LOCOMOTIVE AIR FILTER/DRYER SYSTEM

DESCRIPTION

To ensure that locomotive air operated equipment is supplied with clean dry air, locomotives have been fitted on special order with an air filter/dryer system, Fig. 1. The system is made up of two complete filter/dryer units that regularly alternate between dehydrating and regenerating - one unit works while the other regenerates. A timer controlled dual solenoid valve maintains this cycle by switching the filter/dryer function every two minutes.

OPERATION

During the dehydration cycle, Fig. 2, air is first channeled through a spiral air path in which centrifugal action throws contaminants, including free water and oil, out of the air stream. The air then passes filtering media which includes an oil scrubber of stainless steel turnings, desiccant beads to remove the moisture, and a final paper element filter to remove entrained particles. During the regeneration cycle, Fig. 3, the dryer unit drain valve is opened to purge collected moisture, oil, and other contaminants from the system. Incoming regenerating air regenerates the desiccant and expels the contaminants to atmosphere.

A pressure check valve located in the dryer system protects against unusual drops in air pressure that could impair operation of the air system. The valve places each dryer in the charging stage should main reservoir pressure drop below 690 kPa (100 psi). Installations normally include the application of a transfer valve, Fig. 4, which permits all compressed air that the locomotive uses to be from the No. 2 main reservoir and the dryer system when main reservoir pressure is at normal operating level. If No. 2 main reservoir pressure drops below 690 kPa (100 psi), the transfer valve changes the air flow so that air for auxiliary devices comes from the No. 1 main reservoir. This allows air to be retained in the No. 2 main reservoir for braking demands.

MAINTENANCE

WARNING

Compressed air can be dangerous if not handled carefully. Do not attempt to service, repair, or break any air connections or lines without first bleeding all pressure from the lines and the devices they connect.

CANISTER REPLACEMENT

1. Disconnect the air line at the drain valve (1), Fig. 5, and the air line from swivel fitting (2), if so equipped.

2. Shut off electrical power to heater (3) and remove heater cover attachment nuts and lockwashers (4). Lift off heater cover and disconnect wiring at terminal strip.

3. Remove the eight hex nut and lockwasher sets (11) securing sump bowl (5) to dryer body (9). Sump bowl assembly will drop down followed by canister assembly (6).

4. Inspect bowl gasket (10) and renew if damaged. Ensure that bowl gasket is properly seated in groove on top of sump bowl before reassembly.

5. Place new canister assembly into sump bowl. Make certain the "O" ring bumper (7) and top sealing flat gasket (8) are properly installed on canister.

6. Insert canister and sump bowl into dryer body and secure in place with the eight lockwashers and hex nuts. Reconnect air lines to drain valve and swivel fitting. Reconnect heater electrical connections as shown in Fig. 5 and replace heater cover. Turn on electrical power to heater and repressurize air lines.

