



## Air-O-Matic Division

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# SERVICE BULLETIN 82809

## RECOMMENDED MAINTENANCE AND SYSTEM TROUBLE SHOOTING

7/90

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### CAUTION

Improper installation or reversed air lines can cause sudden and unexpected steering hazards. READ and FOLLOW the installation instructions below, INCLUDING CHECK OUT, prior to moving vehicle. See Page 2.

### NOTICE

To save time and expense, read this before replacing the Torque Valve. More than half of the Torque Valves replaced are in working order. If replacement is determined necessary, use the proper part number as shown in the chart on page 6 or refer to the five digit part number stamped on the valve.

This bulletin covers installation and trouble shooting of air "leaking" from the exhaust port (see p. 6 for a typical "leaking" problem). For a reported "hard steering" complaint, refer to the SERVICE BULLETIN - "Hard Steering".



### IMPORTANT NOTICE

In addition to the maintenance schedule recommended on the following pages, proper operation of the Air-O-Matic System requires the following:

1. The Air Delivery Components for the Air-O-Matic are to be installed in accordance with the General Installation Bulletin 82805 and within the requirements set forth by the original equipment manufacturer for installing accessories. The air supply is to be from a secondary Dry Tank air reservoir (normally the front brake reservoir). NOT from a wet (supply) air reservoir OR from a primary reservoir which is for the rear brakes.

A check for the proper air source can be made while performing the semi-annual maintenance procedure. Using improper air source can result in contamination of the system, hard steering, loss of air, and inconsistent handling. (See page 4 "typical air system").

2. Daily drain the water from all air reservoirs, the water should be inspected and if discolored (especially if black and oily) the compressor must be checked. A worn compressor can "blow-by" oil which will deposit a varnish type material throughout the air system causing early failure of all air actuated devices.

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## CHECK OUT

THE FOLLOWING CHECKS ARE TO BE MADE WITH THE FULL WEIGHT OF THE VEHICLE ON THE WHEELS. **WARNING! DO NOT TOUCH THE INNER EDGE OF THE STEERING WHEEL WHEN TESTING! IF AIR LINES HAVE BEEN CROSSED, THE STEERING WHEEL MAY SPIN AND IT WILL NOT BE POSSIBLE TO STEER THE VEHICLE! USE PALMS OF OPEN HANDS ON OUTER EDGE OF STEERING WHEEL!**

- Build up air pressure.
- With palms of open hands on the outer edge of the steering wheel, slowly turn the wheel. If the steering wheel fights the turn, recheck hose routing for possible air lines reversed at Torque Valve.
- Check for air leaks. A short burst of air when the steering wheel is released is normal.
- If assist is not present or air does not exhaust, check air supply to Torque Valve.
- **DO NOT MOVE VEHICLE** until system is providing assist.

## INSTALLATION

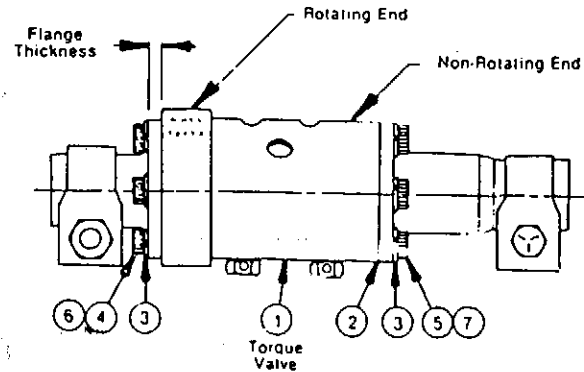
The following **MUST** be adhered to:

- **DO NOT REUSE CAPSCREWS. USE ONLY NEW AIR-O-MATIC SUPPLIED CAPSCREWS** of the length specified.
- All capscrows **MUST** have an 81117 Lockwasher under the head.
- An 81835 Gasket **MUST** be used at the Non-Rotating end of the Torque Valve.
- The capscrows **MUST** be torqued within 216-240 in. lbs. (18-20 ft. lbs.). **DO NOT OVER TORQUE.**
- The rotating end of the Torque Valve is to be placed toward the shorter end of the drag link, preferably the pitman end.
- Exhaust ports. **MUST BE DOWNWARD.**

