

CONNECTOR AMPLIFIER FOR PROPORTIONAL VALVES



TYPE PQ 11

Brochure 2961

Description:

Connector amplifier PQ-11 is used to control HERION proportional valves. It is secured directly to the valve solenoid by means of a screw.

Function:

The amplifier supplies a PWM DC current for driving a proportional solenoid. Amplifier output current is proportional to an analog setpoint signal - which may be supplied from a customer's potentiometer or PLC.

Features:

- Accepts standard voltage or current (mA) command signals.
- All customer adjustments are accessible from snap-top cover.
- Electronic limiting circuit for solenoid current - no internal fuses.
- Standard model is pre-wired; optional DIN plug connector version available.
- Body rotates 270 degrees - allowing convenient mounting options.
- Pin-compatible with previous Herion amplifier model.



General Characteristics:

Design	Connector amplifier with PWM current regulator.
Protection class	IP65 (mounted)
Mounting position	Arbitrary
Environmental temp	-5 to 120F
Weight	6 oz.
Electrical connection	Pre-wired cable, 6 ft. 7 x 20 AWG shielded. Optional DIN 43651 connector model.

Electrical Characteristics:

Power supply requirement	18 to 32 VDC at 1.4A (10% max ripple)
Output current for solenoid	0 - 1600 mA
Solenoid resistance	2.5 - 7 ohms @ 70F
Internal supply for setpoint potentiometer	15 V at 3 mA
Null adjustment	0-30% of FS output
Gain adjustment	10-100% of FS output
Dither frequency	40/80 Hz selectable
Ramp time adjustment (100% step input)	0.18 to 18 sec symmetrical
Setpoint (voltage) Input resistance	0-10 VDC >330K ohm
Setpoint (voltage) Input resistance	0-20 mA or 4-20 mA <135 ohm

Order Information:

Item	Part No.	Remarks	Dimension Drawing
Connector amplifier with 6 ft. shielded cable	59-800-85		Fig 1.
Connector amplifier with DIN 43651 connector.	59-800-81	Order mating connector separately	Fig 2.

Accessories:

Mating connector for 59-800-81	06-606-89		
Potentiometer Assembly	59-985-34	See Brochure N-227	
Power supply 28 VDC 2 AMP	81-105-99	See Brochure N-227	

Dimensions:

All dimensions in mm (inches)

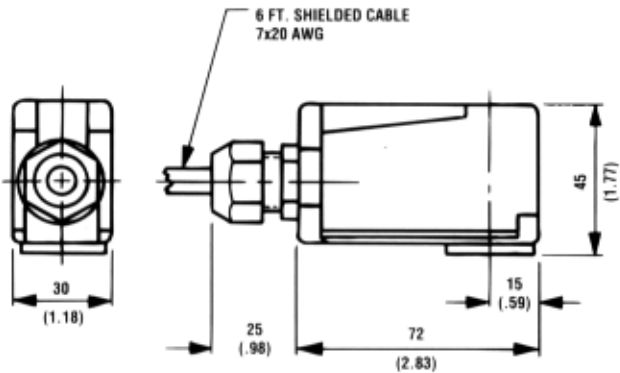


Figure 1. PQ-11 Amplifier (Cable Version)

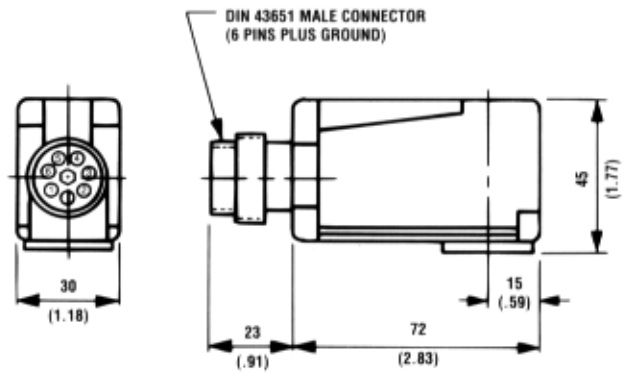


Figure 2. PQ-11 Amplifier (Connector Version)

