



DUAL-SOLENOID AIR VALVE INSTALLATION MANUAL for

Part Numbers:

☐ **RCL-556 (1")**

☐ **RCL-558 (1½")**

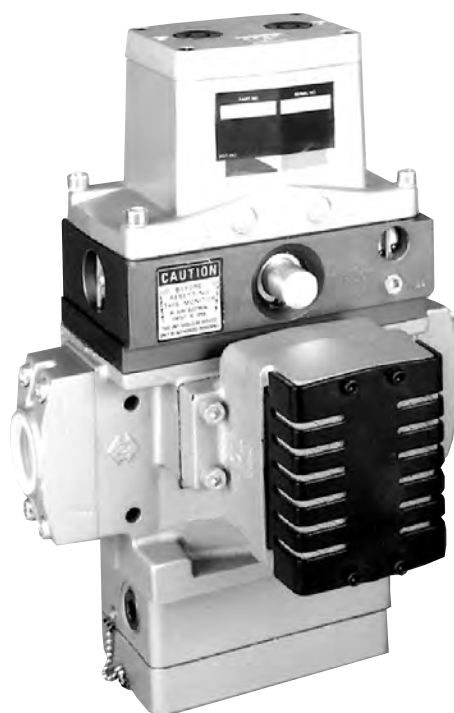
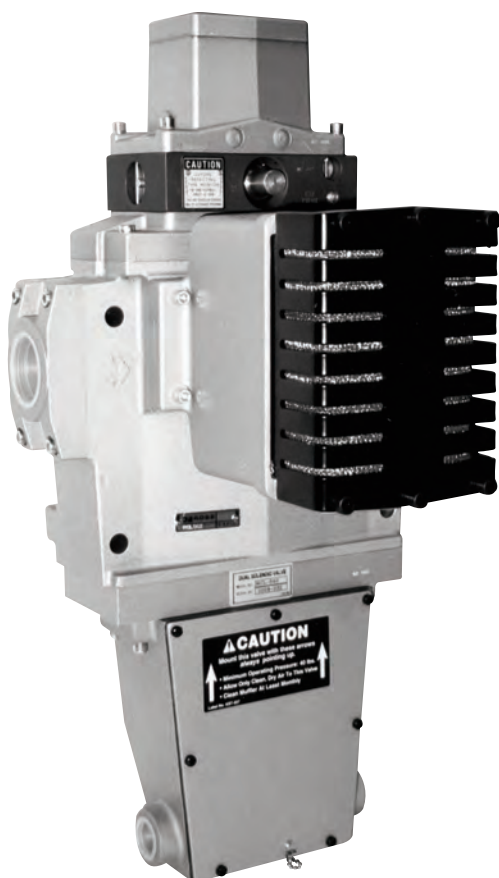
[With Diagnostics (Pressure Switch)]

Part Numbers:

☐ **RCL-555 (1")**

☐ **RCL-557 (1½")**

(Without Diagnostics)



IMPORTANT: PLEASE REVIEW THIS ENTIRE PUBLICATION BEFORE INSTALLING, OPERATING, OR MAINTAINING THE DUAL-SOLENOID AIR VALVE.

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Dual-Solenoid Air Valve

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SECTION 1—IN GENERAL

Safety Precautions

“ DANGER” Danger is used to indicate the presence of a hazard which **WILL** cause SEVERE personal injury if the warning is ignored.

“” THIS SAFETY ALERT SYMBOL IDENTIFIES IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL , BE ALERT TO THE POSSIBILITY OF PERSONAL INJURY, AND CAREFULLY READ THE MESSAGE THAT FOLLOWS.

Efficient and safe machine operation depends on the development, implementation and enforcement of a safety program. This program requires, among other things, the proper selection of point-of-operation guards and safety devices for each particular job or operation, a thorough safety training program for all machine personnel, that includes instruction on the proper operation of the machine, the point-of-operation guards and safety devices on the machine, and a regularly scheduled inspection and maintenance program.

Rules and procedures covering each aspect of your safety program should be developed and published both in an operator's safety manual, as well as in prominent places throughout the plant and on each machine. Some rules or instructions which must be conveyed to your personnel and incorporated into your program include:

 DANGER Never place your hands or any part of your body in this machine.

 DANGER Never operate this machine without proper eye, face and body protection.

 Never operate this machine unless you are fully trained, instructed, and have read the instruction manual.

 Never operate this machine if it is not working properly—stop operating and advise your supervisor immediately.

 Never use a foot switch to operate this machine unless a point-of-operation guard or device is provided and properly maintained.

 Never operate this machine unless two-hand trip, two-hand control or presence sensing device is installed at the proper safety distance. Consult your supervisor should you have any questions regarding the proper safety distance.

 Never tamper with, rewire or bypass any control or component on this machine.

A company's safety program must involve everyone in the company, from top management to operators, since only as a group can any operational problems be identified and resolved. It is everyone's responsibility to implement and communicate the information and material contained in catalogs and instruction manuals to all persons involved in machine operation. If a language barrier or insufficient education would prevent a person from reading and understanding various literature available, it should be translated, read or interpreted to the person, with assurance that it is understood.

 FOR MAINTENANCE AND INSPECTION ALWAYS REFER TO THE OEM's (ORIGINAL EQUIPMENT MANUFACTURER'S) MAINTENANCE MANUAL OR OWNER'S MANUAL. If you do not have an owner's manual, please contact the original equipment manufacturer.

(Continued on next page.)

Safety References

OSHA ACT AND FEDERAL REGULATIONS

Since the enclosed equipment can never overcome a mechanical deficiency, defect or malfunction in the machine itself, OSHA (Occupational Safety and Health Administration) has established certain safety regulations that the employers (users) must comply with so the machines used in their plants, factories or facilities are thoroughly inspected and are in first-class operating condition before any of the enclosed equipment is installed.

1. An Act – Public Law 91 – 596, 91st Congress, S. 2193, December 29, 1970

Duties:

Sec. 5.(a) Each employer —

- (1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;
- (2) shall comply with occupational safety and health standards promulgated under this Act.
- (b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

2. OSHA 29, Code of Federal Regulations, Subpart O, that an employer (user) must comply with include:

Section 1910.211 Definitions

Section 1910.212 (a) General Requirements for all Machines

Section 1910.217 Mechanical Power Presses

Section 1910.219 (b)(1) Mechanical Power-Transmission Apparatus (Flywheel and Gear Covers)

3. OSHA 29, Code of Federal Regulations, Subpart J 1910.147 The Control of Hazardous Energy (Lockout/Tagout)

4. OSHA Publications

“General Industry Safety and Health Regulations Part 1910,” Code of Federal Regulations, Subpart O

“Concepts and Techniques of Machine Safeguarding,” OSHA 3067, Revised 1992

These publications can be obtained by contacting:

Superintendent of Documents
US Government Printing Office
P.O. Box 371954
Pittsburgh, PA 15250-7954
Phone: (202) 512-1800
Fax: (202) 512-2250
www.gpo.gov

ANSI SAFETY STANDARDS FOR MACHINES

The most complete safety standards for machine tools are published in the ANSI (American National Standards Institute) B11 series. The following is a list of each ANSI B11 Standard available at the printing of this publication.

- B11.1 Mechanical Power Presses
- B11.2 Hydraulic Presses
- B11.3 Power Press Brakes
- B11.4 Shears
- B11.5 Ironworkers
- B11.6 Lathes
- B11.7 Cold Headers and Cold Formers
- B11.8 Drilling, Milling and Boring
- B11.9 Grinding Machines
- B11.10 Sawing Machines
- B11.11 Gear Cutting Machines
- B11.12 Roll Forming and Roll Bending
- B11.13 Automatic Screw/Bar and Chucking
- B11.14 Coil Slitting Machines
- B11.15 Pipe, Tube and Shape Bending
- B11.16 Metal Powder Compacting Presses
- B11.17 Horizontal Hydraulic Extrusion Presses
- B11.18 Coil Processing Systems
- B11.19 Performance Criteria for the Design, Construction, Care and Operation of Safeguards as Referenced in the Other B11 Machine Tool Safety Standards
- B11.20 Safety Requirements for Manufacturing Systems/Cells
- B11.21 Lasers
- B11.22 CNC Turning Machines
- B11.23 Machining Centers
- B11/TR1 Ergonomic Considerations for the Design, Installation and Use of Machine Tools
- B11/TR2 Mist Control
- B11/TR3 Hazard ID and Control
- B11/TR4 Control Reliability
- R15.06 Robotic Safeguarding

These standards can be purchased by contacting:

American National Standards Institute, Inc.
11 West 42nd Street
New York, New York 10036
Phone: (212) 642-4900
Fax: (212) 302-1286
www.ansi.org

OR

Association of Manufacturing Technology (AMT)
7901 Westpark Drive
McLean, Virginia 22102
Phone: (703) 827-5211
Fax: (703) 893-1151
www.mfgtech.org

(Continued on next page.)

