X-7525

1975 AND 1976 MAINTENANCE MANUAL MOTOR HOME

ZEO 6581

AND

TRANS MODES

ZEO 6083

ZEO 6583

GMC

TRUCK & COACH DIVISION
GENERAL MOTORS CORPORATION
PONTIAC, MICHIGAN 48053

Printed in U.S.A.
X-7525, 5M

SECTION INDEX

SECTION 4
REAR SUSPENSION

Contents of this section are listed below:

4

GENERAL DESCRIPTION

The rear suspension system (figure 1) on the vehicle consists mainly of air bellows, height control valves, control arms, and shock absorbers. The system operates automatically as load varies, to retain frame at proper ride height.

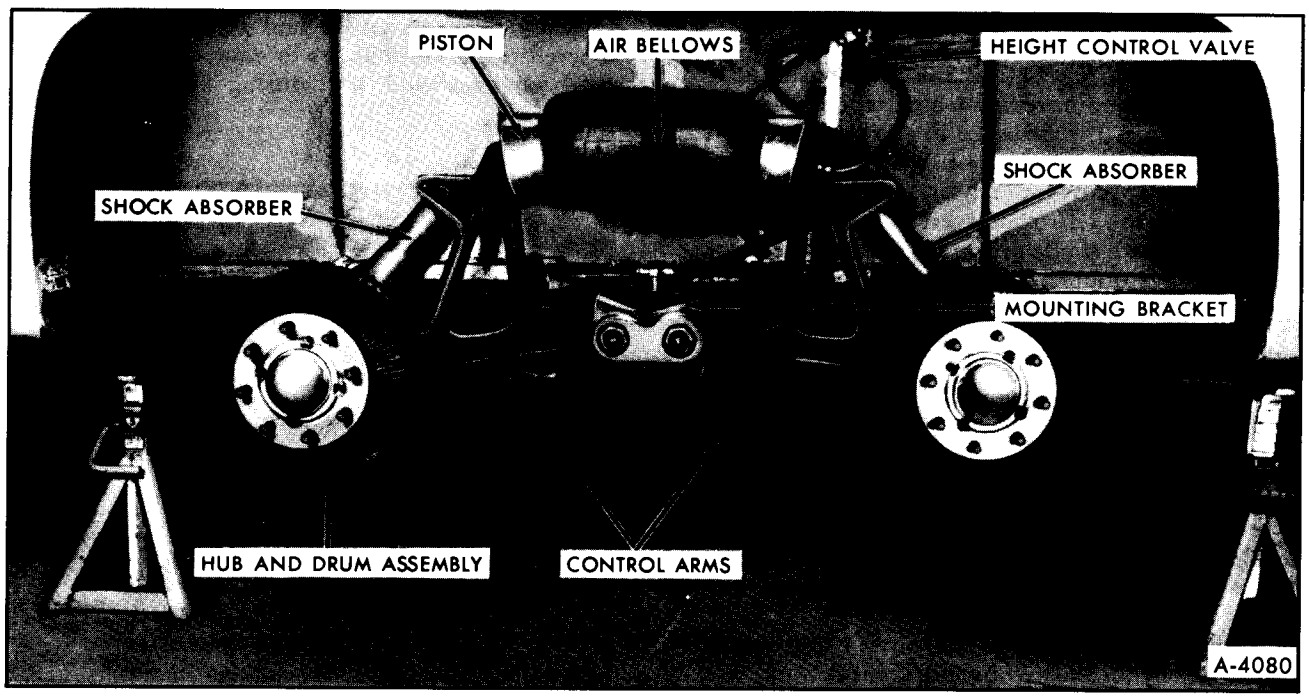


Figure 1—Rear Suspension (Left-Side View)

Figure 2—Air Compressor Location (Brown)

AIR BELLOWS

The air bellows are mounted between the control arms, for the tandem rear wheels. On each side of the air bellows is a piston which is connected directly to the control arm.

AIR COMPRESSOR

Compressed air for the system is supplied by an electric compressor which operates when the ignition key is in the "ON" or "ACCESSORY" position. It is a demand-type compressor which will start compressing air when the pressure in the system drops below 100 psi, and will shut off when the pressure reaches 120 psi. Air compressor for the system is located behind the left-front access door. There are two models used, a single piston Brown Compressor, (figure 2) and a double piston Dana (figure 3).

AIR RESERVOIR

The purpose of the air reservoir is to provide a place to store compressed air for the rear suspension. The reservoir is located behind the left front access door. The reservoir allows the rear suspension to adjust without the air compressor operating.

Another purpose of the reservoir is to provide a place where the air, heated during compression, can cool and the water vapor can condense. Drain reservoir monthly.

AIR BELLOWS

The air bellows serve as a flexible connection between the two control arms on each side of suspension bracket. The flexing of the air bellows allows the control arms to move up and down in relation to the frame. This action absorbs road shocks in the same manner as an inflated rubber tire cushions shock caused by road roughness.

SHOCK ABSORBERS

A double acting shock absorber is used at each wheel on the rear suspension. The shocks are mounted to the top of the control arms and to the frame at the bottom.

The shock absorbers are gas filled cell type shocks. They are filled with a calibrated amount of fluid and sealed during production. They are non-adjustable, non-refillable and cannot be disassembled. The only service they require is replacement if they have lost their resistance, are damaged or leaking fluid.

HEIGHT CONTROL VALVE

(FIGURE 4)

Height control valve automatically maintains a constant vehicle height by controlling the flow of compressed air into or out of suspension system air bellows. A delay piston in each valve provides a momentary delay in intake and exhaust valve action. Therefore, air in bellows is exhausted only during load changes and not during intermittent road bumps.

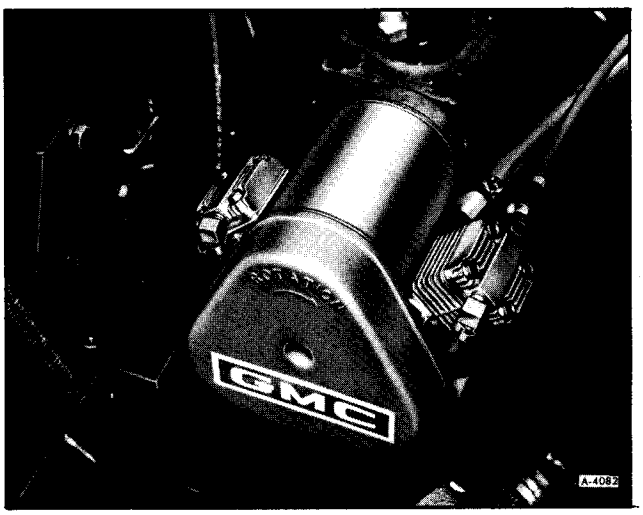


Figure 3—Air Compressor Location (Dana)

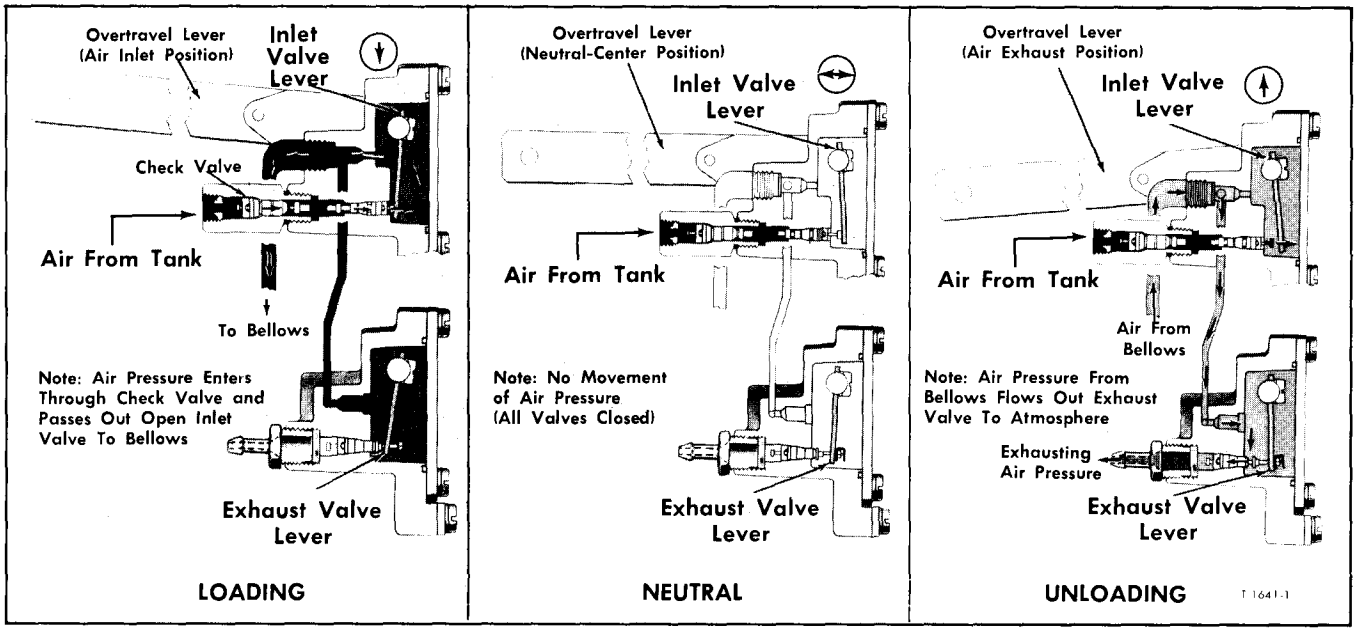


Figure 4—Operation of Height Control Valve

The height control valve contains an intake valve, air bellows outlet, exhaust valve, delay piston, and overtravel control body. The overtravel control body contains a spring-loaded nylon piston which protects valve parts if overtravel lever is moved beyond normal operating range.

HEIGHT CONTROL VALVE OPERATION

Loading

When vehicle is being loaded, frame tends to settle. Since valve is linked to control arm, and valve is bolted to wheel well, valve moves downward with frame as vehicle is loaded. As valve arm and control shaft turns, a force is applied to the delay piston which moves slowly and allows the intake valve lever to move against the intake valve core. As pin is pushed in, air pressure flows through height control valve into bellows. Increased air pressure expands the bellows and raises frame.

Inlet valve is "PROTECTED" by check valve in inlet adapter. Light spring in core freely admits reservoir air, but return flow of air is blocked.