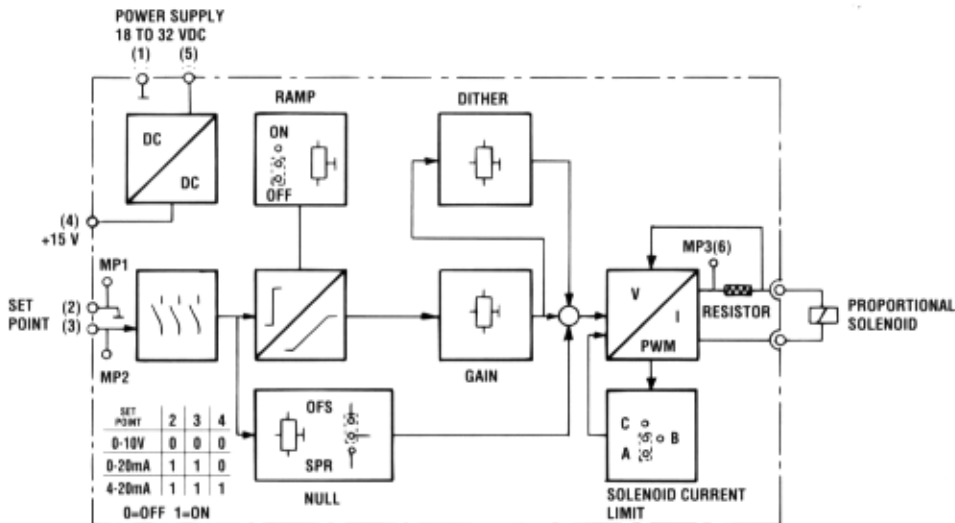


Figure 3. Block Diagram of Circuit

PQ-11 Wiring Connection Diagrams:

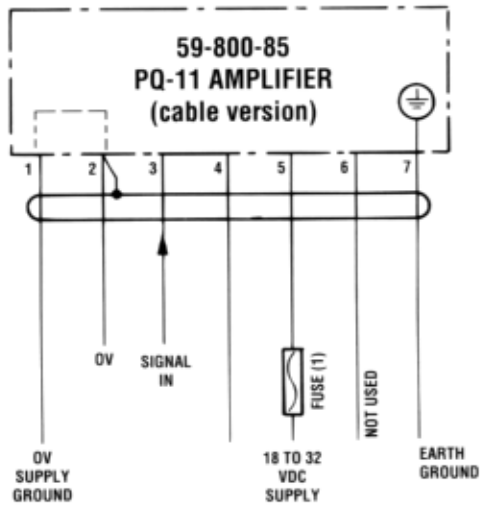


Figure 4. PQ-11 Cable Version External Setpoint Connection

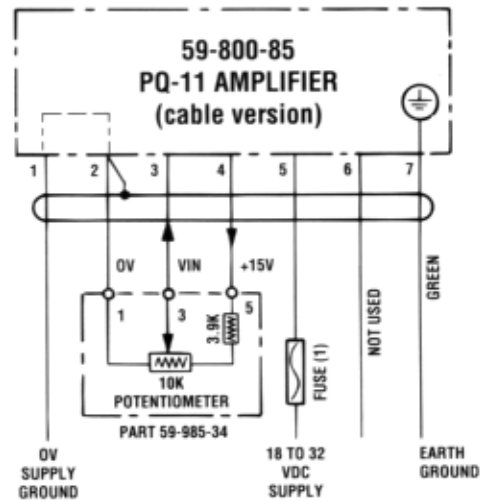


Figure 5. PQ-11 Cable Version Local Potentiometer Connection

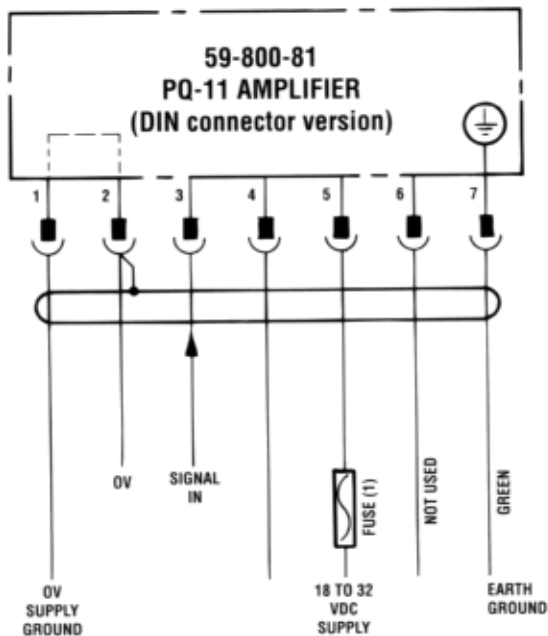


Figure 6. PQ-11 DIN Connector Version External Setpoint Connection

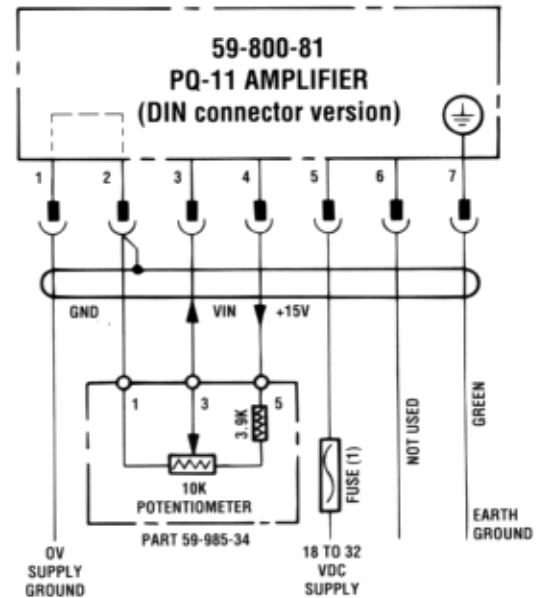


Figure 7. PQ-11 DIN Connector Version Local Potentiometer Connection

NOTE: (1) Recommended external customer fuse 2.5 amp.

Location of Adjustments and Test Points:

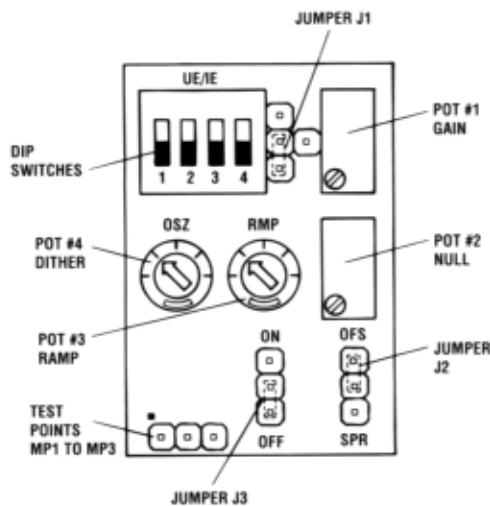


Figure 8. Adjustment Locations with Cover Removed

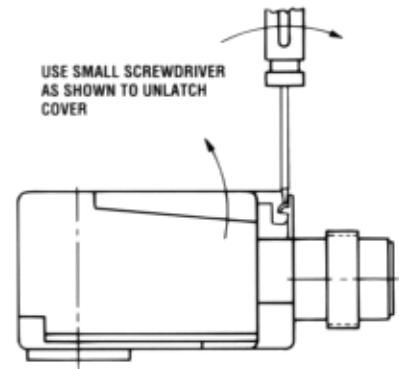


Figure 9. Removing Cover

Potentiometer Adjustments	Range of Adjustment	Factory Setting
Pot #1 Gain	10 To 100% of F.S.	100%
Pot #2 Null	0 To 30% of F.S.	0%
Pot #3 Ramp Time	.18 To 18 Seconds	18 Seconds
Pot #4 Dither	Min. - Max.	Mid Range

Dip Switch Settings:



Figure 10. DIP Switch Settings for Dither and Input Signal

NOTE: (1) Switch No. 1 is used to set dither to either 40 or 80 HZ.
 (2) Switches No. 2, 3, and 4 are used to set input signal range.