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HARDWARE KIT 80399 For Threaded and Tubular Insert Adaptors 3/8" Thick Flange		HARDWARE KIT 80397 For Weldable Adaptors 3/4" Thick Flange		Part No.	Description
Item No.	Qty.	Item No.	Qty.		
2	1	2	1	81835	Gasket
3	12	3	12	81117	Lockwasher
4	6	—	—	81144	Capscrew (1" lg)
5	6	—	—	81146	Capscrew (1 3/4" lg)
—	—	6	6	81115	Capscrew (1 1/2" lg)
—	—	7	6	81116	Capscrew (2 1/4" lg)

## RECOMMENDED MAINTENANCE SCHEDULE AND SAFETY CHECKS

### DAILY:

- Drain water from all air tanks.
- Examine all steering components, including the Air-O-Matic for loose, damaged, cracked or worn parts.
- Check for loose, damaged or dislocated (hazardous positioning of) air lines.

### WEEKLY:

- Perform the above, plus check all fasteners (screws, bolts, nuts, etc.) for proper torque requirements.
- Lubricate Power Cylinder Piston Rod Socket and both Drag Link Sockets.

### SEMI-ANNUALLY: (or every 50,000 miles)

- Check Safety Valve (see pg. 3).

### ANNUALLY: (or every 100,000 miles)

- Dismantle, clean and inspect Safety Valve. (see page 3).

### CAUTION:

- When any component of the Air-O-Matic system is replaced, new fasteners (screws, bolts, nuts, etc.) must be used and torqued as specified by the appropriate instructional aid.
- Use only Air-O-Matic supplied parts when replacing any component of the Air-O-Matic system.

The Air-O-Matic Torque Valve and Cylinder are permanently internally lubricated components and do not require relubrication unless the system is contaminated by petroleum based products such as compressor oil. Once a petroleum based lubricant is ingested by these components it will be necessary to relubricate at frequent intervals. Under no circumstances should penetrating fluid or detergent oil be used in the Air-O-Matic System.

**SEMI-ANNUALLY:** (or every 50,000 miles)

Check operation of Safety Valve for proper air source.

1. Build up the vehicle air pressure until the compressor cuts out and then shut down the engine. The dash mounted air pressure gauges should read at least 120 PSIG. Open the shutoff valve(s) which supply air to the Torque Valve.
2. With the vehicle standing still, operate the Air-O-Matic system (by turning the steering wheel back and forth). Assist will be noticed while turning and a burst of exhaust air will be heard when the direction is reversed or the steering wheel is released. This will occur as long as air pressure maintained above 65 PSI (Reference #4).

The dash mounted air reservoir pressure gauge should drop in response to the operation of the Air-O-Matic System. If the gauge does not drop, this would indicate that the air source is improper, probably from a wet (supply) reservoir. See Typical Air System Section on page 4.

3. If the Air-O-Matic system cannot be made to provide assist and exhaust, further checks will be necessary to determine the problem.
4. When the dash mounted air reservoir pressure gauge drops to 60-65 PSIG, steering assist and the exhaust will no longer be present. If the cutoff point does not fall within 60-65 PSIG range adjust Safety Valve as outlined under operation of the Air-O-Matic components.
5. Start engine and build up the air pressure. Assist should return at approximately 12 PSI above the cutoff point observed above. (For example, if the valve cutoff is 62 PSIG, it should cut on at 62 + 12 PSIG or approximately 74 PSIG.)

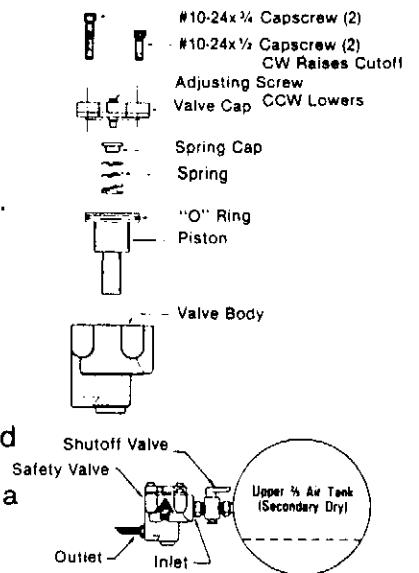
**ANNUALLY:** (Or every 100,000 miles)

Dismantle, clean, inspect the Safety Valve.