Neutral Position

As increased air pressure expands bellows and lifts frame, the height control valve moves upward with frame. As frame is returning to normal ride height, valve arm and shaft return to a neutral position. Inlet valve lever also moves away from inlet valve core and inlet valve closes. This stops the flow of the air into bellows. The exhaust valve remains closed. Since the exhaust valve is closed, and the check valve in the inlet adapter prevents compressed air from returning to air reservoir, air is trapped in bellows and in valve. No further valve action or air pressure change takes place until load is increased or decreased, moving valve arm out of neutral position for four seconds or more to actuate intake valve or exhaust valve.

Unloading

When part of load is removed, air pressure in bellows lifts frame. Valve arm, linked to axle, is pulled downward from neutral position. This applies a force on the delay piston, which moves it slowly. The exhaust valve lever moves with the delay piston. The outer end of exhaust valve lever fits around stem of exhaust valve core. As soon as lever moves beyond free-travel range, lever pulls on stem and opens exhaust valve. Inlet valve remains closed. Compressed air from bellows then flows through the open exhaust valve and out exhaust fitting to atmosphere. As the compressed air is exhausted from bellows, the frame lowers until overtravel lever and shaft are again in normal (neutral) position.

Valve Arm Free Travel

With vehicle in motion and frame at normal ride height, control valve arm and shaft are in neutral position. Small irregularities in road causes slight up and down movement of valve arm. Clearances are provided between operating levers and cores of inlet

and exhaust valves to permit 3/8-inch up or down movement of valve arm, from neutral position without causing valve action. This compensates for small road bumps. The bumps are absorbed by tires and bellows without causing movement of compressed air either into or out of suspension system.

Hydraulic Delaying Action

Operation of delay piston in height control valve prevents change of bellows air pressure as a result of momentary road shocks, conserves air supply, and adds life to valve. The nylon piston moves inside cylinder containing a silicone type fluid. A flapper valve on either end of piston allows displacement of fluid or acts as a check valve, depending on direction piston moves. Delay piston is moved by piston pin, that is threaded into overtravel shaft. A 4 to 18 second delay results from the closing of one valve to the opening of other valve.

Overtravel piston is held against flat side of overtravel shaft by two springs inside piston. Piston keeps overtravel shaft in proper position relative to valve arm. Piston also allows valve arm to rotate through a complete circle, if necessary, without damaging parts inside valve.

POWER LEVEL OPERATION

The power level option consists of two, in-line valves which override the height control valve. These valves allow the operator to raise or lower each side of the rear suspension from the driver's seat. This is accomplished by bypassing the height control valve and adding or expelling air directly from the bellows. For a diagram of air lines see figure 65.

TROUBLE DIAGNOSIS

AIR LEAKS

With the air system at normal operating pressure coat all suspension air line connections with soap and water solution. Air leakage will produce soap bubbles. No leakage is permissible. Leakage at air line connections can sometimes be stopped by tightening connection. If this does not stop the leak replace the affected fittings.

1. Cut end of hose (tube) off square.

2. Place brass insert into end of tube and put appropriate fitting over it (figure 5).

3. Crimp fitting in place with Special Tool J-25520. This tool is designed so that crimp must be completed before tool will release (figure 6).

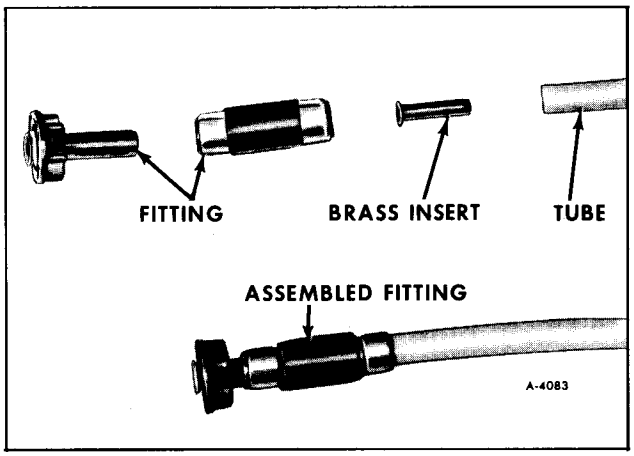


Figure 5—Coupling Assembly

4. Air line leaks can be repaired with the coupling illustrated in Figure 7.

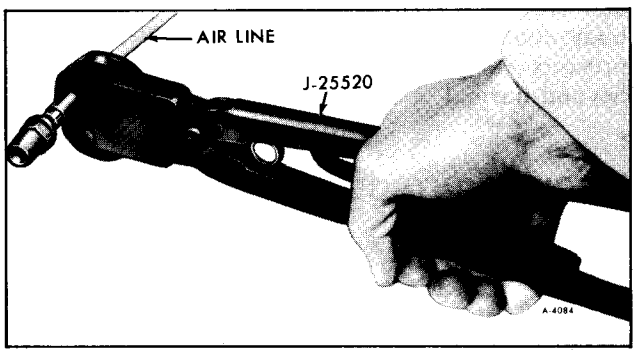


Figure 6—Special Tool J-25520 Crimping Air Line

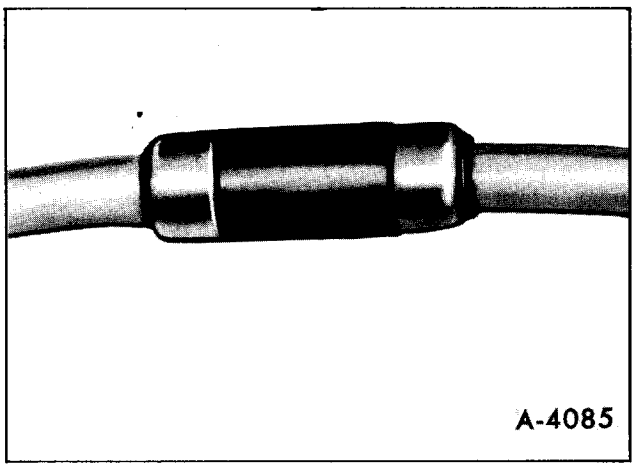


Figure 7—Air Line Repair Coupling

SHOCK ABSORBERS

See Section 3A "FRONT SUSPENSION" for trouble diagnosis of shock absorbers.

HEIGHT CONTROL VALVE AIR LEAKAGE CHECK

NOTE: Air leakage check can be performed for air line connections, only when valve is installed on vehicle. The following instructions explain procedure for performing air leakage check on valve when removed from vehicle.

1. Clean exterior of valve assembly.

2. Connect air pressure line to air inlet port, then open the air pressure (90-120 psi).

3. Submerge valve assembly in a container of water, then watch for air bubbles when the valve arm is in center (neutral) position. No air should escape from any point of valve assembly.

4. If bubbles appear from the bellows port, this is an indication the air inlet valve assembly is defective and must be replaced.

5. Remove air pressure line from air inlet fitting 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 the exhaust valve assembly is defective and must be replaced.

7. If bubbles appear around edge of valve cover plate, the cover plate gasket must be replaced.

8. If no leaks are detected, remove valve assembly from water, then with air pressure still connected to bellows port, actuate valve arm to expel any water which may have entered exhaust valve chamber. Remove air line and connect it to air inlet port and repeat operation to remove water from air inlet valve chamber.

REAR SUSPENSION TROUBLE DIGNOSIS CHART

Problem	Possible Cause	Correction
No air pressure in air reservoir-unit not operating.	1. Open circuit breaker.	1. Find cause of circuit breaker being "OPEN" and correct it. Circuit breaker is located behind the glove box door.
	2. Faulty wiring.	2. Check to see that wiring is intact.
	3. Low battery.	3. The compressor runs off the automotive battery, check its condition and correct as necessary.
	4. Faulty or pitted contacts on pressure switch.	4. Replace pressure switch.
	5. Motor has developed an open circuit.	5. Motor brushes or commutator worn out. Replace motor.

Problem	Possible Cause	Correction
No air pressure in air reservoir-unit is operative.	1. Air leak in system.	1. Eliminate air leaks in system as explained earlier in this section.
	2. Compressor valve seat or valve spring worn or broken.	2. Replace valve seat and/or valve spring.
	3. Piston rings are worn-air leaks heavily at rings.	3. Replace piston rings.
	4. Pressure switch contacts are pitted causing improper compressor action.	4. Replace pressure switch.
	5. Pressure switch not properly adjusted	5. Adjust pressure switch settings to operate at the 100-120 psi range.
Air pressure in tank-unit operating erratically-pump takes too long to pressurize tank.	1. Air leak in system.	1. Eliminate air leaks in system as described earlier in this section.
	2. Compressor valve seat valve broken or worn.	2. Replace valve seat and/or valve spring.
	3. Piston rings are worn-air leaks heavily by rings.	3. Replace piston rings.
	4. Pressure switch contacts are pitted causing improper compressor action.	4. Replace pressure switch.
	5. Battery voltage too low to operate motor.	5. Charge battery.
	6. Bearing failure may cause unit to seize occasionally and break loose if galling occurs.	6. Replace bearings or parts with bearings.