Jumper Positions and Test Points:

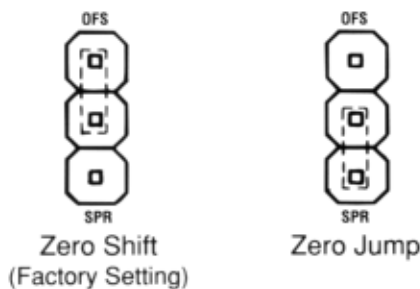


Figure 11. Null Function (Jumper J2)

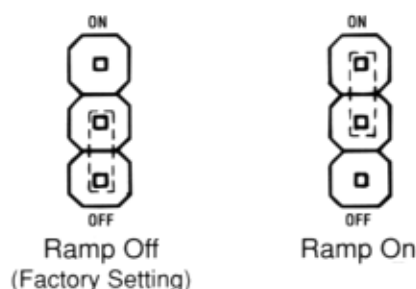
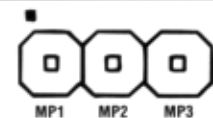


Figure 12. Ramp On-Off (Jumper J3)



MP1 = Reference
 MP2 = Set Point
 MP3 = Solenoid Current

NOTE: MP1 Must be used as the reference for voltage measurements at MP2 and MP3

Figure 13. Test Points

Explanation of Adjustments:

There are (4) trim pots beneath the amplifier top cover. They may be used to tailor the amplifier response to a particular application. See Figure 8.

Trim Pot #1 – “Gain” (Figure 14)

Trim pot #1 is adjusted to match the customer’s working pressure range to the full scale setpoint range. This provides maximum resolution for a particular application. For example, a 10 V input can be made to command 500 mA output instead of 1600 mA if the valve is not used to its maximum pressure.

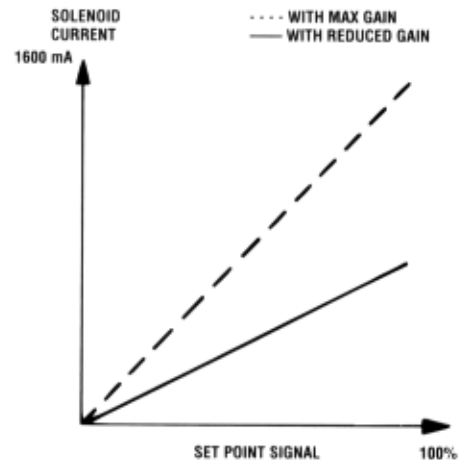


Figure 14. Trim Pot #1 - Gain

Trim Pot #2 – “Null”

Trim pot #2 provides adjustable solenoid current offset in either of (2) modes – as selected by Jumper J2:

Zero-Shift (Figure 15)

Jumper J2 set to “OFS” position

Allows the possibility to achieve a defined solenoid current output when setpoint = 0.

Zero Jump (Figure 16)

Jumper J2 set to “SPR” position

When setpoint signal exceeds 2%, the solenoid current “jumps” to an offset which is defined by Trim pot #2. This provides the flexibility of an offset adjustment – while assuring that solenoid current is 0 mA when setpoint = 0.

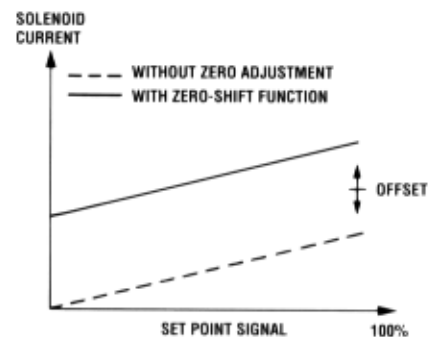


Figure 15. Trim Pot #2 - Null
Jumper J2 to “OFS” Position

Trim Pot #3 - “Ramp Time” (Figure 17)

Provides a ramped solenoid current output in response to an abrupt change in the setpoint. The final level of the solenoid current corresponds to the setpoint. Rising and falling ramp times are symmetrical. They cannot be independently adjusted. The ramp feature may be disabled via Jumper J3.

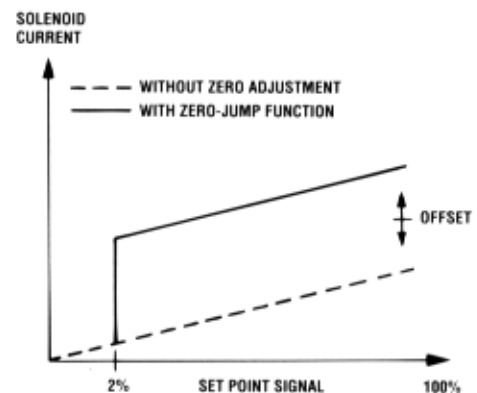


Figure 16. Trim Pot #2 - Null
Jumper J2 to “SPR” Position

Trim Pot #4 - “Dither Amplitude”

A small AC current is superimposed on the solenoid current to reduce effects of static friction. This improves hysteresis and repeatability of the valve. Optimum dither amplitude is achieved when small setpoint changes register similar changes in pressure. The minimum effective dither amplitude should be used.

