DANIEL SERIES 700 ALP VALVES

MODEL 787 AND 789 ALP

INSTRUCTION MANUAL

DANIEL MEASUREMENT AND CONTROL, INC.
AN EMERSON PROCESS MANAGEMENT COMPANY
HOUSTON, TEXAS

Part Number 3-9008-557
Revision A

July 2009

DANIEL®

EMERSON.
Process Management

This page intentionally left blank.

IMPORTANT INSTRUCTIONS

Daniel Measurement and Control, Inc. (Daniel) designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, using and maintaining Daniel products.

- **Read all instructions prior to installing, operating and servicing the product.** If this instruction manual is not the correct manual, call 1-713-827-6314 (24-hour response number for both Service and Sales Support) and the requested manual will be provided. Save this instruction manual for future reference.
- If you do not understand any of the instructions, contact your Daniel representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- When replacement parts are required, ensure that qualified people use replacement parts specified by the manufacturer. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place, except when maintenance is being performed by qualified persons, to prevent personal injury.
- **ALWAYS READ AND FOLLOW THE DANIEL SERIES 700 ALP VALVES INSTRUCTION MANUAL AND ALL PRODUCT WARNINGS AND INSTRUCTIONS.**
- Use of this equipment for any purpose other than its intended purpose may result in property damage and/or serious personal injury or death.
- Before opening the flameproof enclosure in a flammable atmosphere, the electrical circuits must be interrupted.

This page intentionally left blank.

DANIEL MEASUREMENT AND CONTROL, INC.
DANIEL SERIES 700 ALP VALVES
INSTALLATION AND MAINTENANCE INSTRUCTIONS

NOTICE

THE CONTENTS OF THIS PUBLICATION ARE PRESENTED FOR INFORMATIONAL PURPOSES ONLY, AND WHILE EVERY EFFORT HAS BEEN MADE TO ENSURE THEIR ACCURACY, THEY ARE NOT TO BE CONSTRUED AS WARRANTIES OR GUARANTEES, EXPRESSED OR IMPLIED, REGARDING THE PRODUCTS OR SERVICES DESCRIBED HEREIN OR THEIR USE OR APPLICABILITY. ALL SALES ARE GOVERNED BY DANIEL'S TERMS AND CONDITIONS, WHICH ARE AVAILABLE UPON REQUEST. WE RESERVE THE RIGHT TO MODIFY OR IMPROVE THE DESIGNS OR SPECIFICATIONS OF SUCH PRODUCTS AT ANY TIME.

DANIEL DOES NOT ASSUME RESPONSIBILITY FOR THE SELECTION, USE OR MAINTENANCE OF ANY PRODUCT. RESPONSIBILITY FOR PROPER SELECTION, USE AND MAINTENANCE OF ANY DANIEL PRODUCT REMAINS SOLELY WITH THE PURCHASER AND END-USER.

TO THE BEST OF DANIEL'S KNOWLEDGE THE INFORMATION HEREIN IS COMPLETE AND ACCURATE. DANIEL MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THIS MANUAL AND, IN NO EVENT, SHALL DANIEL BE LIABLE FOR ANY INCIDENTAL, PUNITIVE, SPECIAL OR CONSEQUENTIAL DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PRODUCTION, LOSS OF PROFITS, LOSS OF REVENUE OR USE AND COSTS INCURRED INCLUDING WITHOUT LIMITATION FOR CAPITAL, FUEL AND POWER, AND CLAIMS OF THIRD PARTIES.

PRODUCT NAMES USED HEREIN ARE FOR MANUFACTURER OR SUPPLIER IDENTIFICATION ONLY AND MAY BE TRADEMARKS/REGISTERED TRADEMARKS OF THESE COMPANIES.

DANIEL AND THE DANIEL LOGO ARE REGISTERED TRADEMARKS OF DANIEL INDUSTRIES, INC. THE EMERSON LOGO IS A TRADEMARK AND SERVICE MARK OF EMERSON ELECTRIC CO.

1. **LIMITED WARRANTY:** Subject to the limitations contained in Section 2 herein, Daniel Measurement & Control, Inc. ("Daniel") warrants that the licensed firmware embodied in the Goods will execute the programming instructions provided by Daniel, and that the Goods manufactured by Daniel will be free from defects in materials or workmanship under normal use and care and Services will be performed by trained personnel using proper equipment and instrumentation for the particular Service provided. The foregoing warranties will apply until the expiration of the applicable warranty period. Goods are warranted for twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Daniel, whichever period expires first. Consumables and Services are warranted for a period of 90 days from the date of shipment or completion of the Services. Products purchased by Daniel from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer. Buyer agrees that Daniel has no liability for Resale Products beyond making a reasonable commercial effort to arrange for procurement and shipping of the Resale Products. If Buyer discovers any warranty defects and notifies Daniel thereof in writing during the applicable warranty period, Daniel shall, at its option, correct any errors that are found by Daniel in the firmware or Services or repair or replace F.O.B. point of manufacture that portion of the Goods or firmware found by Daniel to be defective, or refund the purchase price of the defective portion of the Goods/Services. All replacements or repairs necessitated by inadequate maintenance, normal wear and usage, unsuitable power sources or environmental conditions, accident, misuse, improper installation, modification, repair, use of unauthorized replacement parts, storage or handling, or any other cause not the fault of Daniel are not covered by this limited warranty, and shall be at Buyer's expense. Daniel shall not be obligated to pay any costs or charges incurred by Buyer or any other party except as may be agreed upon in writing in advance by Daniel. All costs of dismantling, reinstallation and freight and the time and expenses of Daniel's personnel and representatives for site travel and diagnosis under this warranty clause shall be borne by Buyer unless accepted in writing by Daniel. Goods repaired and parts replaced by Daniel during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Daniel and can be amended only in a writing signed by Daniel. THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. THERE ARE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE OR ANY OTHER MATTER WITH RESPECT TO ANY OF THE GOODS OR SERVICES. **Buyer acknowledges and agrees that corrosion or erosion of materials is not covered by this warranty.**

2. LIMITATION OF REMEDY AND LIABILITY: DANIEL SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE. THE REMEDIES OF BUYER SET FORTH IN THIS AGREEMENT ARE EXCLUSIVE. IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL DANIEL'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE TO BUYER OF THE SPECIFIC GOODS MANUFACTURED OR SERVICES PROVIDED BY DANIEL GIVING RISE TO THE CLAIM OR CAUSE OF ACTION. BUYER AGREES THAT IN NO EVENT SHALL DANIEL'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXTEND TO INCLUDE INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES. THE TERM "CONSEQUENTIAL DAMAGES" SHALL INCLUDE, BUT NOT BE LIMITED TO, LOSS OF ANTICIPATED PROFITS, REVENUE OR USE AND COSTS INCURRED INCLUDING WITHOUT LIMITATION FOR CAPITAL, FUEL AND POWER, AND CLAIMS OF BUYER'S CUSTOMERS.

TABLE OF CONTENTS

Figures

Tables

1.0 INTRODUCTION

This manual discusses proper installation, operation and maintenance of the Daniel Series 700 ALP Control Valves.

These two-stage electronic control valves are typically used when handling products exhibiting high vapor pressure found in applications such as LPG or ammonia services.

Two basic valves (in four configurations) will be covered in this manual. Each valve description, operation and physical installation is dependent on the pilots chosen for the specific application. Series 787 ALP valves are two-stage electric "differential pressure" (vapor pressure) control valves.

