

MOOG

641 Series Installation and Operation Instruction

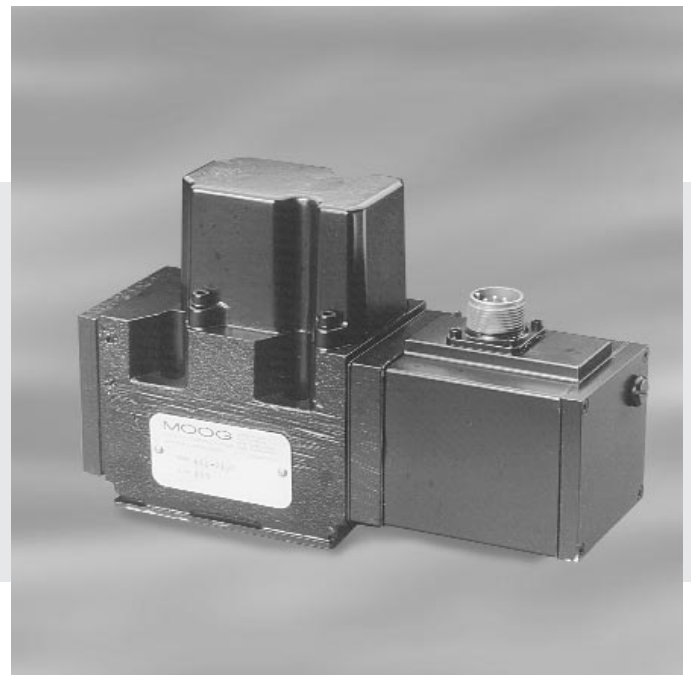
Proportional Control Valve

1. INTRODUCTION

This manual provides instructions and procedures necessary to install, operate and troubleshoot the Moog 641 Series Proportional Control Valve. Troubleshooting instructions are outlined so that the specific component(s) suspected of failure can be identified.

2. OPERATION

The Moog 641 Series proportional control valves are suitable for open and closed loop position and velocity control systems where accelerations need to be regulated. The 641 can be used like a directional solenoid valve or a proportional valve while controlling ram or motor acceleration, deceleration and velocity.



The 641 Series valves are two-stage devices consisting of a double nozzle-flapper pilot stage and a sliding spool main stage. The position of the main stage spool is measured by a non-contacting position transducer. On-board integrated electronics provide closed-loop position control of the main stage spool.

The operation of the 641 Series valve is controlled by an electrical command signal (V_{CS}) provided to the integrated control electronics which drives the pilot stage coils. The current sent from the electronics causes the flapper to move toward one nozzle, diverting the pilot stage flow to one end of the spool. The position transducer measures the position of the spool (V_{LI}) and produces a feedback voltage which is directed back to the control amplifier and compared to the command voltage. The control amplifier then drives the pilot stage until the command voltage and feedback voltage are equal, centering the flapper between the nozzles which holds the spool at a position proportional to the command signal.

ELECTROHYDRAULIC VALVE CUT-AWAY

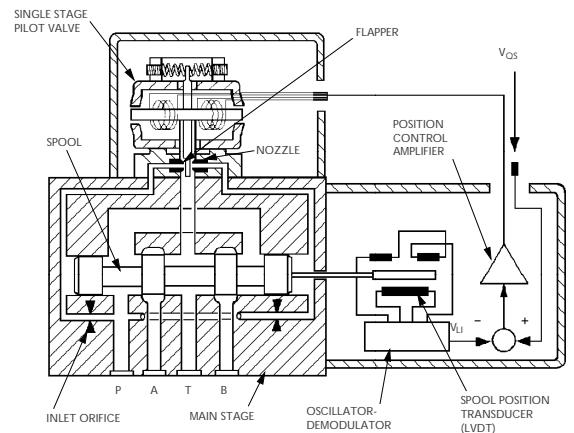


Figure 1 Moog Series 641

CAUTION

DISASSEMBLY, MAINTENANCE, OR REPAIR OTHER THAN IN ACCORDANCE WITH THE INSTRUCTIONS HEREIN OR OTHER SPECIFIC WRITTEN DIRECTIONS FROM MOOG WILL INVALIDATE MOOG'S OBLIGATIONS UNDER ITS WARRANTY.

3. HYDRAULIC SYSTEM PREPARATION

To prolong proportional control valve operational life and to reduce hydraulic system maintenance, it is recommended that the hydraulic fluid be kept at a cleanliness level of ISO Code 14/11 (NAS Class 5) or better. The most effective filtration scheme incorporates the use of a kidney loop or "off-line" filtration as one of the major filtration components. The filter for the "off-line" filtration scheme should be a $\beta_3 \geq 75$ filter for maximum effectiveness.