SECTION 1—IN GENERAL

Dual-Solenoid Air Valve

NATIONAL SAFETY COUNCIL SAFETY MANUALS AND DATA SHEETS

Other good references for safety on machine tools are the National Safety Council's Safety Manuals and Data Sheets. These manuals and data sheets are written by various committees including the Power Press, Forging and Fabricating Executive Committee. Copies of the following publications are available from their library:

Manuals

Power Press Safety Manual - 4th Edition
Safeguarding Concept Illustrations - 6th Edition
Forging Safety Manual

Data Sheets

Bench and Pedestal Grinding Wheel Operations 12304-0705
Boring Mills, Horizontal Metal 12304-0269
Boring Mills, Vertical 12304-0347
Coated Abrasives 12304-0452
Cold Shearing Billets and Bars in the Forging Industry 12304-0739
Degreasing (Liquid), Small Metal Parts 12304-0537
Dies, Setup and Removal of Forging Hammer 12304-0716
Drill Presses, Metalworking 12304-0335
Drills, Portable Reamer 12304-0497
Drop Hammers, Steam 12304-0720
Electrical Controls for Mechanical Power Presses 12304-0624
Forging Hammer Dies, Setup and Removal of 12304-0716
Forging Presses, Mechanical 12304-0728
Gear-Hobbing Machines 12304-0362
Handling Materials in the Forging Industry 12304-0551
Kick (Foot) Presses 12304-0363
Lathes, Engine 12304-0264
Milling Machines, Metalworking 12304-0364
Planers, Metal 12304-0383
Power Press (Mechanical) Point-of-Operation Safeguarding, Concepts of 12304-0710
Power Press Point-of-Operation Safeguarding: Two-Hand Control and Two-Hand Tripping Devices 12304-0714
Power Press Point-of-Operation Safeguarding: Type A and B Movable Barrier Devices 12304-0712
Power Press Point-of-Operation Safeguarding: Point-of-Operation Guards 12304-0715

Power Press Point-of-Operation Safeguarding: Presence Sensing Devices 12304-0711
Power Press Point-of-Operation Safeguarding: Pullbacks and Restraint Devices 12304-0713
Power Presses (Mechanical), Inspection and Maintenance of 12304-0603
Power Presses (Mechanical), Removing Pieceparts from Dies in 12304-0534
Power Press, Setting Up and Removing Dies 12304-0211
Press Brakes 12304-0419
Robots 12304-0717
Saws, Metal (Cold Working) 12304-0584
Shapers, Metal 12304-0216
Shears, Alligator 12304-0213
Shears, Squaring, Metal 12304-0328
Upsetters, 12304-0721

Copies of these manuals and data sheets can be obtained by contacting:

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
1-800-621-7619 ext. 2199
Fax: (630) 285-0797
www.nsc.org

OTHER SAFETY SOURCES

National Institute of Occupational Safety and Health (NIOSH)
4676 Columbia Parkway
Cincinnati, OH 45226
Phone: (513) 533-8236
www.NIOSH.cdc.gov

Robotic Industries Association (RIA)
P.O. Box 3724
Ann Arbor, MI 48106
Phone: (734) 994-6088
www.robotics.org

For additional safety information and assistance in devising, implementing or revising your safety program, please contact the machine manufacturer, your state and local safety councils, insurance carriers, national trade associations and your state's occupational safety and health administration.

Warranty, Disclaimer and Limitation of Liability

WARRANTY

Rockford Systems, Inc. warrants that this product will be free from defects in material and workmanship for a period of 12 months from the date of shipment thereof. ROCKFORD SYSTEMS INC.'S OBLIGATION UNDER THIS WARRANTY IS EXPRESSLY AND EXCLUSIVELY LIMITED to repairing or replacing such products which are returned to it within the warranty period with shipping charges prepaid and which will be disclosed as defective upon examination by Rockford Systems, Inc. This warranty will not apply to any product which will have been subject to misuse, negligence, accident, restriction and use not in accordance with Rockford Systems, Inc.'s instructions or which will have been altered or repaired by persons other than the authorized agent or employees of Rockford Systems, Inc. Rockford Systems, Inc.'s warranties as to any component part is expressly limited to that of the manufacturer of the component part.

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SECTION 2—INTRODUCTION

Dual-Solenoid Air Valve

Operation

Mechanical power presses (punch presses) and mechanical press brakes that use air to engage the clutch and release the brake, must be equipped with a dual-solenoid air valve for redundancy. This valve must also be monitored (checked). When the dual valve is deenergized, the air is dumped from the clutch and brake and the machine's hazardous motion stops. By allowing the compressed air to exhaust from the clutch and brake through the valve, the spring-applied brake stops the crankshaft rotation, thus stopping the ram (slide).

When exhausting air from the clutch and brake, a stop signal is given. If there is a single valve failure, the machine does not receive this signal. This prevents a repeat cycle when the machine is in the *single stroke* mode of operation. For this reason, a dual valve is required. If one valve fails, the second valve prevents a repeat stroke.

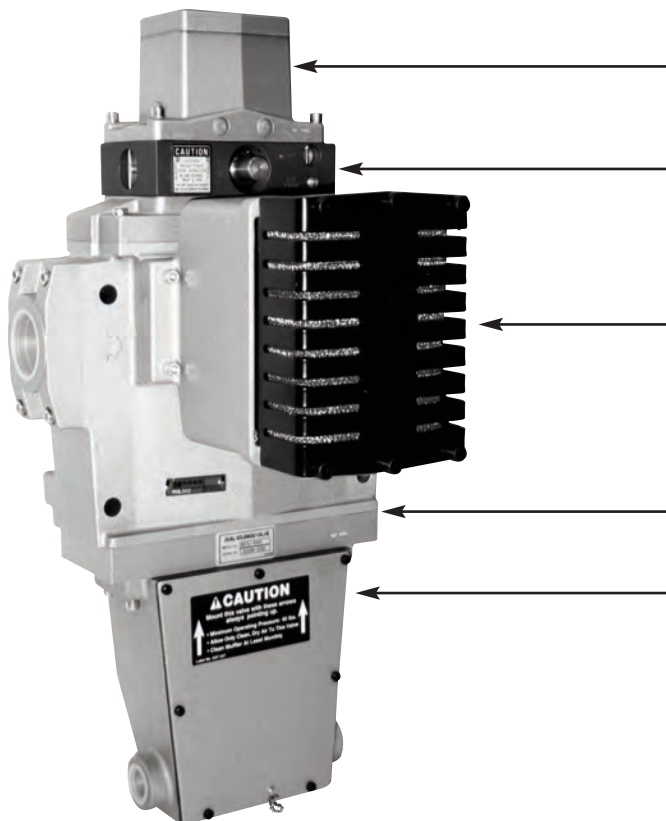
The monitoring (checking) portion of the valve is provided to inhibit another cycle (stroke) of the press if one of the valves should fail.

The two main valve elements in the crossflow dual-solenoid valve (with monitor) move simultaneously during normal operation. If the valve elements fail to move simultaneously, the monitor is designed to detect this condition. The monitor reacts by exhausting pilot air and blocking pilot supply air so further valve operation is inhibited. The valve is then said to be "locked out" and cannot return to normal operation until the monitor is reset. A lock-out is not necessarily an indication that the valve has become faulty. Rather, it is an indication that the monitor has detected nonsimultaneous movement of the main valve elements, and there is a condition in the system that needs correction.

The crossflow dual-solenoid valve (with monitor), consists of four interconnected assemblies: the pilot, monitor, valve body, and junction box assemblies.

Photo 2.1

Part Nos. RCL-555 (not shown) and RCL-556 (1")
RCL-557 (not shown) and RCL-558 (1½")



Pilot Assembly: Two normally closed solenoid controlled pilot valves are housed in a single housing. Each pilot valve controls one of the valve elements in the valve body assembly.

Monitor Assembly: The monitor contains a pressure controlled spool and a mechanical lockout mechanism.

Valve Body Assembly: The valve body has parallel flow paths including two in-to-out crossflow paths, two normally closed poppet valve elements, and spool elements to control air flow in the crossflow passages. A muffler is bolted directly to the exhaust port.

Junction Box Assembly: This contains an electrical terminal strip in a housing with two threaded electrical conduit ports.

Pressure switch for electrical output indication: This is furnished when using controls that have diagnostic features.

SECTION 3—VALVE OPERATION

Dual-Solenoid Air Valve

Introduction

Please study the following information in order to understand both normal valve functioning and what happens if a malfunction occurs.

CONDITIONS AT START

Inlet air is blocked from the outlet port by two normally closed valve elements A and B (**Figure 3.1**). The outlet port 2 is connected to the exhaust port 3. Pilot supply air is carried via passage 4 around spool C in the monitor, and up passage 9 to the normally closed pilot valves F. Spool C is the sensing element of the monitor and is kept in its center position by springs M.

SOLENOIDS ENERGIZED

Simultaneously energizing the two solenoids “a” and “b” (**Figure 3.2**) causes the two pilot poppets E to shift upward. This closes the pilot exhaust passages and opens the pilot supply passages. Pilot air can then go from supply passage 9 to the main valve piston poppets J via passages 5. Pressure on the piston poppets shifts the main valve elements. This closes off the exhaust port 3 and connects inlet port 1 to outlet port 2 via crossflow passages 10 and 11.

With the main valve inlet poppets U and V open, the monitoring passages 6 are open to inlet pressure which is directed to both ends of spool C. Because these monitoring signal pressures are equal, spool C remains in its center position.

SOLENOIDS DEENERGIZED

Simultaneously deenergizing solenoids “a” and “b” allows the two pilot poppets E to return to their normally closed positions (**Figure 3.2**). Pilot pressure on the main valve pistons J is exhausted through exhaust port 3 via internal exhaust passages. The main valve elements A and B return to their normal deactuated positions. Inlet air is again blocked by poppets U and V. Pressure at outlet port 2, at the ends of spool C and in the monitoring passages 6, is exhausted through exhaust port 3. This completes the normal operating cycle, and the valve has returned to the “Conditions at Start” described previously.