Series 787 ALP is a two-stage differential pressure control valve consisting of:
- The basic 700 Series Valve Body
- Two Series 1710 Normally Closed Pilots
- One Series 1711 Normally Open Pilot
- One Series 1710 Differential Pressure Pilot Strainer
- Microswitch
- Pneutrol Controller (opening speed)
- Needle Valve Adjustor (closing speed)

Series 787ALP/S754/S760EXF is a two-stage control valve designed for Differential Pressure Control, Pressure Control, Maximum Rate of Flow and Excess Flow Shut-down. It consists of:
- The basic 700 Series Valve Body
- One Series 1760 Excess Flow Shut-down Pilot
- One Series 1754 Maximum Rate of Flow Pilot
- One Series 1770 Differential Pressure Pilot
- One 3-way Ball Valve/Excess Flow Shut-down

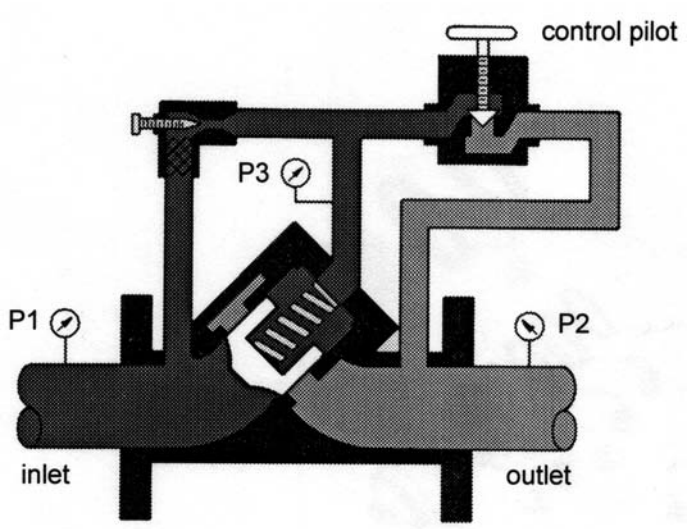
Series 789 ALP is a two-stage, back pressure control valve. Components include:
- The basic 700 Series Valve Body
- Two Series 1710 Normally Closed Pilots
- One Series 1711 Normally Open Pilot
- One Series 1760 Back Pressure Pilot
- Strainer
- Microswitch
- Pneutrol Controller (opening speed)
- Needle Valve Adjustor (closing speed)

Series 789ALP/S754/S760EXF is a two-stage control valve designed for Back Pressure Control, Maximum Rate of Flow and Excess Flow Shut-down. It consists of:

- The basic 700 Series Valve Body
- Two Series 1760 Pilots (one for Excess Flow and one for Back Pressure Control)
- One Series 1754 Maximum Rate of Flow Pilot
- One 3-way Ball Valve

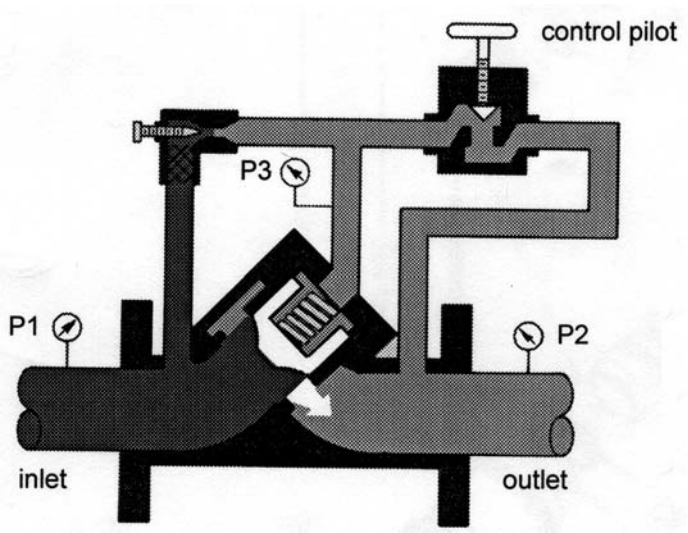
1.1 THEORY OF OPERATION

The Model Series 700ALP Control Valve operates on a balanced-piston principle. When pressures on both sides of the piston are equalized, a spring located on top of the piston acts as a differential force and closes the valve. When the pressure against the bottom of the piston exceeds the pressure plus the force of the spring exerted against the top of the piston, spring tension is overcome, and the valve opens. See Figure 1-1 for more information.



The control valve operates using the balanced piston principle, meaning the exposed area on the spring side (P3) of the piston and the bottom side (P1) of the piston are equal in area. The spring is the differential force that closes the piston when P1 and P3 pressures are equal.

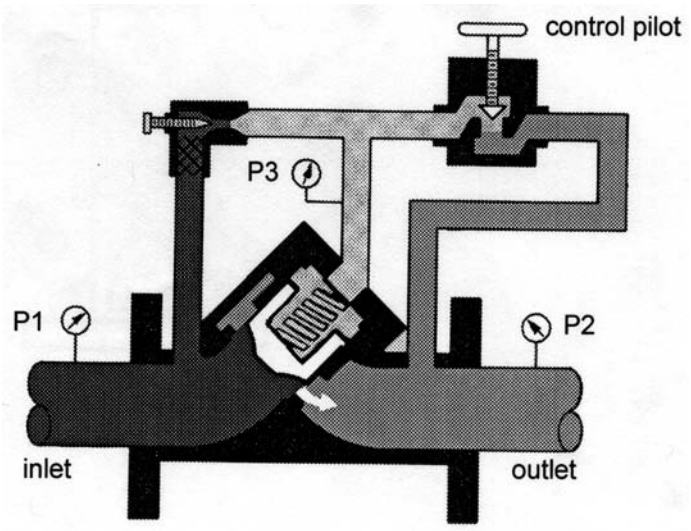
P1 and P3 = inlet pressure
P2 = outlet pressure



When the pressure against the bottom of the piston (P1) exceeds the pressure exerted against the top of the piston (P3), including the force of the spring, spring tension is overcome and the valve opens.

P1 = inlet pressure
P2 and P3 = outlet pressure

Figure 1-1. Theory of Operation



Flow through the valve is adjusted using the control pilot, a variable orifice that regulates the pressure at P3 by controlling the flow through the outlet port. Adjusting P3 pressure will cause the piston to change positions, thus, regulating flow through the valve.

P1 = inlet pressure
P2 = outlet pressure
P3 = controlled pressure

Figure 1-1. Theory of Operation (continued)

2.0 SPECIFICATIONS

WARNING

PERSONAL INJURY OR EQUIPMENT DAMAGE

Do not operate this instrument in excess of the specifications listed below.

Failure to heed warning may result in serious personal injury or damage to the equipment.

Ratings

Pressure Class
150 lb., 300 lb. ANSI

Maximum Safe Working Pressure
150 lb. steel body - 275 psi (1896 kPa)
300 lb. steel body - 720 psi (4964 kPa)

Maximum Safe Working Temperature
Standard: 150˚F (66˚C)
Optional: Valves for up to 250˚F (121 ˚C)

Size: 2" through 4"

Materials of Construction

Main Valve Body
Steel - ASTM-A352-GR-LCC

Main Valve Cylinder Assembly
2" through 4" 17- 4PH Stainless Steel
Optional: 316 Stainless Steel

Main Valve Piston
Standard: 304 Stainless Steel
Optional: 316 Stainless Steel

Seat Ring
304 Stainless Steel
Optional: 316 Stainless Steel

O-Rings
Standard: Viton™ Dynamic, Buna-N static
Optional: Neoprene ™, EPR, all Viton, all Buna-N

Other Internal Parts
Stainless Steel

3.0 INSTALLATION AND MAINTENANCE

3.1 INSTALLATION

The Model Series 700ALP Control Valve features a two-piece cylinder, characterized ports, and indicator with (1) or (2) microswitches. Pilots and other optional accessories enable the valve to perform a variety of control functions such as regulating rate of flow, differential pressure, back pressure, and/or excess flow.

If you have questions or need information not contained in this manual, please contact your Daniel sales representative or the Daniel Measurement and Control service center nearest you.

Installation of the Series 700 ALP will depend greatly on the control function to be employed. Reference pilot installation information pertinent to your valve. Typical considerations include:

1. The valve must be mounted in line in the proper flow direction. Flow direction is indicated on all valve bodies. The valve may be installed in a horizontal line or vertical line (upward flow). Do not install in a vertical line with downward flow.

2. If possible, the control valve should be installed withing 25 feet of the point at which upstream line pressure is to be controlled. This distance limitation is due to the sense line which must be run to the pilot. Consult factory for distances greater than 25 feet.

3. It is recommended that the control valve be installed between isolating valves. This will permit the system to remain operational while maintenance is being performed on the valve.

4. The product must be completely free of all foreign material before the valve is bolted into the line. If it is impractical to flush the line before installing the valve, the valve body may be bolted in place, and the cylinder assembly removed. In such case it will be necessary to fabricate a temporary valve cover for sealing the valve. It will also be necessary to disconnect, isolate or seal all sense lines connected to valve pilots. This operation will eliminate the possibility of foreign material entering the sense lines. Flushing will not be necessary if the product line and liquid are positively known to be clean.

5. Sense Lines: As applicable, a 3/8" sense line is required between upstream or downstream sense points.

6. The inclusion of a pressure gauge (not included with valve) in the valve circuit is recommended. This gauge will permit upstream pressure to be monitored.