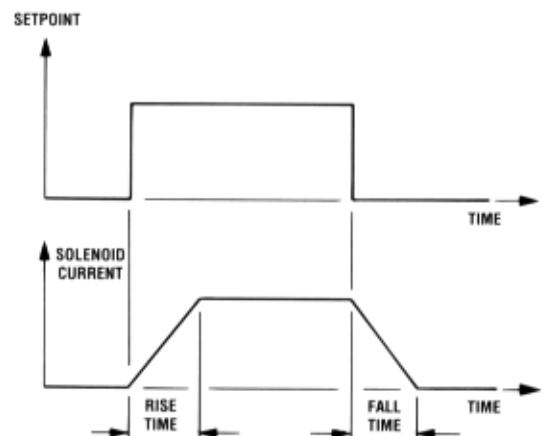


Figure 17. Trim Pot #3 - Ramp Function
Jumper J3

Installation and Adjustments:

Installation:

- 1) Supply voltage should be 18 to 32 VDC. Excess voltage will damage the amplifier!
- 2) Do not install amplifier near high voltage relays or other sources of electrical interference.
- 3) For best results, shielded cable is suggested for setpoint leads. Shields may be terminated at terminal 2.

Adjustment Procedure:

The PQ-11 amplifier must be calibrated while connected to an operating proportional valve.

1) Before Proceeding

Be certain that Jumper J1 is in the factory adjusted position shown in Figure 8. This limits solenoid current range to approximately 1600 mA.

2) Setpoint Select

Select voltage or current setpoint via DIP switch settings at positions 2, 3, 4. See Figure 10.

3) Dither

- a) Begin with setpoint at midrange and dither adjustment (Pot #4) fully CCW.
- b) Adjust Pot #4 CW until small variations of the setpoint register similar changes in pressure.
- c) The smallest effective dither amplitude should be used.

4) Null

- a) Begin with Jumper J2 in the "OFS" position and Pot #2 fully CCW.
- b) Adjust setpoint to 0.
- c) Turn Pot #2 CW until the desired minimum pressure is achieved.
- d) If the Zero-Jump function is desired, switch Jumper J2 to the "SPR" position **after** adjusting Pot #2.

5) Gain

- a) Turn Pot #1 approximately (12) turns CCW – to begin at a minimum gain setting.
- b) Adjust setpoint to maximum value (usually 10 V or 20 mA).
- c) Turn Pot #1 CW to increase pressure until the desired maximum is achieved.
- d) Re-check NULL adjustment - and repeat step #4 if necessary.

6) Ramp Time

- a) If ramp function is desired, set Jumper J3 to the "ON" position.
- b) Factory setting of Pot #4 is full CW for maximum ramp time. Adjust Pot #4 CCW to reduce ramp time. Rising and falling ramp times are symmetrical.

Troubleshooting:

NOTE: The PQ-11 contains no serviceable components. Do not attempt to disassemble! Tampering will void product warranty.

A voltmeter can be used to diagnose most difficulties with the PQ-11 amplifier.

- 1) Verify that proper power supply voltage (18 to 32 VDC) is connected to terminals 5 & 1. (terminal 1 is common).
- 2) Confirm that internal amplifier operating voltage (+ 15 V) appears across terminals 4 & 1. (terminal 1 is common).

Steps 3 & 4 make use of test points located beneath the snap-top cover. Test point MP1 is the reference point for voltage measurements at MP2 and MP3. DO NOT use the power supply common as a reference for test points measurements – as this will yield incorrect readings.

- 3) Confirm that the setpoint is within specified limits. The setpoint may be measured with a voltmeter across test points MP2 and MP1. Scale factor for this measurement is according to the table below.

Set Point	Measured Value MP1 To MP2
0-10V	0-10V
0-20mA	0-2V
4-20mA	0.4-2V

- 4) Solenoid current may be measured with a voltmeter across test points MP3 and MP1. The amplifier must be connected to a solenoid. The scale factor for this measurement is:

1mV at MP3 = 10 mA solenoid current

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