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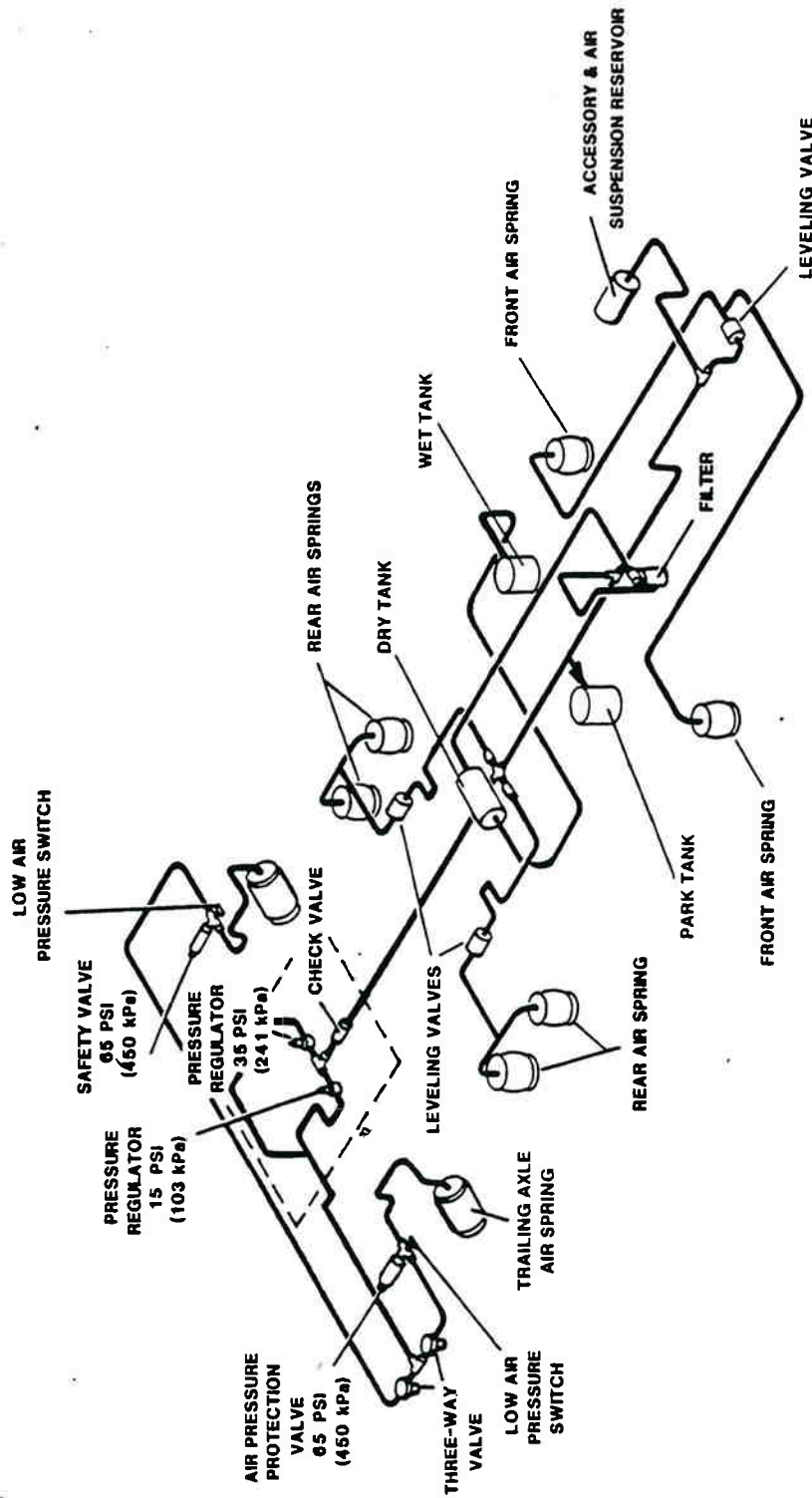
MC-9 MAINTENANCE MANUAL

SECTION 12

SUSPENSION

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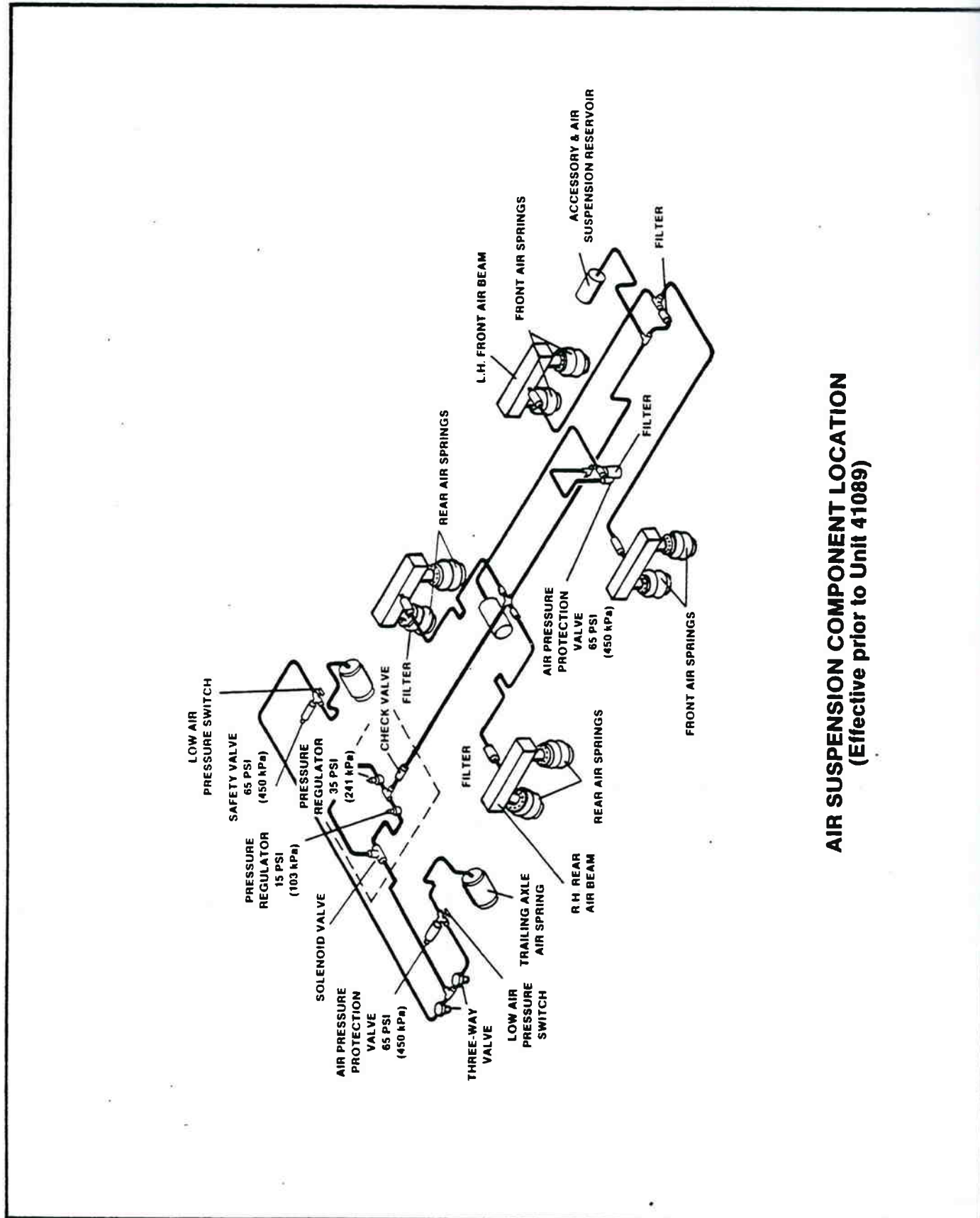
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AIR SUSPENSION COMPONENT LOCATION
(Effective with Unit 41089)

Figure 12-1A. Air Suspension Component Locations.
(Effective with Unit 41089)

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AIR SUSPENSION COMPONENT LOCATION
(Effective prior to Unit 41089)

Figure 12-1B. Air Suspension Component Locations.
(Effective prior to Unit 41089)

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SUSPENSION

DESCRIPTION

The coach rides on an air suspension system. Air springs (bellows) are installed above both the front and rear axles. They are fastened between the axle support structures and the bogies. Air is supplied to the air springs from the coach air reservoirs.

Prior to unit 41089, the air reservoirs are in the bogie air beams (see figure 12-1A). Effective with that unit, air is stored in air tanks (see figure 12-1B).

Other suspension components are height control valves, radius rods and shock absorbers. The system is entirely automatic in operation and is designed to maintain a constant vehicle height regardless of load. A pressure regulating valve maintains constant pressure in the air springs and uniform loading of the rear trailing wheels regardless of total vehicle load. Refer to Section 4, Brakes and Air System, for regulating valve pressure setting.

The air springs are made from a special compound rubber molded to the proper contour and dimensions. The entire vertical load of the coach is taken by these air springs. See figures 12-1A and 12-1B.

Radius rods are used to hold the axles in the proper transverse and longitudinal position. Four radius rods are used at the rear axle and five at the front axle. These rods transmit both braking and driving forces from the axles to the coach body.

Delay-type height control valves increase or decrease the air pressure as required. Two height control valves are located at the rear axle, and one at the front axle. The valves are mounted on the coach body and are connected to the axles by rubber-bushed links. Because of the delay mechanism in each height control valve, the valves respond only to sustained variations in the height of the axles in relationship to the coach body. Thus no change in air pressure takes place during normal driving. However, the valves automatically regulate air pressure to compensate for changes in the load carried by the coach, or due to changes in the location of the coach load.

Double-acting shock absorbers are used to enhance ride characteristics. Two shock absorbers are used at the front axle, four at the rear and two at the rear trailing wheels.

An auxiliary air system is provided to supply compressed air for the operation of the system. Compressed air from the main system is fed to an auxiliary tank.

MAINTENANCE

The suspension system requires periodic lubrication only at the rear trailing axle trunnions. Refer to Lubrication (Section 10) of this manual. Routine maintenance should also include visual inspection procedures and occasional tests to determine that the correct coach body height is maintained. The suspension air filter should also be replaced periodically.

To remove axles, refer to Section 1, Front Axle, and to Section 2, Rear Axle.

NOTE: When installing major components of the suspension system, refer to the torque recommendations shown in the figures at the end of this section.

TRAILING AXLE UNLOADING SYSTEM - OPTIONAL

A switch mounted on the switch panel will allow the driver to partially unload the trailing wheels to add weight to the drive wheels on icy conditions (figure 12-2).

A buzzer and a low air tell-tale light will remind the driver to return the system to normal as soon as conditions permit. The trailing axle bellow air pressure is controlled from 35 psi to 15 psi (241 kPa to 104 kPa) in the unloaded position. This will increase the load on the drive wheels by approximately 2,000 lbs. (907 kg). See figures 12-3 and 12-4.

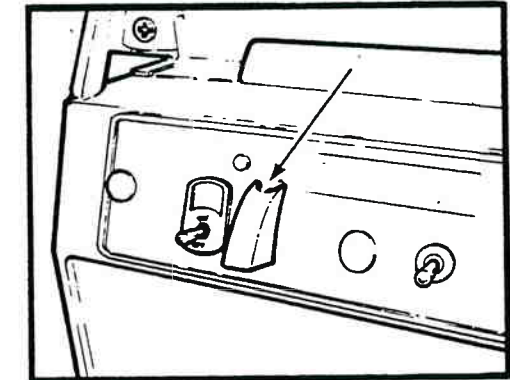


Figure 12-2. Unloading Switch on Instrument Panel.

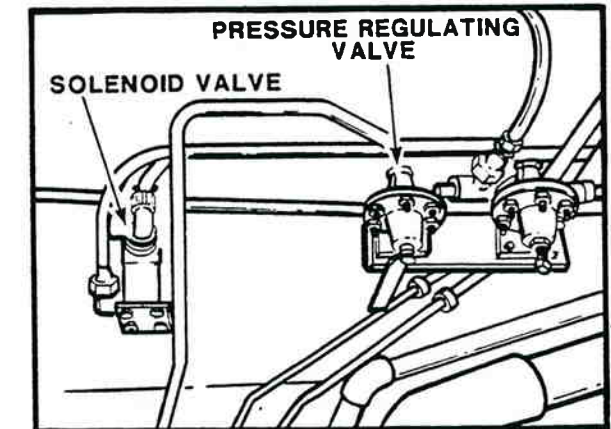


Figure 12-3. Axle Unload Solenoid Valve and Pressure Regulator.