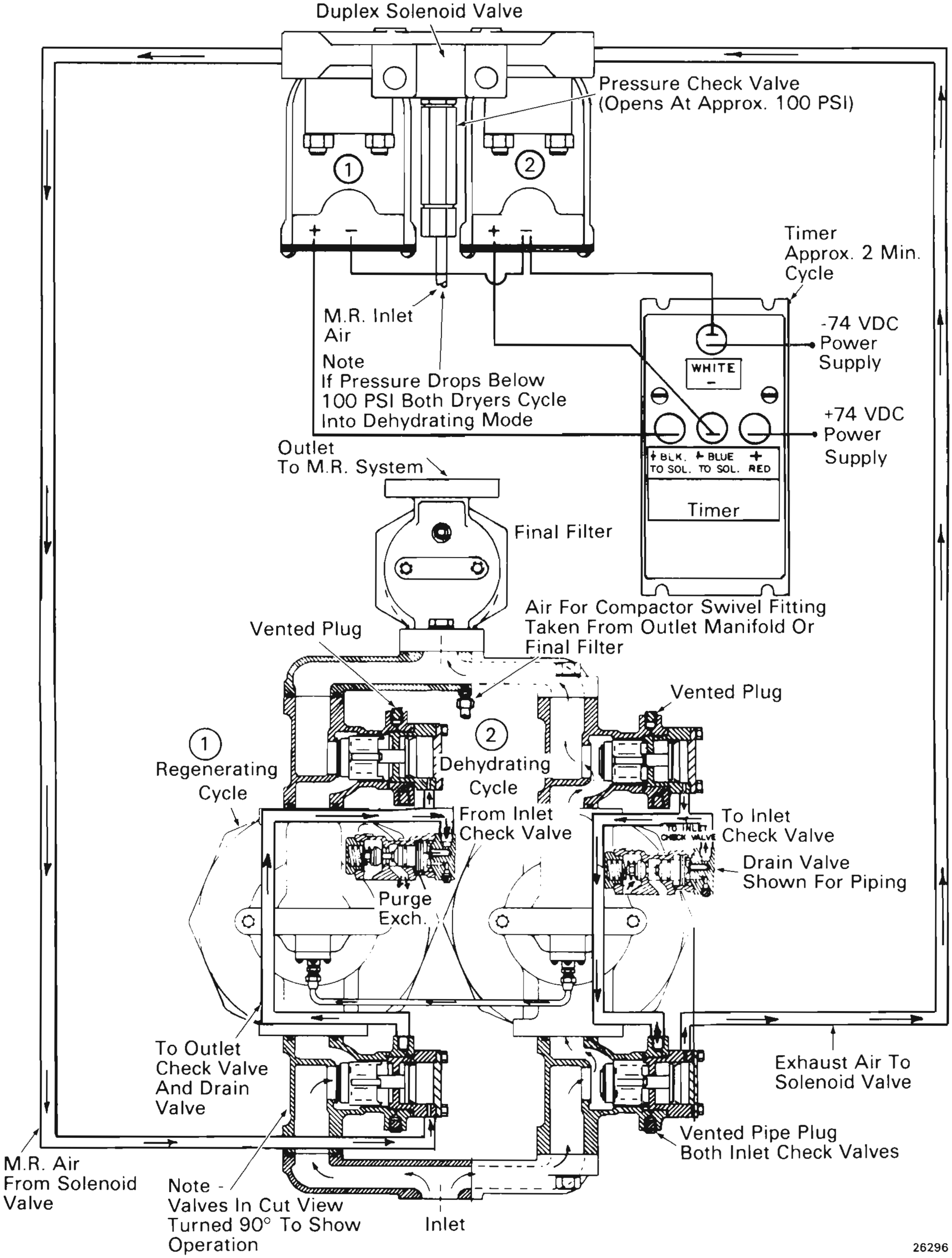


Fig.1 – Main Reservoir (M.R.) Air Filter/Dryer System

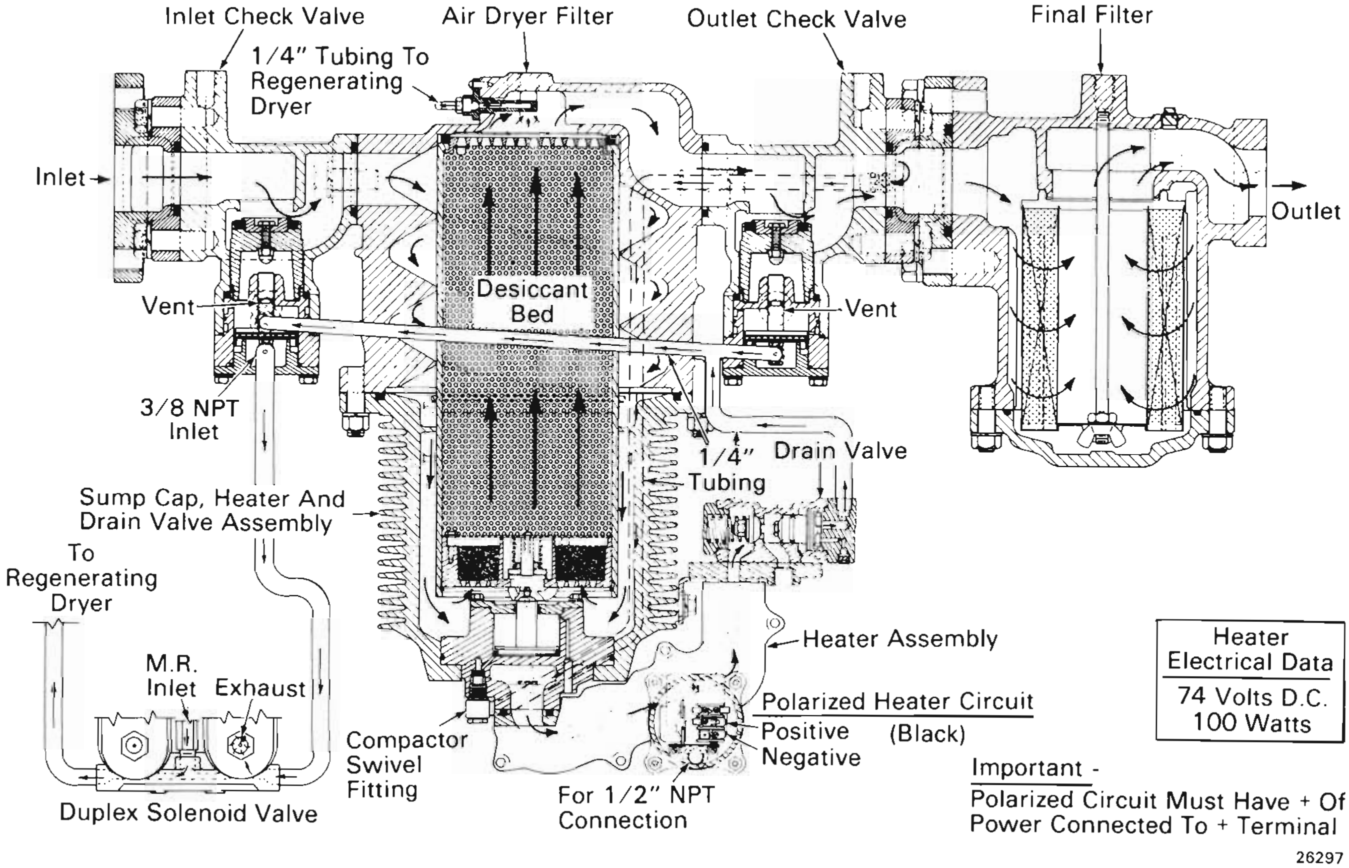


Fig.2 – Dehydration Cycle

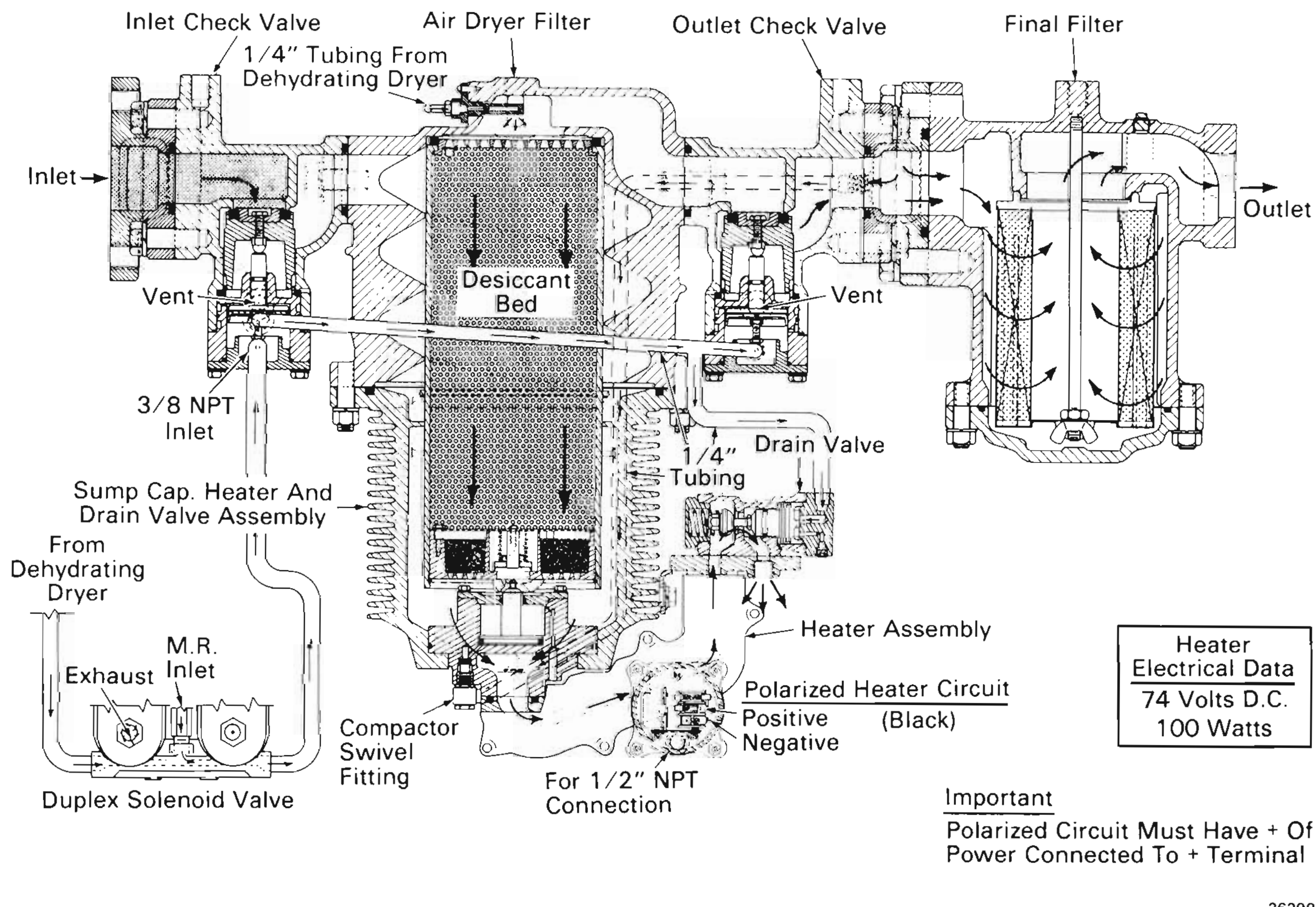
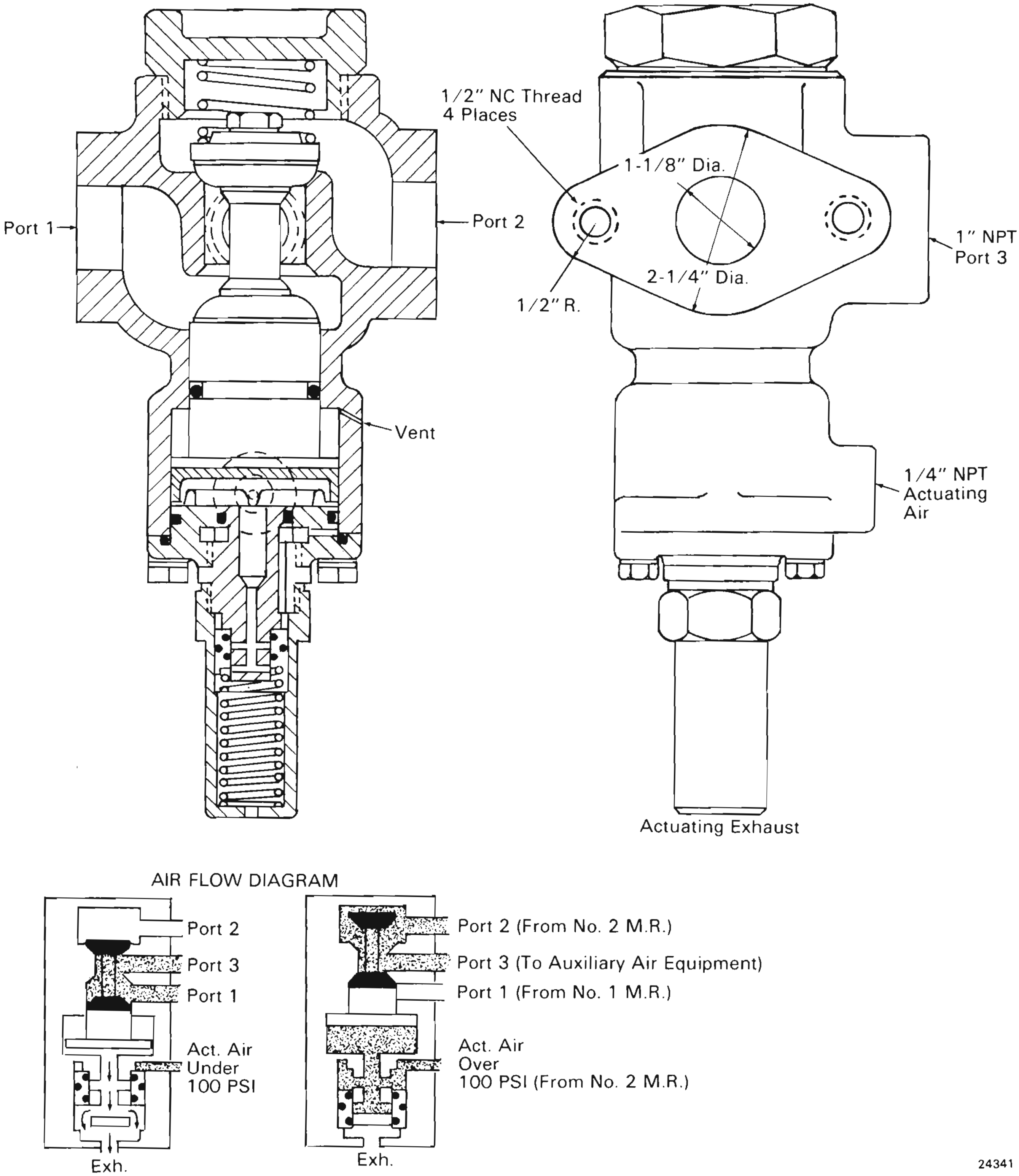