1. Remove the Safety Valve from vehicle.
2. Remove the four Socket Head Capscrews that retain the valve cap.
3. Remove Cap, Spring Cap, Spring, and Piston.
4. Remove "O" Ring from Piston.
5. Do Not Remove internal Retaining Ring and Valve Seat.
6. Wash all parts in diesel fuel, kerosene, or mineral spirits (Standard Solvent) and dry with a clean, lint free shop rag. If any parts appear worn, corroded, or damaged, replace the entire valve with a new one. Specify 80338 Safety Valve for standard 1/4 NPT Ports: 80348 for special Safety Valve with 3/8 NPT Ports.

7. Assemble the "O" Ring to Piston (Do Not Stretch "O" Ring). Apply a thin coating of Dow Corning 33 lubricant or an equivalent to the "O" Ring, fill the inside diameter of lower cavity of Valve Body and upper cavity of Piston.
8. Re-assemble Safety Valve (and mounting bracket if so equipped). Torque the #10-24 Socket Head Capscrews, which retain the Valve Cap to 5 ft. lbs.
9. Unless special provisions have been made, remount Safety Valve as shown above.
10. Check for proper installation, operation and adjustment as outlined in the Semi-Annual Procedures.

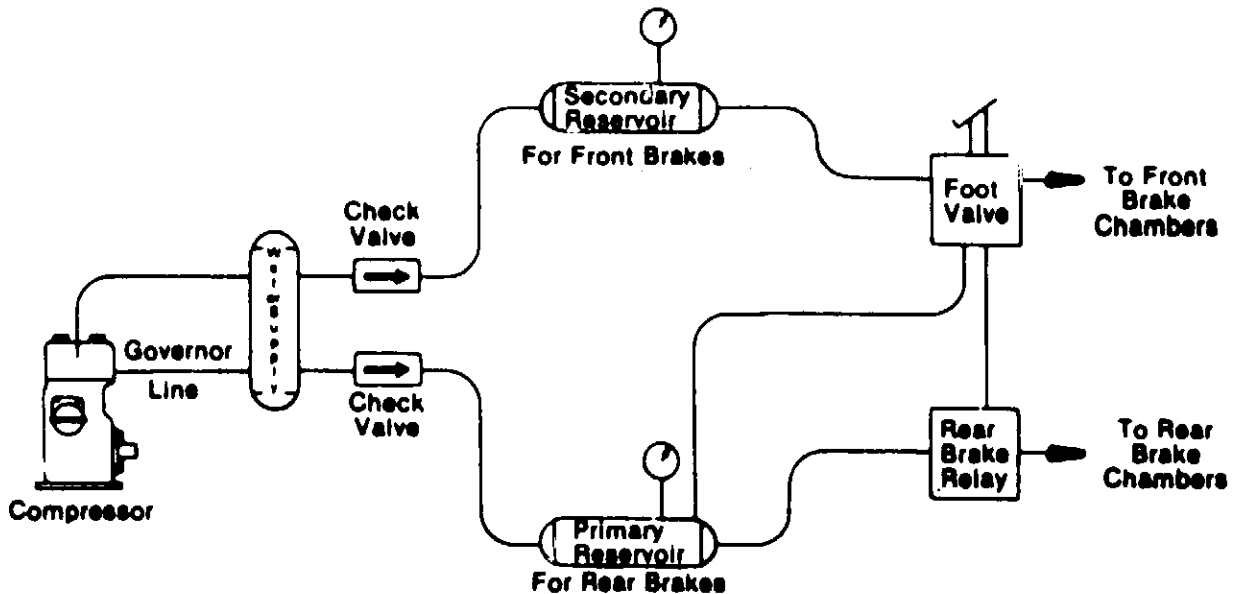
If additional information is required, refer to the diagram to the right and the General Installation Bulletin 82805.