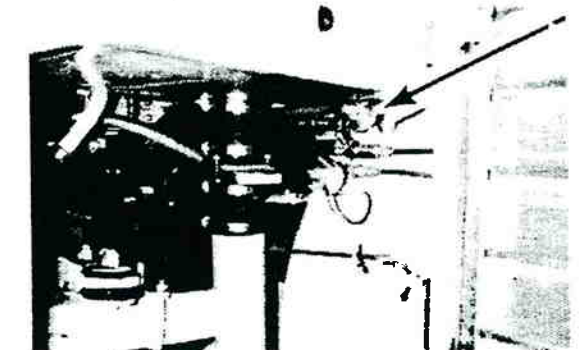


Figure 12-4. Trailing Axle Low Air Pressure Switch.

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AIR SPRINGS

Effective with unit 41089, the air springs are all of the rolling lobe (involute) type. The spring is made of molded rubber and consists of an outer section and a smaller inner, or piston, section which moves vertically.

Prior to unit 41089 the air springs used at the front and rear driving axles are of the double-convolution type, having beads reinforced at top and bottom with wire. Bead rings are specially formed and use special bolts. The surfaces of the bead ring and bolts are so designed as to prevent any chafing of the bellows. A girdle ring is molded in the center section of the bellows for reinforcement. The trailing axle air springs on the earlier suspension system are the rolling lobe style just as in the later system.

1. Raise and block the coach body as outlined under Front Axle Removal, Section 2.
 2. Disconnect height control valve links and pull down on valve arm to exhaust air from the air spring.
 3. On the front suspension, after air is exhausted, remove the air line to the air spring.
 4. Remove nuts and washers from studs at top of air spring.
 5. Remove the mounting bolts from the air spring mounting plate to the bottom of the air spring. The air spring may then be removed from coach.
 6. On the rear suspension, after air is exhausted, remove the line to the air spring.
 7. Remove the nuts and washers at top of the air spring.
 8. Remove bolt from bottom and remove air spring.
- Reverse procedure to replace air spring.

RADIUS RODS

The following instructions apply to radius rods used at the front and the rear driving axles.

Radius rods are mounted at both ends by means of bushings. The condition of these bushings should be checked periodically and any defective parts replaced. Radius rods should be checked for distortion and cracks. The Magnaflux process is recommended for detecting cracks in the radius rods. New bushings should be used when rods are replaced.

To remove radius rods, follow this procedure:

1. Flatten attaching nut locking plate and remove nuts.
2. Remove radius rod end plates from anchor pins.
3. Withdraw radius rod.

Installation of the radius rods is the reverse of removal. Apply Never-Seize or equivalent lubricant to the bushing inner race and radius rod pin.

It is extremely important upon reconnection of the rods that the proper clearance height between the axle and body is maintained; otherwise, the rubber bushings in radius rod ends will become preloaded, shortening the life of these parts. Refer to figures 12-5 and 12-6.

CAUTION: When reinstalling radius rods, make sure that the rod is centered on the bushing before tightening retaining nuts.

The radius rod should be held in a centered position with a pry bar against the coach body or axle while the stud nuts are tightened. See specifications at end of section for proper torque.

It is strongly recommended that periodic checks, depending upon operation conditions, be made on all radius rods and bushings. Due to the difficulty in checking the radius rod bushings at the anchor pin above the rear axle, they tend to be overlooked. Therefore, special emphasis should be placed on the checking of this area. If all worn bushings are not replaced, excessive wear to suspension components and tires will result.

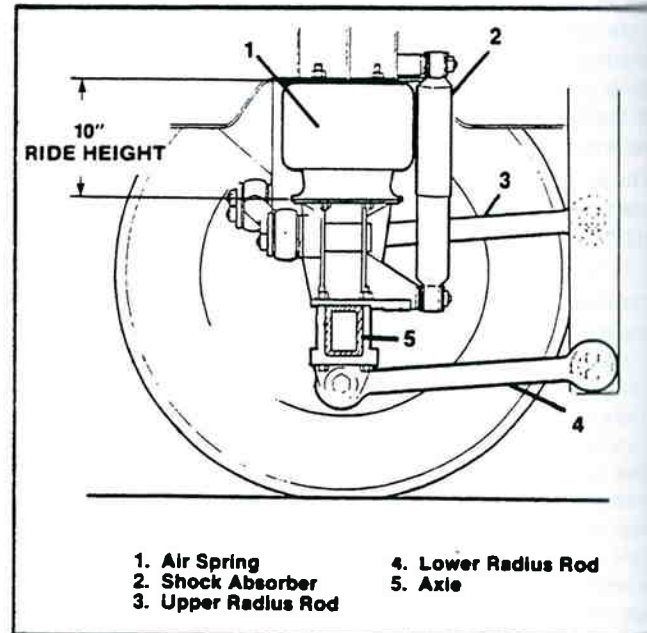


Figure 12-5A. Front Suspension Effective With Unit 41089.

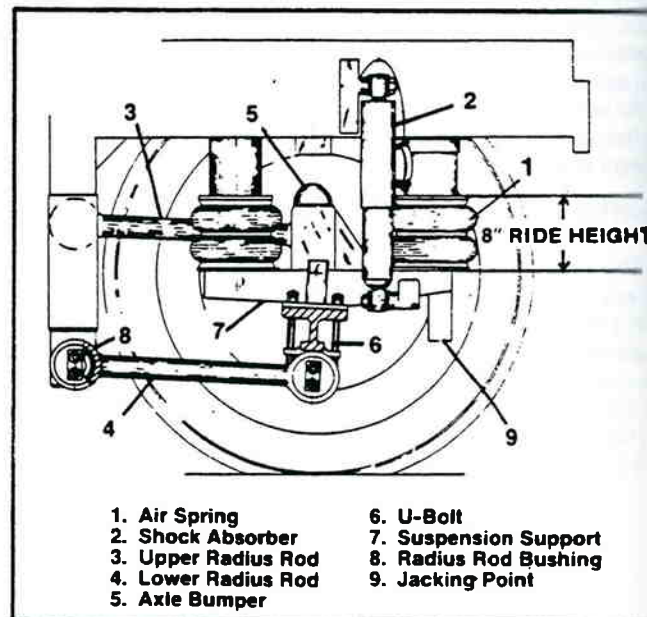


Figure 12-5B. Front Suspension Effective Prior to Unit 41089.

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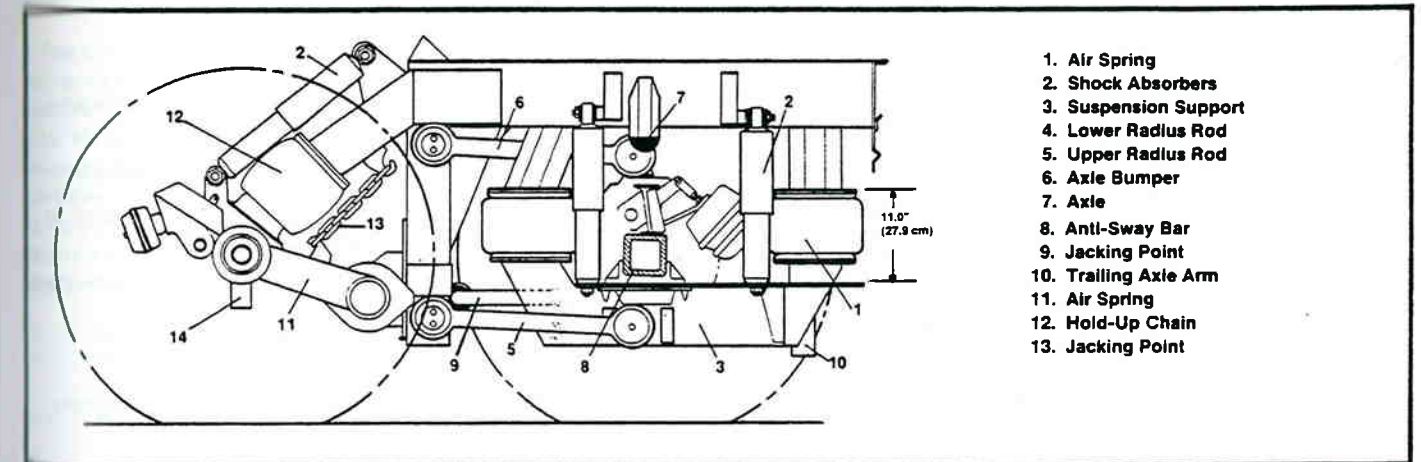


Figure 12-6A. Rear Suspension Effective With Unit 41089.

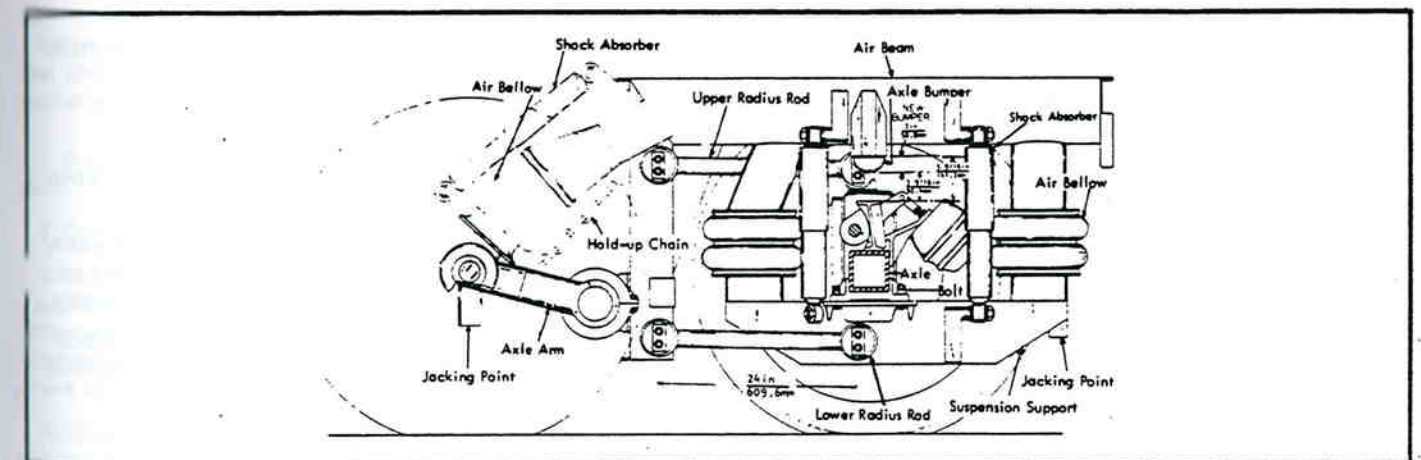


Figure 12-6B. Rear Suspension Effective Prior to Unit 41089.

HEIGHT CONTROL VALVES

The operation of the height control valves and the general design is detailed in Figure 12-7. The height control valves

require no periodic maintenance. Height control valve linkage operates on rubber bushings and no lubrication at these points should be attempted.