Upon system start-up, and prior to mounting the valve, the entire hydraulic system should be purged of built-in contaminating particles by an adequate flushing. The valve should be replaced by a flushing plate and the hydraulic circuit powered up under conditions of fluid temperature and fluid velocity reasonably simulating the normal operating conditions. Best possible flushing is achieved if a 4 way/3 position directional control valve is fitted in place of the proportional valve since, when the directional control valve is actuated alternately, the downstream actuators are also flushed. New system filters are installed during the flushing process whenever the pressure drop across the filter element becomes excessive. The flushing processes should turn over the fluid in the reservoir between fifty to one hundred times.

To maintain a clean hydraulic system, the filters must be replaced on a periodic basis. It is best to monitor the pressure drop across the filter assembly and replace the filter element when the pressure drop becomes excessive. In addition to other filters installed in the hydraulic circuit, it is recommended that a large capacity, low pressure $\beta_3 \geq 75$ filter be installed in the return line. This filter will increase the interval between filter element replacements and greatly reduce system contamination.

4. INSTALLATION

The Moog 641 Series Proportional Control Valves may be mounted in any position, provided the valve pressure, control, and return ports match respective manifold ports. The mounting pattern and port location of the valve are shown on Installation Drawing No. G2785. Apply a light film of oil to the mounting screw threads and torque the screws to 90 inch-pounds.

Wire mating connector for desired coil configuration and polarity. Thread connector to valve.

5. ELECTRICAL NULL ADJUSTMENT

It may be desirable to adjust the proportional valve for flow null independent of other system parameters. The electrical null adjustment permits convenient control set-ups. The electrical null adjust is a 4-turn potentiometer located behind the pan head screw in the electronics housing. When turned, it provides control of the spool position to obtain the desired flow null.

Adjustment Procedure

1. Verify that ± 15 vdc power is supplied to the valve, and that the input signal (pin D or E) is zero or grounded.
2. Using a flat blade screwdriver, remove the pan head screw (see Figure 2) to permit adjustment of the potentiometer.
3. Using a flat blade screwdriver, adjust the potentiometer to obtain the desired flow null. Note: Clockwise rotation of the potentiometer p reduces flow out of control port A.
4. Replace the pan head screw.
5. Restore the input signal wiring for system operation.

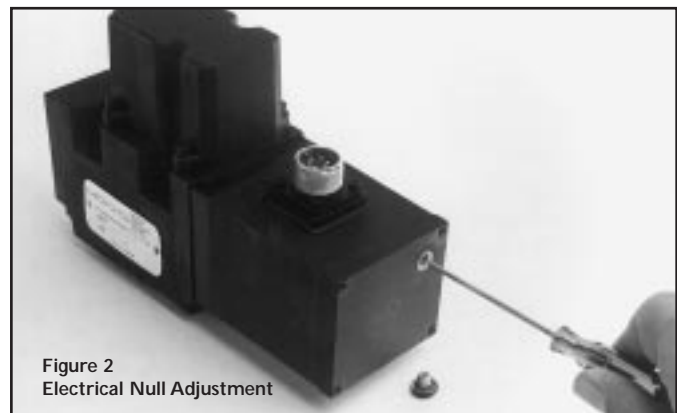
Tools and Equipment:

- a. Flat blade screwdriver
- b. Allen wrench set (2 1/2, 3, 4, 5 mm; 3/16, 7/32 inch)
- c. Volt-ohm-milliammeter
- d. Torque wrenches, various, to meet reassembly requirements

Table 1. Replacement Parts

Part Description	Qty.	Part Number
641 Series Filter Replacement Kit	1	B52555RK90K1
Base O-Rings	5	42082-4
Base O-Rings	2	42082-11
Filter O-Ring (1)	1	G2140-13-15
Filter Retainer Plate O-Ring (1)	1	G2140-17-20
Filter (1)	1	G2196-100

(1) Included in Filter Replacement Kit



**Figure 2
Electrical Null Adjustment**

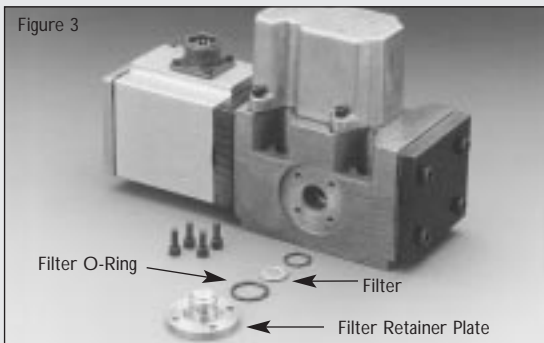
6. GENERAL SERVICING RECOMMENDATIONS

- a. Disconnect the electrical lead to the control valve.
- b. Relieve the hydraulic system of residual pressure.
- c. Remove the valve.