## TYPICAL AIR SYSTEM

This outline is to provide a guide for identification of the air reservoirs on a typical heavy duty truck. Refer to the vehicle manufacturer's manual for the specific air system diagram. To locate the secondary reservoir, trace the vehicle air lines and/or use the following procedure:

1. Build up reservoir air pressure to 100-120 PSI, shut down engine.
2. There are two gauges in the cab or one gauge with two needles. One indicates the primary reservoir pressure; the other, the secondary.
3. Open the drain cock on one of the reservoirs and have an observer tell which needle responds; repeat with the other reservoirs, making note of the respective reservoir/needle relationship. When the wet (supply) reservoir drain cock is opened, neither needle will respond due to check valves in the system.
4. With air pressure still in the reservoirs, disconnect one of the air lines which goes to a front brake chamber. Operate and hold the brakes and observe which needle continues to drop; this needle corresponds to the front brake reservoir. Reconnect the Front Brake Line. This identifies the wet tank. **Do not tap into this reservoir.**



### IMPORTANT NOTICE

Our recommendations, if any, for the use of this product are based on tests believed to be reliable. The greatest care is exercised in the selection of our raw materials and in our manufacturing operations. However, since the use of this product is beyond the control of the manufacturer, no guarantee or warranty, expressed or implied is made as to such use or effects incidental to such use, handling or possession or the results to be obtained, whether in accordance with the directions or claimed so to be. The manufacturer expressly disclaims responsibility therefor. Furthermore, nothing contained herein shall be construed as a recommendation to use any product in conflict with existing laws and/or patents covering any material or use.

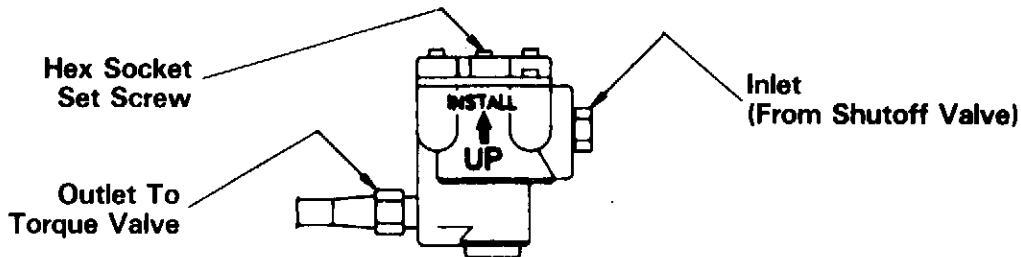
# OPERATION of the AIR-O-MATIC System

## SAFETY VALVE

The function of the Safety Valve is to conserve air in the event the air pressure in the reservoir should fall below approximately 65 PSI. When this occurs, the steering reverts to manual. Then, when the air pressure builds up again, to approximately 12 PSI above the cutoff setting of 65 PSI, the Safety Valve will re-open and Power Steering assist is restored. The Safety Valve is **not** a regulating valve which can be adjusted to give more or less power assist. Its **ONLY** purpose is to conserve air in the event of inadequate supply pressure.

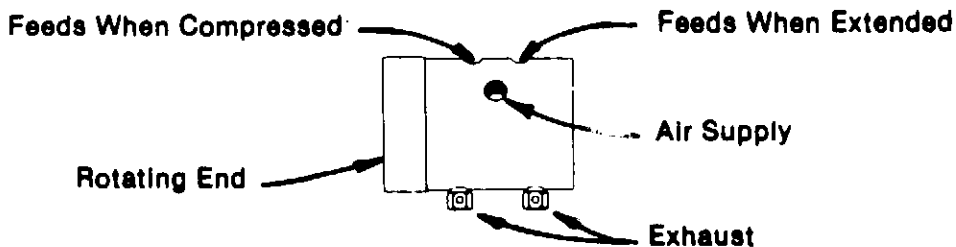
When the dash mounted air reservoir pressure gauge drops to 60-65 PSIG, steering assist and the exhaust from the Torque Valve will no longer be present. If the cutoff point does not fall within the 60-65 PSIG range, the Safety Valve can be adjusted as follows:

By turning the hex socket set screw, located in the center of the top cap of the Safety Valve, clockwise will raise the cutoff point; counter-clockwise will lower the cutoff point. Cleaning may be necessary as outlined in the "ANNUAL MAINTENANCE" section of this bulletin.