3.2 CONTROL OPTIONS AND REQUIREMENTS

ALP valves can be fitted with additional pilots and accessories to provide other functions. Typical functions may include the following:

A. **Maximum Rate of Flow** is achieved by adding a normally open differential pilot (1754). Control of this pilot is established by a 5 psi minimum differential pressure developed across either a meter or an integral orifice on the inlet of the valve.

B. **Excess Flow Shutdown** is established by adding a normally closed Model 1760 pilot sensed through a three-way ball valve to the downstream side of the valve. This concept requires "initial setting" by positioning the three-way ball valve to apply valve inlet pressure to the normally closed pilot, permitting it to open, which then allows the main valve to open. Once the downstream side of the control valve is pressurized under normal flow conditions the three-way ball valve is returned to its normal position permitting the control pilot to continue to be held open by downstream pressure.

For operator convenience in "setting and resetting" this type of excess flow shutdown valve, the three-way ball valve is fitted with a spring on its stem which causes spring return to its normal position once the operator releases the ball valve knob.

If a line break occurs downstream of the control valve, line pressure will drop, allowing the control valve pilot to return to its spring loaded-closed position, thus shutting down the main control valve.

C. **Pressure Reducing** capability is obtained by adding a normally open 1750 pilot. Control of this pilot is by sensing downstream pressure.

D. **Thermal Relief** permits bleed-back of pressure buildup form the downstream side of the valve back to the valve inlet. This device is a small, direct acting, spring loaded relief with a nominal factory setting of approximately 15 psi.

E. **Low Flow Start** is accomplished by adding an additional microswitch on the valve indicator. The valve can be wired with a suitable time delay to provide two-stage opening (low flow start).

F. **Excess Flow Test Port**
The valve may be equipped with (2) needle valves to allow for functionality testing the excess flow pilot during normal operation. This will require connecting an external pressure vessel to the valve to contain a small amount of propane during this test.

3.3 ELECTRICAL WIRING HOOK-UP

Hookup of solenoid pilots and microswitches is the same as any two-stage valve with one exception: ALP valves have two normally closed solenoid pilots (1710) which must be wired in parallel with one another.

3.4 CHANNEL MOUNTING OF PILOTS

Because of the number of pilots typical to the ALP series the pilots are channel mounted by clamping the inter-pilot fittings with "U" bolts to a section of "U" channel welded to the body of the main valve. This is necessary to provide for the structural integrity of the overall assembly.

3.5 SENSE LINE CONNECTIONS

The Model 787ALP, utilizing a 1770 differential pilot, must have sense connections piped in the field. The lower sense connection (high pressure) normally goes to the meter outlet/valve inlet. The upper sense connection (low pressure) usually goes to the product vapor pressure.

The Model 789ALP, utilizing a 1760 back pressure pilot must have the sense connection piped in the field usually to user piping to the meter outlet/valve inlet.

When fitted for excess flow shutdown all required connections for excess flow function are made in the factory.

When fitted for maximum rate of flow control with integral orifice the sense lines between the rate of flow pilot and the orifice are factory piped. If the differential control pressure for the rate of flow pilot is to be taken across a meter, sense lines must be fitted in the field.

NOTICE

Sense connections may be factory piped to valve inlet if requested and orifice has been provided.

When fitted for pressure reducing control the sense lines between the 1750 pilot and downstream of the valve must be fitted in the field.

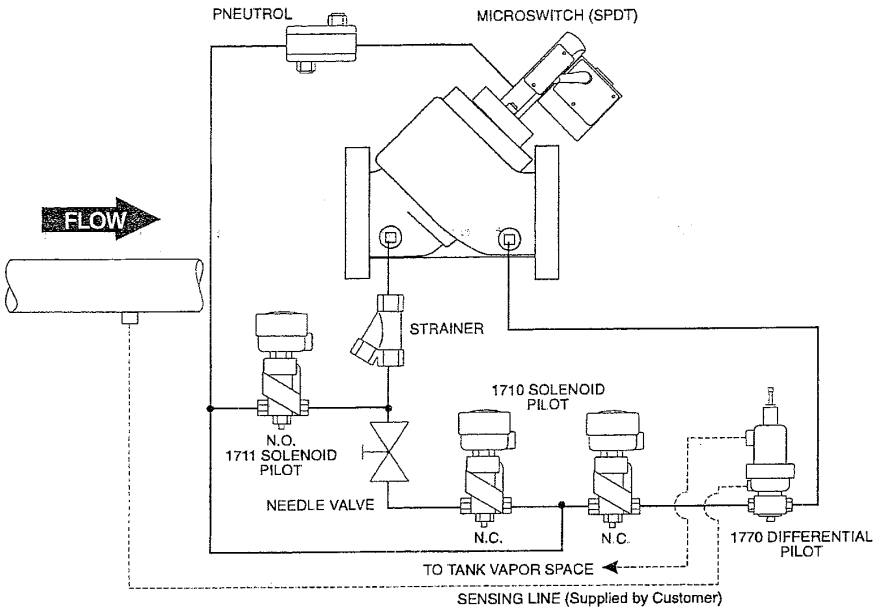


Figure 3-1. Model 787ALP Two-Stage Electric Valve with Differential Pilot

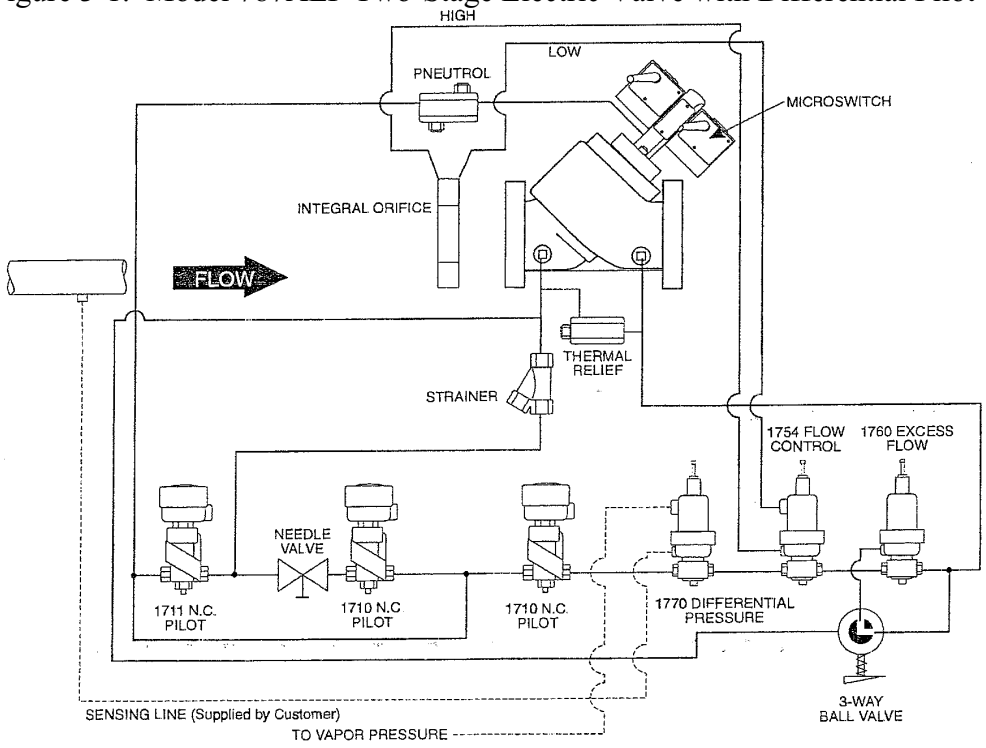


Figure 3-2. Model 787ALP/S745/S760EXF Two-Stage Electric Valve with Differential Pressure Control, Maximum Rate of Flow, Excess Flow Shutdown, and Additional Microswitch for Low-Flow Start