7. TROUBLESHOOTING CHART

The following troubleshooting chart list potential troubles encountered, probable causes, and remedies.

Potential Trouble	Probable Cause	Remedy
Proportional valve does not respond to command signal	<ol style="list-style-type: none"> 1. Controller does not function 2. Open or miswired controller cable 3. Open connector lead or damaged electronics board 4. Jammed spool 5. Filter completely plugged 	<ol style="list-style-type: none"> 1. Replace controller 2. Replace/repair controller cable 3. Return to factory 4. Return to factory 5. Replace filter
Output flow obtained from one control port only. Limited or no response to command signal.	<ol style="list-style-type: none"> 1. Controller not functioning properly 2. Filter silted with contamination 3. Plugged inlet orifice assembly 4. Plugged torque motor 5. Jammed spool 6. Electrical null adjust adjusted hardover 	<ol style="list-style-type: none"> 1. Replace controller 2. Replace filter 3. Return to factory 4. Return to factory 5. Return of factory 6. Readjust electrical null
High null bias (actuator drifts or hydraulic motor slowly rotates when controller returns to neutral).	<ol style="list-style-type: none"> 1. Incorrect null adjustment 2. Filter silted with contamination 3. Partially plugged inlet orifice assembly 4. Partially plugged torque motor 5. Damaged electronics 	<ol style="list-style-type: none"> 1. Readjust electrical null 2. Replace filter 3. Return to factory 4. Return to factory 5. Return of factory
Poor response (valve delays in returning to neutral after controller is returned to neutral).	<ol style="list-style-type: none"> 1. Filter silted with contamination 2. Contamination in spool bore 	<ol style="list-style-type: none"> 1. Replace filter 2. Return to factory
Non-repeatability (valve fails to return to neutral each time controller is returned to neutral).	<ol style="list-style-type: none"> 1. Controller not functioning properly 2. Contamination in spool bore 3. Partially plugged torque motor assembly 	<ol style="list-style-type: none"> 1. Replace controller 2. Return to factory 3. Return to factory



8. FILTER ASSEMBLY REPLACEMENT

- Using a 3 mm Allen wrench, remove the four (4) socket head capscrews and lockwashers. Remove filter plate.
- Remove, inspect and discard filter disc. Remove O-Ring from filter cavity and retainer plate.
- Install new O-Rings and filter. Install filter retainer using 4 socket head capscrews. torque to 36 inch pounds.

9. FUNCTIONAL CHECKOUT AND CENTERING

- Install the control valve in your hydraulic system or test fixture, but do not connect electrical lead.
- Apply required system pressure to the control valve and visually examine for evidence of external leakage. If leakage is present and cannot be rectified by replacing O-Rings, remove the discrepant component and return for repair or replacement.

Note: If the system components are drifting or hardover, adjust the electrical null of the control valve.
- Connect electrical lead to control valve and check phasing in accordance with system requirements.

10. AUTHORIZED REPAIR FACILITIES

Moog does not authorize any facilities other than Moog or Moog subsidiaries to repair its servovalves. It is recommended you contact Moog at (716)655-3000 to locate your closest Moog repair facility. Repair by an independent (unauthorized) repair house will result in voiding the Moog warranty and could lead to performance degradation or safety problems.

641 SERIES INSTALLATION AND OPERATION INSTRUCTION

NOTES

1 Fluid:

Industrial type petroleum base hydraulic fluid, maintained to ISO DIS 4406 Code 14/11 recommended.