COMPONENT REMOVAL

CAUTION: *Whenever it is necessary to support the rear suspension with jack stands or other supporting equipment, as shown in Figure 1, be sure jack stands are used only at a junction point(s) of the frame rail and crossmember. Failure to locate jack stand as instructed could result in damage to frame of vehicle.*

PRESSURE SWITCH REMOVAL

1. Release pressure in air reservoir through Schrader valve.

2. Remove one screw at top of switch cover and remove switch cover (figure 8).

3. Disconnect two electrical wires held by screws inside switch body.

4. Disconnect air line elbow below switch and remove switch assembly.

AIR COMPRESSOR REMOVAL

(BROWN, SINGLE PISTON)

1. Release pressure in air reservoir through Schrader valve.

2. Remove air line from piston dome (figure 2).

3. Disconnect hose at back of compressor.

4. Disconnect electrical wire at overheat switch in top of compressor body.

5. Remove four screws that secure compressor frame to mounting bracket and remove compressor from vehicle.

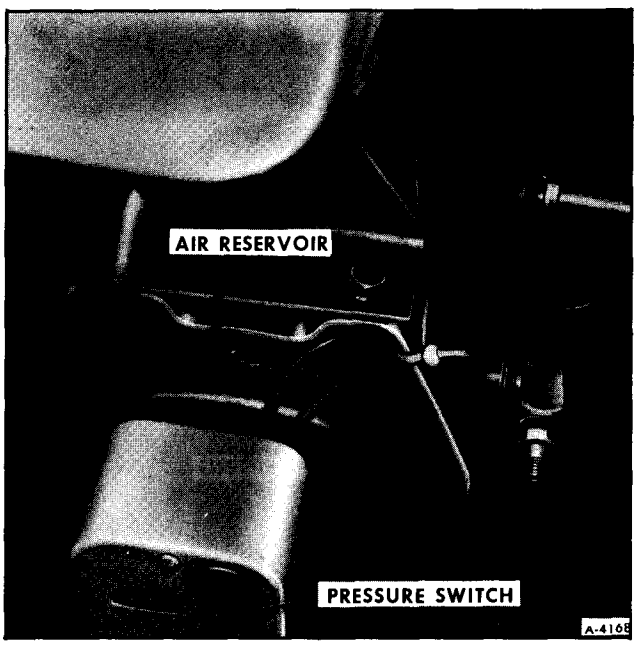


Figure 8—Pressure Switch Installed

AIR COMPRESSOR

(DANA, DOUBLE PISTON)

1. Disconnect electrical wires at back of compressor motor (figure 3).

2. Release pressure in air reservoir through Schrader valve.

3. Disconnect air lines at back of compressor and at head of one piston.

4. Remove three bolts that secure compressor to mounting bracket and remove compressor.

AIR RESERVOIR REMOVAL

(FIGURE 9)

1. Disconnect pressure switch wiring. See PRESSURE SWITCH REMOVAL steps 2 and 3.

2. Release pressure in air reservoir through Schrader valve, or drain cock.

3. Disconnect two air lines on same side of reservoir.

4. Remove two bolts and nuts from front air reservoir bracket, then two nuts and bolts from rear bracket and remove air reservoir.

5. Disconnect pressure switch from reservoir.

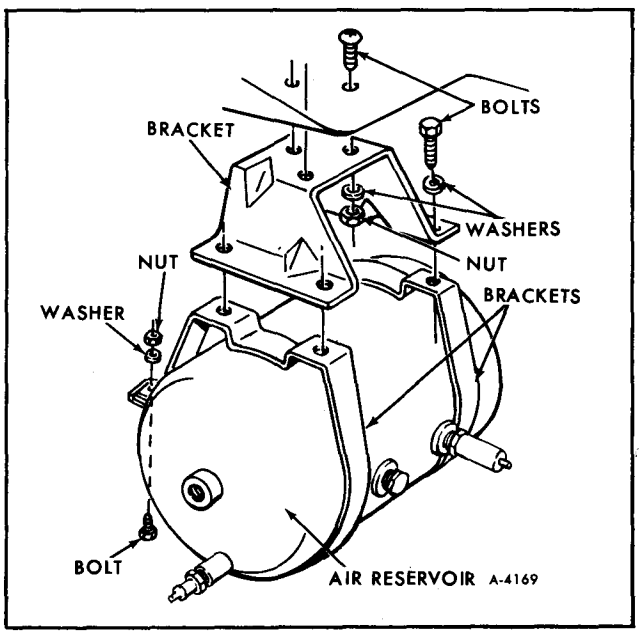


Figure 9—Air Reservoir Installed

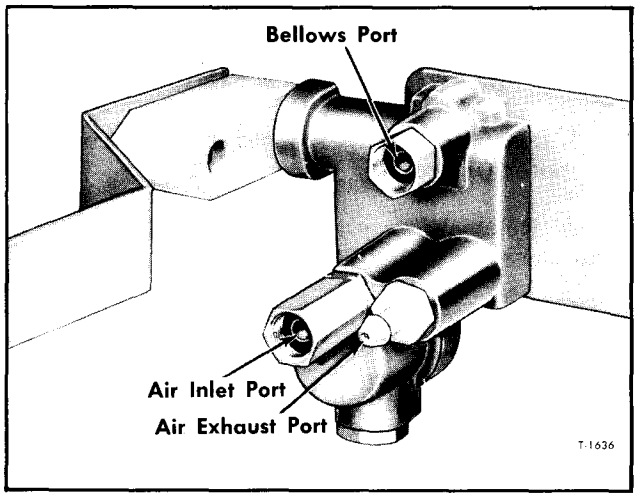


Figure 10—Height Control Valve Ports

6. Remove mounting brackets, safety valve, and Schrader valve. Remove drain cock if reservoir is so equipped.

HEIGHT CONTROL VALVE REMOVAL

Before disconnecting any height control valve air lines, securely support frame to prevent it from lowering as air is released from suspension. Exhaust air from air supply system by opening schrader valve on air reservoir. After the above precautions have been taken, remove height control valve as follows:

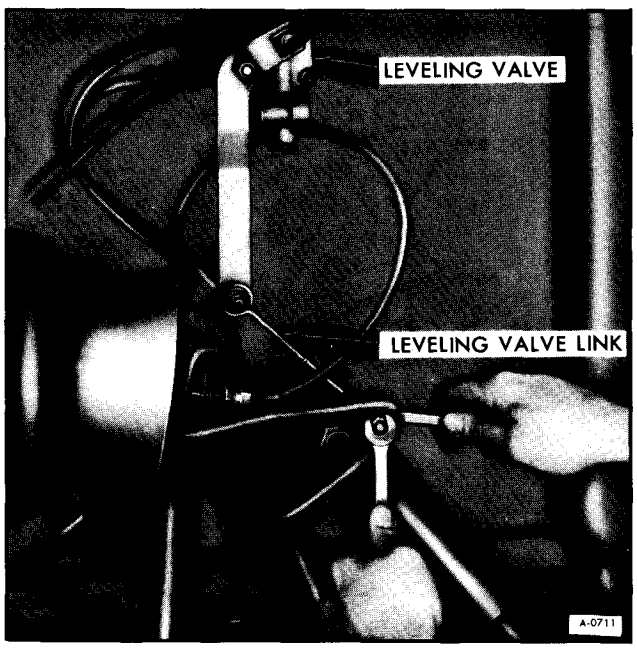


Figure 11—Disconnecting Height Control Valve Link

1. Disconnect height control valve overtravel lever from valve link. Pull lever downward and hold several seconds to overcome time delay feature; This will release compressed air from bellows.

2. Referring to Figure 10, disconnect air supply line and bellows air line from height control valve. Tape ends of lines to prevent foreign material from entering.

3. Remove two nuts attaching height control valve to wheel well and remove valve assembly.

AIR BELLOWS REMOVAL

1. Support vehicle on jack stands.

2. Referring to Figure 11, disconnect leveling valve link and move arm down to open exhaust valve and let air out of bellows.

3. Referring to Figure 12, disconnect air line to bellows.

4. Referring to Figure 13, remove retaining nuts and washers.

5. Remove air bellows from vehicle.

CONTROL ARM REMOVAL

1. Raise vehicle until rear wheels are off the floor.

Figure 12—Disconnecting Bellows Air Line

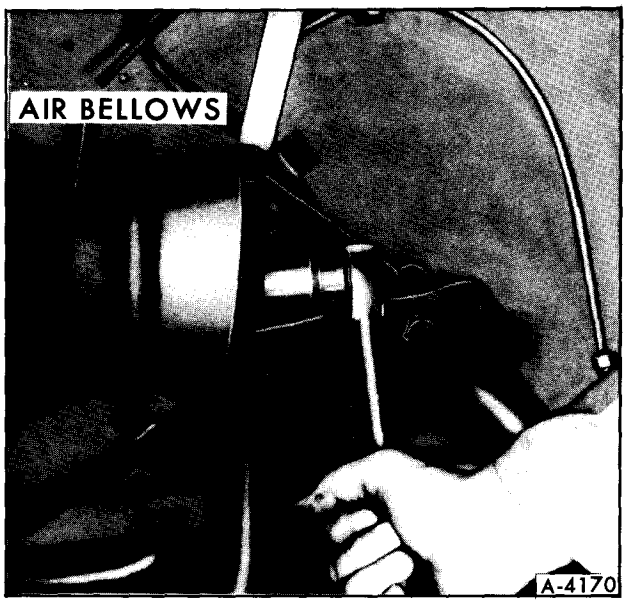


Figure 13—Removing Bellows Retaining Nut

2. Remove wheels.

3. Disconnect leveling valve link at control arm. Remove air from bellows by moving valve arm down. Disconnect air line at the bellows as shown in Figure 12.

4. Remove bellows retaining nuts, located at either end of air bellows, as shown in Figure 13.

Figure 14—Disconnecting Brake Line

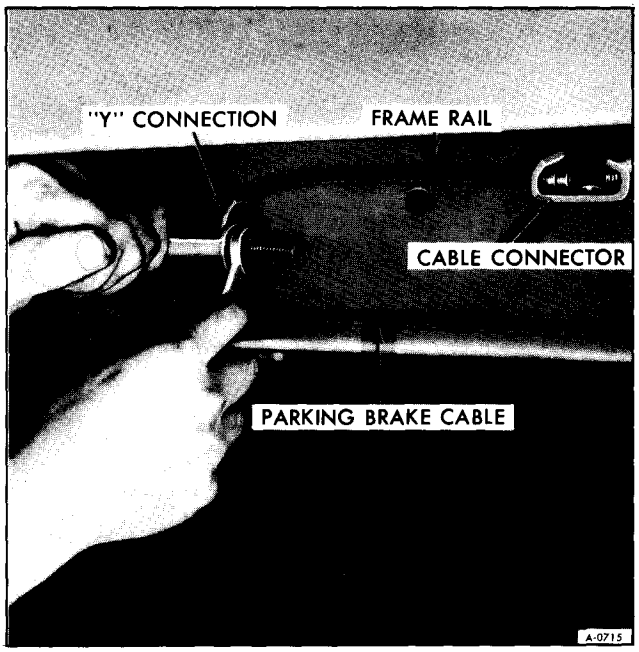


Figure 15—Disconnecting Parking Brake Cable

5. Disconnect shock absorbers from control arm mounting.

6. Referring to Figure 14, disconnect brake line at center mounting bracket and at each brake backing plate. Remove brake lines from control arms by unbolting all mounting points.