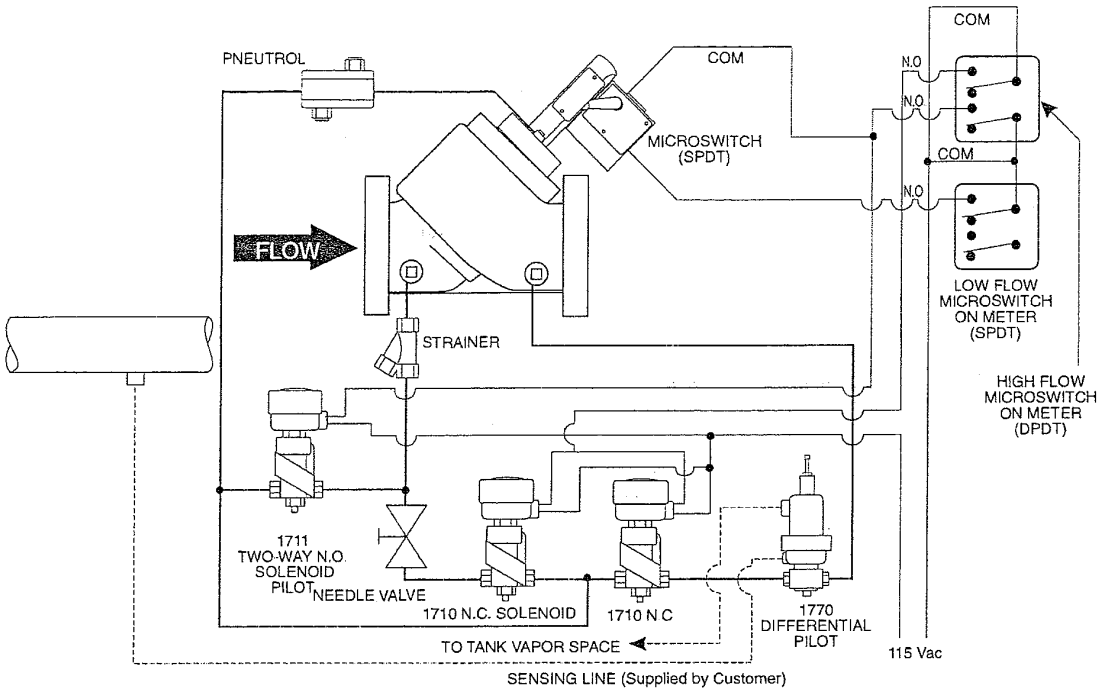


Figure 3-3. Model 787ALP Two-Stage Electric Valve with Differential Pressure Pilot Electrical Schematic

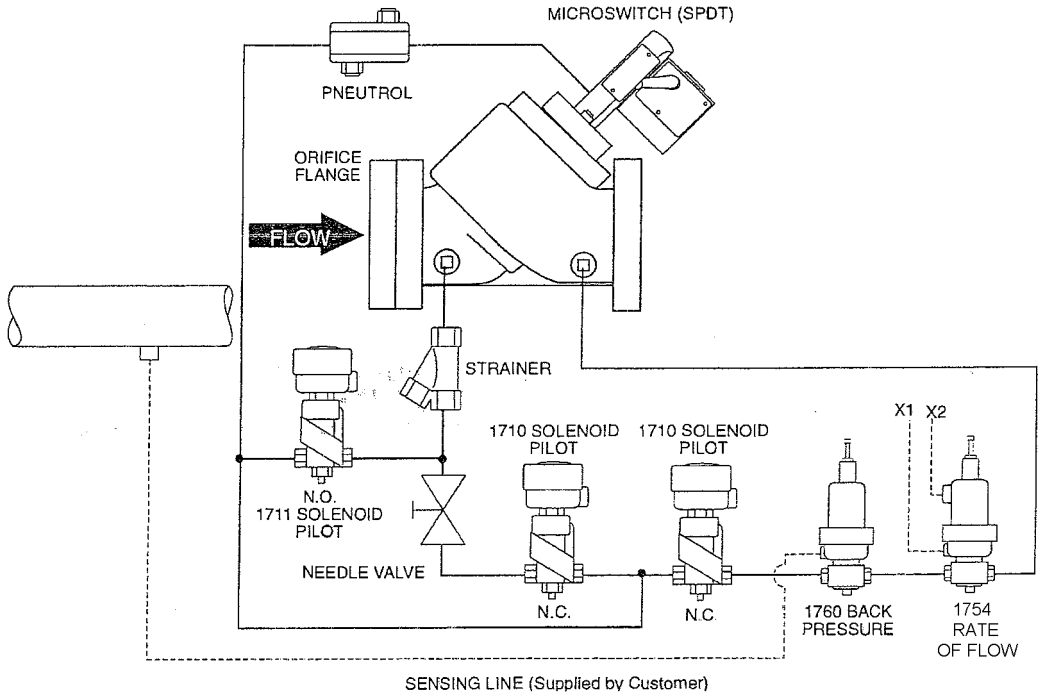


Figure 3-4. Model 789ALP Two-Stage Electric Valve with Back Pressure Control and Rate of Flow Control

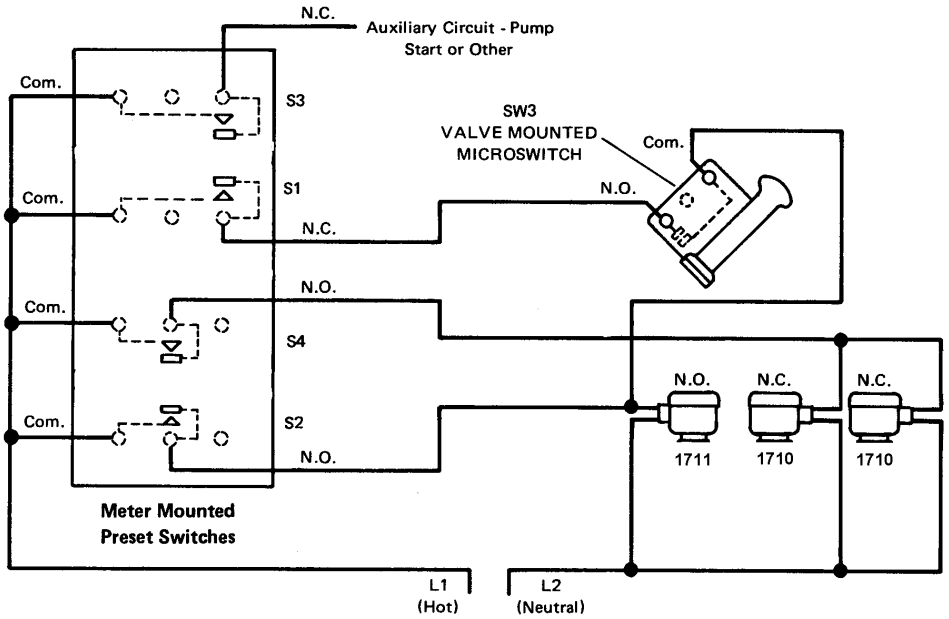


Figure 3-5. Wiring Diagram - All Models without Time Delay Circuit

VALVE POSITION	SOLENOID PILOTS	SOLENOID PILOT PORTS	MICRO SWITCH CONTACTS		
			S1 & S3	S2 & S4	SW3
START AND HIGH FLOW	N. C. ENERGIZED N. O. ENERGIZED	OPEN CLOSED	CLOSED	CLOSED	OPEN
TRANSITION FROM HIGH TO LOW FLOW	N. C. DEENERGIZED N. O. DEENERGIZED	CLOSED OPEN	CLOSED	OPEN	OPEN
LOW FLOW	N. C. DEENERGIZED N. O. ENERGIZED	CLOSED CLOSED	CLOSED	OPEN	CLOSED
NO FLOW	N. C. DEENERGIZED N. O. DEENERGIZED	CLOSED OPEN	OPEN	OPEN	CLOSED