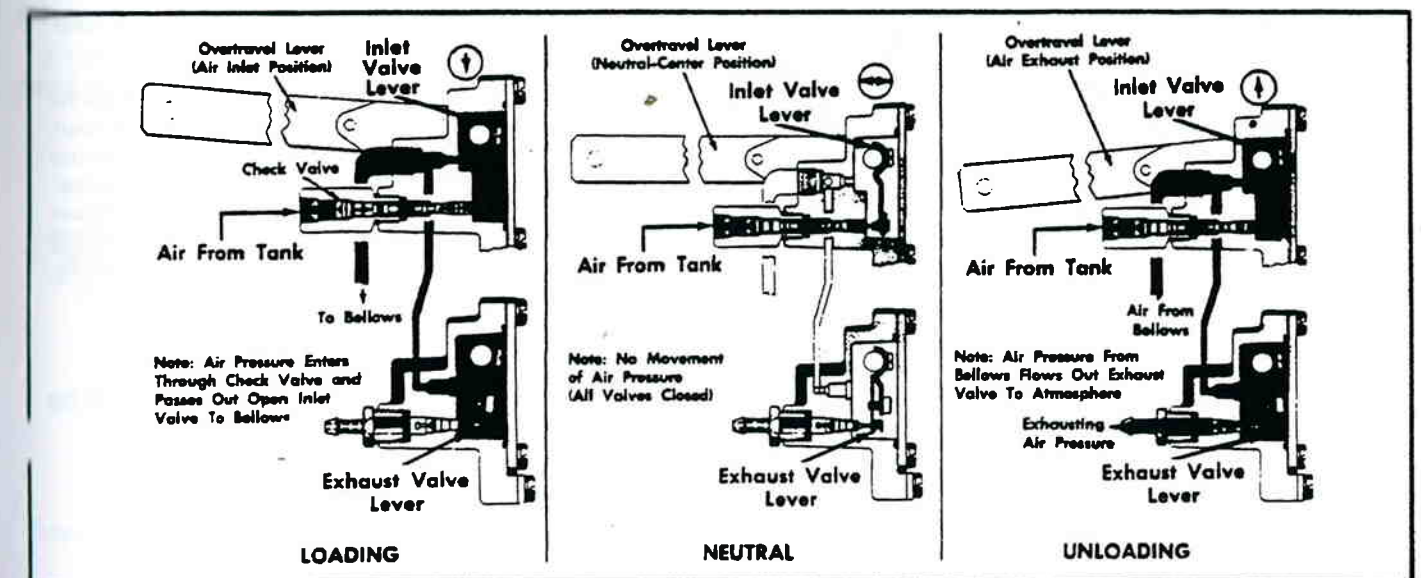


Figure 12-7. Height Control Valve Operation.

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LOADING OPERATION

When loaded, the body of the coach settles. Since the height control valve is linked to the suspension, and the valve is mounted to the vehicle body, the valve moves downward with the body during loading. As the overtravel lever and control shaft turns, the intake valve lever presses against the pin of the valve core. As the pin is depressed, air pressure flows through the height control valve into the air springs. Increased air pressure expands the air springs and raises the body of vehicle. The intake valve is protected by a check valve which permits air to travel in one direction only.

NEUTRAL POSITION

Increased pressure expands the air springs lifting the vehicle body and height control valve. The overtravel lever returns to "neutral" as vehicle body approaches normal ride height. The intake valve lever also moves the closing valve. The exhaust valve remains closed and the check valve in intake adapter prevents air from escaping from the valve body and air springs. This condition remains static until coach load is altered, moving the overtravel lever from "neutral" for one or more seconds actuating the intake or exhaust valves.

UNLOADING OPERATION

When the load is lightened, pressure in the air springs raises the coach body. Overtravel lever is pulled downward from "neutral." This applies a force that slowly moves the delay piston and opens the exhaust valve when the lever moves beyond free travel range. The intake valve remains closed allowing air from the air springs to exhaust to atmosphere. As air is exhausted from air springs, the vehicle body is lowered until the overtravel lever returns to neutral position.

When the coach is in motion with body at normal ride height, the overtravel lever is in neutral position. Small movements of the lever may occur without activating the control valve as it must move in excess of 3/16" (4.7 mm) before either the inlet or exhaust valve is opened.

The delay piston, connecting through a pin to overtravel shaft is contained in a cylinder of silicone fluid. The slowing action of this fluid delays by 1 to 6 seconds the closing of one valve to the opening of the other. The flapper valves allow both valves to close from full-open position within 1 second.

The overtravel piston is held against the shaft by two springs (one inside the other) and keeps the shaft in proper position relative to the overtravel lever. The purpose of the piston is to prevent damage of parts inside the control valve if the lever exceeds normal travel, and to allow the lever to move without moving parts inside the valve.

REMOVAL

1. Support coach by placing blocks under body at jacking points.
2. Open drain cock in air filter and vent all air from system.
3. Disconnect overtravel lever from link and pull down to exhaust remaining air from air beams.
4. Disconnect both lines from control valve and cover the ends with tape to prevent contamination.
5. Detach height control valve from mounting bracket.

Replacement is the reverse of removal. After assembly, check for leakage using soap and water solution.

LEAKAGE TEST

The following procedure is a leakage test when the valve assembly is removed from vehicle.

1. Clean the exterior of the valve assembly.
2. Connect air pressure line to air valve inlet port, then open the air pressure (70-100 psi; 483-690 kPa).
3. Dip the valve assembly in a container of water and watch for air bubbles when the overtravel lever is in the center position. No air should escape from any point of the valve assembly.
4. If bubbles appear from the bellows port, this is an indication that the air inlet valve assembly is defective and must be replaced.
5. Remove the air pressure line from the air inlet port and connect it to the bellows port. If bubbles appear at the air inlet check valve port, this is an indication that check valve unit is defective and must be replaced.
6. If bubbles appear at the exhaust port, it is an indication that the exhaust valve assembly is defective and must be replaced.
7. If bubbles appear around edge of the valve cover plate, the cover plate gasket should be replaced.
8. If no leaks are found, remove the valve assembly from the water, then with air pressure still connected to the bellows port, actuate the overtravel lever to remove any excessive amount of water which may have entered the exhaust valve chamber. Remove the air line and connect it to the air inlet port to remove water from the air inlet valve chamber.

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HEIGHT ADJUSTMENT

The correct coach body-to-axle clearance which should be maintained is shown in Figures 12-5 and 12-6. It should not be necessary to make an adjustment under normal service conditions. However, if an adjustment is necessary, it is made by changing the position of the overtravel lever in relation to the overtravel control body. The lever should be moved up to raise the level of the coach body, and down to lower it. Check that air pressure is above 100 psi (690 kPa) and raise coach to the specified height.

CAUTION: Always adjust on "fill cycle." If it is necessary to lower coach height, release sufficient air to be well below clearance and adjust to specified clearance.

NOTE: Ride height should be rechecked after road testing.

When it is found that the coach is falling below the correct level after being parked for a period of time, the following procedure should be carried out:

1. Support coach by placing blocks under body at jacking points.
2. Open drain cock in air filter and vent all air from system.
3. Locate the suspension system height control valve which is applicable to the side of the coach which is low. One height control valve controls both front air beams or springs; the rear air beams or springs are controlled by two height control valves — one left hand side and one right hand side.
4. Disconnect the air line (inlet from air tank) and remove the adapter assembly (figure 12-8) and discard.
5. Remove the two small filter screens located behind the adapter assembly.
6. Clean with solvent and compressed air.
7. Replace the two small screens and install a new adapter and reconnect air line.
8. Charge the air system, remove the blocks and check the height control valve for leaks.

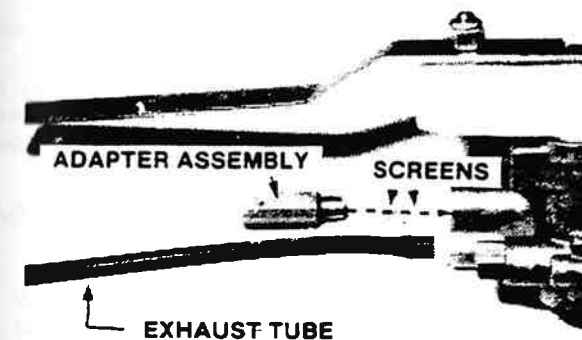


Figure 12-8. Height Control Valve Adapter and Screens.

OVERTRAVEL LEVER CENTER POSITION ADJUSTMENT

The following procedure is to adjust the overtravel lever:

1. Clean the exterior of the height control valve.
2. Remove delay piston retaining ring, cover, and O-ring from control valve assembly, then drain off the silicone fluid.
3. Remove exhaust fitting and exhaust screen from control valve.
4. Referring to figure 12-9, scribe a line 1-3/8" (34.9 mm) from plug end of overtravel lever control body.
5. Place valve assembly in vise as shown in figure 12-9.
6. If vacuum source is available, attach supply hose to valve exhaust port using Sun Tester fitting No. 115-3 or equivalent. Do not apply vacuum at this time.
7. Attach air pressure supply hose to air inlet port. Do not apply pressure at this time.
8. Locate dial indicator in position as shown in figure 12-9. Move overtravel lever to full air exhaust position — top of delay piston flush with top of bore — without overtraveling (position "C" Figure 12-10). Relocate indicator push rod to just contact 1-3/8" (34.9 mm) mark on control body and reset indicator dial to zero at this point (position C).

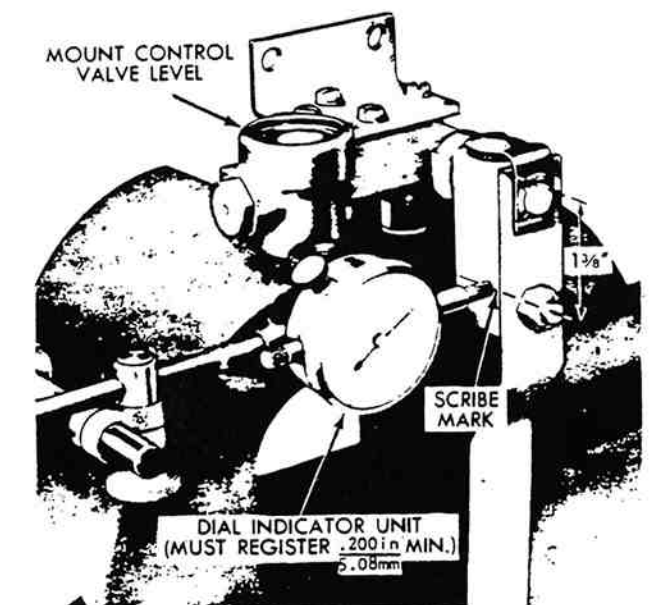


Figure 12-9. Dial Indicator Locations.

9. Move overtravel lever to full air intake position without overtraveling (position "A" Figure 12-10)(delay piston at bottom of bore). Take indicator reading which may vary 0.60" (1.52 mm - 4.82 mm).

10. Repeat steps 8 and 9 above to recheck this reading.

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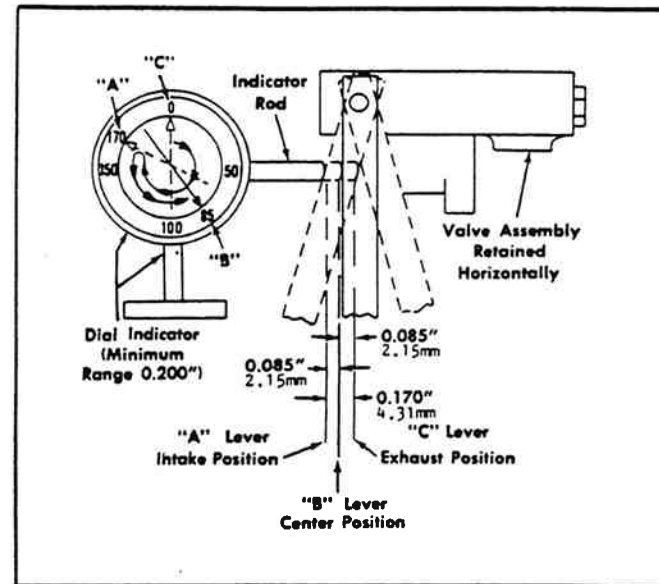


Figure 12-10. Locating Lever Center.

11. Divide the total travel dimension by two (example: 0.170" divided by 2 equals 0.085"; (4.31 mm divided by 2 equals 2.15 mm) to the center (position B).

12. Important; Without disturbing lever center position, reset indicator dial to zero, which actually is 0.100" (2.54 mm) on indicator of type registering 0.100" (2.54 mm) for each revolution of indicator needle, then proceed with valve lever gap adjustments following.

AIR INTAKE AND EXHAUST VALVE LEVER ADJUSTMENT

Two methods of adjustment are available:

- Using both air pressure and vacuum — If vacuum source is available, this method will take less time to perform. Vacuum source is used to make the exhaust valve lever gap check only.
- Using air pressure only — When this method is used, it will take longer to perform adjustments as the valve cover must be in place each time air pressure is applied and then removed to permit adjustment of exhaust valve lever.

Instructions covering lever adjustments are identical for front and rear valves. Rear valve lever and front valve lever must be bent to proper setting. In these valves both exhaust and intake levers are part of one unit which contains "score" marks to permit easy bending. Persons may accomplish this operation with lever in the valve body, or lever may be removed and bent on the bench.