Valve Conditions Resulting From a Malfunction

DURING A MALFUNCTION

Due to a mechanical or electrical malfunction, one of the valve elements may not respond to its energizing signal, or alternatively, may not return to its normal position after the signal is removed. In either case, we have the condition depicted in

Figure 3.1
Solenoids Deenergized
(Valves Normally Closed)

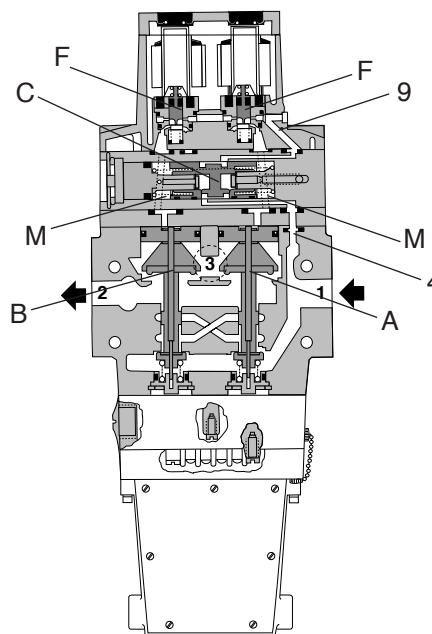


Figure 3.2
Solenoids Energized

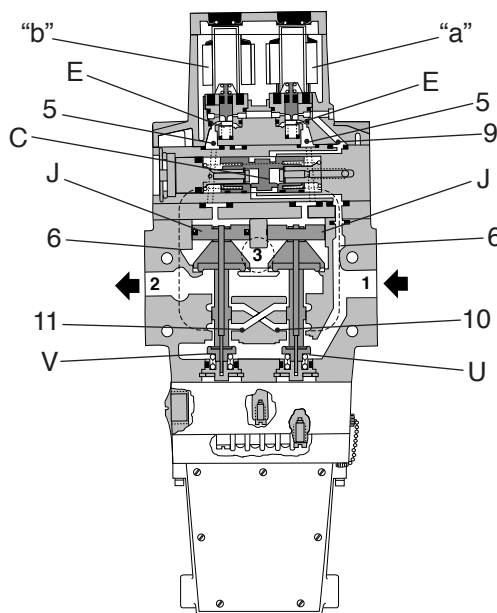


Figure 3.3—one valve element closed, one open. Inlet air flowing past open poppet U and into crossflow passage 10 is practically blocked by spool SB on valve element B. Although some air can pass around spool SB, the amount is so small and the exhausting capacity of the valve is so large that the pressure at outlet 2 does not exceed two percent of inlet pressure. At the same time, a monitoring air signal goes via passage 6 only to the right end of spool C. When

(Continued on next page.)

SECTION 3—VALVE OPERATION

Dual-Solenoid Air Valve

DURING A MALFUNCTION (continued)

the difference in pressure at the ends of the spool exceeds 20 PSI, the spool is shifted. In this case, the spool is shifted left as shown in **Figure 3.4**. The spring-loaded lockout pin K drops into lockout groove 8 so the spool is held in its shifted position. Pilot supply air from passage 4 is then diverted around the spool and out to the atmosphere via bleed vent 12. Simultaneously, air in the pilot supply passage 9 is vented to the atmosphere via bleed vent 13. This exhausting of pilot air allows the main valve elements A and B to return to their deactuated positions and prevents further actuation. The valve is then locked out of operation and cannot be actuated until the monitor is reset.

*Note: The lockout conditions described previously also hold true when the spool is shifted to the right. (See **Figure 3.4**).*

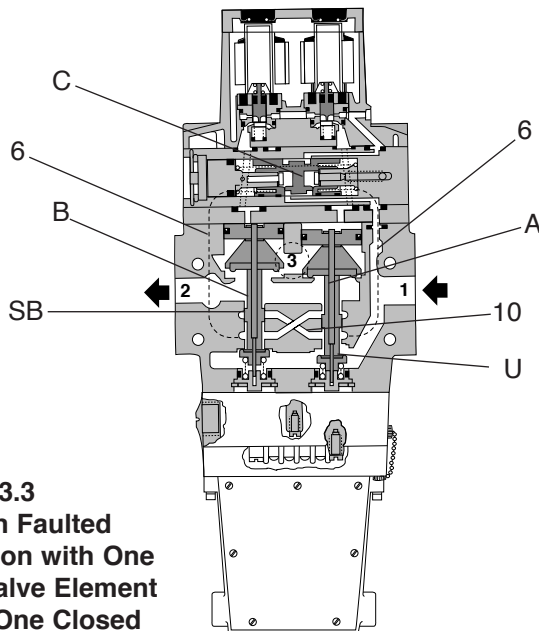


Figure 3.3
Valve in Faulted
Condition with One
Main Valve Element
Open, One Closed

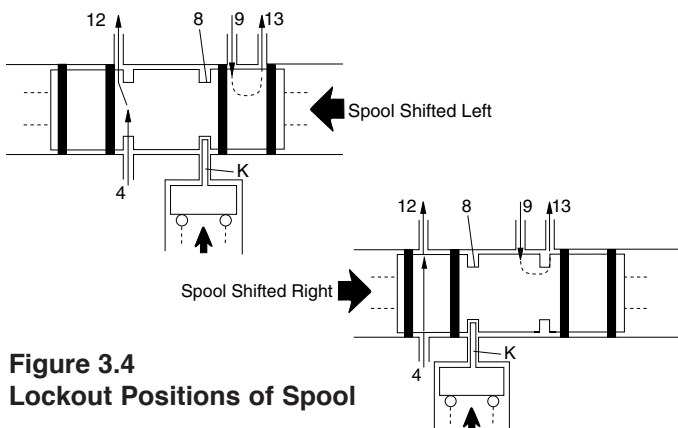


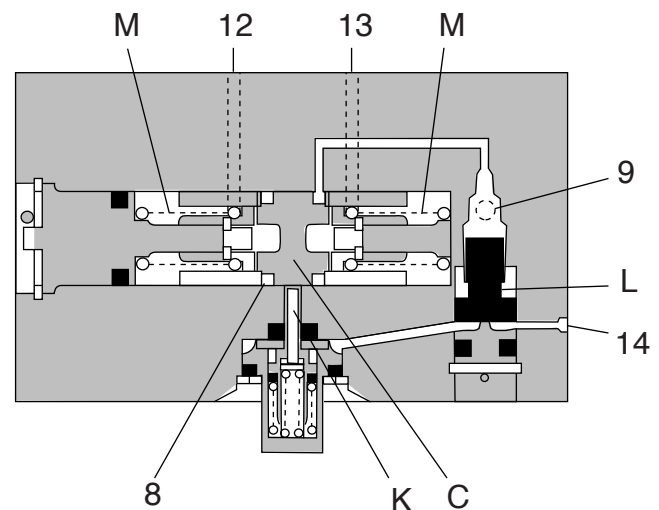
Figure 3.4
Lockout Positions of Spool

RESETTING THE MONITOR

After the cause of a lockout has been corrected, the spool in the monitor must be reset in its normal center position in order for the valve to function properly. The resetting action is accomplished by applying an air pressure signal of at least 60 psig to the pneumatic reset port 14 (**Figure 3.5**). Pressurizing port 14 produces two results:

1. Lockout pin K is lifted out of the lockout groove so centering springs M can return the spool to its normal center position; and
2. Differential spool L (**Figure 3.5**) is shifted so the pilot air supply passage 9 is blocked and remains blocked during the resetting process. In this way, the valve is kept inoperative while resetting air pressure is applied, and any attempt to circumvent the functions of the monitor is inhibited. **To ensure that the equipment controlled by the valve does not begin operating immediately after resetting the monitor, electrical power to the valve solenoids must be off.** Otherwise, the energized solenoids would actuate the valve as soon as the reset pressure signal is removed.

Figure 3.5
Horizontal Cross Section of Monitor



REMOTE RESET BUTTON

This button is supplied with all 1" and 1½" dual-solenoid air valves. It is used to reset the valve as described above.

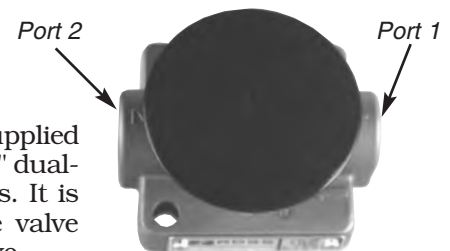


Photo 3.1
Part No. RCD-055

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SECTION 3—VALVE OPERATION

Dual-Solenoid Air Valve

REMOTE RESET BUTTON (continued)

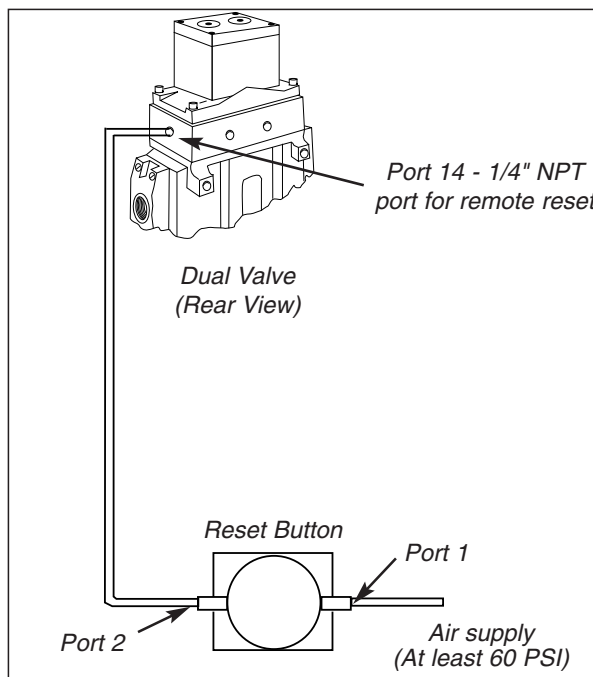
The reset button should be mounted in a convenient location on the machine. Make sure it is easily accessible to the operator or setup person from the floor level.