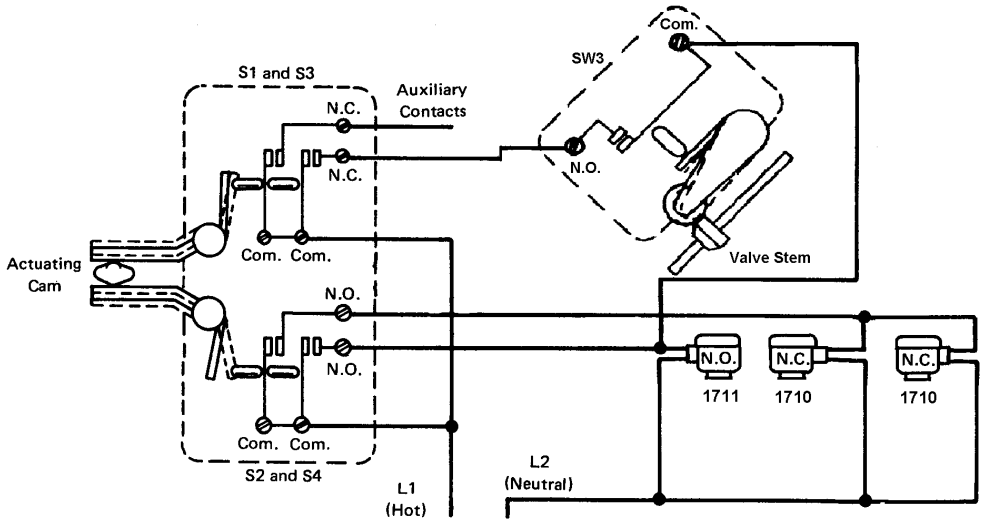


Figure 3-6. Wiring Schematic - All Models without Time Delay Circuit

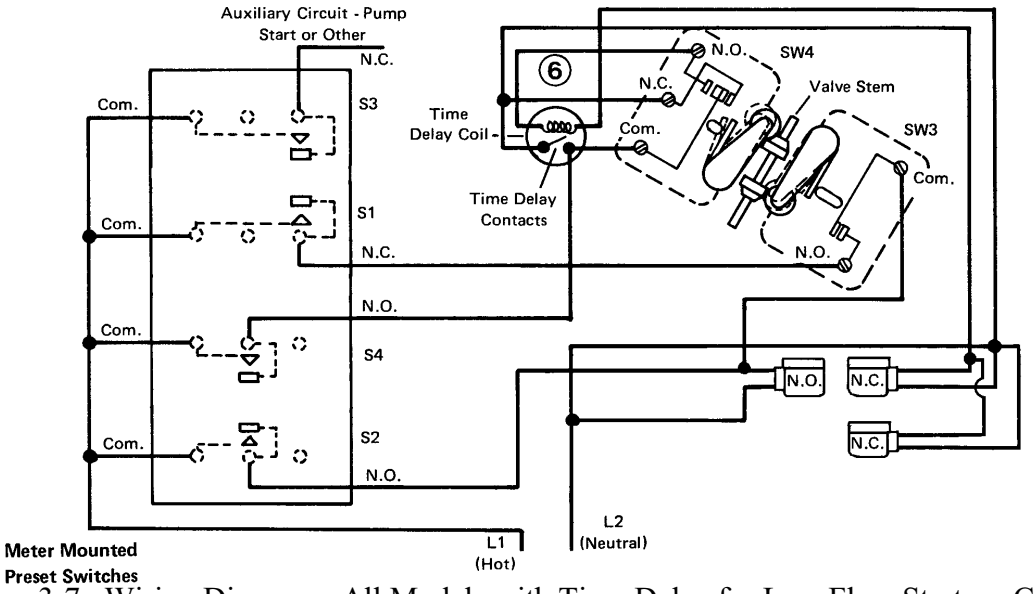


Figure 3-7. Wiring Diagram - All Models with Time Delay for Low Flow Start-up Control

VALVE POSITION	SOLENOID PILOTS	SOLENOID PILOT PORTS	TIMER		MICRO SWITCH CONTACTS			
			COIL	CONTACTS	S1 & S3	S2 & S4	SW3	SW4
START AND HIGH FLOW	N. C. ENERGIZED N. C. ENERGIZED	OPEN CLOSED	ENERGIZED	CLOSED	CLOSED	CLOSED	OPEN	OPEN
TRANSITION FROM HIGH TO LOW FLOW	N. C. DEENERGIZED N. O. DEENERGIZED	CLOSED OPEN	DEENERGIZED	CLOSED	CLOSED	OPEN	OPEN	OPEN
LOW FLOW	N. C. DEENERGIZED N. O. ENERGIZED	CLOSED CLOSED	DEENERGIZED	OPEN	CLOSED	OPEN	CLOSED	OPEN
NO FLOW	N. C. DEENERGIZED N. O. DEENERGIZED	CLOSED OPEN	DEENERGIZED	OPEN	OPEN	OPEN	CLOSED	CLOSED
LOW FLOW START	N. C. DEENERGIZED N. O. ENERGIZED	CLOSED CLOSED	ENERGIZED	OPEN	CLOSED	CLOSED	CLOSED	OPEN

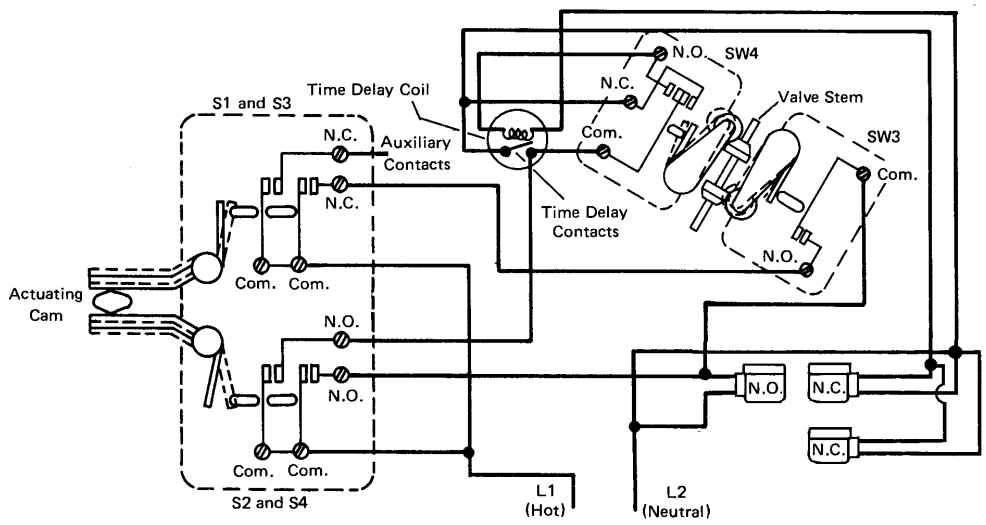


Figure 3-8. Wiring Schematic - All Models with Time Delay for Low Flow Start-up Control

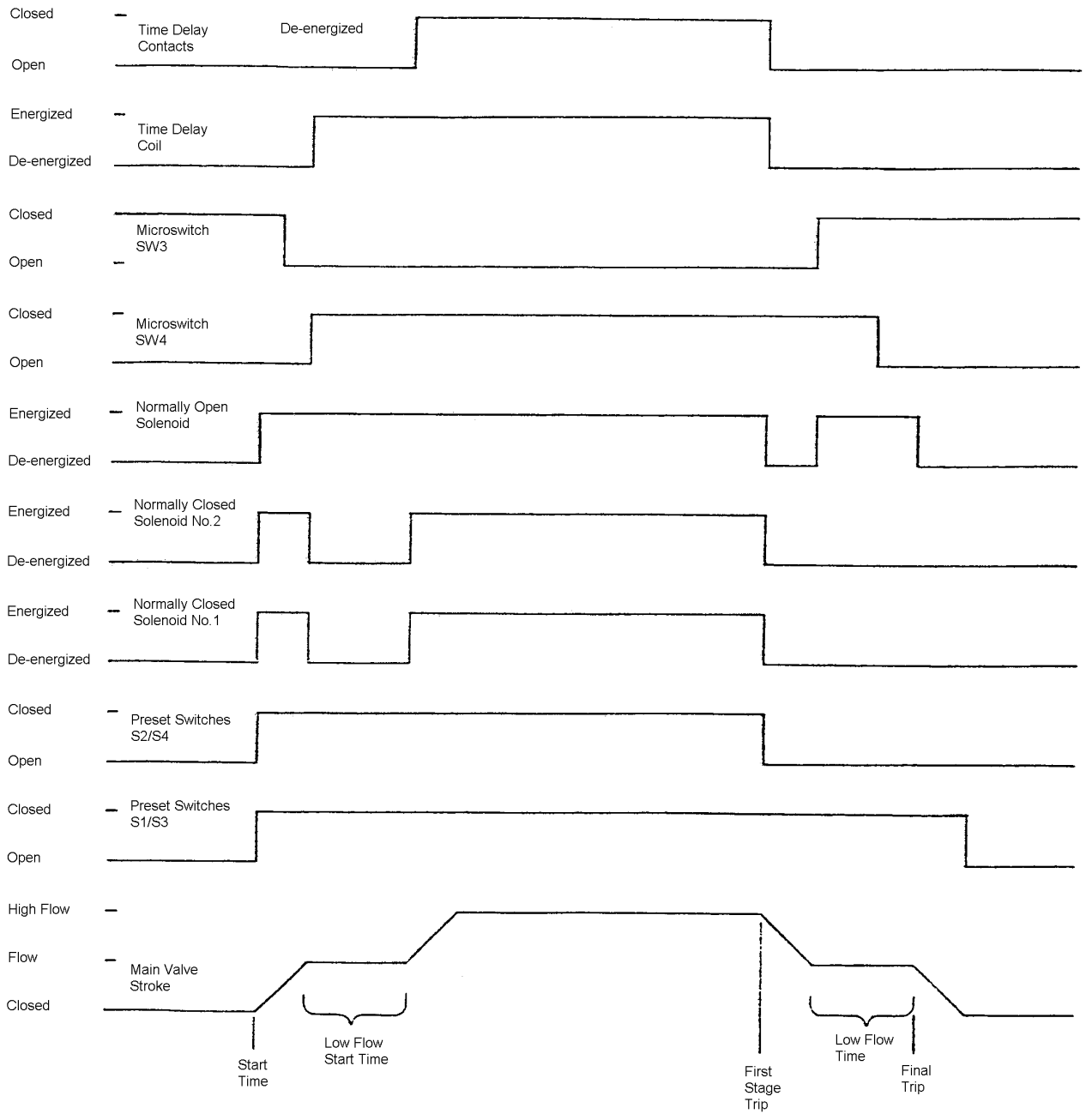


Figure 3-9. Operation Logic

4.0 OPERATION

4.1 GENERAL

The following information is intended as a guide for the general operation, replacement and maintenance of any standard 700 Series Control Valve.