Fig.3 – Regeneration Cycle



24341

Fig.4 -Transfer Valve Operation

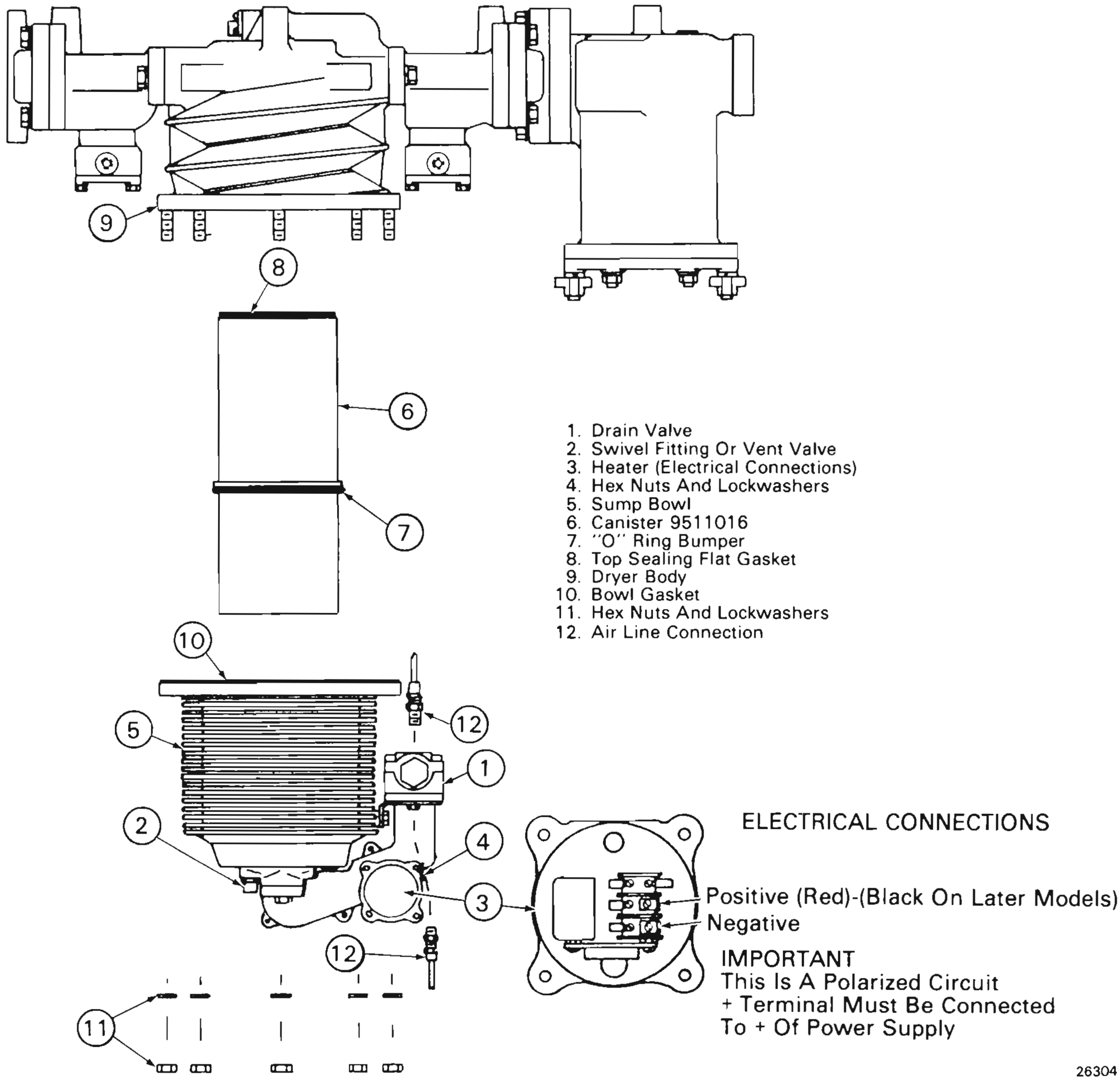


Fig.5 - Canister Replacement

FINAL FILTER ELEMENT REPLACEMENT

1. *First*, remove the four hex nuts and lockwashers (1), Fig. 6, *then* the two hex wing nuts and lockwashers (2). Later filter designs do not have hex wing nuts; however, removal and application of the filter element is similar in both of the designs shown. Bottom cap (3) will drop down along with spring (4) and cap gasket (5).