Note: An air supply of at least 60 PSI should be used.

Be sure the supply line to the button is large enough and does not restrict the air supply because of a crimp in the line or sharp bends. Air flow must be in the direction of the arrow on the body of the reset button. The port size of the reset button is 1/4". The air line should be piped into port 1 (indicated on the reset button). Next install a separate air line from port 2 and pipe it to port 14 on the dual solenoid air valve. *Note: Plastic tubing is best for this application.*

When installing the reset button, apply teflon tape to the two threaded fittings. Insert one fitting into port 1 and the other into port 2 and tighten. This procedure will prevent tape from entering and contaminating the valve.

Figure 3.6
Reset Button Mounting



SECTION 4—INSTALLATION

Specifications

Actuation Mode:	Solenoid (electromagnetic) pilot operated, 120 V AC
Construction:	Piston poppet valve
Flow Media:	Compressed air, filtered and lubricated or nonlubricated
Solenoids:	Two, rated for continuous duty
Power Consumption:	87 VA inrush, 30 VA sealed
Temperature Range:	40° to 120°F (4° to 50°C)
Pilot Pressure:	Supplied internally from inlet port
Inlet Pressure:	30 to 125 PSI
Reset Pressure:	60 PSI minimum

Table 4.1

Part No.	Size	Average C _v		Weight (lb)
		Ports 1 to 2	Ports 2 to 3	
RCL-555	1"	8.5	19.0	19.0
*RCL-556	1"	8.5	19.0	19.5
RCL-557	1-1/2"	21.0	43.0	37.5
*RCL-558	1-1/2"	21.0	43.0	40.0

*Includes pressure switch which is used for Diagnostic Controls and when two valves are furnished for a split clutch and brake.

Port 1: Inlet Port
Port 2: Outlet Port
Port 3: Exhaust Port



These valves should only be installed by qualified personnel.



For safety reasons, do not install any pneumatic devices between the valve and the clutch/brake or air cylinder, including quick-dump valves.



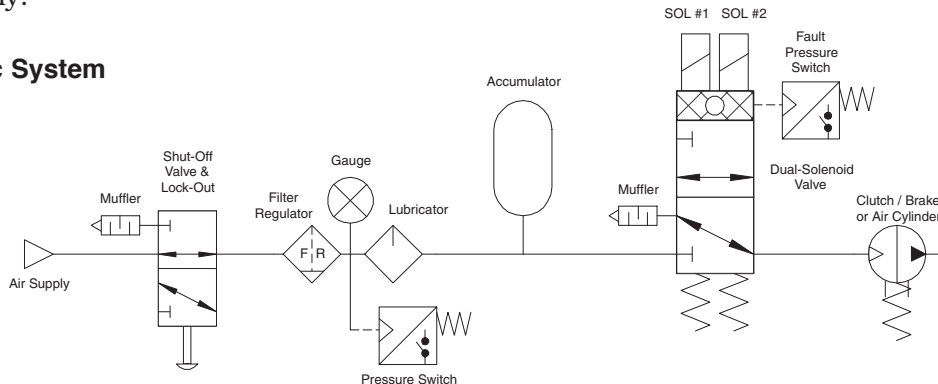
These valves require clean air. Blow all lines clean of dirt, scale, etc., before making final connection. Drain water from the airline filter bowl regularly. If the bowl refills in a short period of time, it may indicate the need for a larger filter in the main air supply line. The air filter must be kept clean at all times. Never operate the machine unless the air filter is clean and water is drained.

(Continued on next page.)

Mounting

1. Determine the mounting location of the dual solenoid valve in the pneumatic system. See Figure 4.1. For faster pressurizing and exhausting of the outlet volume, install the valve as close to the clutch/brake or air cylinder as possible. The valve should be mounted with the pilot assembly on top as illustrated in Photo 4.1.
2. Measure or spot four holes on the machine at the mounting location.
3. Drill and tap four holes.
4. Attach the dual solenoid air valve to the machine with four $\frac{3}{8}$ -16 x 4" screws (not furnished). Tighten securely.

Figure 4.1
Pneumatic System

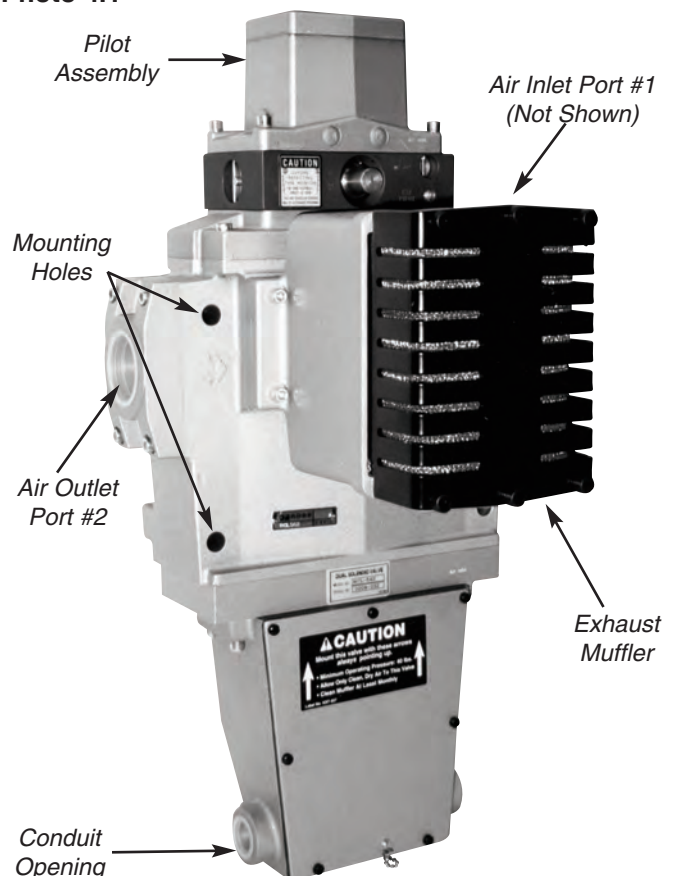


Piping

When installing the dual solenoid valve, remove the dust covers from the valve port connections. Avoid getting particles, such as chips, sealing compounds, tape, or scale, in the piping. This may affect the performance of the valve and the machine.

1. Attach a pipe or hose (customer to furnish) to the inlet port (marked "1" on the valve body). Connect the other end of the pipe or hose to the FRL assembly. Use teflon tape on the male threads. Make sure the tape does not extend beyond the threaded portion.
 - A minimum of 30 to 40 PSI must be maintained at the valve for proper operation.
 - Do not restrict air supply when piping the valve. Any restriction of the air supply lines (i.e., sharp bends or undersized lines) will reduce the speed with which the outlet volume is pressurized.
2. Attach a flexible hose (customer to furnish) to the outlet port (marked "2" on the valve body). Attach the other end of this hose to the threaded inlet port of the rotor coupling on the clutch and brake.
 - Any restriction in the outlet lines will reduce both pressurizing and exhausting speeds. Be sure the valve is sized properly (large enough) for the application.

Photo 4.1



(Continued on next page.)

SECTION 4—INSTALLATION

Dual-Solenoid Air Valve

Piping (continued)

3. Attach a ½" flexible conduit fitting to either conduit opening (on the sides of the valve junction box).
4. Do not restrict exhaust. Limiting the exhausting speed decreases an important safety feature of the dual solenoid valve. During a malfunction in which only one of the valve elements is shifted, air escaping past the spool in the valve stem of the closed valve element must be quickly exhausted to keep outlet pressure at or below the designed pressure of two percent of inlet pressure. Only the furnished muffler should be used.



The exhaust air muffler must be cleaned on a regular basis. Never operate the machine unless the muffler is clean.

Wiring

We recommend that NEC (National Electrical Code) practices be followed for wiring, especially color coding and the use of numbered wire markers on both ends of every wire. Color coding is red for 120 V AC control circuits, white for current carrying ground (frequently referred to as common), and Green for any equipment grounding conductor.

The dual valve incorporates two solenoid coils. Each coil is wired independently to terminals located on the enclosure cover.

A 1/2" conduit opening is provided on both sides of the junction box.

Note: These valves are prewired to the terminal strip.