7. Disconnect parking brake cable at "Y" connection as shown in Figure 15.

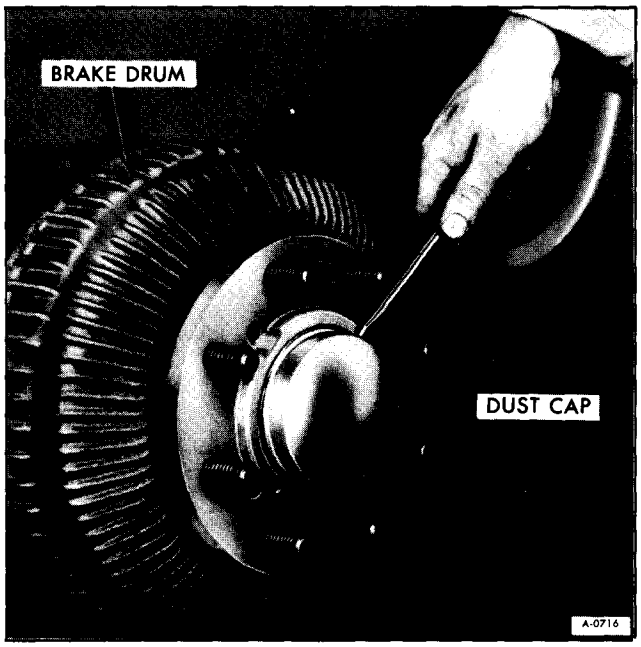


Figure 16—Outer Dust Cap Removal

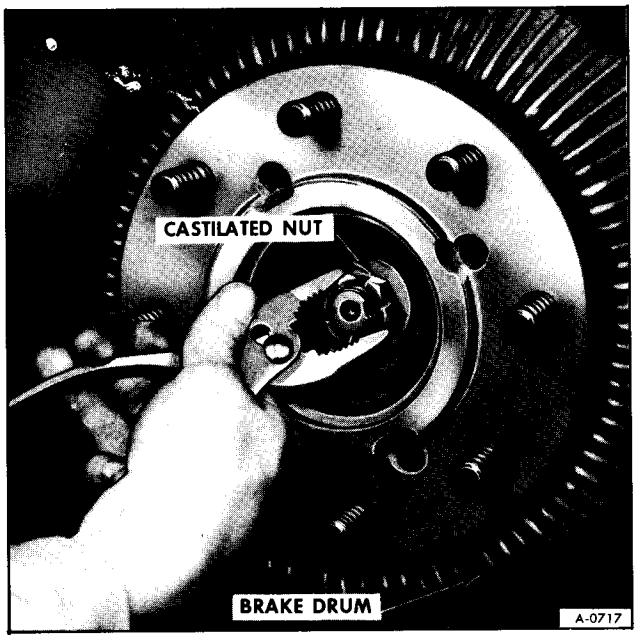


Figure 17—Castilated Nut Removal

8. Remove brake drums, then—

A. Remove outer dust cap (figure 16) and then remove inner cap.

B. Remove cotter pin and castilated nut (figure 17).

C. Remove drum, hub, and bearings as a unit (figure 18).

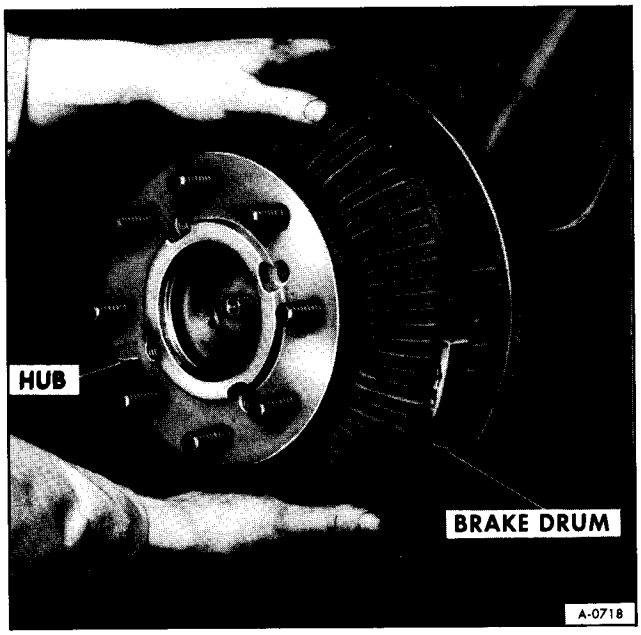


Figure 18—Removing Hub and Drum

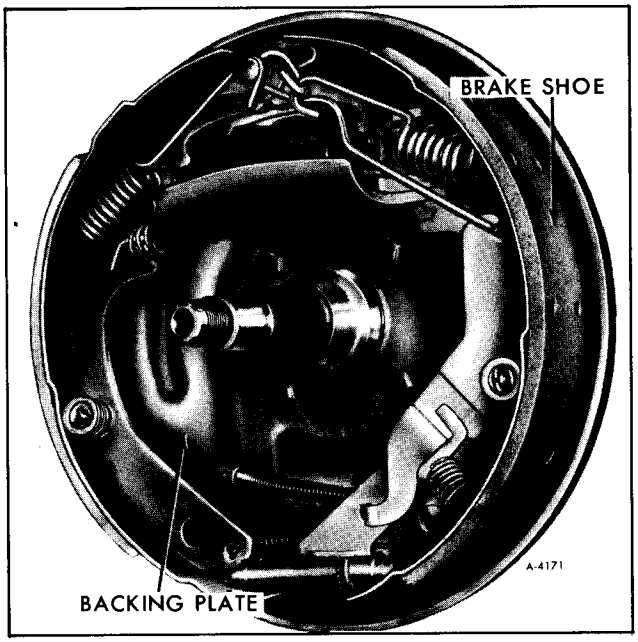


Figure 19—Removing Brake Backing Plate and Brake Shoe Assembly

9. Referring to Figure 19, remove four bolts and nuts retaining brake backing plate to control arm. Repeat procedure on opposite wheel.

10. Support mounting bracket with floor jack. Referring to Figure 20, remove two bolts holding mounting bracket to crossmember. Remove four bolts holding mounting bracket to frame rail.

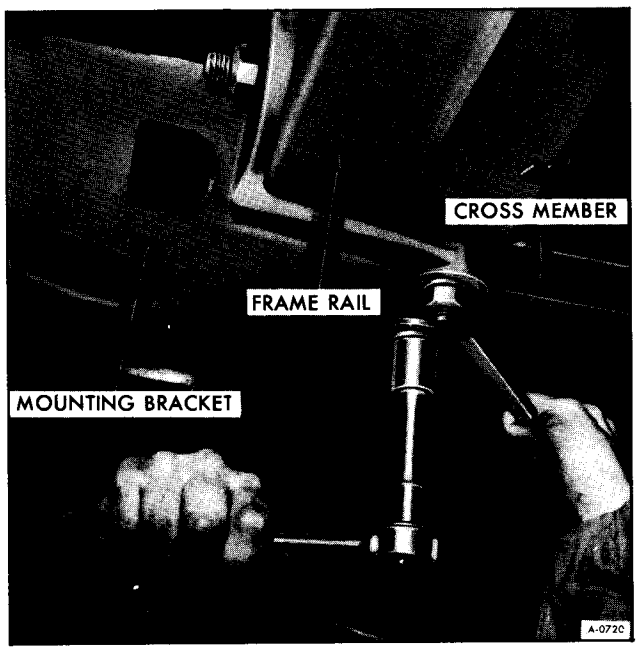


Figure 20—Removing Mounting Bracket Retaining Bolts

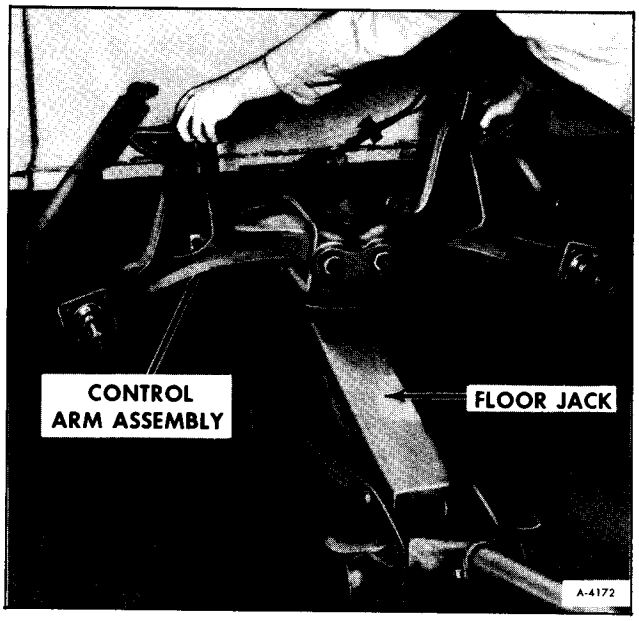


Figure 21—Lowering Control Arm Assembly from Vehicle

11. Lower rear suspension unit to floor as shown in Figure 21.

12. Referring to Figure 22, remove two nuts on mounting bracket. Remove Allen head retainer screws on back of mounting bracket as shown in Figure 23.

13. Press out control arm mounting pins, then remove control arms.

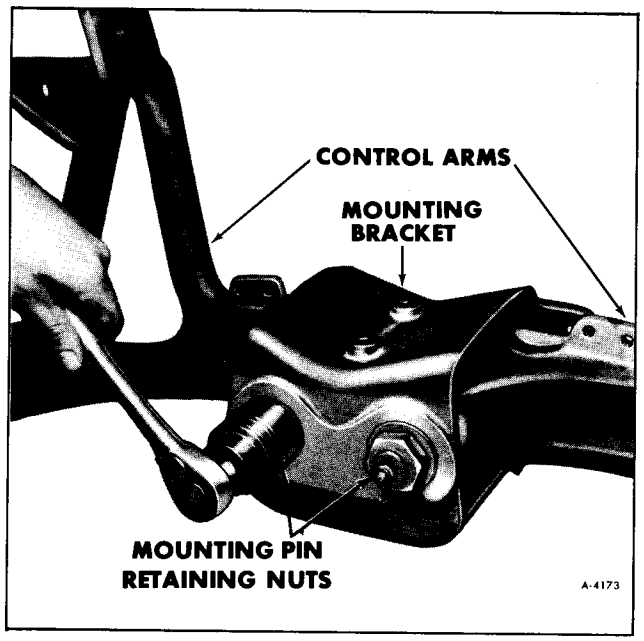


Figure 22—Removing Mounting Bracket Nuts

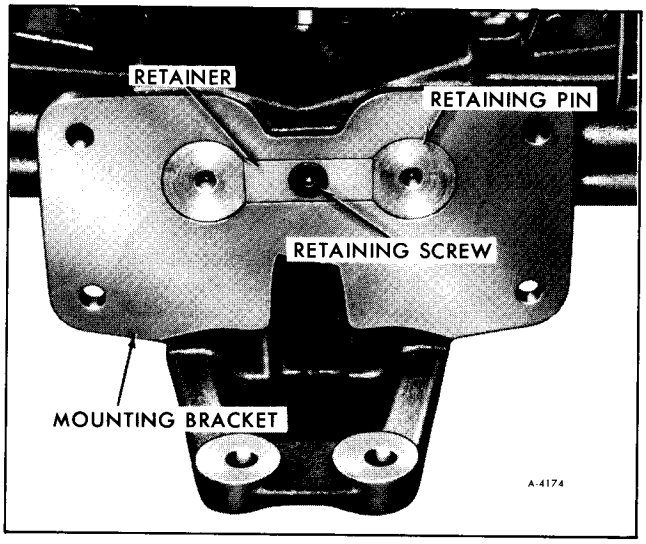


Figure 23—Location of Retainer

14. Apply penetrating oil to wheel spindle and suspension arm mating surfaces. Position screw pad J-25265-6 as shown in Figure 24.