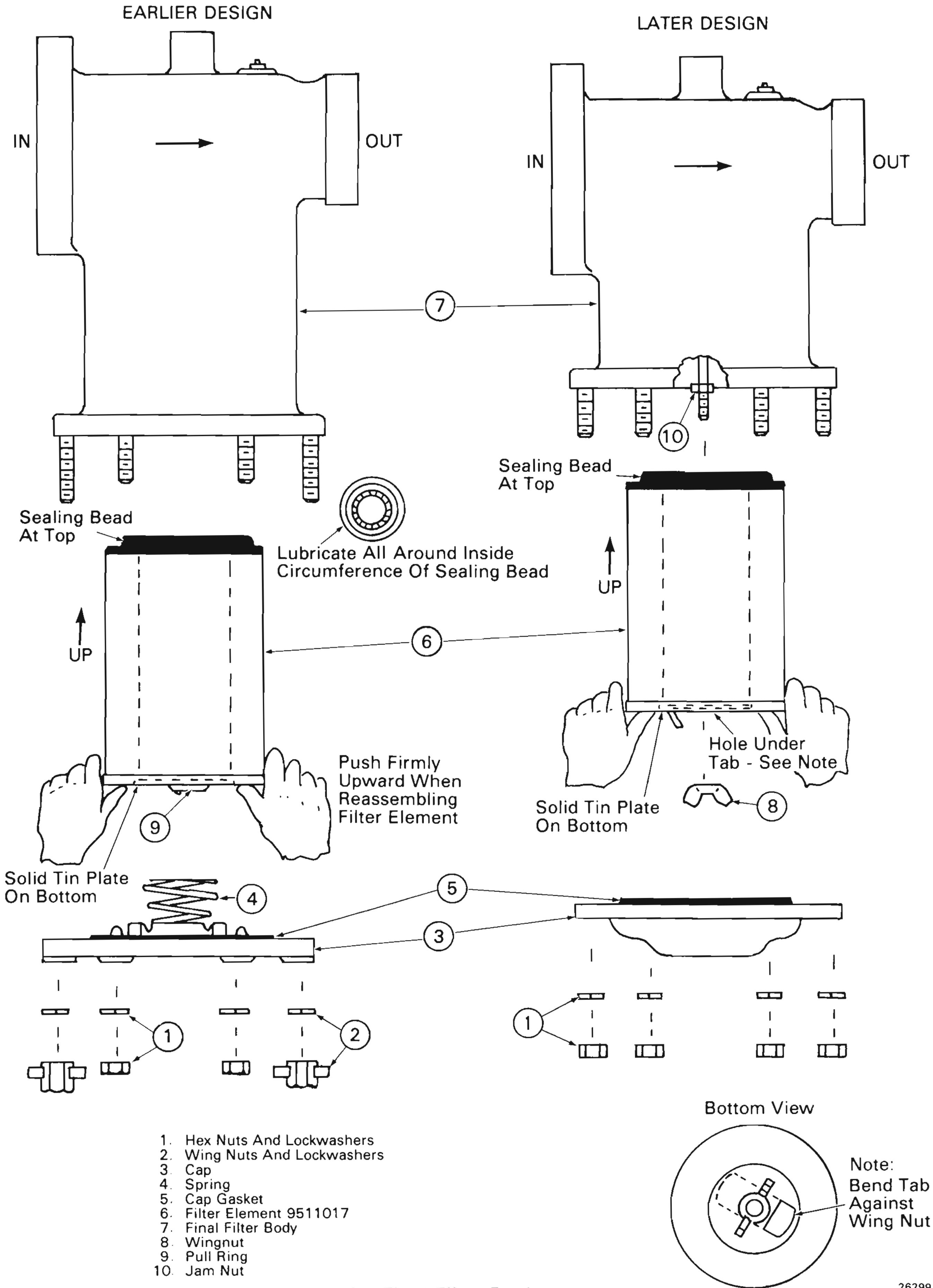
2. Pull filter element (6) out of filter body (7) by grasping the pull ring at the bottom of the element.

NOTE

If filter element shows any sign of accumulated oil or desiccant dust, both filter/dryer canisters should be renewed.

3. Inspect cap gasket and renew if damaged. Ensure that gasket is properly seated in groove on bottom cap before reassembly.

4. Apply Dow 55M silicon grease to inside circumference of new filter element sealing bead, then install element into filter body with sealing bead to the top as shown in Fig. 6.



1. Hex Nuts And Lockwashers
2. Wing Nuts And Lockwashers
3. Cap
4. Spring
5. Cap Gasket
6. Filter Element 9511017
7. Final Filter Body
8. Wingnut
9. Pull Ring
10. Jam Nut

Fig.6 – Final Filter Replacement

5. Position spring on bottom cap so ends fit recesses in filter element and cap. Reinstall bottom cap with spring and gasket on filter body using one hand to push up and hold cap while running up the two hex wing nuts and lockwashers on the long studs with the other hand. Apply the four hex nuts and lockwashers on the short studs and final tighten all hex nuts.

As shown in Fig. 6, some designs do not include hex wing nuts or a spring in the filter cap.

INLET AND OUTLET CHECK VALVE SERVICE

REMOVAL PROCEDURE, Fig. 7

1. Using a 1/2" wrench, remove three cap screws with lockwashers.
2. Actuating cap will drop down, exposing piston in actuating housing. Remove piston.
3. Disconnect actuating air lines from actuating housing. Using 1/2" wrench, remove four cap screws with lockwashers.
4. Carefully remove actuating housing and wing valve assembly from check valve body, being careful not to drop wing valve assembly.
5. For wing valve removal, inspection and maintenance procedure, see below.

CHECK VALVE MAINTENANCE PROCEDURE, Fig. 8

1. With valve wing assembly removed from check valve body, inspect seat (4) for damage. To replace, use two 7/16" sockets - one with extension to hold acorn nut (6) and one to turn cap screw (2). Remove seat retainer (3). Remove old seat, then reassemble with new seat if necessary.

2. With actuating assembly removed from check valve, inspect seals (7) for damage. Replace if necessary. Using a 1/2" wrench, remove three cap screws (17) with lockwashers and actuating cap (16). Inspect seal (15) for damage. Replace if necessary. Extract cup washer (12) and piston (11) from actuating housing (8). Inspect seal (9) and cup washer for damage or unusual wear. Replace if necessary.

   IMPORTANT: To replace cup washer, use 7/16" wrench to loosen and relieve tension on cup washer retainer (13). Remove cap screw (14) from piston using the wrench. Replace cup washer and reassemble.