NOTE: Before making these adjustments the overtravel lever must be centered as explained previously.

VACUUM METHOD

- Apply available vacuum and regulate air pressure to approximately 95 psi (655 kPa).
- Move overtravel lever fore and aft several times and then back to center position.
- Starting at center position, slowly move lever to where air intake valve just begins to open. Listen for escaping air. Note reading on dial at this point. Reading should be 0.025-0.027" (0.635-0.685 mm) from lever center position. If necessary bend intake valve lever to correct setting, refer to figure 12-11.
- Return overtravel lever to center position. Slowly move lever to exhaust side and at the same time note the vacuum gauge reading. When vacuum just begins to fall, the exhaust valve has opened. Valve should open when overtravel lever is moved 0.035" to 0.037" (0.889-0.940 mm) from center position. If necessary, bend exhaust valve lever to correct setting; refer to Figure 12-11.

AIR PRESSURE METHOD

This method may be performed when a vacuum source is not available.

- Apply air pressure regulated to approximately 95 psi (655 kPa) to air inlet port.
- To adjust air intake valve lever gap, move the overtravel lever slowly from center position to point where intake valve just begins to open. Listen for escaping air: Note reading on dial at this point which should register 0.025-0.027" (0.635-0.685 mm). If necessary, bend intake valve lever to correct setting. Refer to Figure 12-11.

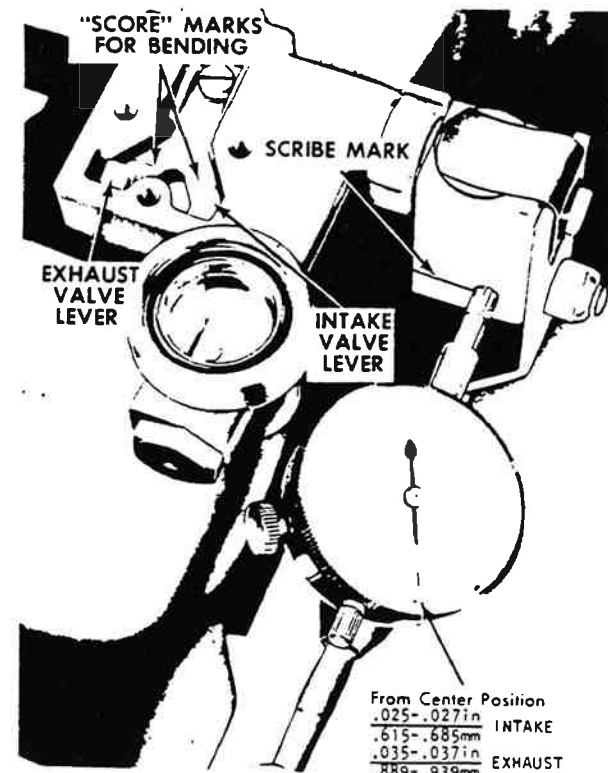


Figure 12-11. Adjusting Air Intake Valve Lever Gap.

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- To adjust air exhaust valve lever gap, install valve cover on the valve using a new gasket and four attaching screws. Be careful not to disturb indicator setting.
- Disconnect air supply from the air inlet port and connect it to the air springs port.
- Move overtravel lever slowly to open exhaust port while observing the indicator dial. Air should start to escape from the exhaust port when indicator registers 0.035-0.037" (0.889-0.940 mm).
- If adjustment is necessary, shut off air pressure supply and remove valve cover. Bend exhaust valve lever to correct setting. Then install cover and re-check valve opening dimension.

TIME DELAY CHECK

After adjusting valve gaps check time-delay for opening and closing of valves (1-6 seconds one valve to opening of the other is recommended). Valves should close from full-open position within one second.

- Place new O-ring over delay plug and install plug. Tighten to 20-30 inch-pounds (2.2-3.4 Nm) torque.
- Pour 5.5 CC + 0.25 CC of Silicone fluid (750 centistokes Viscosity at 25°C) into delay piston chamber. With valve body tilted slightly as shown in Figure 12-12 carefully operate overtravel lever fore and aft to vent air from fluid. When all air has been expelled from piston pin cavity, check fluid level using depth gauge as shown in Figure 12-13.

NOTE: Use only No. S F96-1000 centistokes L-HF22 40 lbs. (5 gal.).

- With valve assembly level take measurement from center of bore only. Add or remove fluid to bring fluid 13/64" (5.1 mm) from top of valve body. An eyedropper will serve this purpose.
- Place new delay piston cover O-ring in groove of valve body. Install cover with retaining ring.
- Place valve assembly vertically in holding vise. Refer to Figure 12-14.
- Move overtravel lever up and down for approximately one minute.

AIR INTAKE TIME DELAY CHECK

- Connect pressure line to valve intake port (figure 12-15) and open air pressure to 95 psi (655 kPa).
- Move the overtravel lever upward quickly approximately 1/8" (50.8 mm) and simultaneously start counting the number of seconds before air starts to escape from the bellows ports. A delay of 1-6 seconds should exist. Repeat this check.

AIR EXHAUST TIME DELAY CHECK

To time the delay for exhaust, two methods can be used; one using vacuum source and one using air pressure. If vacuum source is available, perform steps 1 thru 3. If not, proceed to Steps 4 thru 6.

Method Using Vacuum:

- Install cover plate on height control valve using gasket.
- Connect pressure line to air exhaust port and open air pressure to 95 psi (655 kPa).

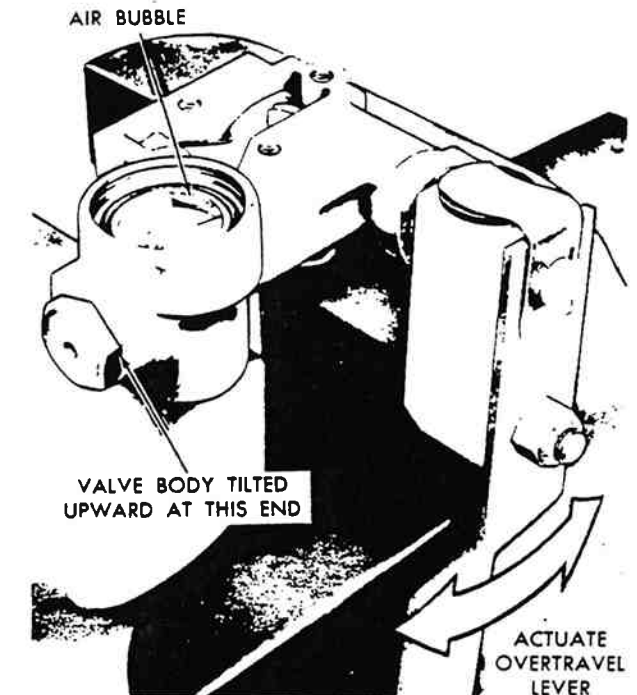


Figure 12-12. Venting Air From Silicone Fluid.

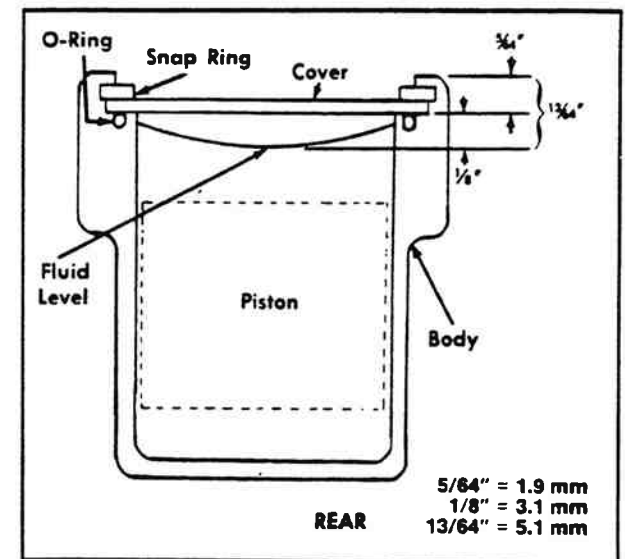


Figure 12-13. Measuring Silicone Fluid Level.

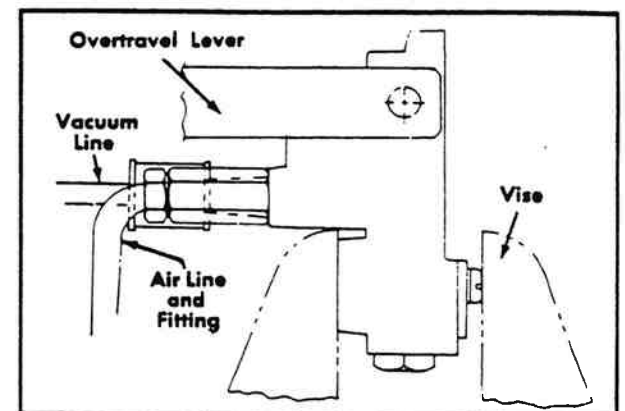


Figure 12-14. Valve Position for Time Delay Check.

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3. Quickly move the overtravel lever downward approximately 2" (50.8 mm) and simultaneously start counting the number of seconds before the vacuum gauge starts to drop off. A delay of 1-6 seconds should exist.

Method Using Air Pressure:

4. Install valve cover with new gasket on valve assembly.
5. Connect air pressure supply hose to air spring port.
6. Move overtravel lever downward quickly approximately 2" (50.8 mm) and simultaneously start counting the seconds before air starts to escape from the exhaust port. A delay of 1 to 6 seconds should exist.

A time delay over 6 seconds could mean too large a valve lever gap adjustment and a time delay under 1 second would mean too small a valve lever gap adjustment. If the time delay is not within 1 to 6 seconds, first recheck the fluid level. If fluid level is satisfactory, the valve lever gap adjustment must be repeated as set forth previously.

After obtaining proper valve adjustments, install valve cover using new gasket. Install new screen in spring port. If screen was removed from exhaust port, install new screen and exhaust fitting.

Place tape over ends of air line ports until such time as valve assembly is installed on the vehicle.

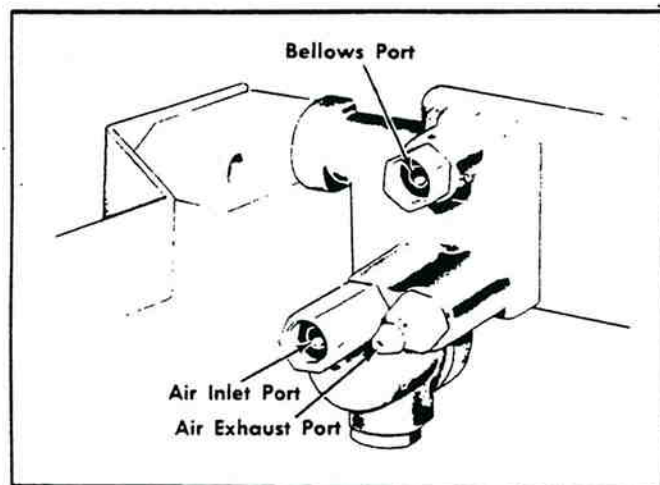


Figure 12-15. Height Control Valve Air Ports.

DISASSEMBLY OF HEIGHT CONTROL VALVE

Refer to Figure 12-16 for identification of parts.

1. Remove inlet adapter and check valve assembly (18) from valve body (10). Remove outlet adapter (20). Remove adapter O-rings (17). Remove air line fitting gasket (21) from adapters. Remove outlet adapter screen (19).

2. Remove four cover screws and lockwashers (1) from cover and bracket (2). Remove cover, bracket and gasket (6).

3. Position valve with delay plug (13) at top. Unscrew delay plug from valve body (10). Drain silicone fluid from cavity. Remove plug O-ring (12). Unscrew piston pin (11) from control shaft (23).

4. Remove delay cover retaining ring (35), cover (3) and cover O-ring (4). Remove delay piston (5). Discard O-ring.

5. Remove valve lever screw and lockwasher (7) from valve lever. Remove exhaust valve and intake valve lever (36) from valve body.