15. Install spindle removing tool as shown in Figure 25.

16. Tighten tool through bolts and then reaction set screw as shown in Figures 25 and 26.

17. Press out spindle by turning forcing screw, (it may be necessary to tap spindle end lightly after preloading screw).

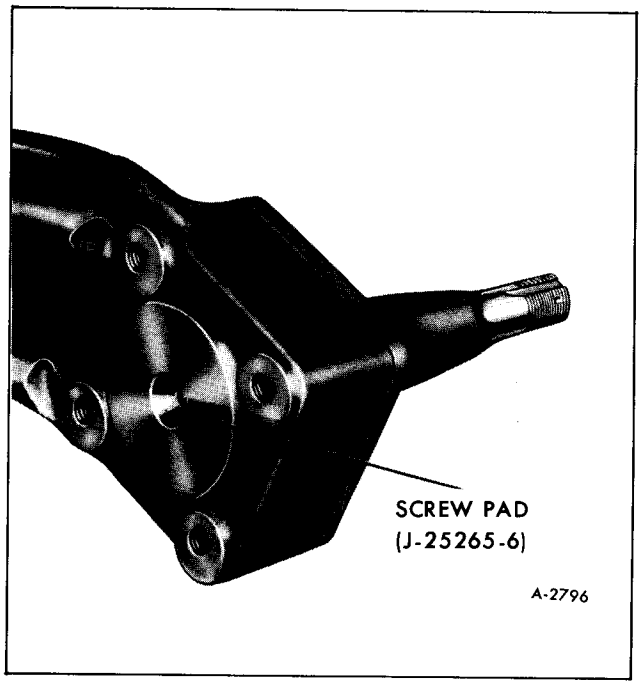


Figure 24—Special Tool J-25265-6

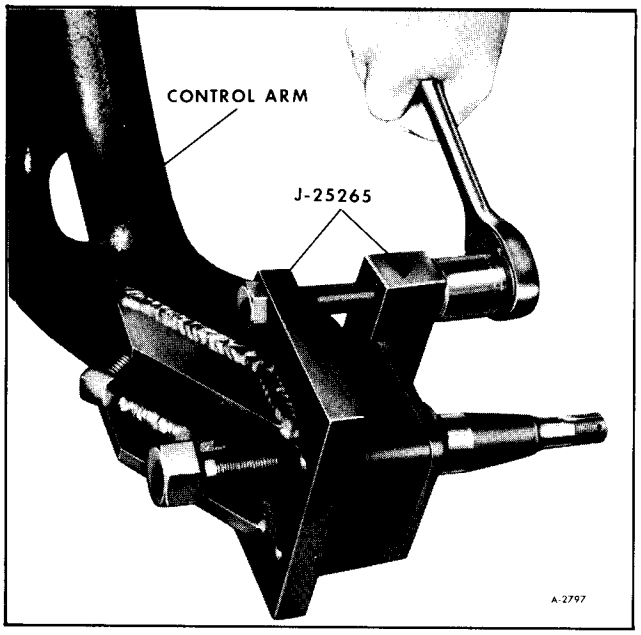


Figure 25—Special Tool J-25265

SHOCK ABSORBER REMOVAL

Block control arms in an up position with a wooden block about one inch in thickness as shown in Figure 27.

Remove nut at top of shock absorber as shown in Figure 28, and remove shock from control arm. Remove nut from bottom of shock and remove shock from mounting bracket.