CAUTION

DAMAGE TO COMPONENTS

Read the entire recommended procedure for all installation operations and maintenance procedures before attempting to install or disassemble the valve.

Failure to follow recommended procedures may cause damage to equipment.

4.2 OPERATION

To safely start flow through the valve and maintain good operating procedures is necessary to acclimate the valve to operating conditions.

1. Activate the pump and slowly open the upstream isolating valve to allow flow into the main control valve. Loosen any external sense line connections to bleed air from the system. Retighten upon completion and deactivate the pump when the system is free of air.

2. Activate all sense lines to pilot controls and adjust as required. Reference appropriate valve and pilot Installation, Operation Service Manuals.

3. Start the pump and slowly open the downstream isolating valve and observe the pressure gauge to determine when the valve begins controlling. (This will be indicated by a drop in upstream pressure as the downstream isolating valve opens.) When pressure drop is observed adjust pilot controls as required.

4. Completely open the downstream isolating valve. Adjust regulating pilots (if applicable) accordingly.

5. Pulsation in flow controlled applications may be eliminated by turning the sensitivity adjustment clockwise. (Used only for back pressure or pressure relief control.)

4.3 CYLINDER DISASSEMBLY AND REASSEMBLY

The following tools will be needed to disassemble and reassemble your control valve:

- socket wrench
- adjustable wrench
- T-handle or extended Allen wrench
- arbor press (may be needed for 4- and 6-inch valves)
- retaining ring pliers

CAUTION

EQUIPMENT DAMAGE

Read the entire recommended procedure for all installation operations and maintenance procedures before attempting to install or disassemble the valve. Disassembly of this cylinder assembly is different from previous Daniel Control Valves and requires strict adherence to the procedures outlined in this manual.

Failure to read and comply with these procedures could result in damage to the equipment and compromise in the integrity of the operation.

4.4 CYLINDER ASSEMBLY REMOVAL - ALL DANIEL VALVES

1. Isolate the Control Valve from the system and bleed off pressure.

2. Loosen and remove the tubing from the cylinder head.

3. Remove the nuts securing the cylinder assembly within the valve body.

4. Tighten the two jack screws provided in the cylinder head until the cylinder assembly has been freed from the valve body. These screws should be tightened evenly to prevent damage to the cylinder O-ring and binding the cylinder assembly.

5. Remove the cylinder assembly from the valve body by pulling upward and evenly using both hands (on smaller valves) or a mechanical device (for larger models).

4.5 CYLINDER DISASSEMBLY

⚠WARNING

PERSONAL INJURY AND/OR EQUIPMENT DAMAGE

Caution is required when performing any disassembly procedure as the Cylinder head is bolted to a spring loaded cylinder assembly. Service should only be performed by trained and qualified service personnel.

Failure to comply with recommended could result in serious injury and/or damage to the equipment.

1. Position the cylinder assembly with the cylinder head up. Larger units may require the use of a spindle or arbor press to facilitate removal of the piston assembly in which case the arbor should be resting against the cylinder head.

2. Loosen set screws holding the switch-activating cam to the indicator shaft, and remove.

3. Carefully loosen the socket-head screws which hold the cylinder head in place. Alternate to opposite sides to equalize release of spring tension on the cylinder head.

4. Using EXTREME CAUTION hold the cylinder head firmly against the cylinder assembly and remove the retaining screws.

5. Lift off the cylinder head and retain accompanying O-rings for reassembly. If an indicator is being used, care should be taken to avoid bending or damaging the indicator stem in this operation.

NOTICE

It is not necessary to remove the indicator guard or other component parts of the indicator at this time; however, the indicator stem should be wiped clean of any residue or foreign material that may have gathered on its surface. This will protect the internal cup seal from unnecessary abrasion upon removal of the indicator stem.

6. The spring, piston, indicator stem assembly and cylinder may be removed at this time by pushing from the bottom of the unit.

NOTICE

If equipped with Teflon cup-seals, do not attempt to remove the piston through the seat area. Removal through the seat area will destroy the spring-loaded Teflon cup-seals.

7. Inspect all O-rings (cylinder, piston, cylinder head and indicator), and cup-seals for nicks, damage or wear and replace as required.

8. The cylinder and piston may be cleaned to remove foreign materials or residue that may impede proper operation. Care should be taken not to damage the piston seat radius or seals.

4.6 CYLINDER REASSEMBLY

1. The O-rings or cup-seals should be protected at all times against damage or distortion of any kind.

2. Proper installation dictates that cup-seals be installed with the closed ends facing “in”.

3. To best accommodate cup-seal installation:
   a. Place the inside edge of the bottom seal in the deep recess of the piston body (below the seal’s resting position) and carefully pull into position. Adjust cup-seal position in its proper location.

   b. Replace O-rings as required. Lubricate with light oil before re-assembly.

   c. Complete cylinder assembly by installing piston and all component parts through the top of the cylinder housing.

NOTICE

If equipped with Teflon cup-seals, do not attempt to install the piston through the seat area. Attempts to assemble through the seat area will destroy the spring-loaded Teflon cup-seals.

WARNING

PERSONAL INJURY AND/OR EQUIPMENT DAMAGE

Caution is required when performing any disassembly procedure as the Cylinder head is bolted to a spring loaded cylinder assembly. Service should only be performed by trained and qualified service personnel.

Failure to comply with recommended could result in serious injury and/or damage to the equipment.

d. Secure cylinder assembly to cylinder heads using hand pressure or arbor press for ease of installation.

e. Lower the cylinder assembly and cylinder head into the valve body. Align the bolt holes in the cylinder head with the studs in the main valve body.

f. Fasten the cylinder head into position using retaining nuts. Tighten nuts, alternating to opposite sides, to assure a uniform seat.

g. Return all tubing and/or valve accessories to their original position.

4.7 CONTROL VALVE COMPONENTS AND SEQUENCE FOR PILOT CONTROL SETTINGS

Table 3-1 indicates those pilots and components included with each basic control valve package in the 700ALP series. Pilots have been numbered in sequence to indicate preferred order in which they are to be set. This information is intended as a guide in set-up operations and may vary according to specific application requirements.

NOTICE

It is important that pressure gauges be installed to assure proper pilot settings based on line pressures.

Pilot adjustment can be made on Series 1760 and 1770 Pilots. Turning the pilot adjustment screw in the CLOCKWISE direction will INCREASE pressure. Turning the adjustment screw in the COUNTER-CLOCKWISE direction will DECREASE pressure.

For the Series1754 Pilot, turning the pilot adjustment screw in the CLOCKWISE direction will INCREASE the maximum flow rate, and turning it COUNTER-CLOCKWISE will DECREASE the maximum flow rate.

Table 4-1. Control Valve Components and Sequence for Pilot Control Settings

CONTROL VALVE	PILOT SERIES					Micro-switch	Opening Speed Control	Closing Speed Control	3-Way Ball Valve
	MODEL 1710 Normally Closed	MODEL 1711 Normally Open	MODEL 1754 Rate of Flow	MODEL 1760 Back Pressure	MODEL 1770 Diff Pressure				
787 ALP Adjustment Sequence	Two Required	One Required			One Required	YES	YES	YES	
	No Adjustment	No Adjustment			1				
787ALP/S754 /S760EXF Adjustment Sequence			One Required	One Required	One Required				YES
			2 Set to Max. Rate	3	1				
789 ALP Adjustment Sequence	Two Required	One Required		One		YES	YES	YES	
	No Adjustment	No Adjustment		1					
789ALP/S754 /S760EXF Adjustment Sequence			One Required	Two Required					YES
			2	1 BackPress. 3 EXF					

4.8 LOW FLOWRATE ADJUSTMENT

The cam position determines the first stage low flowrate of the valve before final shutoff. It is recommended that the low flowrate be adjusted between 10 and 20 percent of the maximum rated capacity of the meter. For turbine meters, it may be necessary to adjust for less than 10 percent.

