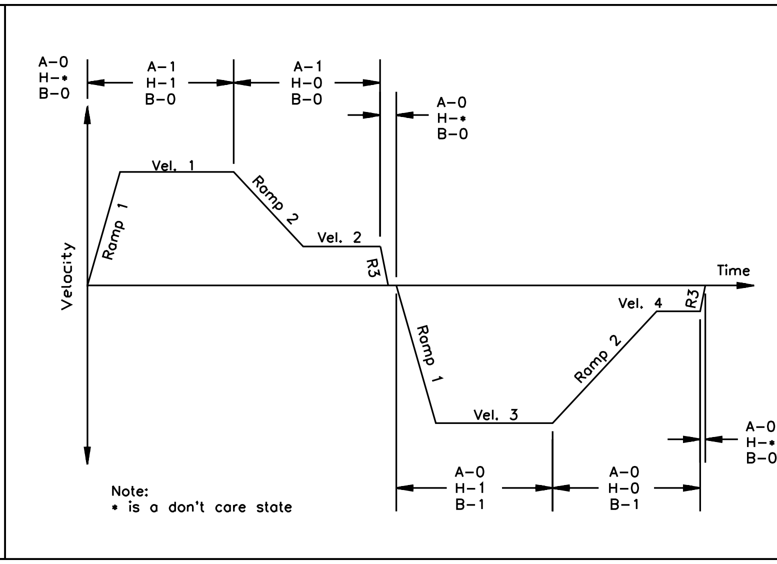


Figure 12 - Operation Diagram - Motion Profile Mode (Jumper JP1 removed)

Operation

After following the setup procedures in the previous section, the valve is now ready for operation.

To move the actuator in the forward ('A' port flow) direction at the first velocity (V1), apply the required power to the 'High/Low' and 'A' Command Logic Input. The actuator will accel at the rate set by the R1 ramp control to a velocity set by the V1 velocity control.

At this point, to decel the actuator from velocity V1 to the second velocity (V2) in the forward ('A' port flow) direction, remove only the 'High/Low' Command Logic Signal. The actuator will decel at a rate set by the R2 ramp control to the velocity set by the V2 velocity control.

To stop the actuator from velocity V2, remove the power to the 'A' Logic Input. The actuator will decel at a rate set by the (R3) ramp control to the end of travel.

If at any time during the forward ('A' port flow) cycle of the motion profile the power to the ''A' Logic Input is removed, the actuator will decel to a stop at a rate set by (R3) ramp control to the end of travel.

To move the actuator in the reverse ('B' port flow) direction at the first velocity (V3), apply the required power to the 'High/Low' and 'B' Command Logic Inputs. The actuator will accel at the rate set by the R1 ramp control to a velocity set by the V3 velocity control.

At this point, to decel the actuator from velocity V3 to the second velocity (V4) in the reverse ('B' port flow) direction, remove only the 'High/Low' Command Logic Signal. The actuator will decel at a rate set by the R2 ramp control to the velocity set by the V4 velocity control.

To stop the actuator from velocity V4, remove the power to the 'B' Logic Input. The actuator will decel at a rate set by (R3) ramp control to the end of travel.

If at any time during the reverse ('B' port flow) cycle of the motion profile the power to the 'B' Logic Input is removed, the actuator will decel to a stop at a rate set by (R3) ramp control to the end of travel**.

To accel the actuator from a stop to the lower velocity V2 or V4, remove power from the 'High/Low' Logic Input, then apply power to the 'A' or 'B' Logic Input. This is useful for Jogging the actuator or when a low initial velocity is required in the profile.

By changing the state of the 'High/Low' Logic Input, both decel from high to low speed or accel from low to high speed can be accomplished during actuator motion.

**** To adjust R3 to equal a ramp time of (1) second (same as older models) set R3 to 0.6 volts.**

D		1	F	L				C				0		
Directional Control Valve	Size	Port Connection	Flow Regulation	Std. Response, Open Loop, & On-Board Profiler Electronics	Flow Ratio	V-Notch Spool Type	Flow Code	Style	Pilot Connections	Seals	Electronic Variation	Electronic Accessory	Valve Accessories	Design Series

Design Series: Not required For ordering

Size

Code	Description
4	DIN NG16 CETOP 07 NFPA D07
9	DIN NG25 CETOP 08 NFPA D08 conn ∅ 32 min