6. Remove valve stem lock clip (8) from stem of exhaust valve core. Spread locking arms and slide clip from around stem.

7. Pull overtravel assembly and shaft from valve body.

8. Remove intake valve core (9) with tool (TMC/MCI Part No. 20-35). See figure 12-17.

9. Remove exhaust fitting (16) and screen (15), then remove exhaust valve core (14) with tool (TMC/MCI Part No. 20-38).

10. Remove plug retainer (33) from overtravel control body (30). Retainer must be cut off. Use caution to avoid damage to nylon body. Remove overtravel body plug (25).

11. Place forked end of tool (TMC/MCI Part No. 20-36) around shaft in overtravel control body (30), then tighten clamp screw. Refer to figure 12-18.

CAUTION: Tighten tool until overtravel control shaft (23) can be turned 90° to allow notch in shaft to pass free of overtravel piston (26). Do not apply more pressure than is required.

Remove overtravel control shaft (23) and overtravel control body seal (29) from body. Remove shaft O-rings (22 & 24). Back off vise jaw and take body and tool from vise. Remove tool, overtravel piston (26), overtravel lever large spring (27), and overtravel lever small spring (28) from body. Remove lever screw nut (34) from overtravel lever screw or stud. Remove lever (23) from body.

CLEANING AND INSPECTION

1. The following parts should be discarded and replaced with new parts at each overhaul: Plug retainer (33), overtravel control body seal (29), gasket (6), and O-rings (22, 24, 17, 12 and 4).

2. Thoroughly clean all metallic parts in a suitable cleaning solvent. Dry with compressed air.

3. Inspect all bearings and rubbing surfaces for scoring, fractures or noticeable wear. Discard all damaged or worn parts and replace with new parts.

REASSEMBLY

CAUTION: Height control valve parts must be kept free from dirt and moisture.

1. Install intake valve core (9) and exhaust valve core (14) with screen (15) in control body (10) as shown in Figure 12-17. Tighten to 2-1/2 to 3 inch pounds torque (.28 to .33 Nm). Install exhaust fitting (16).

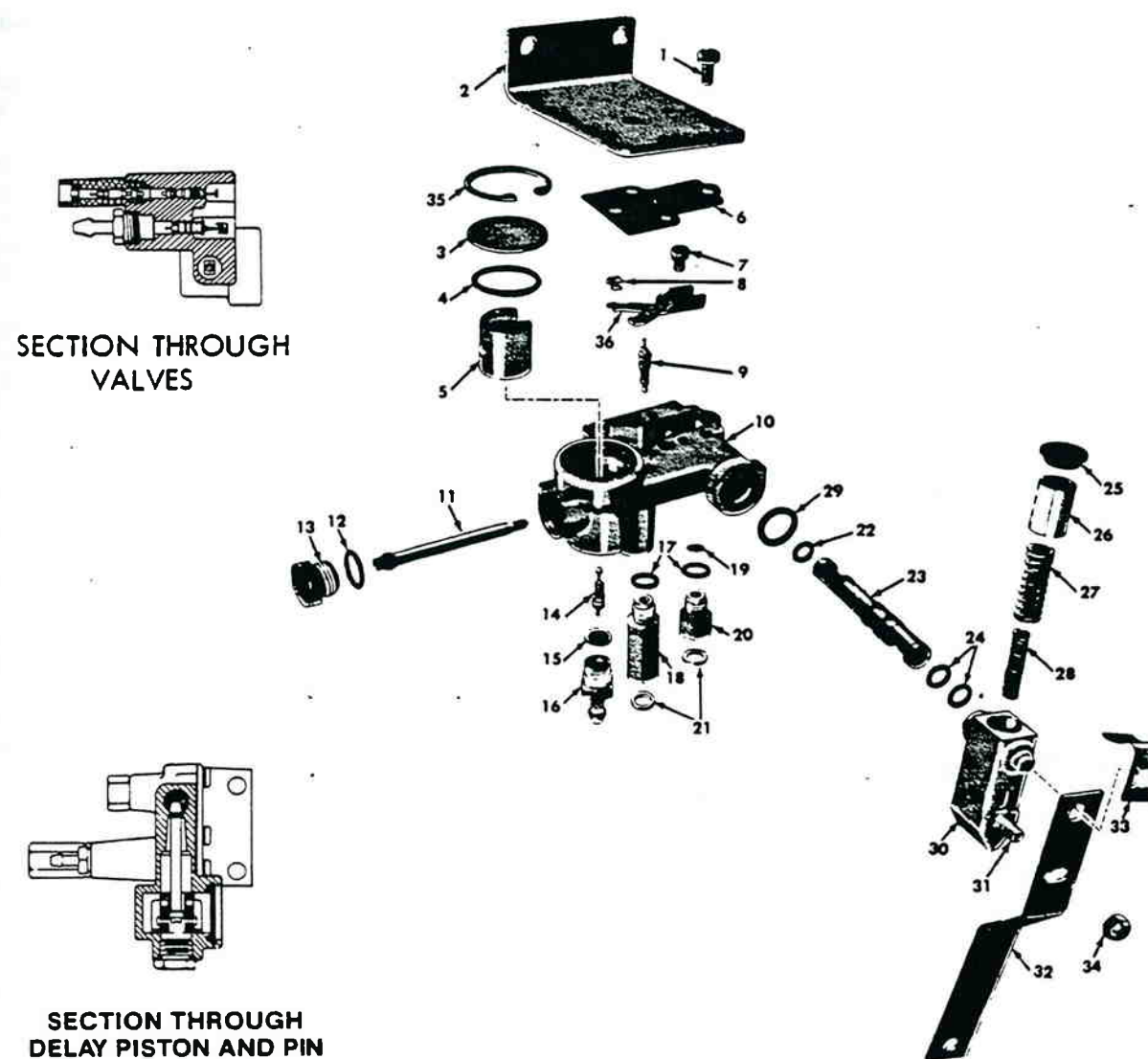
2. Lubricate overtravel control body with multipurpose grease.

3. Install lever (32) on control body. Place lever stud nut (34) on stud and torque to 70-80 inch pounds (8.0 to 9.0 Nm).

4. Place overtravel lever large spring (27), and overtravel lever small spring (28) inside piston (26). Insert piston in control body (30).

5. Place three new O-rings (22 and 24) on overtravel control shaft (23). Lubricate shaft and O-rings with multi-purpose grease.

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1. Cover Screw & Lock Washer
2. Cover & Bracket
3. Delay Cover
4. Delay Cover O-Ring
5. Delay Piston
6. Cover Gasket
7. Valve Lever Screw
8. Valve Stem Lock Clip
9. Intake Valve Core
10. Valve Body
11. Piston Pin
12. Plug O-Ring

13. Delay Plug
14. Exhaust Valve Core
15. Exhaust Screen
16. Exhaust Fitting
17. Adapter O-Ring
18. Inlet Adapter and Check Valve Assembly
19. Outlet Adapter Screen
20. Outlet Adapter
21. Airline Fitting Gasket
22. Shaft O-Ring (Medium)
23. Overtravel Control Shaft
24. Shaft O-Ring (Large)

25. Overtravel Body Plug
26. Overtravel Piston
27. Overtravel Spring (Large)
28. Overtravel Spring (Small)
29. Overtravel Control Body Seal
30. Overtravel Control Body
31. Overtravel Lever Stud
32. Overtravel Lever
33. Plug Retainer
34. Lever Stud Nut
35. Delay Cover Retainer
36. Intake & Exhaust Valve Lever

Figure 12-16. Height Control Valve Component Parts.

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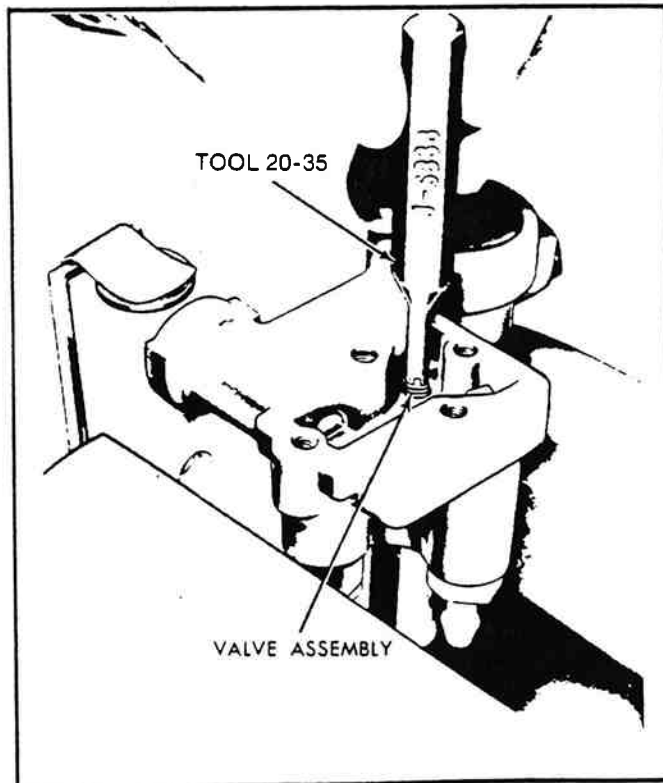


Figure 12-17. Replacing Valve Core Assemblies.

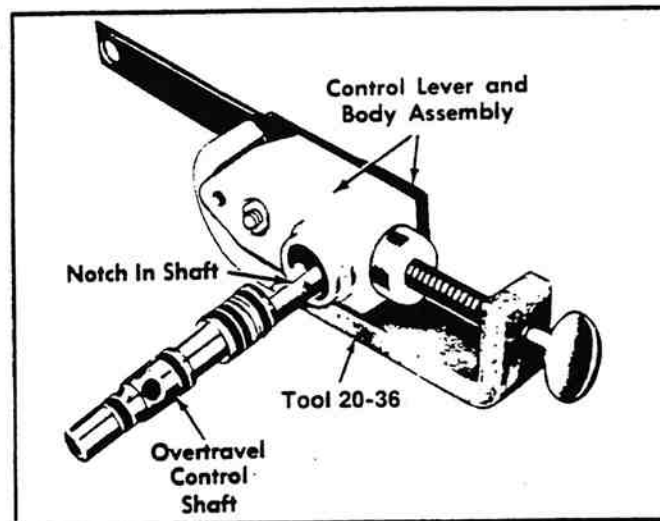


Figure 12-18. Replacing Overtravel Lever.

6. Position fork of tool 20-36 so that the shaft can be inserted in body (figure 12-18). Carefully apply pressure with clamp screw. Compress springs only enough to allow shaft to be inserted. Install overtravel control shaft (23). Rotate shaft so that flat is next to piston, and remove tool 20-36.

7. Insert overtravel body plug (25) in bore of body. Force new plug retainer (33) in position over nylon pivot and body plug (25).

8. Place new overtravel control body seal (29) on shoulder of body. Slide overtravel assembly into valve body (10). Insert carefully to avoid seal damage.

9. Place delay piston (5) in valve body with open side of piston toward the overtravel shaft (23).

10. Align pin openings in piston and in shaft. Fit piston pin (11) in tapered side of hole in shaft. Tighten pin to 70-80 inch pounds torque (8.0 to 9.0 Nm).

11. Place intake valve and exhaust valve lever (36) in position on overtravel shaft. Make sure the fork on the exhaust lever side is around stem of exhaust valve core (14). Fork should be high enough on stem so that stem will not be held open. Insert valve lever screw (7) and tighten to 8-10 inch pounds torque (.90 to 1.13 Nm).

12. Spread ends of valve stem lock clip (8) slightly and place on exhaust valve stem around stem head. Use suitable tool to brace stem and pinch ends of clip just enough to secure on stem. Clip must rotate freely on stem.

13. Using new O-ring (17), install air inlet adapter and check valve assembly (18) into valve body.

14. Make all of the valve assembly adjustments explained earlier in this section.

SHOCK ABSORBERS

The shock absorbers are double-acting type. They are of welded construction and cannot be repaired. Defective shock absorbers must be replaced with new units.

On MC-9 coaches prior to January 1988, the shock absorbers at front wheels and at the trailing wheels are identical and may be interchangeable.

OPERATION

The operation of the shock absorber is relatively simple: Fluid contained within the shock absorber is forced through a restricted opening by a piston when the suspension air springs are flexed. The main function of the shock absorber is to regulate the vehicle axle travel by dampening the rebound motion.

REMOVAL AND REPLACEMENT

Two styles of shock absorbers are present on the coach.