Figure 4.2
Terminal Strip Wiring

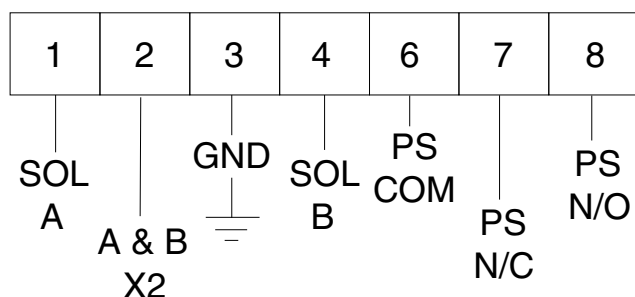
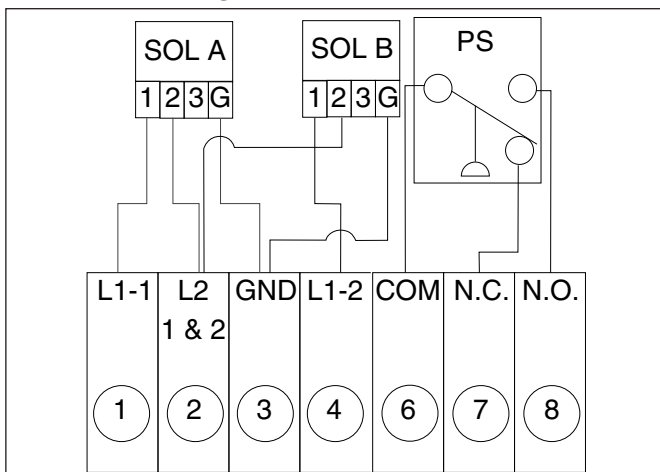


Figure 4.3
Dual Valve Wiring



ELECTRICAL CONNECTIONS

The solenoids are rated for continuous duty at 85% to 110% of 120 V. A supply voltage that does not fall within this range can cause nuisance lockouts or premature solenoid burnouts. The transformer should be capable of handling the inrush current of the solenoids without significant voltage drop.

Dual Valve and Pressure Switch Connections

VALVE SOLENOID CONNECTIONS

- 1 - Red wire to Terminal [1]
- 1 - White wire to Terminal [2]
- 1 - Green wire to Terminal [3] (ground)
- 1 - Red wire to Terminal [4] or jumper to Terminal [1] as required

PRESSURE SWITCH CONNECTIONS

- 1 - Red wire to terminal [6] common
- 1 - Red wire to terminal [7] normally closed
- 1 - Red wire to terminal [8] normally open (if used)

Refer to control diagram for proper wire numbers.

Other Installation Considerations

For convenience, a shut-off and lockout valve should be installed in the air line just ahead of the filter-regulator-lubricator assembly. Make sure the air filter-regulator-lubricator is consistent in size with the dual-solenoid air valve. Port size and pipe size must be the same to prevent air flow restriction. If this is not done, it will affect the performance

(Continued on next page.)

Other Installation Considerations (continued)

of the machine. An accumulator (air surge tank) is recommended directly ahead of the valve to assure sufficient air volume. Installing the dual valve provides rapid dumping of the operating air to provide fast braking action. If the clutch and brake are split, two dual valves with electrical monitoring may be required.

Note: A minimum of 30 to 40 PSI must be maintained at the valve for proper operation.



If both valves fail simultaneously on the same stroke (cycle), this valve will not prevent a repeat stroke.



Never place the hands or any body part in the point of operation of this press at any time, for any reason.

Removal of Certain Dual Valves

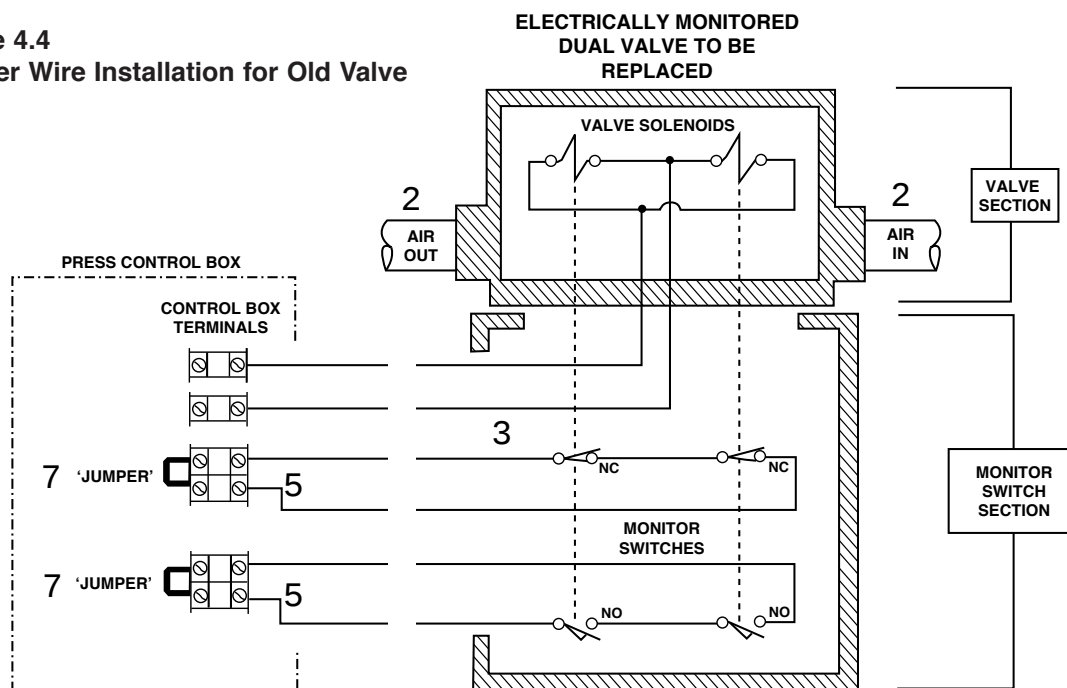
When replacing an electrically monitored dual valve with the enclosed pneumatically monitored dual valve, jumper wires must be installed on the respective terminals in the machine control box. These jumper wires replace the monitoring switch connections that were in the original dual solenoid air valve. The air pressure switch included with valve Part Nos. RCL-556 and RCL-558 is used for diagnostics on control systems that require this feature. This pressure switch is also used when an

application requires two dual valves for a split clutch and brake. It monitors both valves for a failure.

The pneumatically monitored dual-solenoid air valve is self-contained with internal checking. The monitoring switches are not required. Please read the following instructions for removing the existing valve and installing the jumper wires.

1. Disconnect electrical power and air pressure from the machine. Attach lockout devices to the energy source of the machine.
2. Remove piping at the dual valve input and output.
3. Disconnect all electrical wires and conduit at the dual valve.
4. Remove the old valve from the machine.
5. Trace the wires of the monitored switches back to the machine control box and disconnect them from the control box terminal strip.
6. Pull the wires used for the monitor switches from the conduit.
7. Install "jumper" wires between the respective control box terminals as shown in **Figure 4.4**.
8. Follow the instructions for installing the new pneumatically monitored dual solenoid air valve (pages 9 & 10), including the proper wiring of the pressure switch for diagnostics.

Figure 4.4
Jumper Wire Installation for Old Valve



SECTION 5—OPERATING CONSIDERATIONS

Dual Solenoid Valve

Test Procedure

Please follow this test procedure after the valve is initially installed or whenever the valve has been disassembled for maintenance or repair. These tests require the use of the manual overrides. The solenoids must also be wired so they can be individually energized. If the valve fails any of these tests, please refer to the *Troubleshooting* Section (pages 14 - 19). These tests should be performed at both the repair bench and on the machine.



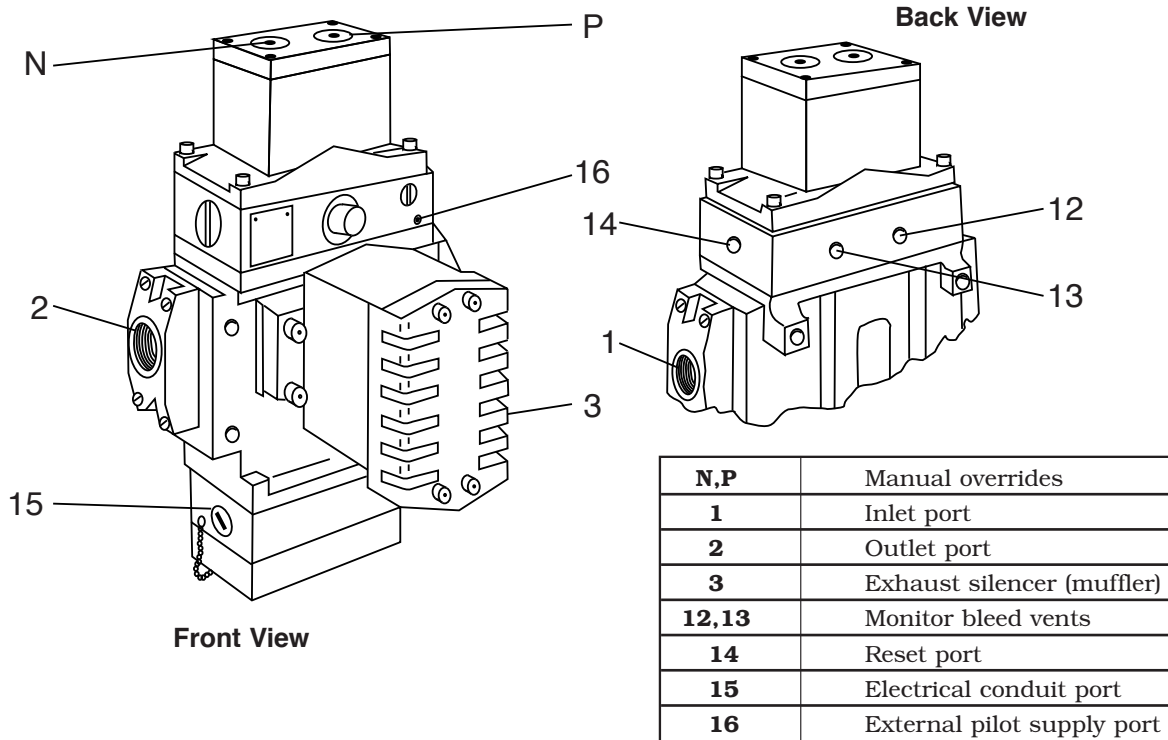
Testing should be performed by experienced personnel only.