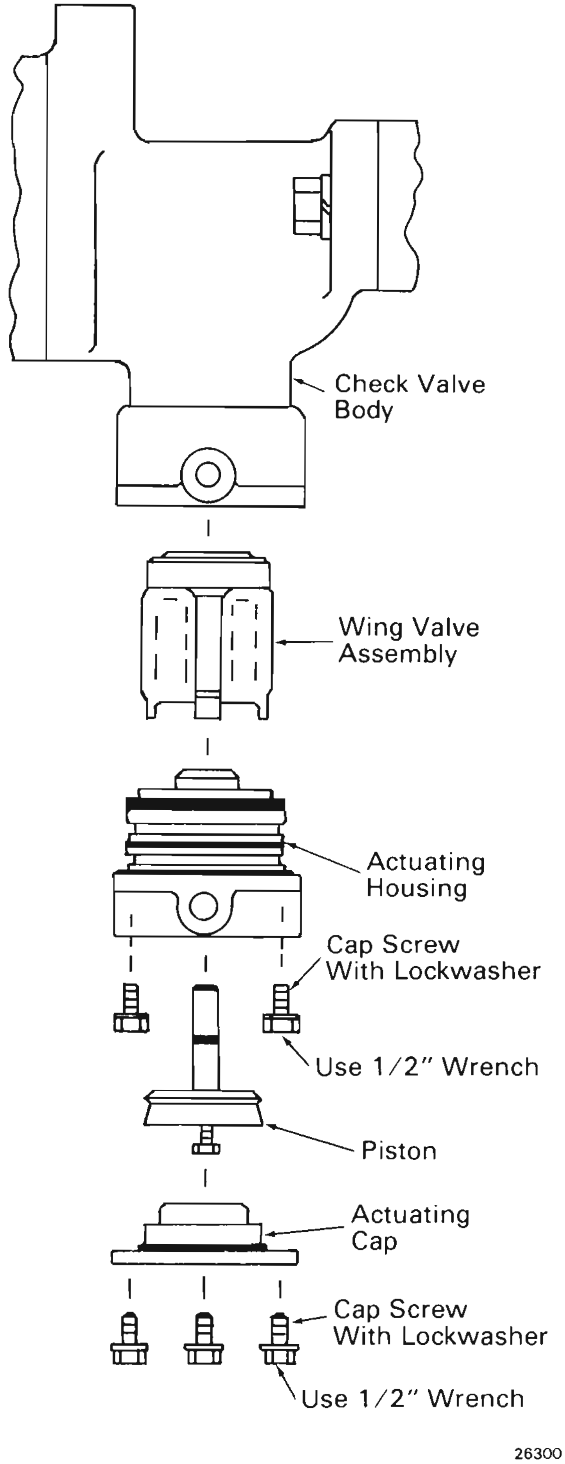
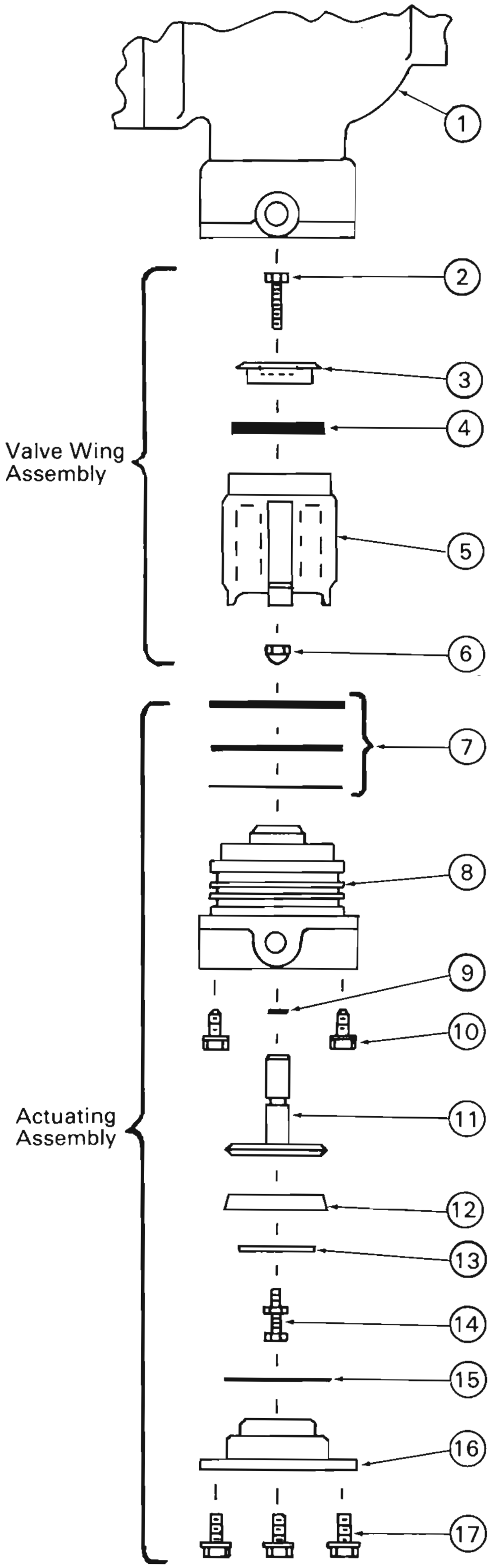


Fig.7 - Inlet And Outlet Check Valve Removal Procedure

3. To reassemble actuating assembly and wing valve assembly to check valve body, *first* generously lubricate all outside diameters of seals and metal surfaces of check valve assembly with Dow Corning M55, then carefully insert into check valve body and attach with four cap screws with lockwashers (17) using a 1/2" wrench. Reconnect actuating air lines.



1.	Check Valve Body	11.	Piston
2.	Cap Screw	12.	Cup Washer
3.	Seat Retainer	13.	Cup Washer Retainer
4.	Seat	14.	Cap Screw With Locknut
5.	Valve Wing	15.	Seal
6.	Acorn Nut	16.	Actuating Cap
7.	Seals	17.	Cap Screw With Lockwasher
8.	Actuating Housing	18.	Check Valve Body
9.	Seal		
10.	Cap Screw with Lockwasher		

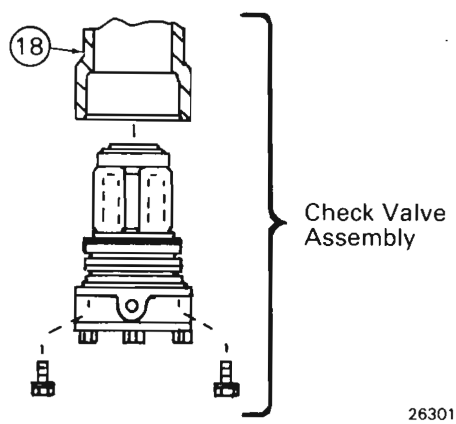
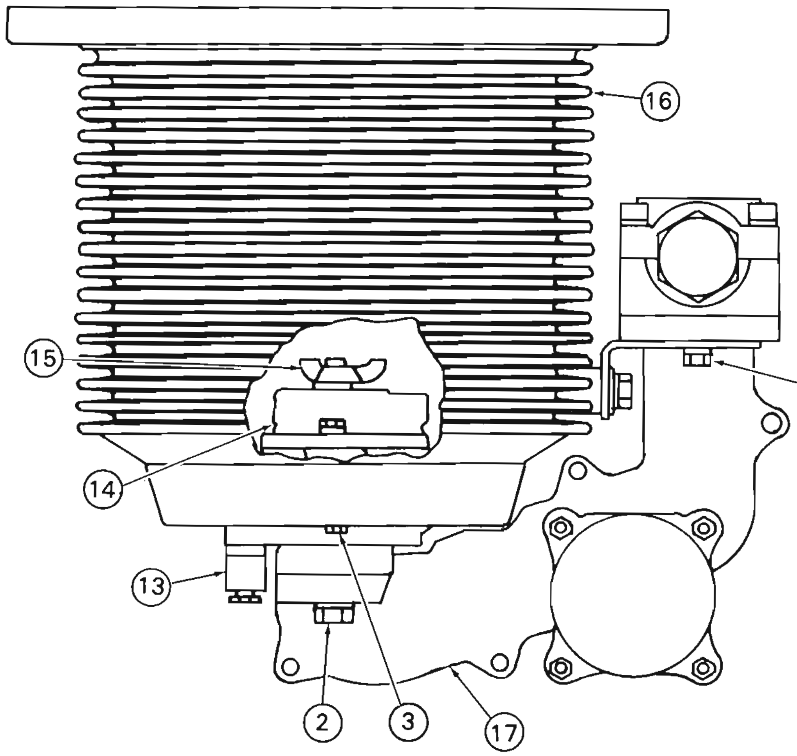


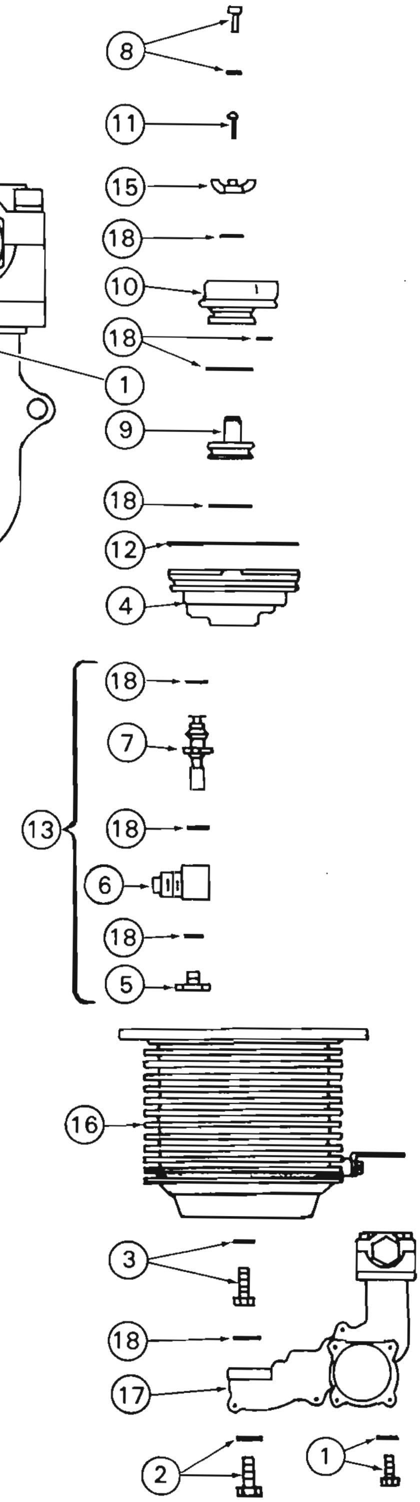
Fig.8 – Check Valve Maintenance Procedure

DESICCANT COMPACTOR REMOVAL AND SERVICE

1. Disconnect air lines at drain valve and electrical wiring from heater, as previously described for CANISTER REPLACEMENT.