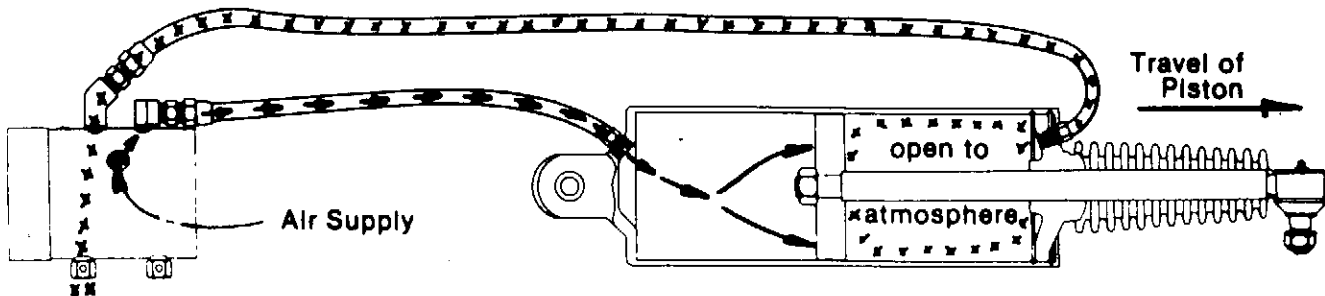
## TORQUE VALVE AND POWER CYLINDER

The Sealed Torque Valve is installed into the Drag Link where it senses the steering forces. It is of a spring balance design which extends or compresses, as required, in response to the steering forces sensed. The valve then supplies the Power Cylinder accordingly.



The metering of air begins after the valve has extended or compressed approximately .040 inch. As air is being metered to one side of the Power Cylinder, the other side of the Power Cylinder is open to the atmosphere, allowing the Piston to move.

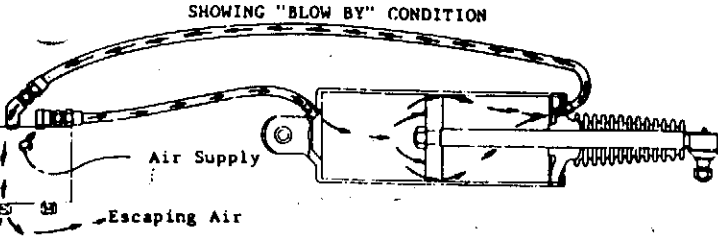
## METERING SHOWN AS VALVE IS EXTENDED



When the turn is completed, and the direction of steering is reversed, the Torque Valve repositions itself to the neutral position which opens the pressurized side of the Power Cylinder to atmosphere exhausting the air.

**TYPICAL PROBLEM**

In the event air "blows by" the cylinder piston, the air being metered will escape through the "opposite" exhaust port. This "blow by" gives the impression of a leaking Torque Valve, when the Torque Valve may be in normal working order.



NOTE: This diagram shows a typical system only. The actual air line connections may vary. See caution on page 1.

**CHECKING TORQUE VALVE**

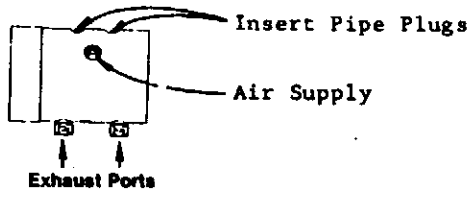
Before checking, lubricate the Air-O-Matic system in accordance with the Quarterly Maintenance Procedure.

To determine whether or not the Torque Valve leaks, build up the vehicle air pressure, shut down the engine and check the following:

1. There should be no air coming out the exhaust ports when the vehicle is setting still and Torque Valve in neutral condition.
2. At the Torque Valve, disconnect the air lines which go to the Power Cylinder and insert pipe plugs into the Torque Valve.

**CAUTION**

Care must be taken to keep dirt and other foreign matter out of the Torque Valve and air lines.