1. Remove the muffler. Apply compressed air in the 30 to 125 PSI range to inlet port 1. There should be no pressure at outlet port 2 or exhaust port 3.
2. Connect outlet port 2 to a small volume tank fitted with a damped pressure gauge. Simultaneously energize both solenoids. Inlet and outlet pressures should be equal. There should be no leakage at the exhaust port. Deenergize both solenoids.
3. Depress both manual overrides (N and P) simultaneously (**Figure 5.1**). Release override N on the outlet side of the valve. Outlet pressure should drop to approximately two percent

of inlet pressure and there should be a flow of exhaust air. The back of the monitor has two bleed vents—12 and 13. Bleed vent 12 should emit a continuous flow of air. Release manual override P.

4. Step 3 should have caused the monitor to lock-out. Depress both manual overrides simultaneously. There should be no pressure at either the outlet or the exhaust port. Bleed vent 12 should continue to emit air. Release overrides.
5. Reset the monitor by applying air pressure of at least 60 psi to the pneumatic reset port 14. Air flow from bleed vent 12 should stop. With reset pressure still applied, energize both solenoids. No action should occur. Remove reset pressure.
6. Depress both manual overrides simultaneously. Release override P. Conditions should correspond to those described in step 3. Release override N.
7. Step 6 should have caused the monitor to lock-out. Depress both overrides simultaneously. Conditions should correspond to those described in step 4. Release overrides.
8. Reset the monitor as described in step 5. Bleed air should stop. Install the muffler. The valve is now ready for normal operation.

Figure 5.1
External Ports and Overrides



Air System

How often an inspection of the entire air system is required depends on how frequently the machine is operated and how clean the plant air lines are. Both free moisture and solids should be removed automatically by the filter/regulator. Drain the filter whenever the water level in the sump reaches the lower baffle. To remove the filter element for cleaning, shut the air line down and exhaust secondary pressure.

Check the lubricator for proper oil level and oil delivery adjustment. If oil is required, refer to the OEM's instruction manual.

If oil is required for the clutch/brake, use only oils which are compatible with the materials used for seals and poppets. Some of the available lubricants are listed in chart 6.1.

The dual-solenoid valve must be protected from foreign material. The muffler must be removed regularly and cleaned so an unrestricted flow of exhaust air is obtained.

Chart 6.1

COMPATIBLE LUBRICANTS	
Maker	Brand Name*
Amoco	American Industrial Oil 32 Amoco Spindle Oil C Amolite 32
Citgo	Pacemaker 32
Exxon	Spinesstic 22 Teresstic 32
Gulf	Harmony 32
Mobil	DTE (light) Velocite 10
Non-Fluid Oil	Air Lube 10H/NR
Shell	Turbo T 32
Sun	Sunvis 11 Sunvis 722
Texaco	Regal R&O 32
Union	Union Turbine Oil
*Oil manufacturers sometimes change the chemistry of their oils for various reasons. The above oils, although believed to be compatible at the time of this printing, could change without notice from the manufacturer. Therefore, the best oils to use are those specifically compounded for air line lubricator service.	

Worn Components

When a defective component is found, do not operate the machine until the component is replaced. In most cases, removing the valve from its installation is not required.



After any maintenance, always operate the machine numerous times in all modes of operation before allowing the operator to start production. Always make sure all point-of-operation safeguarding is in place, adjusted and operating properly for the job and the operator.



Only allow qualified and trained personnel to perform troubleshooting and installation of this valve.

Service

Dual solenoid valves do not require air lubrication during operation, but if the valve is disassembled, moving parts should be lightly lubricated before reassembly.

Cleaning the Valve

A deposit of varnish may gradually build up on the internal surfaces of the valve. This can eventually cause sluggish valve action or intermittent lock-outs. Establish a schedule for periodic cleaning of the valve. To remove varnish, a water soluble detergent should be used. Cleaning should be done by qualified personnel only.

Electrical Contacts

All elements (switches, relays, etc.) in the electrical circuits, supplying power to the solenoids, **must** be kept in good condition to avoid solenoid malfunctions.

SECTION 7—REPLACEMENT PARTS

Figure 7.1
Vertical Cross Section of Valve

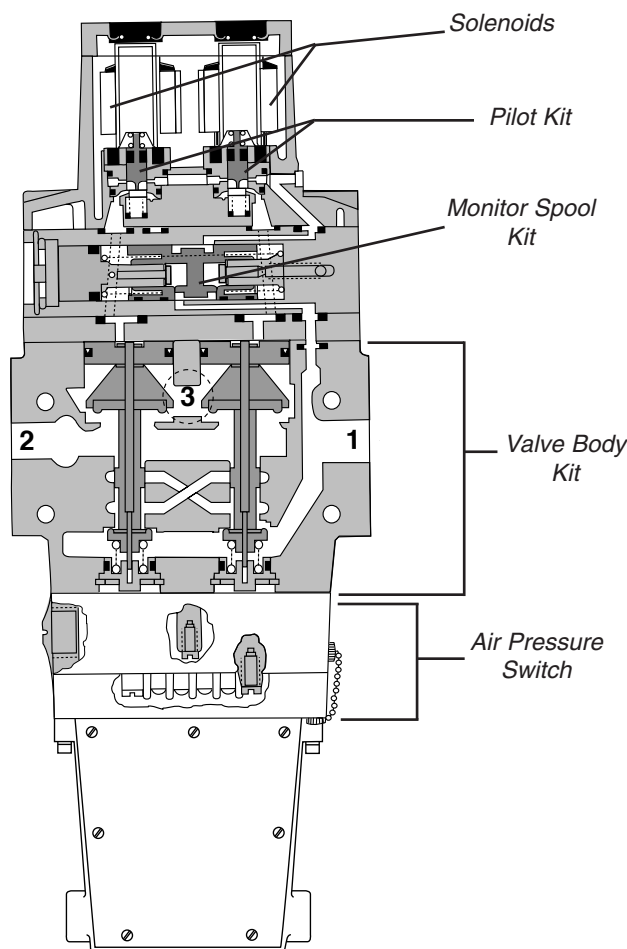
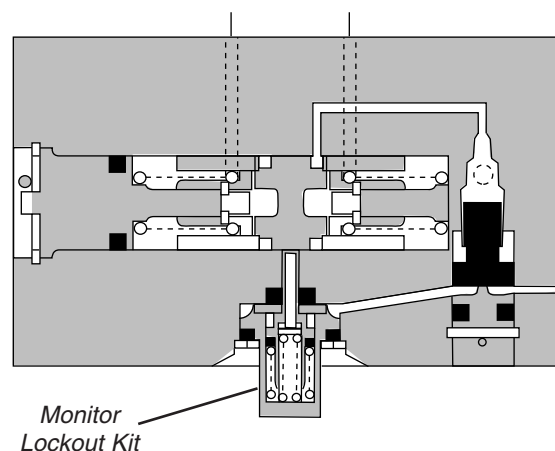


Figure 7.2
Horizontal Cross Section of Monitor



Replacement Parts

Part No.	Description
RCY-211	Valve Body Kit for 1" Valves
RCY-221	Valve Body Kit for 1½" Valves
RCY-212	Monitor Spool Kit
RCY-213	Monitor Lockout Kit
RCY-214	Pilot Kit (2 required)
RCY-113	Solenoid Coil 120 V AC (2 required)
RCY-209	Air Pressure Switch

SECTION 8—TROUBLESHOOTING

The dual-solenoid valve is designed to monitor the outlet pressure of the main valve elements. If the valve elements fail to move synchronously, the monitor is designed to detect this condition and shut down the valve. This prevents further operation. A lockout is not necessarily an indication that the valve has become faulty. Rather, it is an indication that the monitor has detected improper movement of the main valve elements, and there is a condition in the system that needs correction. Troubleshooting involves finding and correcting the condition that caused the lockout.

Table 8.1 on the next page lists several test procedures and various trouble symptoms. By referring

to the possible causes and repair procedures in the troubleshooting table, the specific malfunction can be identified and repair requirements determined. The repair procedures are detailed on pages 16 - 19.

After the valve has been repaired, it should be tested for normal operation by following the test procedure on page 12. If the valve is still not operating properly, repeat the troubleshooting procedure. If this does not solve the problem, return the valve to the factory for repair. Please contact our sales department for an RMA number. Complete the RMA form on the back page of this manual and return a copy of it with the valve.

(Continued on next page.)