2. Disassemble heater and drain valve assembly (17), Fig. 9, from sump bowl (16) by removing two hex bolts and lockwashers (1) at support bracket and two hex head bolts and lockwashers (2) at bottom of sump bowl.





1. Hex Head Bolts And Lockwashers
2. Hex Head Bolts And Lockwashers
3. Hex Head Bolts And Lockwashers
4. Adapter
5. Lock Bolt
6. Swivel
7. Swivel Post
8. Hex Head Bolts And Lockwashers
9. Piston
10. Compactor Cap
11. Slot Head Bolt
12. Adapter Seal
13. Swivel Fitting (if so equipped)
14. Desiccant Compactor Assembly
15. Spider
16. Sump Bowl
17. Heater And Drain Valve Assembly
18. Seal

26302

Fig.9 – Desiccant Compactor Service

3. Disconnect swivel fitting air line (if so equipped) and remove two hex head bolts and lockwashers (3) which mount adapter (4) into bottom of sump bowl. Adapter assembly can now be removed along with seal (12).

4. Disassemble the swivel fitting (13) as follows: remove lock bolt (5), and swivel (6) will drop off swivel post (7) along with two seals. Remove post and post seal from adapter. Clean and inspect all parts and seals for damage or unusual wear and renew if necessary. Apply a small amount of Dow 55M silicon grease to seals *only* and reassemble.

5. Disassemble compactor (14) from adapter by removing two hex head bolts and lockwashers (8). Extract piston (9) from compactor cap (10) by removing slot head bolt (11), spider (15) and seals. Clean and inspect all parts and seals. Renew if damaged. Apply Dow 55M silicone grease to seals and reassemble.

6. Clean and inspect seal (12). Renew if necessary. Reinstall adapter assembly in sump bowl and remount heater and drain valve assembly. Reconnect air lines and heater electrical wiring as described for CANISTER REPLACEMENT.

DRAIN VALVE SERVICE

1. Remove heater and drain valve assembly from sump cap as described for DESICCANT COMPACTOR REMOVAL AND SERVICE.

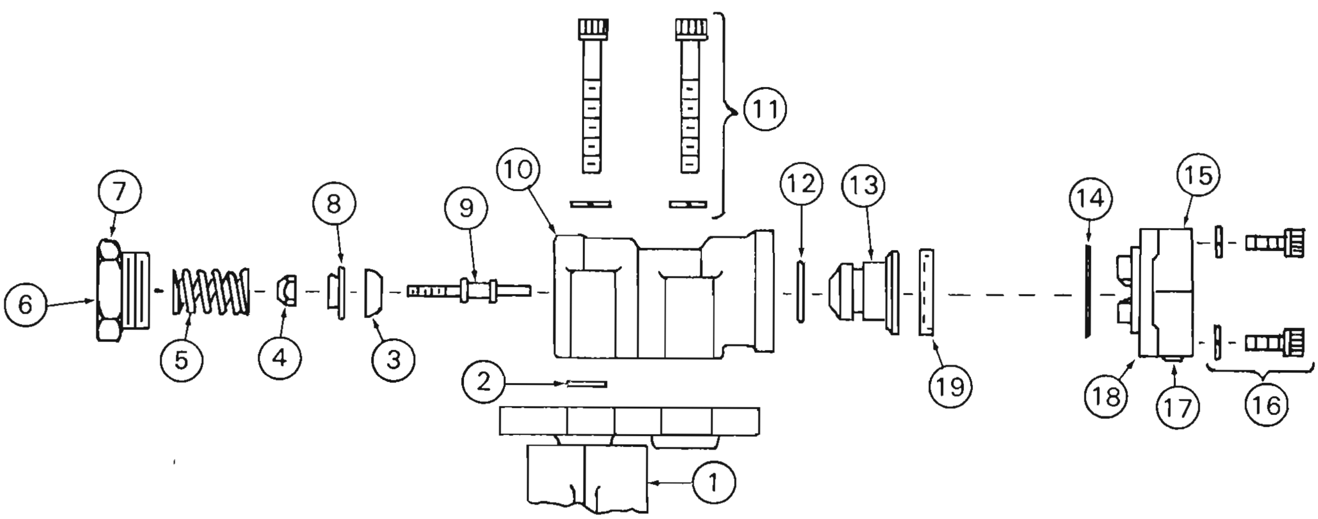
2. Disassemble drain valve from heater assembly (1), Fig. 10, by removing four allen head bolts and lockwashers (2). Lift off valve assembly and remove seal.

3. Remove cap fitting (3) and valve spring (5) from valve body (4). Extract valve stem (6) and inspect assembled valve seat (7) for unusual wear or damage. Renew seat if required.

4. Remove cap (8) at opposite end of valve body by removing four allen head bolts and lock-washers (9). Withdraw cup washer (11), piston (10) and seal (12) from valve body. Inspect cup washer and seal for excessive wear or damage and renew if necessary.

5. Apply a generous amount of Dow 55M silicone grease to seal (12) and cup washer (11), then reassemble drain valve components.

6. Reassemble drain valve to heater using seal qualified by inspection or replaced with a new one.



1. Heater Assembly
2. Seal
3. Valve Seat
4. Nut
5. Valve Spring
6. 1-3/8" Hex
7. Cap Fitting
8. Seat Washer
9. Valve Stem
10. Valve Body
11. 1/4" Allen Head Bolts And Lockwashers
12. Piston Seal
13. Piston
14. Seal
15. 1/4" NPT
16. 3/16" Allen Head Bolts And Lockwashers
17. Plug
18. Cap
19. Cup Washer

26303

Fig.10 – Drain Valve Service

3. Remove diode (3) from coil assembly and test for continuity in both directions with a V-O-M meter. Replace with a new one if necessary.

4. Inspect coil (4) and test to specifications listed in service data section. Renew if required.

5. Qualify spring (5) by measuring free height which must be no less than 25 mm (31/32″). Replace with a new one if necessary. DO NOT STRETCH.

6. Inspect seats (6) to determine if new ones should be installed or, in some cases, whether reversing seats in plunger will provide for satisfactory operation.

7. Reassemble valves and test at operating pressure range of 0-1 380 kPa (0-200 psi) [minimum 0.65 m^3/min at 965 kPa (140 psi)]. No lubrication is necessary.