2 Operating Temperature Range:

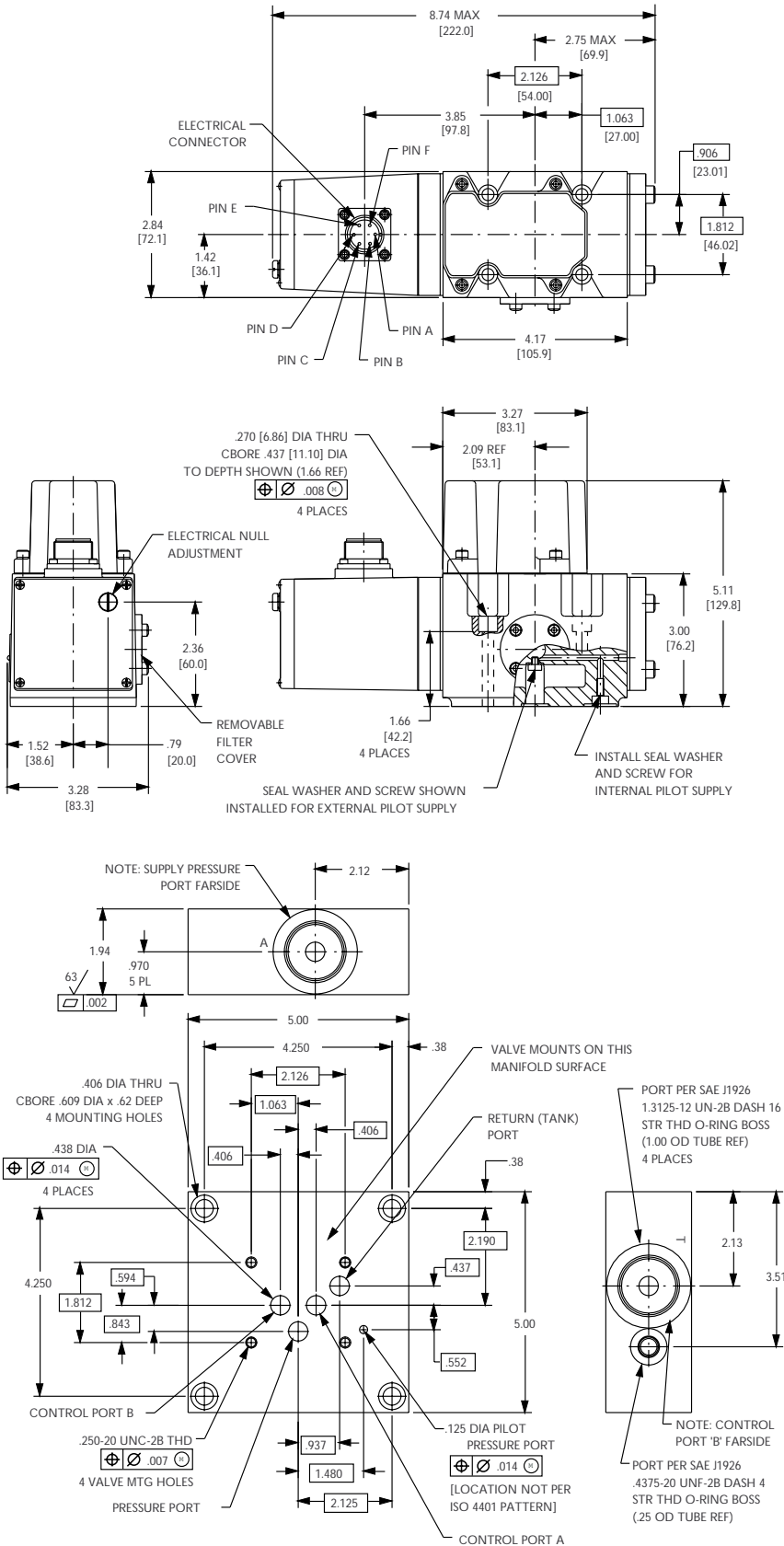
-4°F to 175°F (-20°C to 80°C)

3 Surface:

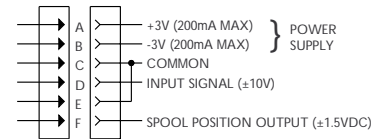
Surface to which valve is mounted requires $\sqrt{\text{V}}$ finish, flat within .002 [0.05] TIR.

4 Null Adjust:

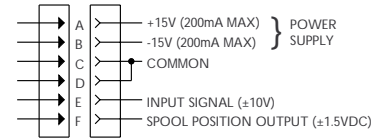
Remove coverscrew. Clockwise rotation of potentiometer increases flow out port A.



STANDARD ELECTRICAL CONFIGURATION



POSITIVE SIGNAL AT PIN 'D' RESULTS IN FLOW OUT PORT 'A'.



POSITIVE SIGNAL AT PIN 'E' RESULTS IN FLOW OUT PORT 'B'.

Figure 4

The products described herein are subject to change at any time without notice, including, but not limited to, product features, specifications, and designs.

MOOG
 Industrial Controls Division
 Moog Inc., East Aurora, NY 14052-0018
 Telephone: 716/655-3000
 Fax: 716/655-1803
 Toll Free: 1-800-272-MOOG