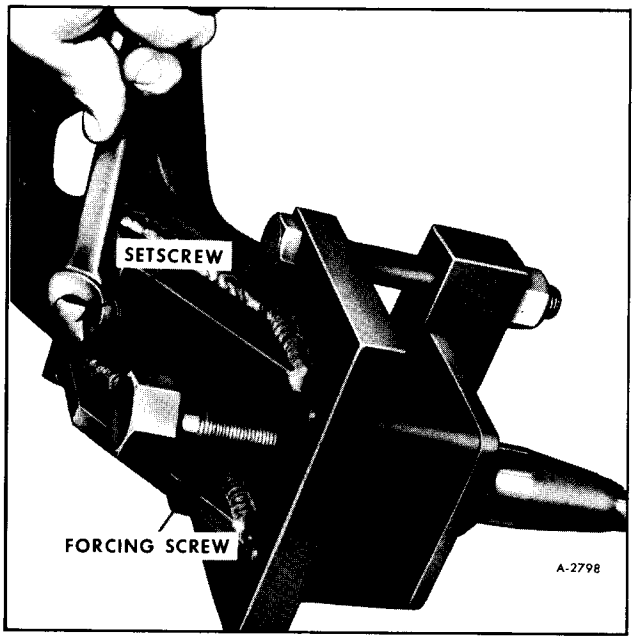


Figure 26—Spindle Removal

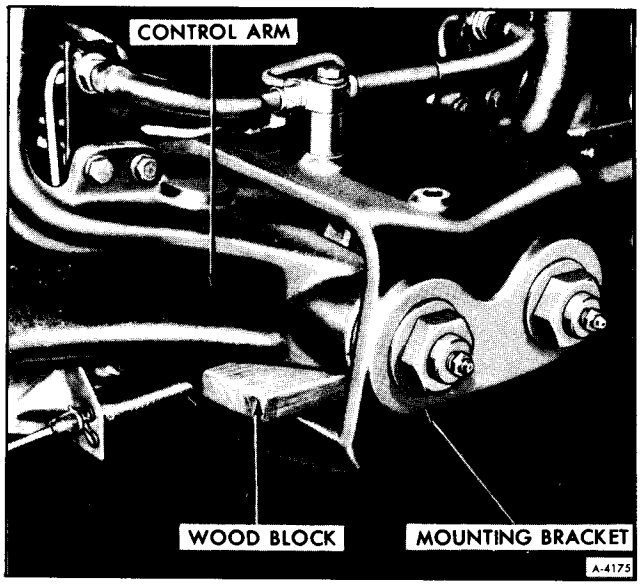


Figure 27—Positioning Wood Block Under Control Arm

POWER LEVEL VALVE REMOVAL

1. Bleed air from reservoir tank and place valve in lower position.

2. Remove four screws on mounting panel.

3. Remove control knobs by removing Allen head screw in center of knobs (See figure 29).

4. Remove two screws holding each valve to mounting panel.

5. Disconnect three fittings from the back of each valve as shown in Figure 30 and remove valves.

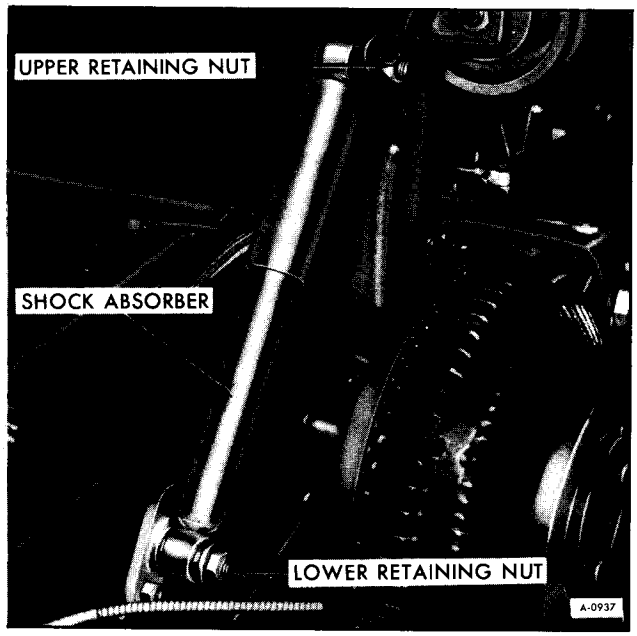


Figure 28—Removing Shock Absorber Retaining Nuts

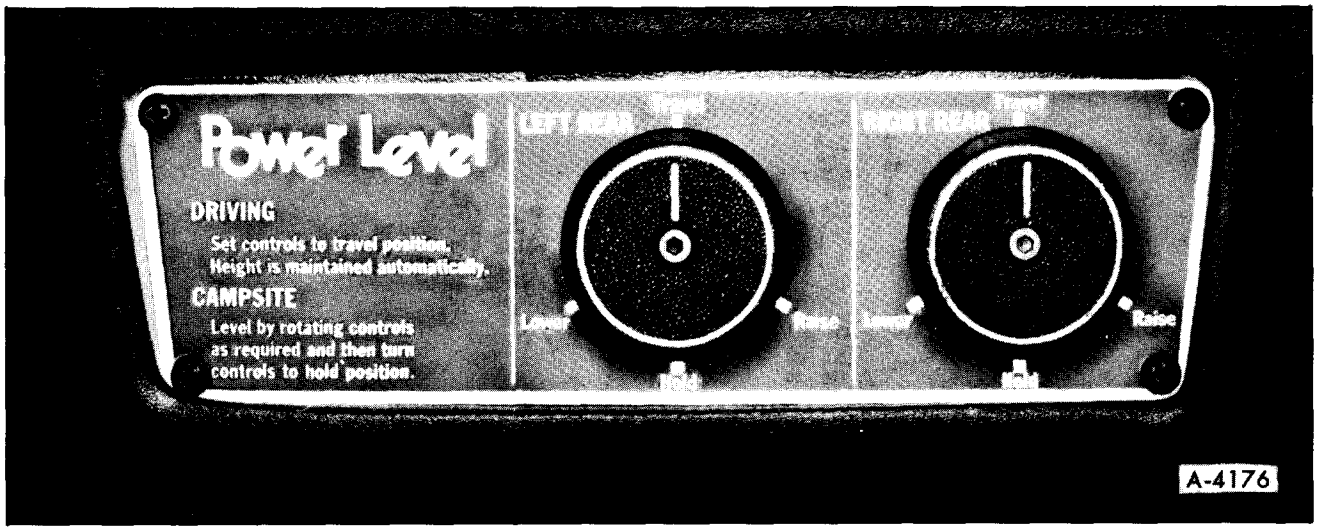


Figure 29—Power Level Control Panel

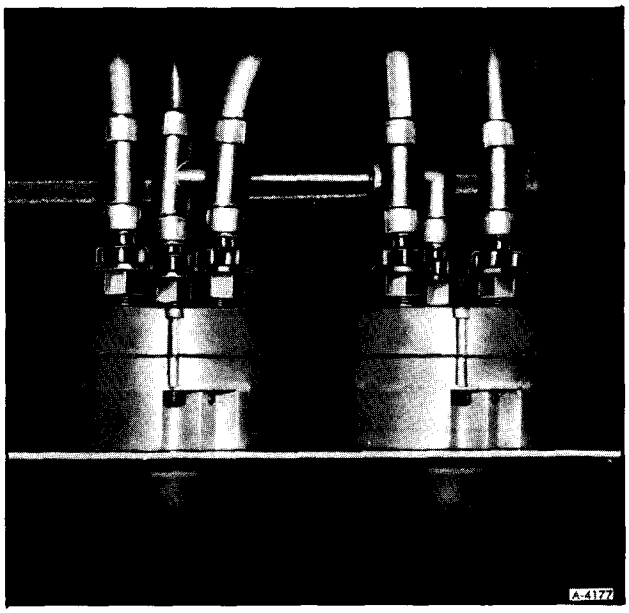


Figure30—Power Level Valves and Fittings

COMPRESSOR OVERHAUL

(BROWN, SINGLE PISTON)

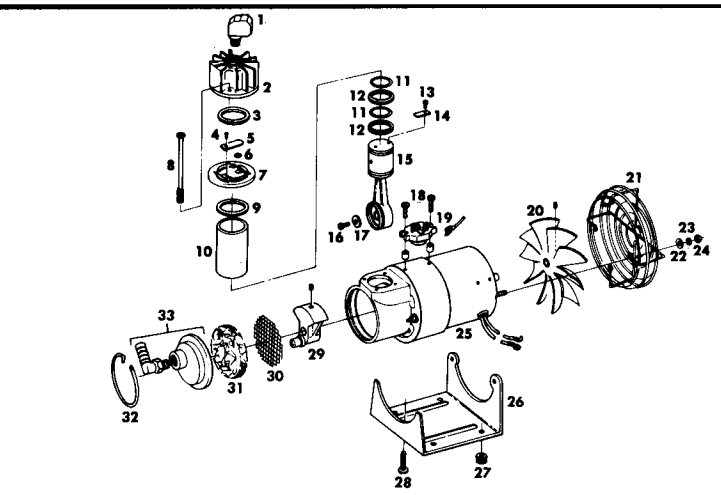
(FIGURE 31)

PISTON RING REPLACEMENT

It is recommended that when the piston rings are replaced, the sleeve and expander rings be replaced also.

1. Remove compressor from vehicle.

2. Remove four screws from piston dome as shown in Figure 32. Remove piston dome and its gasket. Remove valve plate and its gasket.



1 Elbow	8 Screw	15 Piston and Rod Assembly	21 Fan Guard	28 Screw
2 Dome	9 Gasket	16 Screw	22 Lock Washer	29 Eccentric
3 Gasket	10 Sleeve	17 Washer	23 Washer	30 Screen
4 Screw	11 Expander	18 Screw	24 Nut	31 Filter
5 Valve	12 Ring	19 Heat Switch	25 Motor	32 Retainer
6 O-Ring	13 Screw	20 Blade	26 Base	33 Intake Manifold
7 Plate	14 Valve		27 Grommet	A-4306

Figure 31—Brown Compressor Exploded View

3. Referring to Figure 33, remove piston sleeve.

4. Remove and replace piston rings and expanders.

NOTE: There is an expander located under each piston ring. The expander is an O-ring.

5. Install new piston sleeve.

6. Install valve plate and new gasket.

7. Install piston dome and new gasket, and retain in position with four screws.

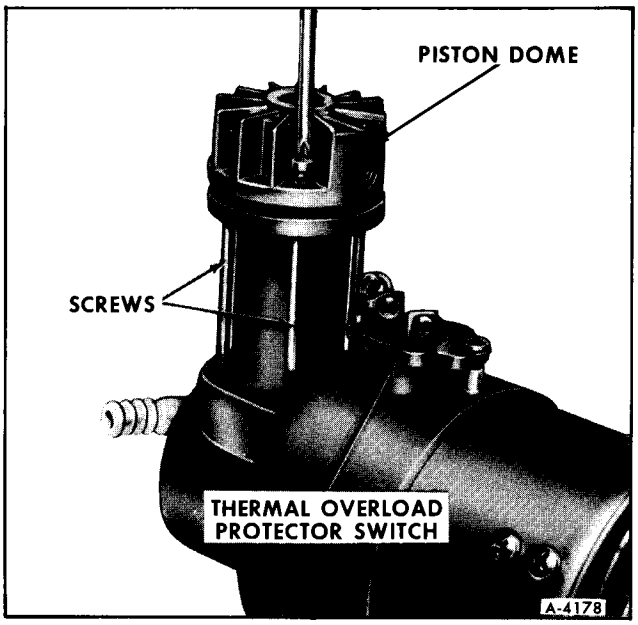


Figure 32—Removing Screws From Piston Dome

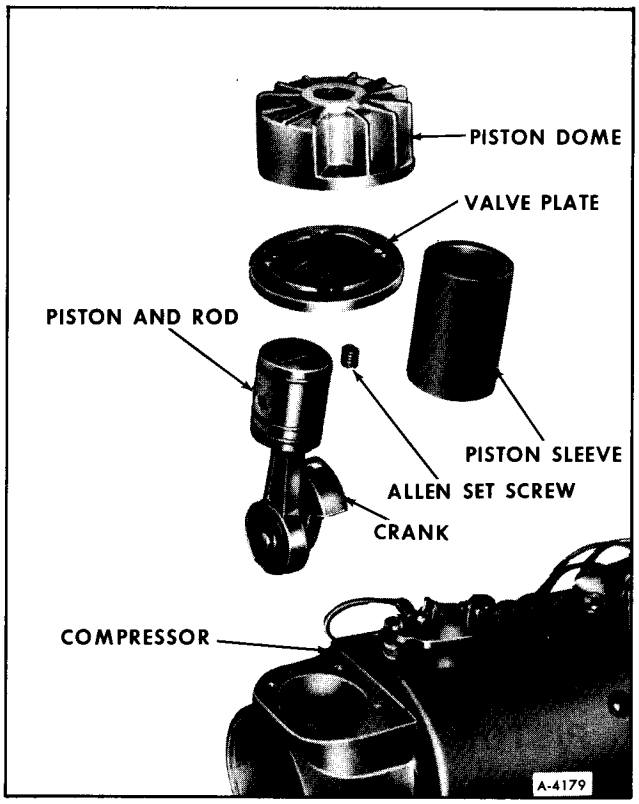


Figure 33—Compressor Components

INTAKE VALVE REPLACEMENT

REMOVAL

1. Remove air compressor from vehicle.

2. Remove four screws from piston dome. Remove piston dome and its gasket, then remove valve plate and its gasket.

3. Remove piston sleeve.

4. Remove screw from valve on top of piston and remove valve.

INSTALLATION

1. Install valve and screw retaining it on the piston.

2. Install piston sleeve.

3. Install valve plate and its gasket and install piston dome and its gasket. Install four screws in piston dome.

EXHAUST VALVE REPLACEMENT

REMOVAL

1. Remove air compressor from vehicle.

2. Remove four screws from piston dome. Remove piston dome and its gasket. Remove valve plate and its gasket.

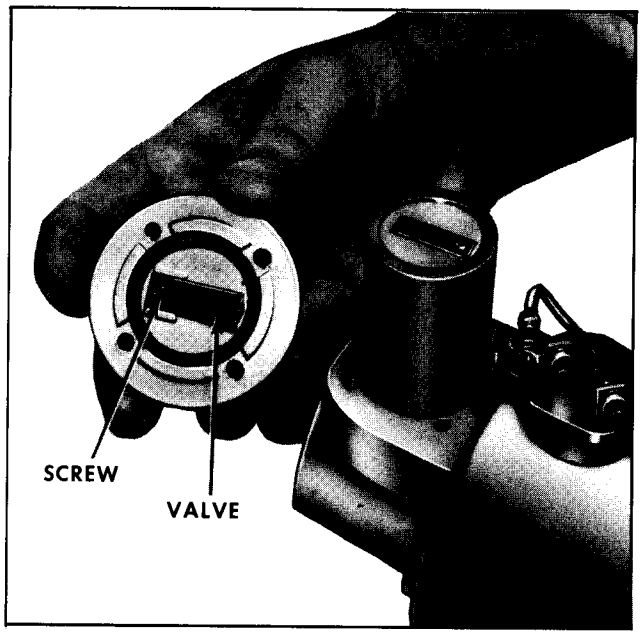


Figure 34—Removing Retaining Screw From Exhaust Valve

Figure 35—Loosening Allen Screw on Eccentric

3. Remove retaining screw from exhaust valve and remove valve as shown in Figure 34.

4. Remove "O" ring under valve.

INSTALLATION

1. Install "O" ring by first applying a small amount of silicone rubber cement or equivalent in recess for "O" ring. Then set "O" ring in place.