SECTION 8—TROUBLESHOOTING

Dual-Solenoid Air Valve

Table 8.1

Test Procedures	Symptoms	Possible Causes	Repair Procedure
TEST 1 - Electrical power to solenoids must be off. Remove muffler. Check for lockout bleed air at vent 12 and for exhaust air.	No lockout bleed and no exhaust air	Inadequate air supply	A
		Inadequate voltage at solenoids	B
		Both solenoids inoperative	C
		Faulty seals on monitor spool	E
		Contaminants in monitor	G
	Both lockout bleed air and exhaust air are present	Faulty seals on monitor spool	E
		Main inlet poppets not sealing	K
		Pilot poppet not sealing	D
		Jammed solenoid plunger	C
	Lockout bleed air is present, but no exhaust air	Proceed to TEST 2	—
TEST 2 - With electrical power still off and muffler removed, attempt to reset monitor by applying pressure of not less than 4 bar (60 PSI) to reset port 14 (Figure 5.1 on page 12).	Will not reset	Faulty seals on monitor spool	E
		Bent lockout pin	H
		Contaminants in monitor	G
	Resets properly	Proceed to TEST 3	—
TEST 3 - Take normal press operation safety precautions during this test to ensure that there is no danger to personnel or equipment when the press cycles. With muffler removed and monitor reset, cycle valve several times by energizing the solenoids in a normal manner.	Locks out intermittently	Inadequate air supply	A
		Inadequate voltage at solenoids	B
		Worn bore in monitor	F
		Varnish deposits in valve	M
		Excessive lubrication	N
	Valve performs normally	Transient foreign material	J
		Dirty or undersized muffler	P
	Locks out on first cycle	Proceed to TEST 4	—
TEST 4 - With electrical power off, muffler removed, and monitor reset, proceed as follows: take normal press operation safety precautions to ensure that there is no danger to personnel or equipment when the press cycles. Actuate the valve by depressing, holding, then releasing both manual overrides. Be sure to depress the overrides simultaneously.	Locks out as overrides are depressed	Inadequate air supply	A
		Jammed solenoid plunger	C
		Pilot poppet not sealing	D
		Varnish deposits in valve	M
		Excessive lubrication	N
		Leaking piston poppet seal	L
	Locks out as overrides are released	Varnish deposits in valve	M
		Excessive lubrication	N
	Operation normal with overrides	Faulty solenoid	C

(Continued on next page.)

SECTION 8—TROUBLESHOOTING

Dual-Solenoid Air Valve

Repair Procedures

A—Inadequate Air Supply Even though the air supply pressure may be in the correct range, the volume of air supplied can be too small. An inadequate air supply volume causes an excessive pressure drop during valve actuation. Thus, even though the pilot air supply is sufficient to unseat the main valve elements, the pressure drop, which results from filling the outlet volume, depletes the pilot air supply. The main valve elements may only be partially actuated so the inlet air flows out the exhaust.

The lowered pilot pressure can also exaggerate the effects of small differences in the operating characteristics of the pilots and valve elements so the valve elements may not move simultaneously. This can produce intermittent lockouts.

Check for very long, undersized, or pinched supply lines, sharp bends, and restrictive fittings. All can reduce the volume of air supplied to the valve.

B—Incorrect Voltage at Solenoids The solenoids are rated for continuous duty at 85% to 110% of 120 V. A supply voltage that does not fall within this range can cause nuisance lockouts, premature solenoid burnout, or impact damage.

The supply voltage should be checked with a voltmeter at the bottom of the valve. Attach the voltmeter leads to the supply terminals. Read the voltmeter while the solenoids are energized. If the voltage falls below the allowable operating range, the electrical supply is inadequate even though the supply voltage may be correct without the electrical load of the solenoids.

A voltage that exceeds the allowable maximum can cause premature solenoid burnout, loss of air gap due to impact damage, or a stuck solenoid plunger. See *Repair Procedure C*.

C—Faulty Solenoid Operation Before removing the solenoids for inspection, check to see if the pilot cover is loose. A loose cover can prevent full travel of one or both pilot valves. However, the valve can operate normally if manual actuation is used because the manual pressure pushes the solenoids down into their correct positions.

If the cover is not loose, shut off electrical power to the solenoids, remove the pilot cover, slip the wires off the solenoid terminals, and remove both solenoids. Check for the following:

Jammed solenoid plunger Great overheating or delamination of the plunger can cause it to jam. A solenoid like this must be replaced.

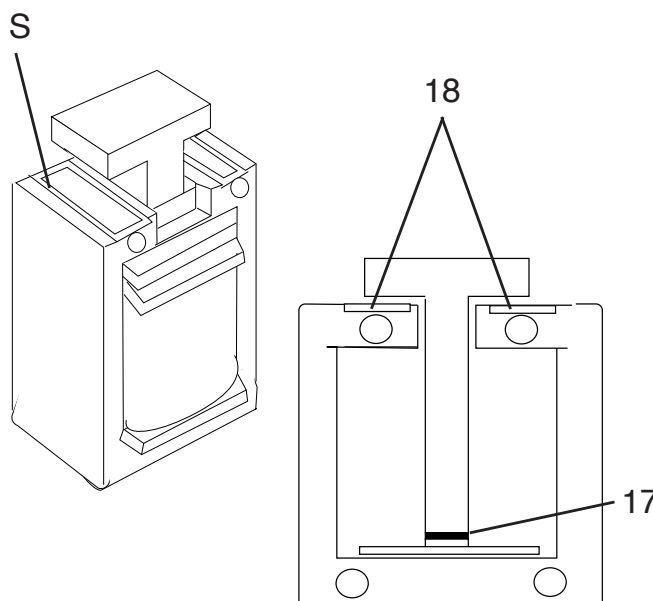
Defective solenoid coil Check the resistance of each coil with an ohmmeter. The coil is defective if the ohmmeter reading is zero or infinite. The most common cause of solenoid burnout is incorrect supply voltage. See *Repair Procedure B*. If the coils are not defective, examine the solenoids for the conditions described below.

Broken shading coil Copper shading coils reduce the solenoid's tendency to buzz when operated on alternating current. If a shading coil is loose or broken, the solenoid must be replaced. (See S, **Figure 7.1**.)

Wear that causes a loss of air gap There must be a small gap between the solenoid plunger and the field frame when the solenoid is energized. (See air gap 17, **Figure 7.1**.) If significant wear is apparent in areas 18 (**Figure 7.1**), the air gap can be lost and the solenoid will buzz loudly. With this much wear, the solenoid should be replaced.

Lubrication will help ensure long solenoid life by preventing many of the troubles listed. Solenoids should be lubricated periodically with a lithium-based grease. Put grease on the plunger and all impact surfaces.

Figure 7.1
Solenoid



(Continued on next page.)

Repair Procedures (continued)

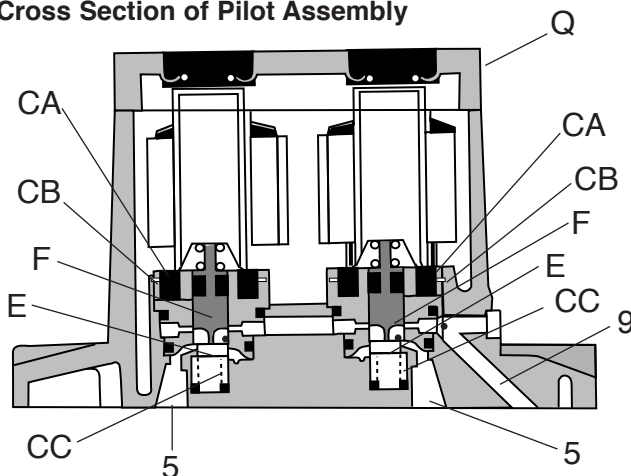
D—Faulty Pilot Insert Shut off electrical power to solenoids; shut off and exhaust the air supply to the valve. Disassemble pilot section as follows:

1. Remove pilot cover Q. See **Figure 7.2**.
2. Slip leads off solenoid tab terminals and lift out solenoids. (To check solenoids, see *Repair Procedure C* on page 16.)
3. Remove rubber cushions CA from tops of inserts (**Figure 7.2**).
4. With Truarc type pliers, remove retaining rings CB (**Figure 7.2**).
5. Remove the inserts by grasping them at shoulder area and pulling with a circular motion. Removing the inserts by pulling on the spring or stem may damage inserts.
6. Be sure the poppet return springs CC (**Figure 7.2**) are removed. Check action of each insert. The stem should move easily with light finger pressure and should not jerk or grab during its travel (approximately .03 inch). If a stem does not move smoothly, the insert should be replaced.

Inspect the poppets E and their seats for foreign particles or damage. If the poppets are swollen or have deteriorated, improper lubricants may be the cause. See page 13 for compatible lubricants.

If a poppet or inlet (upper) seat is defective, the insert must be replaced. Blow out passages 5 and 9 (**Figure 7.2**) to remove loose dirt particles. If an exhaust (lower) seat is defective, the entire pilot must be replaced.

Figure 7.2
Cross Section of Pilot Assembly



E—Faulty Seals on Monitor Spool Faulty seals on spool C can result in air leaks or cause the spool to jam so the monitor does not function properly. See **Figure 7.3**.

Before disassembling to inspect the monitor, shut off electrical power to the solenoids, and shut off and exhaust the air supply to the valve. Proceed as follows:

1. Remove pilot cover, disconnect solenoid leads, and remove pilot assembly.
2. Remove pin X, retaining ring Y, and lockout pin assembly Z. See **Figure 7.3**.
3. Remove pin T, retaining ring R, end plug G, and spring M. See **Figure 7.3**.
4. Remove spool C with your finger. See **Figure 7.3**. If the spool is stuck, it will be necessary to remove the monitor from the valve body, then apply low air pressure to sensing port 7 on the bottom of the monitor. See **Figure 7.4**. As pressure is applied, place your hand over the bore openings so the spool does not fall out and become damaged.