One type has an eye at each end; the other has an eye at the upper end and a stud at the lower end. These stud-type shock absorbers are used only at the drive axle. Some of the earlier coaches have the stud-type shock absorber only in front of the drive axle; later coaches have them in front and behind the drive axle.

To remove the eye-mounted shocks, remove the nuts and washers from the shock absorber mounting pins. Withdraw the shock absorber assembly from the pins.

To remove the drive axle shocks, remove washers and nut from the eye end, and remove washers, nut and rubber bushings from the stud on the lower end of the shock. Withdraw the shock from the upper mounting pins, and lift stud end out of mounting hole in the suspension support.

New rubber mounting bushings should be used when the shock absorbers are replaced. This applies to both the eye and pin connections and to the stud connection.

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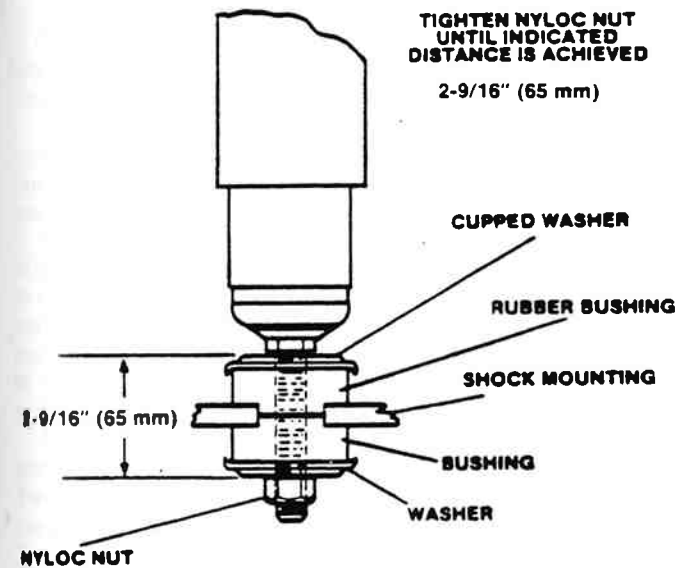


Figure 12-19. Stud Mounted Drive Axle Shock Installation.

Replacement is the reversal of removal. Tighten the mounting nuts at the eye end of the shock absorbers to 150-160 foot-pounds (203-216.96 Nm) torque. Tighten the nut on the stud end of the drive axle shock absorbers until the distance between the cupped washers is 2-9/16" (65 mm). Refer to figure 12-19.

MAIN SUSPENSION AIR FILTER

The purpose of the Type E air filter (figure 12-20) is to keep the suspension and accessory air system free from foreign matter. It is located on a mounting strap on the right hand front air tank with the air filter itself facing inside between the right and left front air tanks.

The filter element and cover gasket should be replaced approximately every 50,000 miles (80,000 km) under average operating conditions. It may be necessary to change the element and gasket more or less frequently depending on the amount of dirt and sludge, etc., accumulated in the filter. It is also recommended that the change be made prior to seasonal freezing temperatures to prevent the element from freezing due to possible water sludge in the system.

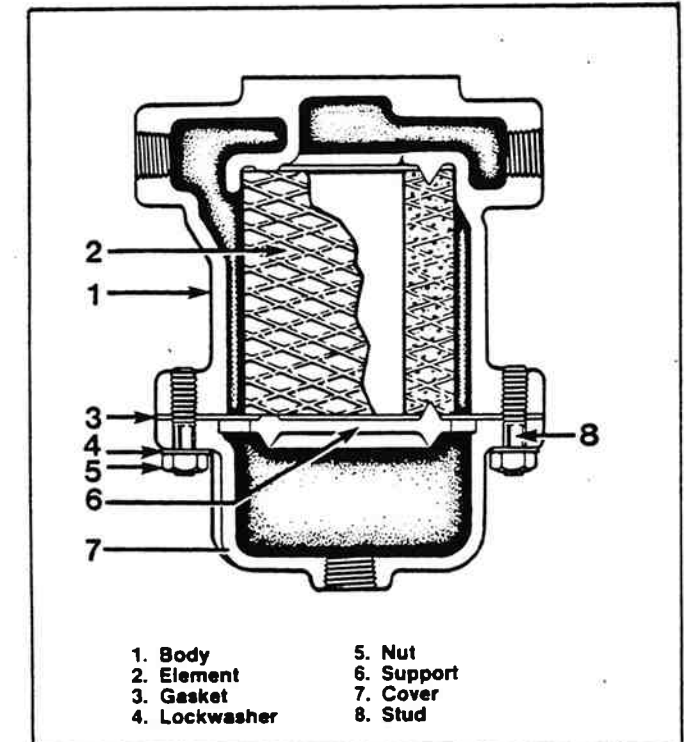


Figure 12-20. Type "E" Air Filter.

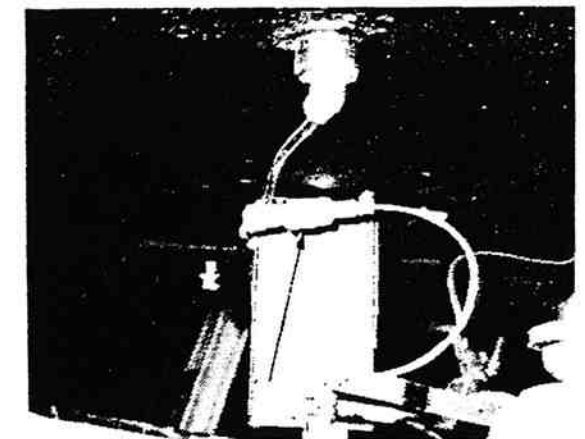


Figure 12-21. Air Line Filter Installed.

SUSPENSION AIR FILTERS

Maintenance of the filtration in the air suspension system is of prime importance. Two air filters are located between the rear suspension height control valves and the left and right air springs. One air filter is located ahead of the tee fitting between the left and right air beams/or air springs and front height control valve in the front suspension (figure 12-21). These filters prevent the entrance of foreign matter from the air beams/or air spring and suspension members, into the height control valve when the air pressure is exhausted from the system.

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The air filter and check valve assembly is used at the inlet port of each height control valve. These filters exclude foreign matter and the check valve assembly prevents air pressure from returning to the auxiliary air system. Regular service intervals should be maintained on these assemblies. If the filter elements become clogged they will retard the air flow in and out of the system.

REMOVAL AND DISASSEMBLY

1. Install blocks under coach at jacking points and exhaust air from auxiliary system by opening drain cock on auxiliary air tank.
2. Remove height control valve link. Do not disturb link adjustment.
3. Move control arm down to exhaust air from air springs and/or air beams.
4. Disconnect air lines from air filters.
5. Disconnect air lines from filter and check valve assemblies.
6. Remove filter from control valve.
7. Cover inlet port of control valve to prevent entry of dust and dirt.
8. Clamp filter in vise and remove filter element and gasket from body. See figure 12-22.
9. Clamp the air filter and check valve in the vise with filter cover up.
10. Remove cover from body and remove filter element. Use end wrench on check valve cap and remove cap from body.
11. Lift check valve spring out of body and remove body from vise. Check valve is then loose.

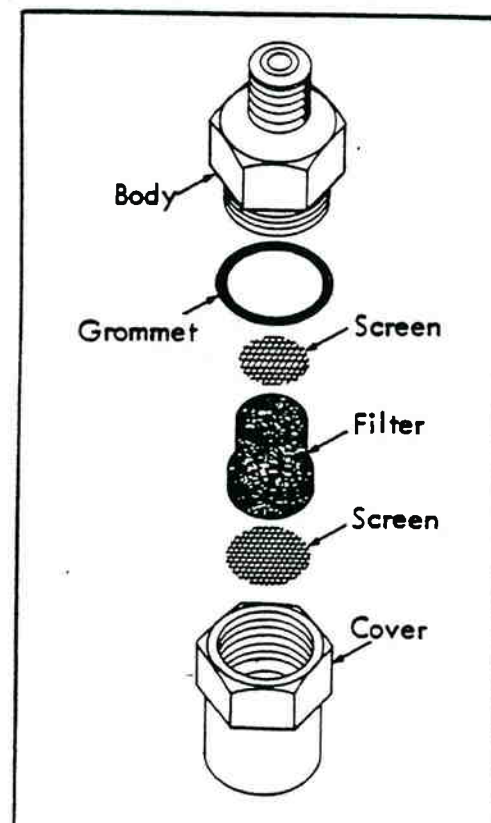


Figure 12-22. Air Line Filter Components.

INSPECTION

1. Examine bronze filter elements and immerse all parts in cleaning solvent and wash thoroughly.
2. Blow out all parts with compressed air and blow air through bronze filters.
3. Examine check valve seat. Seat must be clean and free from scratches or damage.
4. If seat is damaged, replace body. Always use new gaskets on reassembly.

REASSEMBLY

1. Clamp air filter body in vise, large end up.
2. Apply Lubriplate to new gasket and at bottom of threads on filter body.
3. Place on filter element with the small end up and place spring over filter.
4. Tighten filter cover on to the body firmly.
5. On filter and check valve install filter in same manner into filter and check valve body. Check valve may then be dropped into body with flat side down against seat.
6. Place spring over raised center.
7. Install gasket on check valve cap and tighten cap firmly into the check valve end of the body.



Figure 12-23. Pressure Protection Valve Installation.

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PRESSURE PROTECTION VALVE

On the MC-9 the valve is located in the right hand front baggage compartment above and behind the main water valve (figure 12-23).

The pressure protection valve controls the pressure at which compressed air is delivered to the system. The valve remains closed until a pre-set supply pressure is reached (65 psi, 448 kPa). It then opens and passes air to the delivery port.

The chief use for this valve is to protect the main air system, to control the amount of air taken from the main air brake system to operate auxiliary devices. By locating the pressure protection valve between the dry air tank and park brake air tank, air is maintained in the main air brake system before being supplied to the park brake air tank for quick build-up for emergency applications.

The pressure protection valve has a 1/4" (6.35 mm) delivery port on the bottom and a 1/4" (6.35 mm) supply port on the side. Two 9/32" (7.15 mm) mounting holes are cast into the body for mounting purposes if required. See figure 12-24.

OPERATION

Compressed air enters the supply port, and is stopped by the closed inlet valve. When the air pressure entering the supply

port overcomes the pressure setting of the spring above the piston, the piston moves upward. The inlet valve opens, allowing air to pass out the delivery port.

When air pressure underneath the piston is reduced to a lesser force than that of the spring above it, the spring forces the piston down, closing the inlet valve and stopping further flow of air through the delivery port of the valve.

The pressure setting is determined by the force of the spring which is controlled by the cap on the top of the valve. Turning the cap clockwise raises the pressure setting; turning the cap counterclockwise lowers the pressure setting. The lock nut must be tightened after each adjustment.

MAINTENANCE

Every 6 months or 30,000 miles (48,000 km), connect a test gauge to the delivery line and check the pressure setting by observing at what pressure valve closes by venting the delivery system. If the pressure setting varies more than 5 psi (34 kPa) from the specified setting (65 psi, 448 kPa), adjust the valve. (See Operating and Leakage Checks.) Tighten lock nut after each adjustment.