2. Install valve and retain in position on valve plate with screw.

3. Install valve plate and its gasket, and install piston dome and its gasket. Replace four screws in piston dome.

PISTON REPLACEMENT

REMOVAL

1. Remove air compressor from vehicle.

2. Remove four screws from piston dome. Remove piston dome and gasket. Remove valve plate and gasket.

3. Remove piston sleeve.

4. Remove air filter.

5. Rotate eccentric (figure 36) until piston is at the bottom of its stroke.

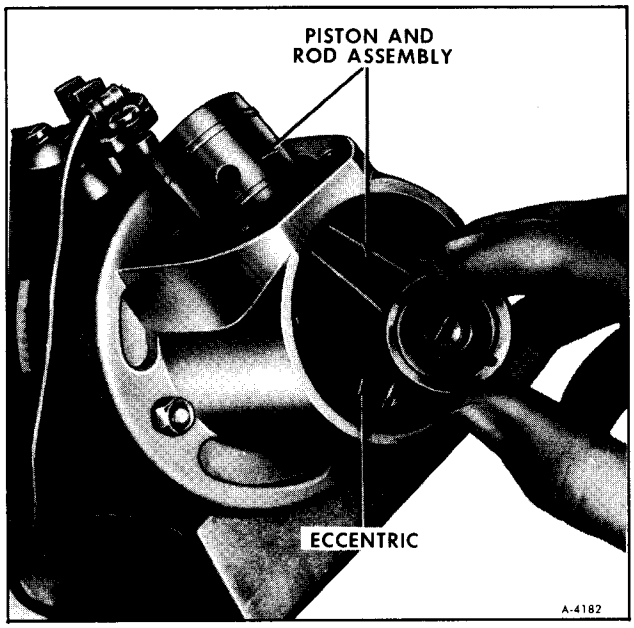


Figure 36—Removing Compressor Piston

6. Referring to Figure 35, loosen Allen Head set screw which is at top of eccentric.

7. Remove eccentric from motor output shaft, and remove piston assembly through air filter opening as shown in Figure 35.

8. Remove piston rings and piston ring expanders.

INSTALLATION

1. Install piston rings and piston ring expanders.

2. Place piston assembly in position with eccentric on motor output shaft. The eccentric must be positioned to contact the bearing on the motor.

3. Tighten Allen Head set screw on eccentric to at least 5 ft. lbs. torque.

4. Install piston sleeve.

5. Install valve plate and gasket, and install piston dome and gasket.

6. Install four screws in piston dome.

7. Install air filter.

MOTOR REPLACEMENT

REMOVAL

1. Remove air compressor from vehicle.

2. Remove four screws from piston dome. Remove piston dome and its gasket. Remove valve plate and its gasket.

3. Remove piston sleeve.

4. Remove air filter.

5. Rotate eccentric until it is at the bottom of its stroke.

6. Referring to Figure 35, loosen Allen Head set screw which is at top of eccentric.

7. Remove eccentric from motor output shaft, and remove piston assembly through air filter opening as shown in Figure 36.

8. Remove two nuts holding on fan blade guard and remove the guard.

9. Loosen Allen Head set screw in fan hub, and remove fan blades.

INSTALLATION

1. Install fan blades and tighten Allen Head set screw.

2. Install fan blade guard.

3. Place piston assembly in position with eccentric on motor output shaft. The eccentric must be positioned to contact the bearing on the motor.

4. Tighten Allen Head set screw, on eccentric to at least 5 ft. lbs. torque.

5. Install piston sleeve.

6. Install valve plate and its gasket, and install piston dome and its gasket.

7. Install four screws in piston dome.

8. Install air filter.

9. Install compressor in vehicle.

FAN REPLACEMENT

REMOVAL

1. Remove two nuts from fan guard and remove guard.

2. Loosen Allen Head set screw at center of fan hub. Remove fan from motor shaft.

INSTALLATION

1. Install fan on motor shaft, tighten Allen Head set screw.

2. Install fan guard and install two nuts.

THERMAL OVERLOAD PROTECTOR SWITCH (FIGURE 32)

The Brown compressor has a thermal overload protector switch mounted in the top of the compressor body. The switch is designed to turn the compressor off in the event that its temperature reaches a level where the motor can be damaged. When the temperature drops to a safe level the switch allows the compressor to operate.

COMPRESSOR OVERHAUL

(DANA, DOUBLE PISTON FIGURE 37)

TIMING BELT

REMOVAL

1. Remove one screw located above label on face of belt guard and remove belt guard (figure 38).

2. Rotate the compressor by hand and gradually work the belt off the two pulleys installed with flanges toward the mounting bracket.

INSTALLATION

NOTE: While installing the timing belt, time the compressor as follows:

1. Remove intake assembly. See "Intake Assembly - Removal" later in this section.

2. Rotate the compressor pulleys to position one piston and rod assembly at the top of its stroke and the other piston and rod assembly at the bottom of its stroke (figure 39).

3. Place the timing belt on the pulley with the flange to the front and gradually work the belt onto the other two pulleys (figure 40).

4. Rotate the compressor by hand until the timing belt is completely onto the pulleys.

NOTE: Following installation of belt, check timing of pistons (See figure 39).

5. Replace belt guard and secure with one screw. Replace intake assembly (following section).

INTAKE ASSEMBLY

REMOVAL

1. Remove air intake tubes from intake assemlies at back of housings (figure 41).

2. Remove two spring wire filter retainers.

3. Remove intake assemblies with "O" rings. The air filter is in the assembly.

4. Pinch the air filter between the thumb and forefinger and remove it from behind the retaining ring still in place. Replace the filter or clean with soap and water and squeeze dry. Install the air filter through the retaining ring and work into place with light finger pressure (figure 42).

INSTALLATION

1. Install air intake assemblies and "O" rings.

2. Install two spring wire filter retainers.

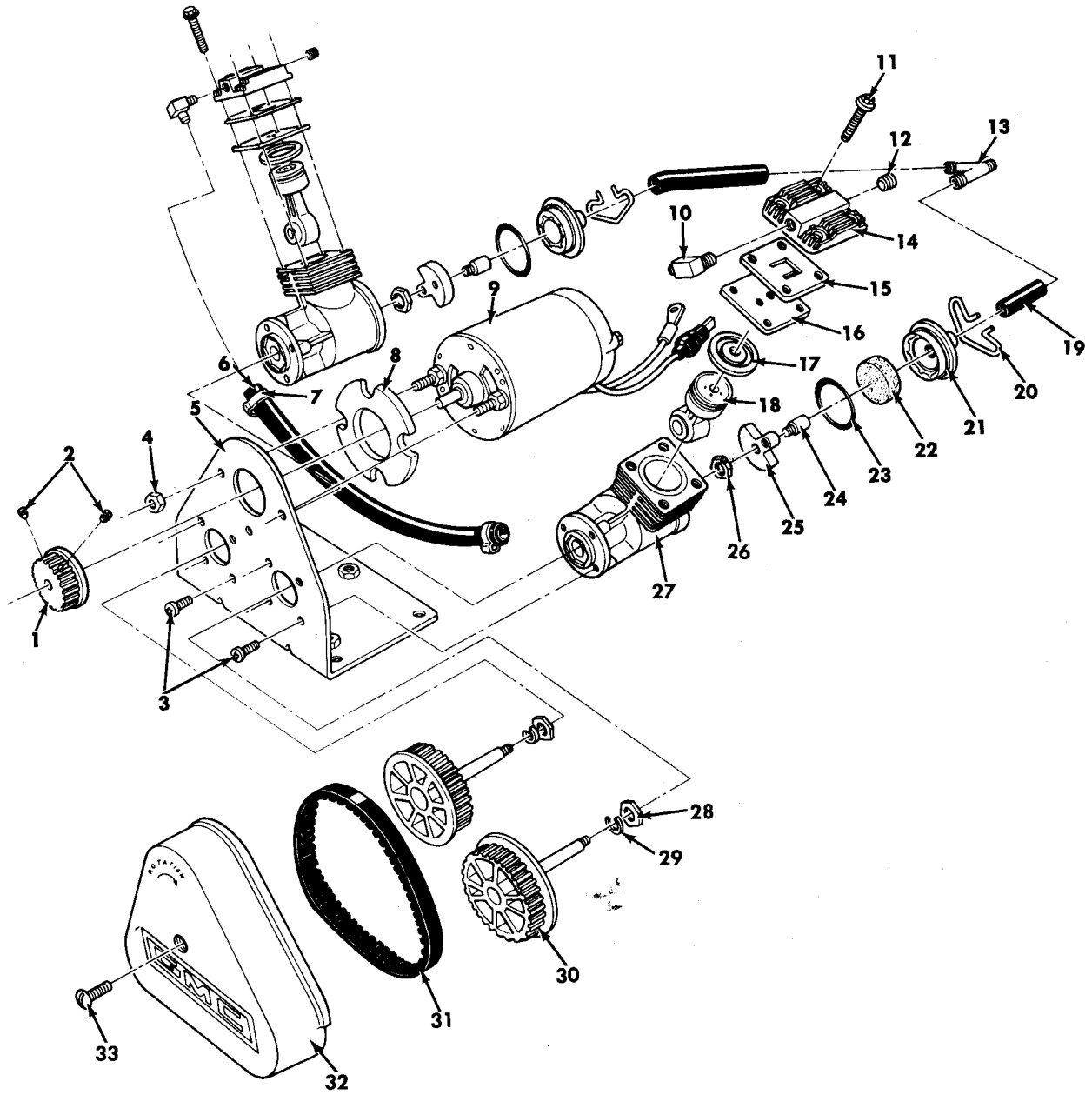
3. Install air intake tubes to intake assemblies at back of housings.