Figure 7.3
Cross Section of Monitor

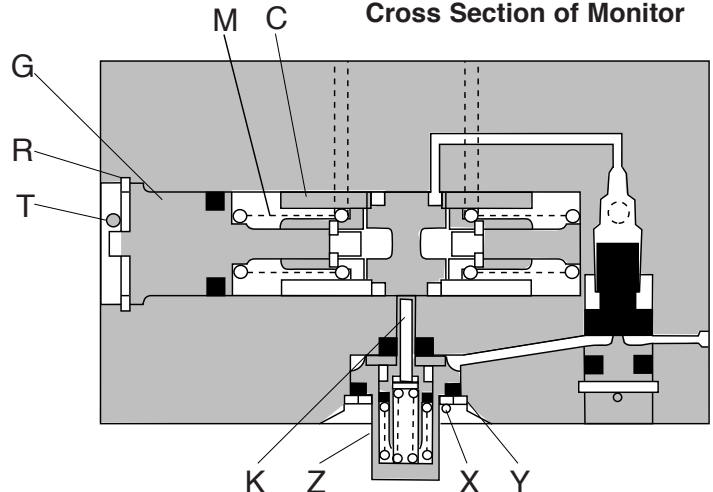
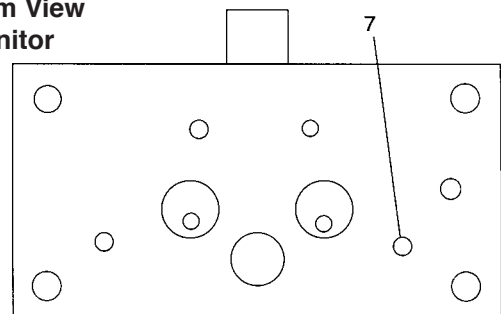


Figure 7.4
Bottom View of Monitor



(Continued on next page.)

SECTION 8—TROUBLESHOOTING

Dual-Solenoid Air Valve

Repair Procedures (continued)

Inspect the Teflon surfaces of the slipper seals for scratches or other defects that could affect their sealing qualities. If the seals are defective, replace the entire spool and seal assembly. Before reassembly, be sure to inspect the monitor bore for burrs or grit that might be the cause of the damage to the seals. See *Repair Procedure F* for remarks about bore wear.

F—Worn Spool Bore A worn spool bore can cause the monitor to lockout because of poor sealing and consequent air leakage. To check the bore, disassemble it using the steps described in *Repair Procedure E*. If the bore is worn or badly scratched, the entire monitor must be replaced.

G—Contaminants in Spool Bore A buildup of grease, oil, or water in the spool bore can restrict or prevent movement of the spool. This can result in a failure of the monitor to lockout when it should, or prevent resetting after a lockout has occurred. To inspect and clean the spool and bore, follow the disassembly instructions in *Repair Procedure E*.

H—Bent Lockout Pin If lockout pin K is bent (**Figure 7.3**), it will not retract when resetting pressure is applied so the monitor remains locked out. To remove the lockout pin, follow steps 1 and 2 in *Repair Procedure E*. Assembly with a new pin is the reverse of disassembly.

I—Transient Foreign Material If the valve resumes normal operation after being reset, the cause of the lockout may have been a transient foreign particle. A bit of scale or other foreign material

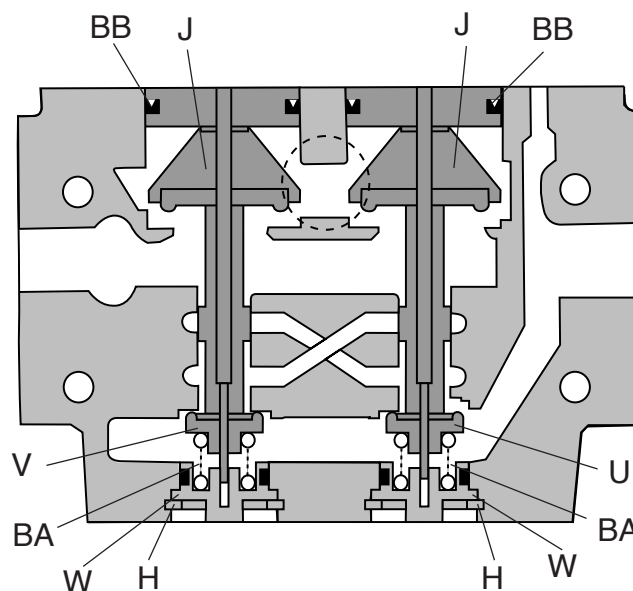
could lodge at various points in the valve to cause a nuisance lockout. After resetting, the air flow of the next operating cycle can “wash” the foreign material out, thus permitting the valve to return to normal operation. This situation is most common after a period of press inactivity. An efficient filter located close to the valve will be of great help in eliminating this problem.

J—Main Inlet Poppet Not Sealing If an inlet poppet is not sealing, air can be detected escaping at the exhaust port. Foreign particles are sometimes responsible for holding a poppet off its seat. Manually cycle the valve several times to see if the flow of air through the valve will flush out the particles. If not, it will be necessary to disassemble the valve to clean it. Take normal press operation safety precautions during this test in order to avoid injury or damage to equipment.

Turn off electrical power to the valve, then shut off and exhaust the air supply to the valve. Remove the pilot assembly, the monitor, adapter plate (if used) and junction box.

Disassembly Note: Before removing the pilot assembly, the solenoid leads must be slipped off the solenoid terminals. When the junction box is removed, exercise care in withdrawing the solenoid leads from the passage through the valve body. To remove the valve elements, first remove the retaining rings H (**Figure 7.5**), end plugs W, and springs BA at the lower end of the bores. Pull inlet poppets U and V off the valve stems and remove the balance of valve elements through the top of the valve body.

Figure 7.5
Cross-Section of Valve
Body Assembly



(Continued on next page.)

Repair Procedures (continued)

If the inlet poppets U and V are damaged or have deteriorated, replace them. Deteriorated poppet material suggests the use of improper lubricants. Only compatible lubricants such as those described on page 13 should be used.

While the valve is disassembled, also inspect the piston poppets J (**Figure 7.5**) for damage and the bores for varnish deposits. See *Repair Procedures L and M*.

K—Leaking Piston Poppet Seal A worn or damaged piston poppet seal BB (**Figure 7.5**) can allow pilot pressure to leak past the piston and cause erratic valve action and intermittent lockouts. Disassemble to inspect seals. For disassembly instructions, see *Repair Procedure J*.

When installed, the seals should have some compression in the bore. Also inspect for varnish deposits, and wear or damage to piston and inlet poppets and their seats.

Replace any worn or damaged parts. If any parts show signs of deterioration, incompatible lubricants or solvents may be the cause. See paragraphs on compatible lubricants and cleaning on page 13.

L—Varnish Deposits Varnish deposits in the valve may affect the motion of a piston poppet and cause intermittent lockouts. Varnish results from the action of oxygen on lubricating oils and can be aggravated by excess heat. Varnish can also come from overheated compressor oil carried over into the air lines and deposited in the valve.

To disassemble for cleaning, follow the procedure given in *Repair Procedure J*.

Use a water soluble detergent for cleaning varnished areas. Avoid chlorinated solvents (i.e. trichloroethylene) and abrasive materials. The former can damage seals and poppets, and abrasives can do permanent damage to metal parts.

M—Excessive Lubrication Excess oil on the piston walls can sometimes cause erratic valve action and result in intermittent lockout. Air line lubrication is not required by dual valves, but if a lubricator is used it should deposit only a thin film of oil on the piston walls. Check the lubricator in the air supply line. Only enough oil should be injected to produce a slight discoloration on a piece of white paper when it is held close to the exhaust port of the valve for a few cycles.

N—Undersized or Plugged Muffler The muffler supplied with the dual valve is designed to create minimal back pressure. However, after long usage with contaminant-laden air, it may become clogged. The increased back pressure can cause erratic motion of the valve elements and lead to intermittent lockouts. A dirty muffler should be removed and cleaned with a water soluble detergent solution.

If a nonstandard muffler is used, excess back pressure may result if the muffler is too restrictive. Be sure the muffler used is the correct capacity.

If a valve locks out intermittently but performs normally when the muffler is removed, clean the muffler or replace it with one that is the correct capacity.

CAUTION: Restricting the exhaust ports of the valves can adversely affect their proper operation. Mufflers must be resistant to clogging and have flow capacities which match the exhaust capacities of the valves. Possible contamination of the muffler matrix may result in a change in flow and increased back pressure.

SECTION 9—RETURN MATERIALS AUTHORIZATION REQUEST FORM

Dual-Solenoid Air Valve

To return material for any reason contact the sales department in our organization at 1-800-922-7533 for an RMA number. All return materials shipments must be prepaid. Complete this form and send with material to Rockford Systems, Inc., 4620 Hydraulic Road, Rockford, IL 61109-2695. Make sure the RMA number is plainly identified on the outside of the shipping container.

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

Contact Name _____ E-mail Address _____

Items Authorized To Return on RMA No. _____ **Original Invoice No.** _____ **Date** _____

Part No. _____ **Serial No.** _____ **Description** _____

Service Requested ☐ Full Credit ☐ 25% Restocking ☐ Repair & Return ☐ Warranty Replacement

Reason for return (describe in detail): _____

Return Materials Authorized By _____ Date _____

SECTION 10—ORDER FORM FOR SIGNS AND LITERATURE

This instruction manual references signs and literature available for your machines. This order form is for your convenience to order additional signs and literature as needed. (This order form is part of your installation manual so please make a copy of it when ordering.)

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____ Fax _____

Name _____ Purchase Order No. _____ Date _____

Part No.	Description	Quantity Required
KSL-037	Installation Manual—Dual-Solenoid Air Valve	_____
KSL-051	Booklet - “Mechanical Power Press Safety” (MPPS)	_____
FAB	Catalog - “Safeguarding Fabricating Machines”	_____
SFM	Catalog - “Safeguarding Metal-Cutting Machines”	_____

For prices and delivery, please use address, phone or fax number listed on the front cover of this manual.

Your Signature _____ Date _____