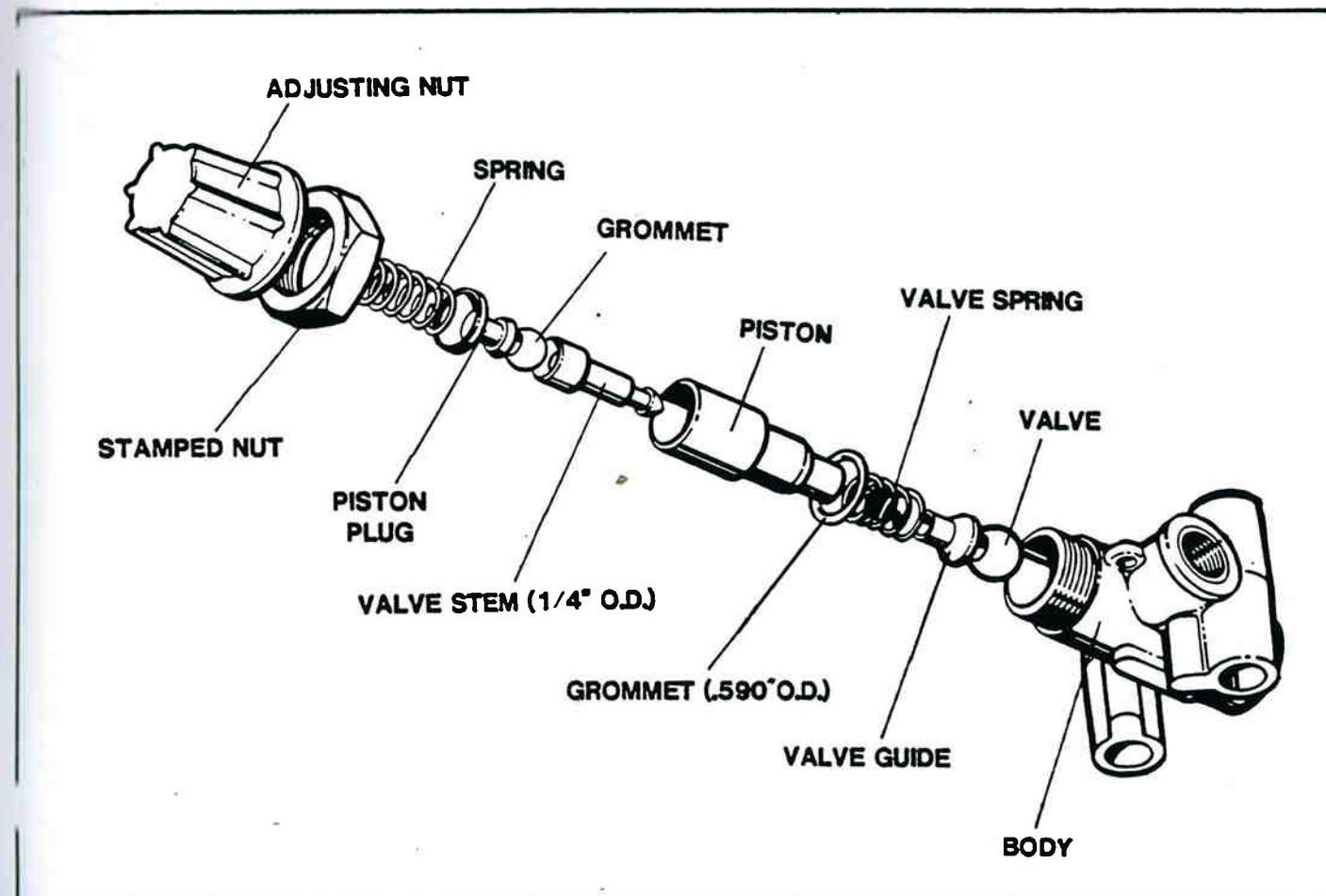


Figure 12-24. Pressure Protection Valve Parts Breakdown.

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Every year or 100,000 miles (161,000 km), dismantle the valve and clean all parts. Replace rubber parts showing signs of wear. Assemble the valve, check and adjust valve to specified setting (65 psi, 448 kPa).

OPERATING AND LEAKAGE CHECKS

1. Remove the pressure protection valve from the vehicle.
 2. Mount the valve with a variable air supply and a small delivery volume.
 3. Connect an accurate gauge in both the supply and delivery lines.
 4. Increase supply pressure until the gauge in the delivery line equals that of the gauge in the supply line.
 5. Close the supply line and vent the delivery line. Note supply pressure when the valve closes which is indicated by the drop of pressure at the delivery line gauge.
 6. Adjust valve if pressure setting varies more than 5 psi (34 kPa) from the specified setting of 65 psi (448 kPa).
 7. With supply pressure at approximately 100 psi (690 kPa), soap the area around the slot in the adjusting cap. No leakage is permitted. Leakage at this point would indicate a leaking piston O-ring or piston plug O-ring.
 8. Vent the delivery line, and check for leakage. No leakage is permissible. Leakage at this point would indicate a faulty inlet valve.
- If the pressure protection valve does not function as described, or leakage is excessive, it should be repaired.

REMOVAL AND DISASSEMBLY

1. Block and hold the vehicle by means other than air brakes.
2. Drain dry and wet air tanks.
3. Disconnect all air lines from the pressure protection valve.
4. Loosen valve and remove. Check and clean air lines to valve.
5. Loosen lock nut and remove adjusting cap, then lock nut.

6. Remove pressure regulating spring.
7. Remove piston and inlet valve assembly from the body.
8. Remove inlet valve from stem, spring retainer and inlet valve spring.
9. Turn the piston over and depress the inlet valve stem fully. This will loosen piston plug with O-ring from center of piston.
10. Remove piston O-ring.

CLEANING, INSPECTION AND ASSEMBLY

1. Wash metal parts in a good cleaning solvent. Rubber parts such as O-rings should be wiped clean.
 2. Inspect all parts for wear or deterioration.
 3. Check spring for cracks, corrosion or distortion.
 4. Inspect all rubber parts and replace if they show signs of cracks, wear, deterioration or are swollen.
 5. Before assembling, lubricate the piston, O-rings and body bores with lubricant BW-204-M (TMC/MCI Part No. 4A-15-113).
 6. Install valve stem in piston.
 7. Put small O-ring on the piston plug. Install piston plug pressing snugly into piston body.
 8. Install inlet valve spring, spring retainer and snap on rubber inlet valve.
 9. Slip piston O-ring on end of piston and move to the shoulder of the body.
 10. Insert the piston into the valve body carefully so as not to cut O-ring.
 11. Place spring into center of piston.
 12. Replace adjusting cap lock nut and replace adjusting cap nut.
- Perform the operating and leakage tests detailed previously.

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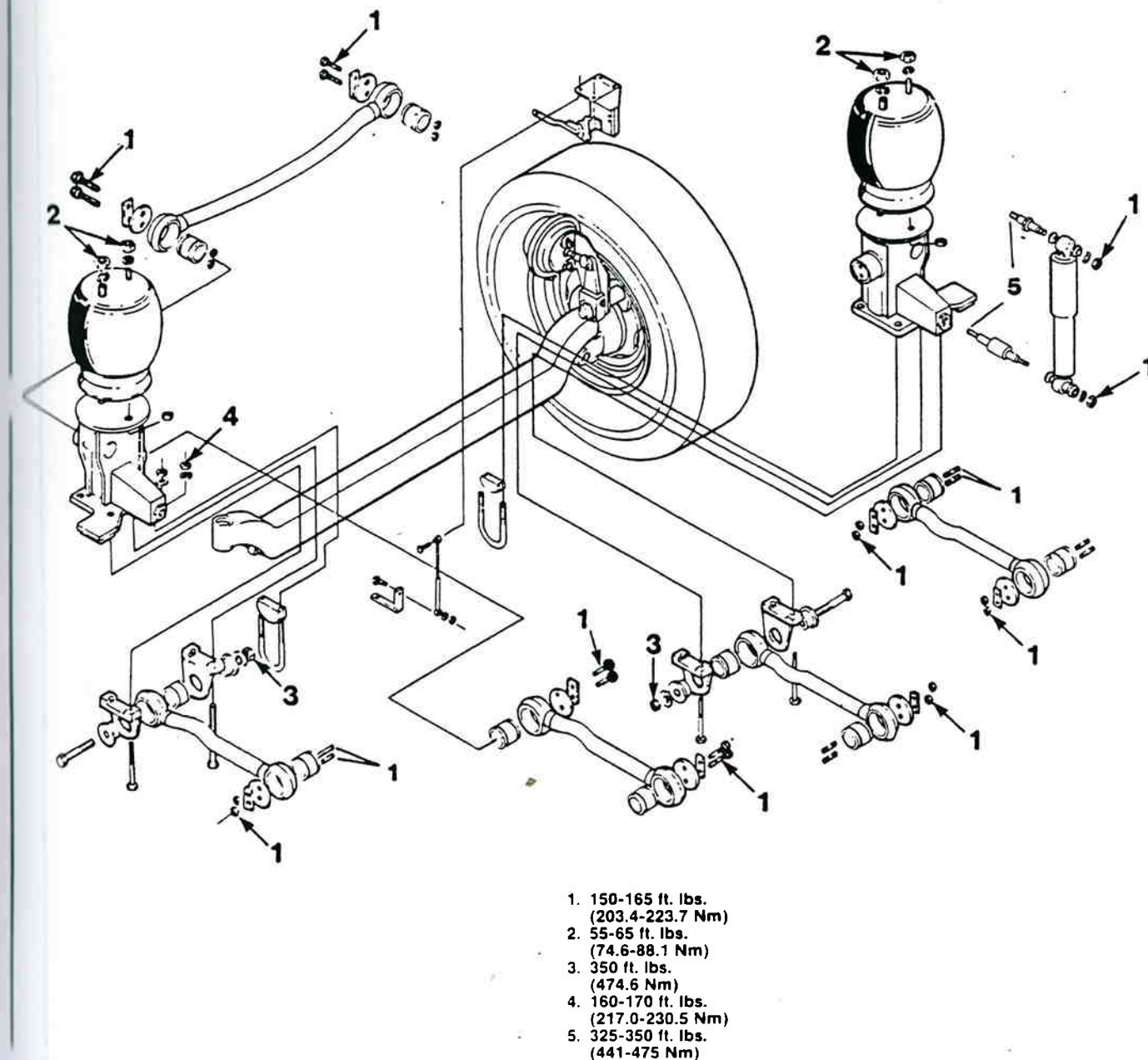
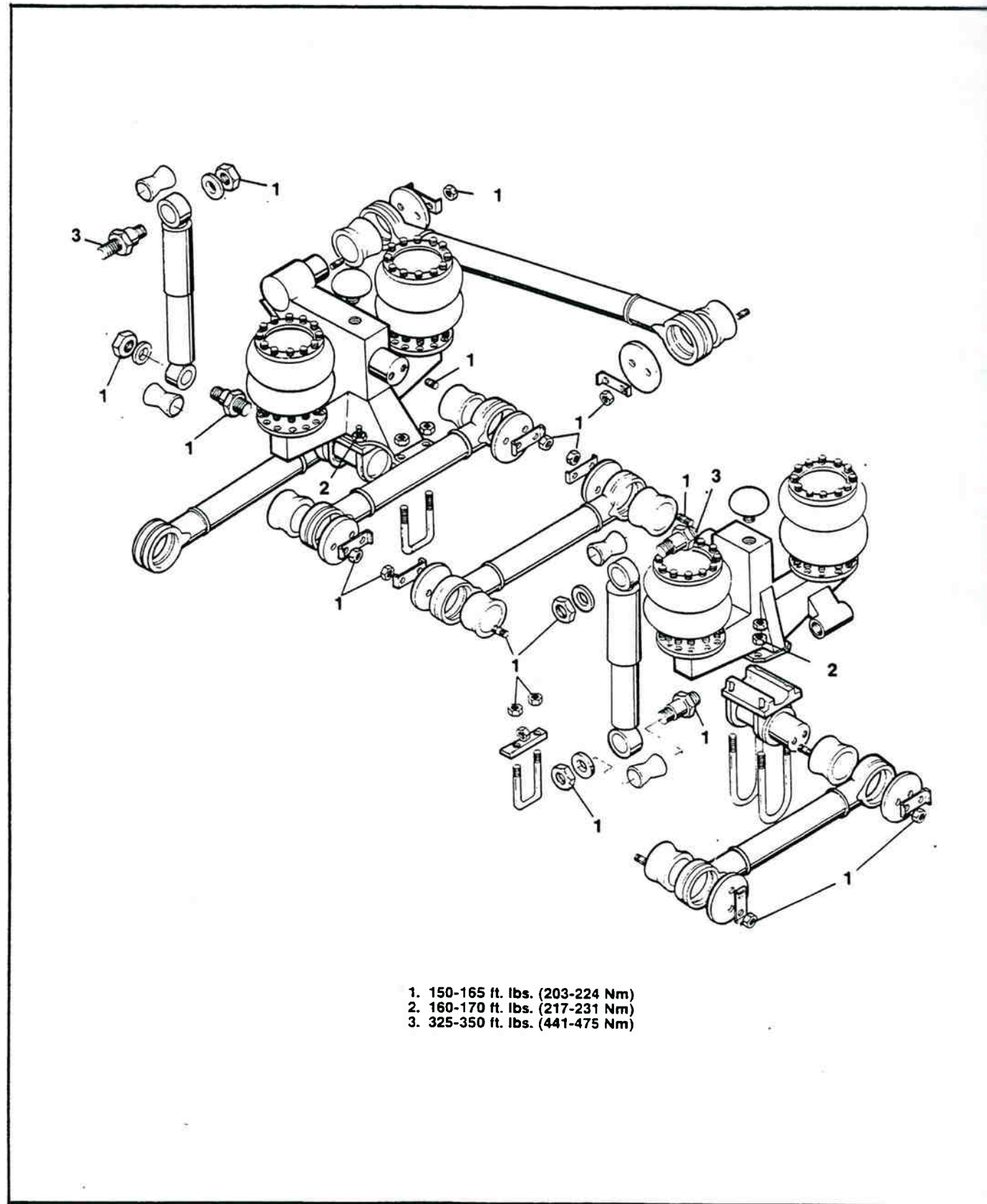


Figure 12-25A. Front Suspension Torque Recommendations (Effective with Unit 41089).