CAUTION

DAMAGE TO COMPONENTS

Do not allow the roller arm to ride over and onto the top side of the cam.

Failure to follow recommended procedures may cause damage to the roller arm of the microswitch.

1. Loosen the two set screws in the cam.

2. Move the cam up to relieve the tension on the microswitch swing arm. The roller on the microswitch swing arm should be approximately 1/16" away from the indicator stem.

3. Position the cam precisely as illustrated in Figure 4-1. Make sure the microswitch swing arm roller is on the beveled surface of the cam.

4. Tighten the set screws in the cam.

NOTICE

Do not start the pump to check low flowrate until all other pre-start checks and adjustments have been made.

5. Enter a predetermined batch quantity into the preset register. This quantity should be approximately 30 units more than when first stage trip occurs.

6. Position operating handle beneath the preset register into the high flow position.

7. Start the pump.

8. Once the first stage trip has occurred, the valve will transfer to low flow rate. Adjust the cam up on the valve position indicator if flowrate is too high or down on the valve position indicator if flowrate is too low. Movement of the cam should be 1/16" increments or less.

9. Repeat steps 5 thru 9 until the desired flowrate is achieved.

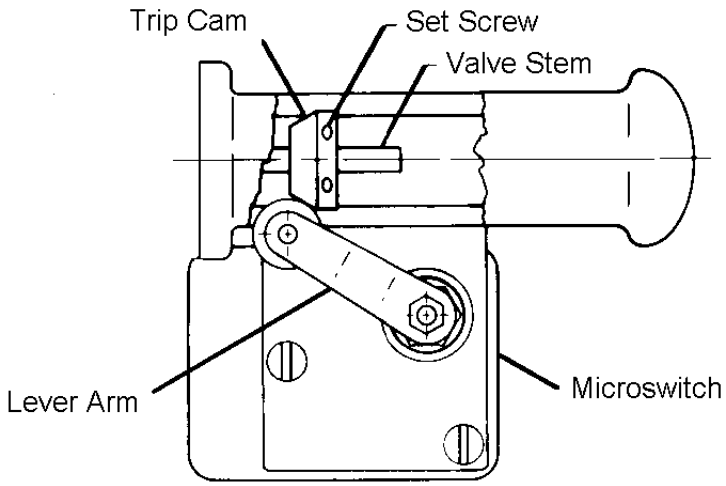


Figure 4-1. Valve Position Indicator Microswitch Trip Cam

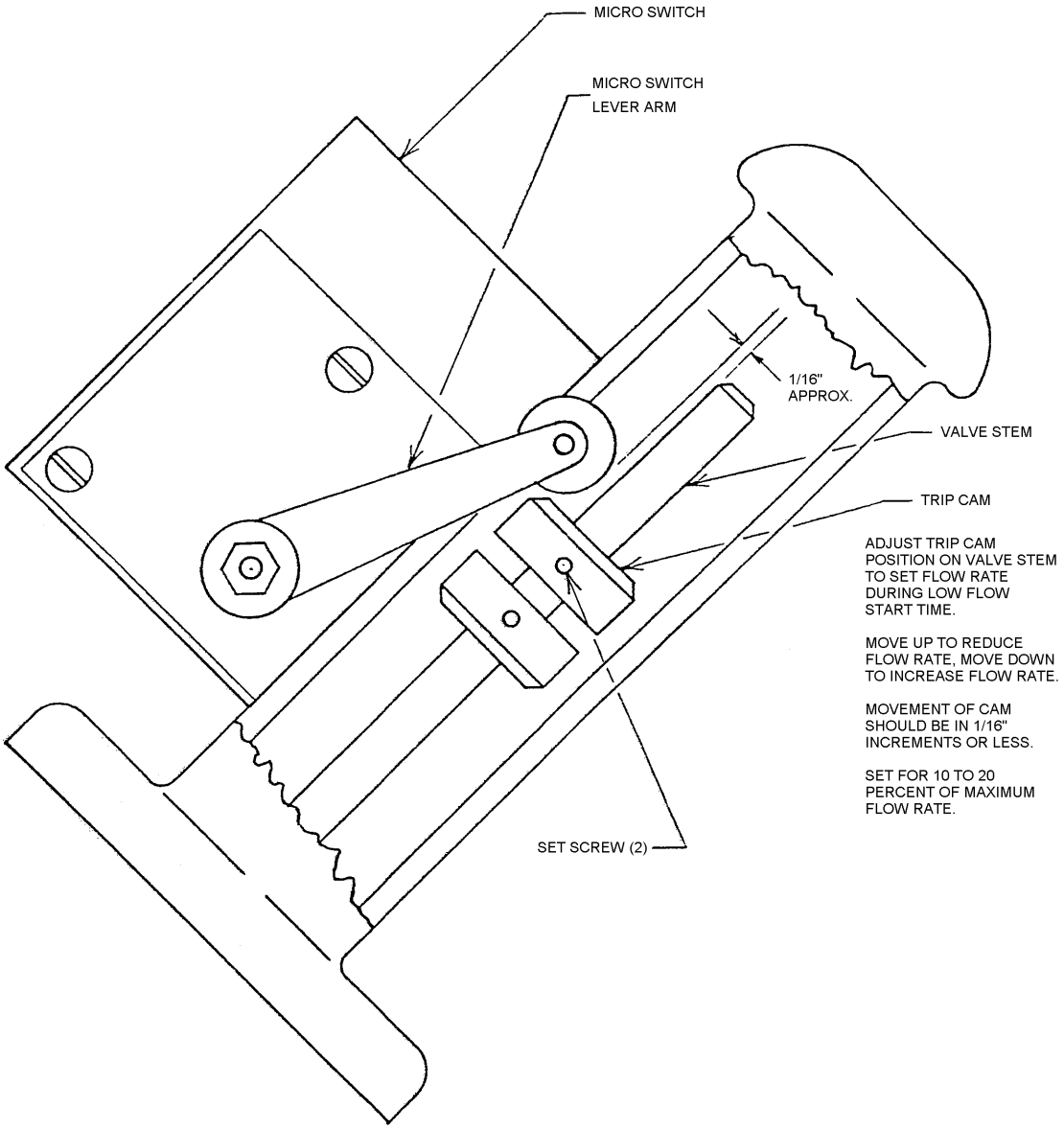


Figure 4-2. Low Flow Start/Low Flow Stop Adjustments

This page intentionally left blank.

5.0 TROUBLESHOOTING

The most frequent problem encountered with any control valve is the accumulation of sediment, rouge, scale and other foreign material in the pilot or its supply system. It is, therefore, good practice to periodically remove the pilot from the valve and inspect it for accumulation of these materials.

The strainer and needle valve in the pilot supply line should also be flushed periodically to avoid erratic control and slow response typical to obstructed flow. If sub-standard conditions persist after thoroughly cleaning the system, examine the pilot for swollen o-rings.

Periodic examination of all seal and o-rings for nicks, cuts and wear is recommended. Reference Section 4, Cylinder Disassembly/Reassembly.

Table 5-1 provides information for identifying and correcting operational problems you may experience with your control valve. Please keep in mind this information is not exhaustive and that system abnormalities may result from causes other than valve error. This information is provided to assist in general field repairs.

Table 5-1. Troubleshooting

Condition	Probable Cause	Correction
Valve will not open	Upstream valve is closed.	Open valve.
	Pump is not operating.	Start pump and check for cavitation.
	Downstream valve is closed.	Open valve. (Check coupler on bottom loading units and internal valve in truck.)
	Insufficient pressure.	Check pump. Check bypass and strainer in line.
	Clogged strainer.	Clean strainer.
	Swollen o-rings.	Disassemble valve and replace o-rings. Check compatibility of o-rings with product.
	Pilot malfunction.	Consult pilot manual.
	No voltage to solenoid pilots.	Check for voltage and/or preset operation.
Valve opens too slowly	Valve inlet pressure below normal.	Check strainer and pump for obstruction.
	Swollen o-rings.	Disassemble valve and replace o-rings. Check compatibility of o-rings with product.
	Pilot malfunction.	Consult pilot manual.
Valve will not close off tightly	Bent indicator stem.	Replace indicator
	Foreign material lodged in main valve piston seat.	Disassemble valve and inspect piston.
	Swollen o-rings	Disassemble valve and replace o-rings. Check compatibility of o-rings with product.
	Piston or seat o-ring cut or defective.	Disassemble valve and replace, if necessary.
	Pilot malfunction.	Consult pilot manual.