Flow Ratio

Code	Description
E	QA = QB
A	QB > QA
B	QA > QB

Flow Code

Code	Flow
D	D41
F	D91

Seals

Code	Description
N	Nitrile
V	Fluorocarbon

Pilot Connections

Code	Inlet	Outlet
1	Internal	External
2	External	External
4	Internal	Internal
5	External	Internal

Valve Accessories

Code	Description
0	Standard
4	CSA Approved

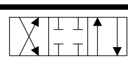
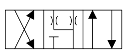
Electronic Accessory

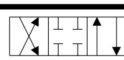
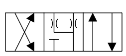
Code	Description
0	Standard

Electronic Variation

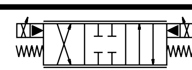
Code	Description
T	AC logic inputs 6 Pin MS connector & 4 Pin MS connector with earth ground
W	DC logic inputs 6 Pin MS connector & 4 Pin MS connector with earth ground

V-Notch Spool Type

Flow QA equal to flow QB Flow ratio Code E			
Overlap	**Code**	**Symbol**	**Ratio Q**
10%	21		1 :1
10%	22		1 :1

Flow QA > flow QB or flow QB > QA Flow ratio Code A and B			
Overlap	**Code**	**Symbol**	**Ratio Q**
10%	41		2 :1
10%	42		2 :1

Style

Code	Symbol
C	

Use one power supply for each valve: #PS24
Standard power connector only: #1210292
Standard logic connector only: #MS3106E-14S-65

Mounting Bolt Kit: D41FL BK160, (4)3/8-16 x 2; 1/4-20 x 2 1/4
BK320, (4) M10 x 60; (2) M6 x 55 (metric)
D91FL BK228, (6)1/2-13 x3
BK360, (6) M12 x 75

Weight: D41FL 10.9 kg (24.01 lbs.)
D91FL 19.1 kg (42.06 lbs.)

Note: EHC****E cables are built to comply with CE EMC Directives. If <u>only</u> connector is purchased, user is responsible for CE Compliance.

EHC			
Electrohydraulic Cable for D41FL and D91FL Valve	Length	Valve Style	Valve Style

Length

Code	Length
3	Length in feet
6	
9	
12	
15	

Valve Style

Code	Description
4LR	4L with environmental connector
6R	6 with environmental connector

Note: One of each cable, (6 wire & 4 wire) is required for valve operation.

Valve Style

Code	Description
Omit	Standard cable/connector
E	CE compliant

2589-m1.p65, dd, lk

A) Power Up Diagnostics

If the valve fails to operate, turn the 'A', 'B', and 'High/Low' Command Logic **OFF.** Then cycle input power to the valve while watching the Diagnostic LEDs. When input power is applied, the LEDs will cycle through a power up test and then all go off.

If any LEDs remain on:

1) Verify that the 'A', 'B', and 'High/Low' Command Logic is OFF

2) Verify that Jumper JP2 is **not** installed

If conditions above are met and LEDs still remain on then, Electronic failure has occurred; consult factory.

If LEDs do not cycle through power up tests:

1) Verify that +24 VDC(range 12-28 volts DC) exists at power connector. See Connection Diagrams (Figures 3, 4, 8, or 9)

2) Verify that Jumper JP2 is **not** installed

If conditions above are met and LEDs still fail to cycle through power up tests then, Electronic failure has occurred; consult factory.

B) Function Diagnostics

If the valve passes the power up tests and still fails to operate

Caution: The use of Manual Overrides cause the actuator to move at the velocity limits of the valve. This may be harmful to personnel and equipment. Skip the Manual Override section of this test if any doubt to safety exists in the use of the Manual Overrides.

Remove input power from electronics and use the manual overrides to verify that the plumbing is correct. If plumbing is correct, reapply power to the electronics then continue.

If valve fails to operate:

1) If you are in the ***Slow Shift Mode,*** verify that Jumper JP1 is installed

2) If you are in the ***Motion Profile Mode,*** verify that the 'A' or 'B' Command Signal is ON

3) Verify that the velocity and ramp controls are set to the proper settings as described in the Setup Procedures. If the ramp and velocity control settings were recorded earlier, these recorded values can be compared to the voltage readings at testpoints V1, V2, V3, R1, R2 and R3.

C) AC Input Guideline

If traic outputs are used current leakage may be significant enough to produce a false signal. To reduce these effects install a load resistor in parallel to your load. For most 120 VAC applications, use a 15 ohm, 2 watt resistor. Please consult your AC output module specifications for manufacturers recommendations.

D) DC Output Guidelines

Note: Irrepairable damage will occur if 120 VAC is applied to DC logic inputs.

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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

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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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If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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Hydraulics

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