MAIN RESERVOIR INLET CHECK VALVE SERVICE

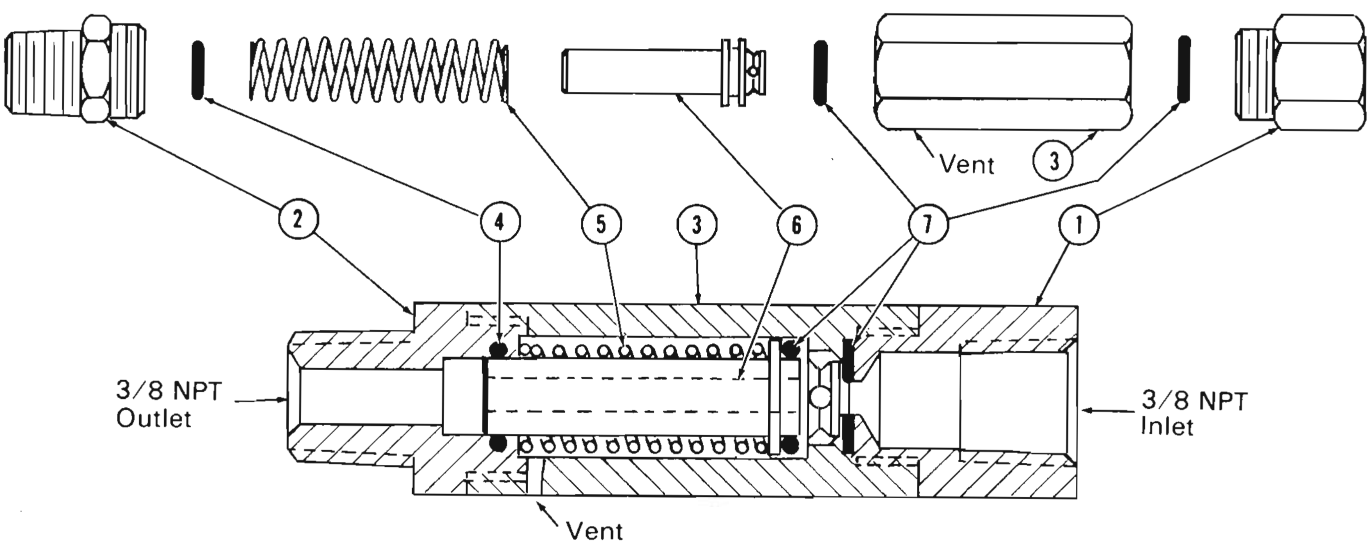
1. Disconnect main reservoir air line from check valve at inlet cap (1), Fig. 12. Remove check valve assembly from duplex solenoid valve mounting bracket.

2. Remove outlet cap (2) from valve body (3) and extract spring (5) and shuttle (6). Remove outlet seal (4) from cap and seal (7) from shuttle.

3. Remove cap (1) and seal (7) from inlet end of valve body. Check vent hole at outlet end and clear if obstructed.

4. Clean all parts and inspect for unusual wear or damage. Renew if required. Clean and inspect all seals and renew if worn or deformed.

5. Begin reassembly by *first* replacing inlet seal (7) into valve body and applying inlet cap (1). Tighten inlet cap in place, *then* install shuttle (6) with seal (7), spring (5) followed by outlet cap (2) with seal (4) assembled internally. This



ITEM	DESCRIPTION
1.	Inlet Cap
2.	Outlet Cap
3.	Valve Body
4.	Outlet Seal
5.	Spring
6.	Shuttle
7.	Seals

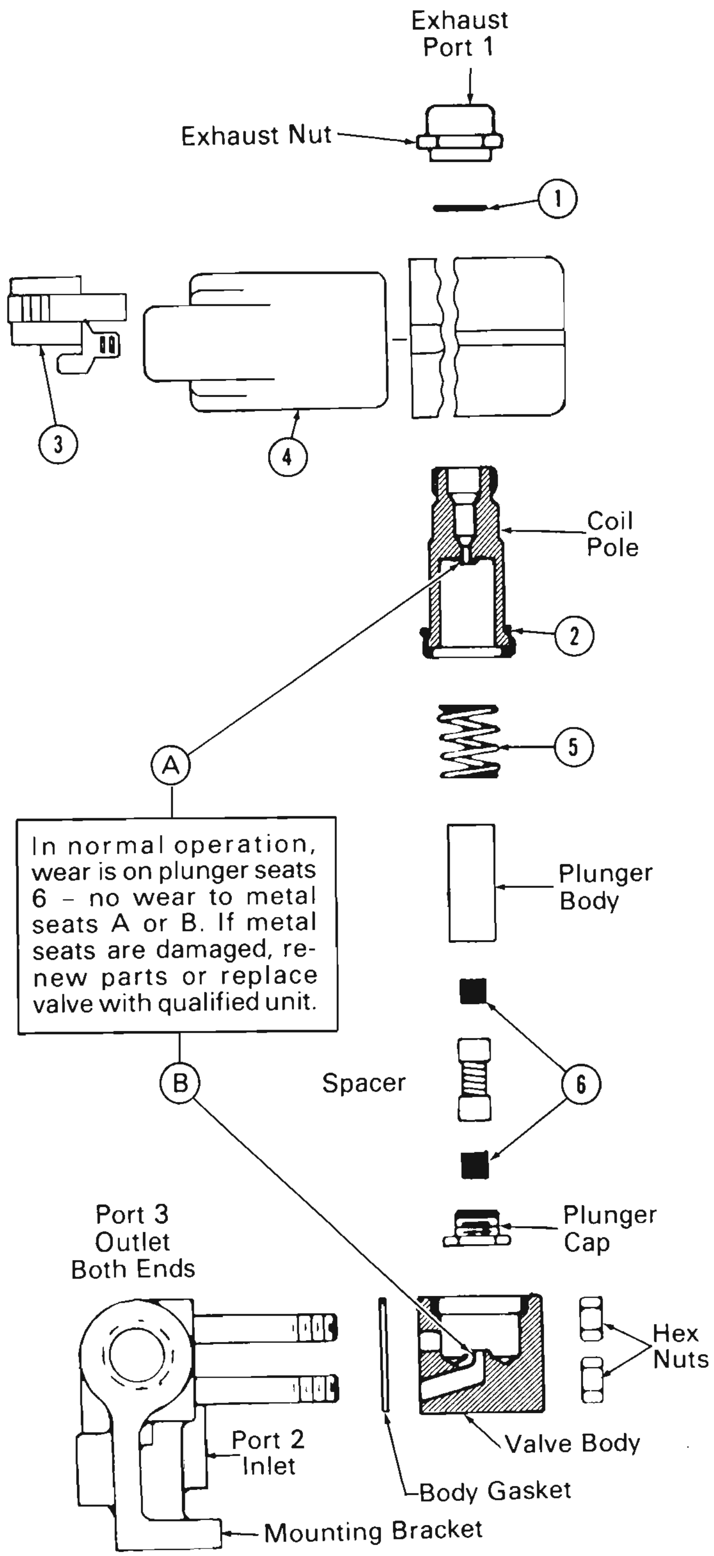
24348

Fig.12 – Main Reservoir Inlet Check Valve Service

DUPLEX SOLENOID VALVE SERVICE

1. Dismantle each solenoid valve, Fig. 11, carefully noting assembly sequence of each part and seal. Thoroughly clean all moving parts and air passages using Rule 66 mineral spirits cleaning solvent.

2. Inspect static seal (1) and pole seal (2). Renew if worn. These seals prevent moisture from being blown between coil pole and coil.

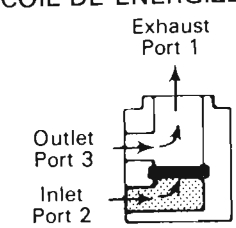


ITEM	DESCRIPTION
1.	Static Seal
2.	Pole Seal
3.	Diode (8453522)
4.	Coil (8468748)
5.	Plunger Spring
6.	Plunger Seats.

AIR FLOW

PIPED FOR NORMALLY CLOSED

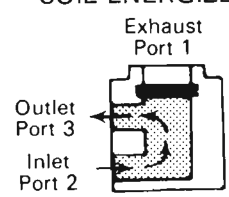
COIL DE-ENERGIZED



Leak At Port 3 With Port 1 Closed Can Be Caused By –

- Weak Spring 5
- Leaking Seat 6 Or Body Seat B Leaks

COIL ENERGIZED



Leak At Port 1 Can Be Caused By –

- Leaking Seat 6 Or Coil Pole Seat A Leaks

24347

Fig.11 – Solenoid Valve Service

sequence of reassembly is necessary to ensure proper seating of inlet seal.

TRANSFER VALVE SERVICE (If So Equipped)

1. Dismantle valve carefully noting assembly sequence of each part and seal. Thoroughly clean all parts with Rule 66 mineral spirits cleaning solvent.

2. Measure free height of spring (20), Fig. 13. If less than 89 mm (3-1/2"), spring should be replaced with a new one.

3. Inspect valve seats (5) and renew if worn. Check all seals for unusual wear or damage and renew if necessary.

4. Inspect cup washer (10) and renew if cracked or hardened.

5. Apply a generous amount of Dow 55M silicone grease to seals (8), (17), (19), piston (9) and cup washer (10). Lightly grease all other seals and reassembly valve.