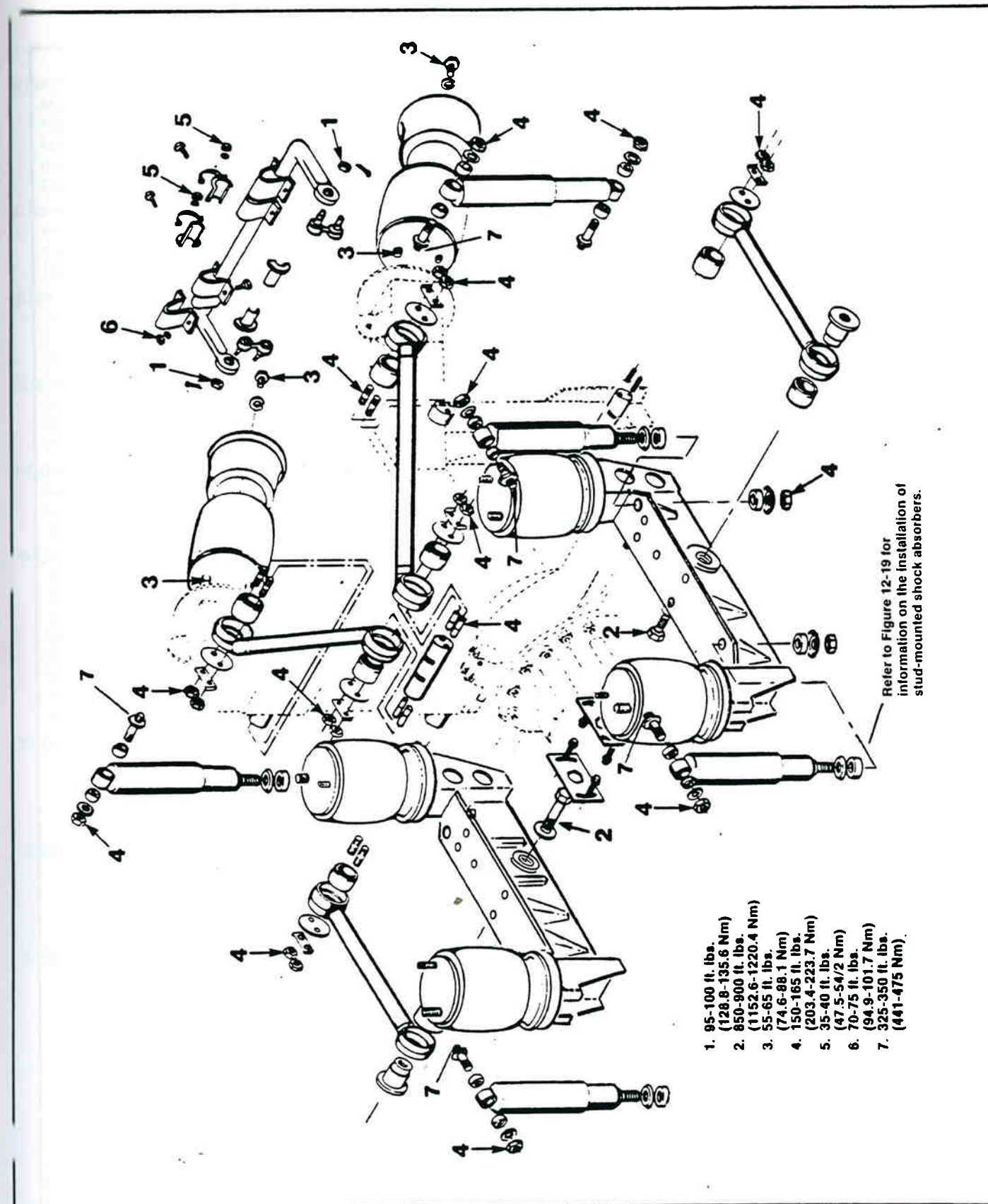
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- 1. 150-165 ft. lbs. (203-224 Nm)
- 2. 160-170 ft. lbs. (217-231 Nm)
- 3. 325-350 ft. lbs. (441-475 Nm)

Figure 12-25B. Front Suspension Torque Recommendations (Effective prior to Unit 41089).

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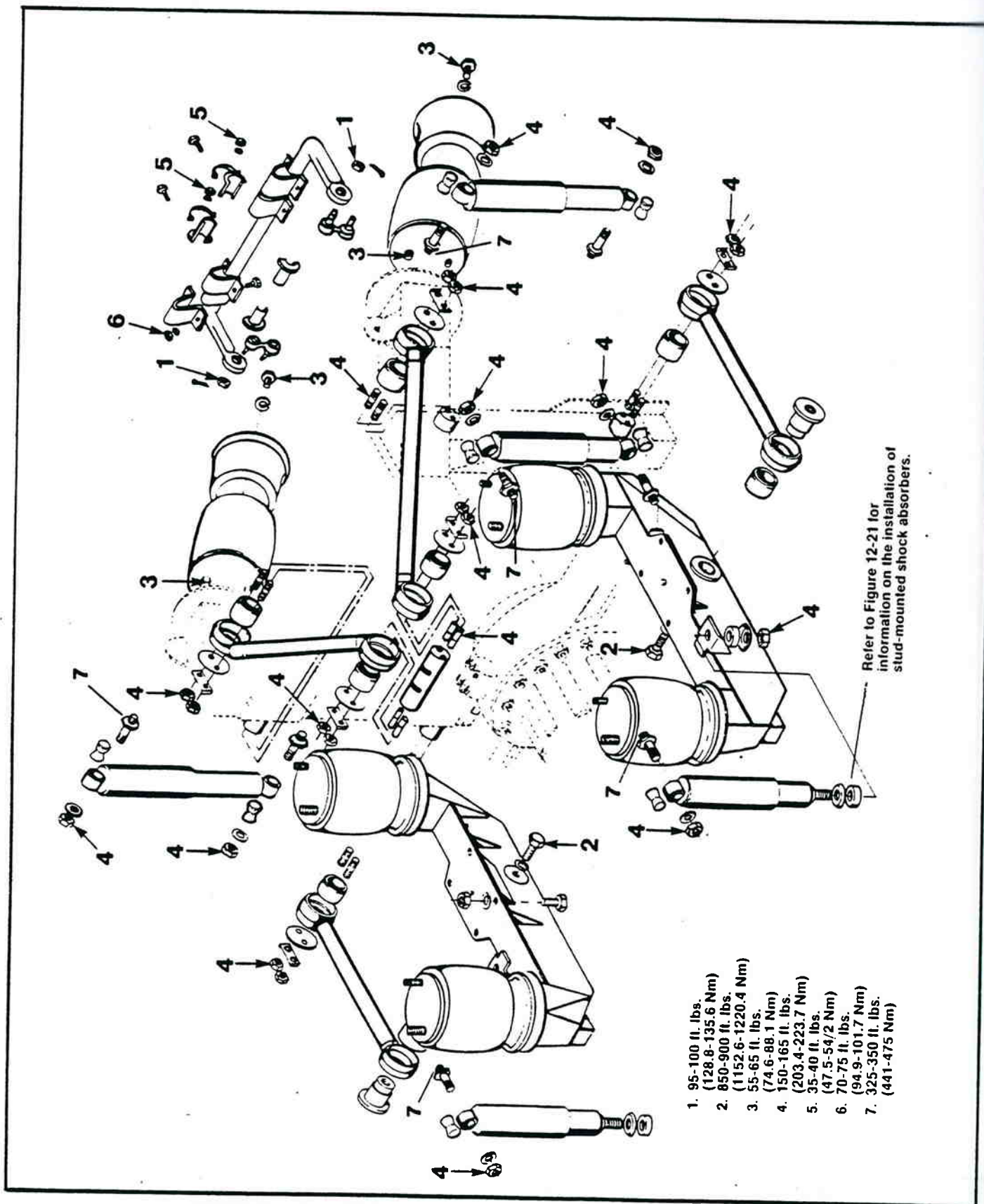


- 1. 95-100 ft. lbs. (128.8-135.6 Nm)
- 2. 850-900 ft. lbs. (1152.6-1220.4 Nm)
- 3. 55-65 ft. lbs. (74.6-88.1 Nm)
- 4. 150-165 ft. lbs. (203.4-223.7 Nm)
- 5. 35-40 ft. lbs. (47.5-54.2 Nm)
- 6. 70-75 ft. lbs. (94.9-101.7 Nm)
- 7. 325-350 ft. lbs. (441-475 Nm)

Refer to Figure 12-19 for information on the installation of stud-mounted shock absorbers.

Figure 12-26A. Rear Suspension Torque Recommendations (Effective with Unit 41089).

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- 1. 95-100 ft. lbs. (128.8-135.6 Nm)
- 2. 850-900 ft. lbs. (1152.6-1220.4 Nm)
- 3. 55-65 ft. lbs. (74.6-88.1 Nm)
- 4. 150-165 ft. lbs. (203.4-223.7 Nm)
- 5. 35-40 ft. lbs. (47.5-54.2 Nm)
- 6. 70-75 ft. lbs. (94.9-101.7 Nm)
- 7. 325-350 ft. lbs. (441-475 Nm)

Figure 12-26B. Rear Suspension Torque Recommendations (Effective prior to Unit 41089).

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SPECIFICATIONS

SUSPENSION AIR SPRINGS (FRONT & REAR AXLES) (Prior to unit 41089)	
Make	Firestone
Type	Double-Convolution
No. Convolutions	Two
Diameter, Front	9" (228 mm)
Diameter, Rear	12" (305 mm)
SUSPENSION AIR SPRINGS (TRAILING AXLE)	
Make	Firestone
Type	Rolling Lobe
Diameter	11" (279 mm)
SUSPENSION AIR SPRINGS (FRONT AXLE) (Effective with unit 41089)	
Make	Goodyear, Firestone
Type	Rolling Lobe
Diameter, Front	12" (305 mm)
SUSPENSION AIR SPRINGS (DRIVE AXLE) (Effective with unit 41089)	
Make	Goodyear, Firestone
Type	Rolling Lobe
Diameter	12" (305 mm)
HEIGHT CONTROL VALVES	
Make	Delco
Quantity used, Front	1
Quantity used, Rear	2
SHOCK ABSORBERS (Prior to unit 41089)	
Make	Delco, Gabriel
Type	1-3/4" (44.45 mm) dia. Cyl. Double Acting
Model No.	F450W
Valve Code	3(1)N 10/J3
Collapsed Length	16-5/8" (422.275 mm)
Extended Length	26-5/8" (676.275 mm)
Travel	10" (254 mm)
Number Used	2 Front; 4 Rear Drive; 2 Rear Trailing
SHOCK ABSORBERS (FRONT AXLE) (Effective with unit 41089)	
Make	Delco, Gabriel
Collapsed Length	16.64" (422.656 mm)
Extended Length	26.14" (663.956 mm)
Quantity used	2
SHOCK ABSORBERS FRONT OF DRIVE AXLE (Effective with unit 41089) & TRAILING AXLE	
Make	Delco, Gabriel
Collapsed Length	16.28" (413.512 mm)
Extended Length	26.17" (664.718 mm)
Quantity used	2
SHOCK ABSORBERS (REAR OF DRIVE AXLE) (Effective with unit 41089)	
Make	Delco, Gabriel
Collapsed Length	14.85" (377.19 mm)
Extended Length	23.61" (599.694 mm)
Quantity used	2