3. Observe the Torque Valve while an assistant extends and compresses the Torque Valve by turning the steering wheel. Minimal or no air should escape from the Torque Valve Exhaust Ports while being extended or compressed (approx. 1/16" each direction). NOTE: Some air may escape from the exhaust port when the Torque Valve first starts to feed. This is normal and should disappear as the Torque Valve continues to extend or compress. Also, a small burst of air will be noticed when the direction is reversed.
4. If the above proves the Torque Valve to be in normal working order, proceed to check the Power Cylinder. If the Torque Valve exhausts a substantial amount of air in any of the above tests, replacement is necessary. Rebuilt Torque Valves are available. Refer to the chart below for proper part number.
5. In the event several Torque Valves have failed on one vehicle, request General Installation Bulletin 82805 to check for proper installation and proper air source.

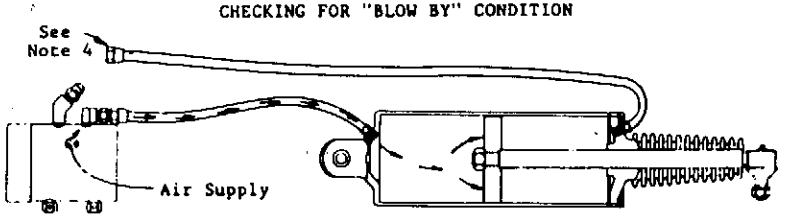
Add "R" to Specify Rebuilt.

Torque Valve Part Number	Application Description
STANDARD	
80830	Standard Truck Valve
80838	Some Navistar Apcltns
80839	Mack W & RW
80870	Freightliner
80860	Bus
80861	Bus
80862	Bus

For other applications, contact factory

**CHECKING POWER CYLINDER**

1. If a Tie Rod Application, adjust Tie Rod and Power Cylinder in accordance with Tie Rod Bracket Assembly instructions 82829. Check for any binding condition in the Power Cylinder as the wheels are turned in each direction. Adjust Tie Rod Roll as outlined in 82829 instruction when necessary.
2. Reconnect the air line which goes to the port opposite rotating end, leaving the other disconnected. (See figure below).
3. With full reservoir pressure, engine shut down and wheels on the ground, have an assistant turn the steering wheel to cause the Torque Valve to extend.
4. While observing the disconnected hose, have the assistant continue to turn the wheels to a full turn. If a substantial quantity of air escapes from the disconnected hose, this would indicate a worn piston.

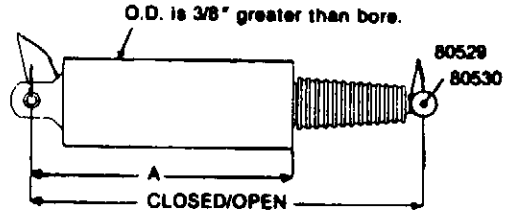


NOTE: This diagram shows a typical system only. The actual air line connections may vary. See caution on page 1.

5. Reverse the above procedure and turn the wheels in the opposite direction.
6. If air escapes from the disconnected hose in either direction, replace the Power Cylinder with a rebuilt one. Refer to Chart below for proper part number.

All power cylinders listed on this sheet have 5/8" spherical bearings and 1/4" ports.

See tabulation for specified ball joint. Minor diameter of tapered stud is .008.



Add "R" to specify rebuilt. The Power Cylinder Part No. Shown does not include mounting Brackets or the "T" shaped bracket to attach Power Cylinder to Tie Rod.

POWER CYLINDER Part No.	Bore (Inches)	Stroke (Inches)	A	*Closed Dimension	*Open Dimension	Ball Joint
85510 (standard 5 x 10)	5	10	14.06	16	26	80530
85512 (standard 5 x 12)	5	12	16.06	18	30	80530
85904 (special 5 x 10)	5	10	14.06	21	31	80530
84512 (standard 4 x 12)	4	12	16.06	18	30	80530
84515 (standard 4 x 15)	4	15	19.06	21	36	80530

\*Dimensions shown are for identification only. In use, the cylinder must not bottom in either direction. For proper operation the working stroke is approximately 1 inch less than shown; allow 1/2 inch margin on each end. On most cylinders, the closed dimension can only be checked by removing the boot or by applying air pressure.

The Power Cylinder and Torque Valve are permanently identified by part numbers stamped into the closed end cap end of barrel of the cylinder and on the rotating cap of the Torque Valve.