TROUBLESHOOTING GUIDE

DRYER FUNCTIONAL CHECK

1. Engine must be running.

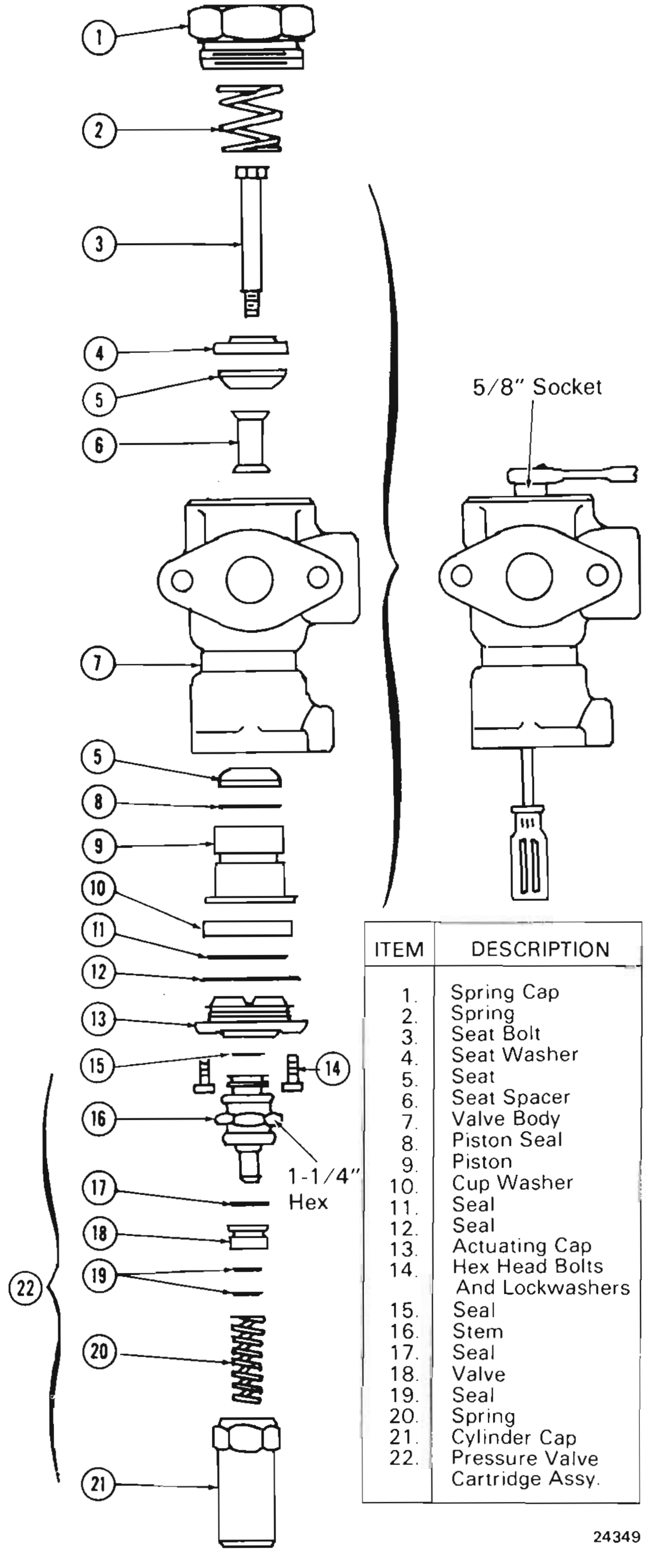
2. Auto drain timer (ADT) circuit breaker must be on. If circuit breaker is tripped and cannot be reset, check for possible shorted diode at duplex solenoid valve (MV-AD).

3. No. 2 main reservoir cutout cock must be open and pressure must be above 690 kPa (100 psi).

4. Normal dryer operation:

   a. Exhaust alternately comes from drain valve of each filter/dryer unit at two minute ± 15 second intervals when in a regenerating cycle. Each exhaust is characterized by pronounced air discharge followed by continuous lesser flow until unit goes back into dehydrating cycle. There should be no air discharge from a dehydrating unit.

   b. Humidity indicator (sight glass), located in pipe tee near final filter, should show at least partial blue. If indicator shows all white and filter/dryers are cycling normally as above, indicator should be replaced with a new one.



ITEM	DESCRIPTION
1.	Spring Cap
2.	Spring
3.	Seat Bolt
4.	Seat Washer
5.	Seat
6.	Seat Spacer
7.	Valve Body
8.	Piston Seal
9.	Piston
10.	Cup Washer
11.	Seal
12.	Seal
13.	Actuating Cap
14.	Hex Head Bolts And Lockwashers
15.	Seal
16.	Stem
17.	Seal
18.	Valve
19.	Seal
20.	Spring
21.	Cylinder Cap
22.	Pressure Valve Cartridge Assy.

Fig.13 - Transfer Valve Service

TRANSFER VALVE FUNCTIONAL CHECK (If So Equipped)

1. With locomotive engine running (air compressor operating), apply pressure gauge [w/1 100 kPa (160 psi) minimum range] to vent port of the No. 2 main reservoir cutout cock. Turn on bell to create air usage.

2. As air pressure drops, valve transfer should take place at a minimum pressure of 620 kPa (90 psi). Transfer can be identified by a pronounced air discharge from actuating exhaust or by transient fluctuation of the gauge.

3. Slowly open No. 2 main reservoir cutout cock. As air pressure rises, valve transfer should take place at a maximum pressure of 760 kPa (110 psi). Transfer can be identified by a transient fluctuation on the gauge and elimination of air discharge from the actuating exhaust.

TROUBLESHOOTING SEQUENCE CHART

TROUBLE REPORT	POSSIBLE CAUSE	RECOMMENDED TEST OR CORRECTIVE ACTION
Neither dryer cycling	No power into dryer timer.	Restore Power.
	No power out of dryer timer.	Replace dryer timer. 9332497
	No power at duplex solenoid valve.	Repair wiring.
One dryer cycling	No power out of one dryer timer circuit (each circuit energizes 2 min. ON and 2 min. OFF).	Replace dryer timer.
	One coil of duplex solenoid valve cool.	Check for correct wiring. If ok, check operation of timer.
Continuous air discharge at either filter/dryer drain valve.		
- Low air volume	Leaking drain valve seat.	Clean and lubricate drain valve.
- High air volume	Leaking inlet or outlet check valve seats.	Plug temporarily, then clean and lubricate check valves and drain valves at next maintenance point.

SERVICE DATA

SPECIFICATIONS

DRYER TIMER COIL

Rating - 65-80 VDC
Hi-Pot - 600 VAC

DUPLEX SOLENOID VALVE

ELECTRICAL DATA

Coil - 48-75 VDC, 330 $\pm$ 5% ohms, 18 watts @ 74 VDC.
Diode - 800 VDC continuous peak reverse voltage 1.5 Amps @ 50° C. max. forward current

AIR DATA

1 380 kPa max. press. (200 psi)
0.65 m^3/min @ 965 kPa (23 C FM @ 140 psi)

REPLACEMENT PARTS AND EQUIPMENT LIST

Dryer Canister Assembly	9511016
Final Filter Element	9511017
Humidity Indicator (Sight Glass)	9337423
Duplex Solenoid Valve Coil	8468748
Duplex Solenoid Valve Diode	8543522
Dryer Timer Assembly	9332497
Transfer Valve Assembly (if used)	9096768
Dow 55M Silicon Grease - 236.6 cm^3 (8 oz.) Tube	9317859
Rule 66 Mineral Spirits Cleaning Solvent	8492097

• • • • A Service Department Publication • • • •

Electro-Motive Division Of General Motors La Grange, Illinois 60525

Litho in U.S.A.