NOTES

NOTES

DANIEL MEASUREMENT AND CONTROL, INC.
RETURN POLICY FOR WARRANTY AND NON-WARRANTY MATERIAL

Use the following procedure for returning equipment to the Daniel factory in the United States.

Step 1 Obtaining a RMA Number

A Return Material Authorization (RMA) number must be obtained prior to returning any equipment for any reason.

To obtain a RMA number, call the Customer Service Department at 713-827-5033 between 8:00 a.m. and 5:00 p.m. (Central Standard Time), Monday through Friday, except holidays or email daniel.support@emersonprocess.com.

NOTICE

No product returns will be accepted without a RMA number and will be returned at the customer's expense.

For warranty consideration, the product must be returned to Daniel within twelve (12) months of the date of original shipment or within eighteen (18) months of the date of original shipment of the product to destinations outside the United States. The Purchaser must prepay any shipping charges.

In addition, the Purchaser is responsible for insuring any product shipped for return, and assumes the risk of loss of the product during shipment.

- The following information is required at the time the RMA is issued:
- Customer name
- Contact name
- Billing address
- Contact Phone # and email address
- Daniel SO #, PO #, or Invoice #
- Item(s) to be returned
- Reason for return
- End user and final destination address
- Consignee's complete name, address, contact name and phone number

- A RMA number is required for each original order. (Example: Two fittings purchased on two separate orders now being returned require two RMA numbers.)

For product returns from locations outside the United States, Daniel Customer Service personnel will provide additional shipping requirements.

Step 2 Cleaning and Decontamination

Prior to shipment, thoroughly clean and decontaminate all equipment removing all foreign substances. This includes all substances used for cleaning the equipment. The cleaning and decontamination requirement applies to any part exposed to process fluids or cleaning substances.

Shipping equipment that has not been decontaminated may be in violation of U.S. Department of Transportation (DOT) regulations. For your reference, the requirements for packaging and labeling hazardous substances are listed in DOT regulations 49 CFR 172, 178, and 179.

If you suspect that a part has been contaminated, the part must be completely drained and flushed to remove contaminants.

⚠WARNING

MAY CAUSE DEATH OR SERIOUS INJURY TO PERSONNEL

Contents may be under pressure or materials may be hazardous

Follow appropriate handling instructions for accessing pressurized equipment. Avoid contact with hazardous materials or contaminated units and parts. Failure to do so may result in death or serious injury.

Decontamination/Cleaning Statement

A blank Decontamination/Cleaning Statement is provided on the "Returned Material Authorization Repair Form for Used Equipment".

- A Decontamination/Cleaning Statement is required for each returned part.
- Fully complete each form and include a signature. If the decontamination statement is incomplete, the customer may be charged for decontamination and cleaning.

If the equipment has been exposed to a known hazardous substance with any characteristic that can be identified in the Code of Federal Regulations, 40 CFR 261.20 through 261.24, the chemical abstracts number and hazardous waste number/hazard code must be stated in the space provided on the form.

Two (2) copies of each Decontamination/Cleaning Statement must be provided:
- One (1) copy must be attached to the outside of the package.
- One (1) copy must be included inside the package.

Step 3 Material Safety Data Sheets (MSDS)

Provide a Material Safety Data Sheet (MSDS) with the returned equipment for each substance that has come in contact with the equipment being returned, including substances used for decontamination and cleaning.

A MSDS sheet is required by law to be available to people exposed to specific hazardous substances, with one exception: if the equipment has only been exposed to food-grade substances or potable water, or other substances for which an MSDS is not applicable, the Decontamination/Cleaning Statement form alone is acceptable.

Two (2) copies of each MSDS must be provided:

- One (1) copy must be attached to the outside of the package.
- One (1) copy must be provided inside the package.

Step 4 Packaging

Shipping a Device With Possible Contamination

To meet DOT requirements for identifying hazardous substances, ship only one device per package.

Shipping a Device Without Any Potential Contamination

Devices being returned may be shipped together in one package, if there is no potential of foreign substance contamination.

Step 5 Shipping

Before returning used equipment:

- Mark each package clearly with a RMA number.
- Include a Decontamination/Cleaning Statement inside the package.
- Attach a duplicate Decontamination/Cleaning statement to the outside of the package.
- Include a MSDS for each substance that has come in contact with the equipment inside the package.
- Attach a duplicate MSDS to the outside of the package.

NOTICE

No product returns will be accepted without a RMA number and will be returned at the customer's expense.

For warranty consideration, the product must be returned to Daniel within twelve (12) months of the date of original shipment or within eighteen (18) months of the date of original shipment of the product to destinations outside the United States. The Purchaser must prepay any shipping charges.

Ship all * mechanical equipment to the following address:

Daniel Measurement and Control, Inc.
Attn: Service Dept.
5650 Brittmoore Rd.
Houston, TX 77041
Ref: RMA#_____

*Mechanical equipment includes: Orifice Fittings, Parts, Plates, Seal Rings, Turbine Meters, Control Valves, Provers, Strainers, Meter Tubes, Ultrasonic Meters, Flow Conditioners, etc.

Ship all * electronic equipment to the following address:

Daniel Measurement and Control, Inc.
Attn: Service Dept.
11100 Brittmoore Park Drive
Houston, TX 77041
Ref: RMA#_____

*Electronic equipment includes: Gas Chromatographs, Petrocount Presets, Danload Preset, Ultrasonic Meter Electronics (CPU boards, transducers, etc.), 2403 Totalizer, MRT 97 Indicator, Preamps, Pick Up Coils, Prover Interface Boards, and the following Flow Computer Models: 2230, 2239, 2270, 2460, 2470, S100, 2100, and 3000.

Daniel Measurement and Control, Inc.
Returned Material Authorization

Repair Form for Used Equipment
Including Decontamination/Cleaning Statement

1. Return Material Authorization (RMA) Number _____

2. Equipment to be returned:
   Model Number _____ Serial Number _____

3. Reason for return: _____
   _____
   _____
   _____

Decontamination/Cleaning Fluids Process

A. List each substance in which the equipment was exposed. Attach additional documents if necessary.

Common Name	CAS# if available	Used for Hazardous Waste (20 CFR 261)	EPA Waste Code if used for hazardous waste
		[ ] Yes [ ] No	
		[ ] Yes [ ] No	
		[ ] Yes [ ] No	
		[ ] Yes [ ] No	
		[ ] Yes [ ] No	
		[ ] Yes [ ] No	

B. Circle any hazards and/or process fluid types that apply:

Infectious	**Radioactive**	**Explosive**	**Pyrophoric**	**Poison Gas**	
Cyanides	Sulfides	Corrosive	Oxidizer	Flammable	Poison
Carcinogen	Peroxide	Reactive-Air	Reactive-Water	Reactive-Other (list)	

Other hazard category (list):

C. Describe decontamination/cleaning process. Include MSDS description for substances used in decontamination and cleaning processes. Attach additional documents if necessary.

Shipping Requirements

Failure to comply with this procedure will result in the shipment being refused.

4. Write the RMA number on the shipping package.

5. Inside the package include one copy of this document and all required Material Safety Data Sheets (MSDS)

6. Outside of the package attach one copy of this document and all required Material Safety Data Sheets (MSDS).

THIS EQUIPMENT, BEING RETURNED "FOR REPAIR," HAS BEEN COMPLETELY DECONTAMINATED AND CLEANED. ALL FOREIGN SUBSTANCES HAVE BEEN DOCUMENTED ABOVE AND MSDS SHEETS ARE ATTACHED.

By: _____ _____

(Signature) (Print name)

Title: _____ Date: _____

Company: _____

Phone: _____ Fax: _____

The sales and service offices of Daniel Measurement and Control are located throughout the United States and in major countries overseas.
Please contact Daniel Measurement Services at
11100 Brittmoore Park Drive, Houston, Texas 77041, or phone (713) 827-6314
for the location of the sales or service office nearest you.
Daniel Measurement Services offers both on-call and contract maintenance service designed to provide single-source responsibility for all Daniel products.

DANIEL®

EMERSON™
Process Management