MOTOR ASSEMBLY

REMOVAL

1. Remove belt guard and timing belt.

2. Loosen two headless set screws in pulley and slide pulley off motor shaft.



1 Motor Pulley
2 Screw
3 Screw
4 Nut
5 Mounting Bracket
6 Hose
7 Clamp
8 Spacer
9 Motor
10 Connector
11 Screw
12 Plug
13 Tee
14 Head
15 Exhaust Valve
16 Head Plate
17 O-Ring
18 Piston and Rod Assembly
19 Tubing
20 Filter Retainer
21 Intake
22 Filter
23 O-Ring
24 Crank Pin
25 Crank
26 Thrust Washer
27 Housing Assembly
28 Thrust Washer
29 Retaining Ring
30 Pulley
31 Belt
32 Belt Guard
33 Screw

A-4183

Figure 37—Dana Compressor Exploded View

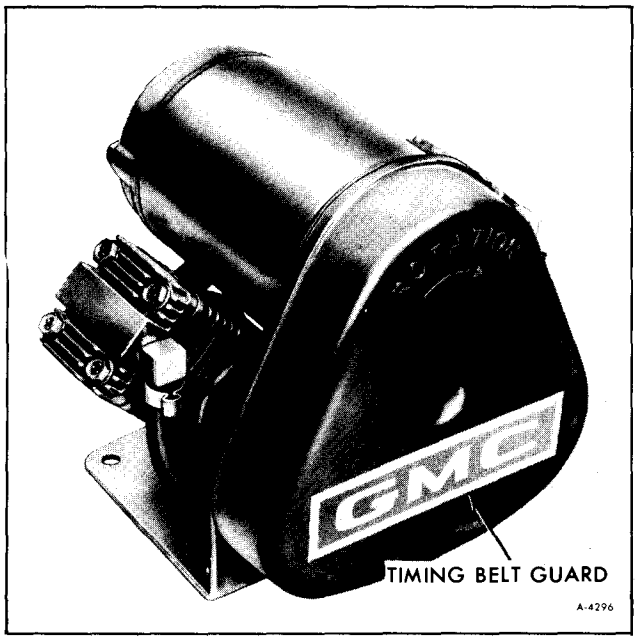


Figure 38—Compressor Belt Guard

3. Remove two hex nuts that hold motor to bracket and remove motor (figure 43).

INSTALLATION

1. Install motor on bracket and secure with two hex head nuts.

2. Slide pulley on motor shaft and secure with two headless set screws.

3. Install belt guard and timing belt.

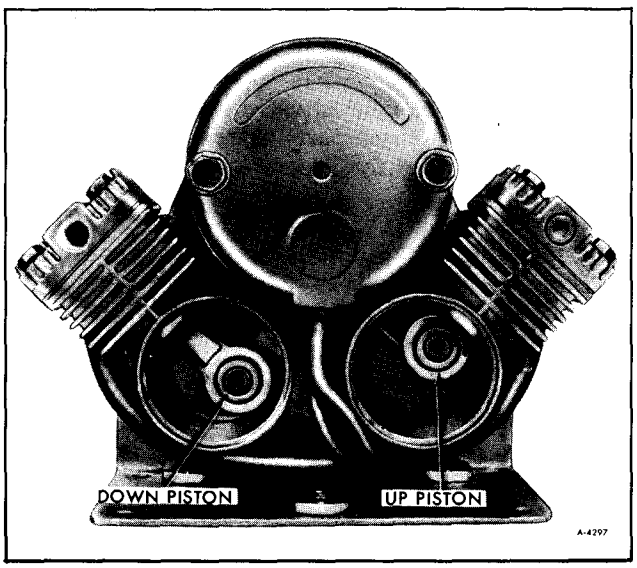


Figure 39—Timing Position

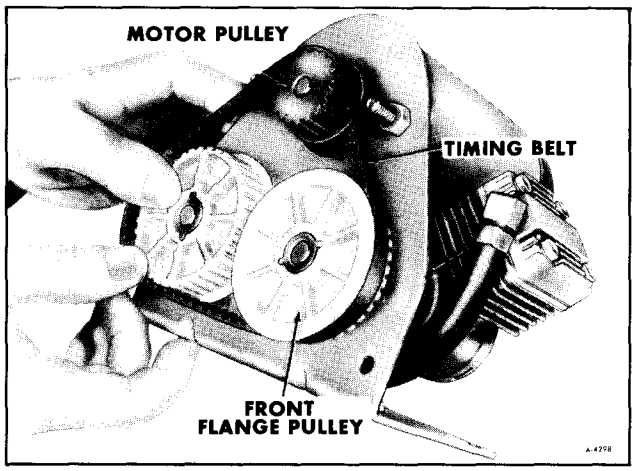


Figure 40—Replacing Timing Belt

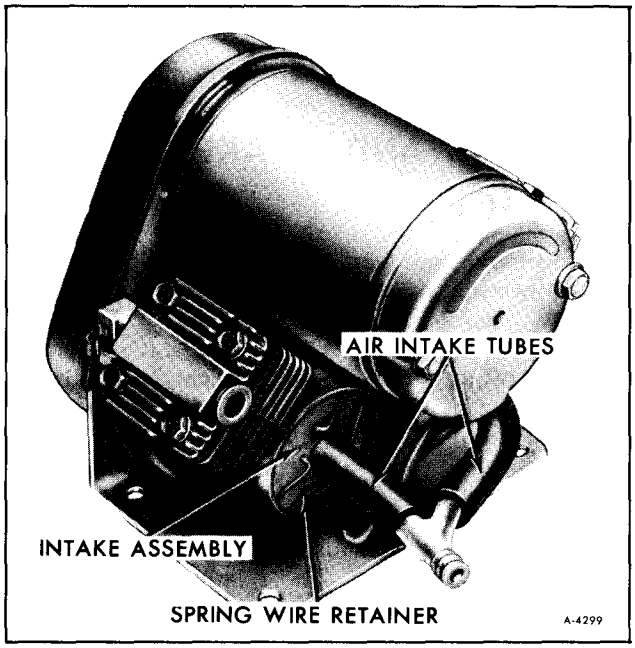


Figure 41—Back of Compressor

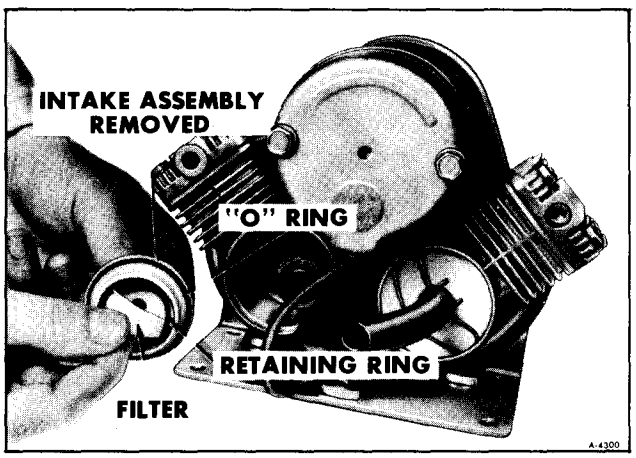


Figure 42—Air Filter Removal

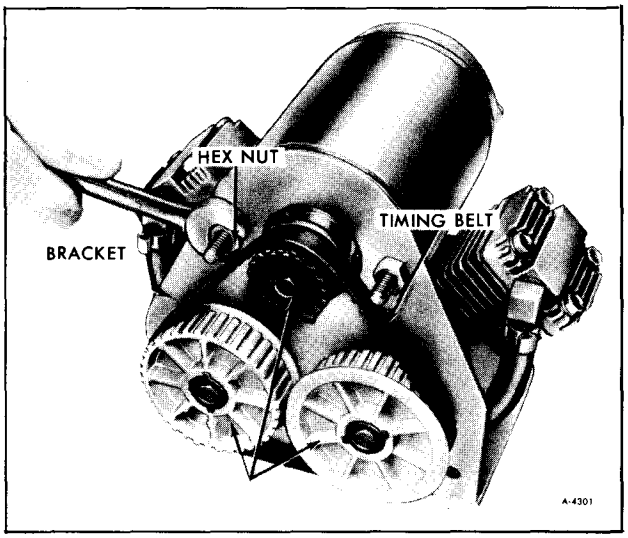


Figure 43—Motor Removal

EXHAUST AND INTAKE VALVES

REMOVAL

1. Remove four hex head screws holding valve head to housing assembly (figure 44).

2. The head, exhaust valve, and head plate usually come off as a unit. These parts can be gradually worked apart by inserting a knife blade between the head and exhaust valve (figure 45).

IMPORTANT: Note the relationship of the red silicone rubber exhaust valve reed to the valve holes in head plate. The relationship must be maintained to insure the proper compressor operation.

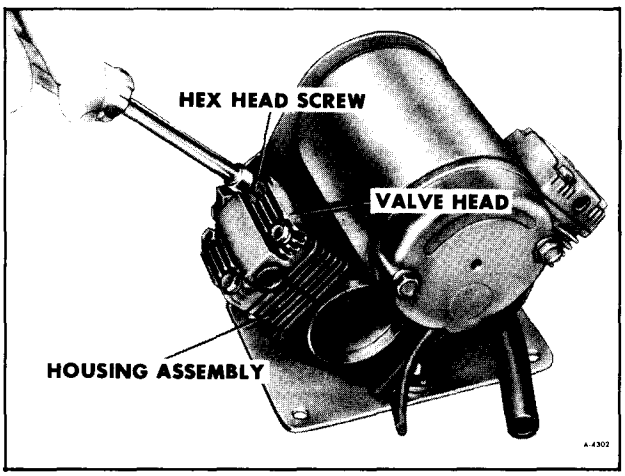


Figure 44—Valve Head Removal

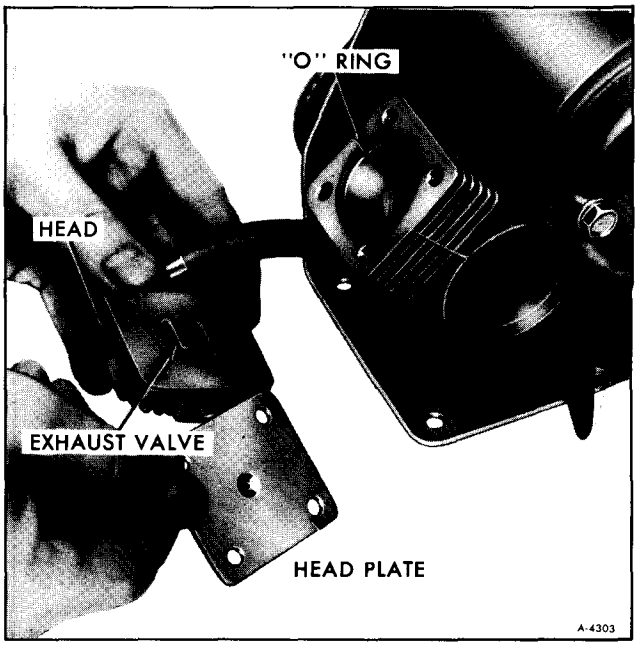


Figure 45—Valve Components

3. Lift the "O" ring seal out of recess on top of housing assembly.

4. Remove the round red silicone rubber intake valve on top of piston by working it off the center rivet.

INSTALLATION

1. To install round red silicone rubber intake valve put a slight amount of engine oil on the center rivet of piston. The valve will rotate freely when it is completely installed.

2. Replace "O" ring seal in recess on top of housing assembly.

3. Install head, exhaust valve, and head plate. It is important that these parts be reassembled in the correct relationship for proper compressor operation.

4. Install head assembly to housing assembly with four hex head screws.

PISTON AND ROD, SHAFT AND PULLEY

REMOVAL

1. Remove belt guard and timing belt.

2. Remove intake assembly.

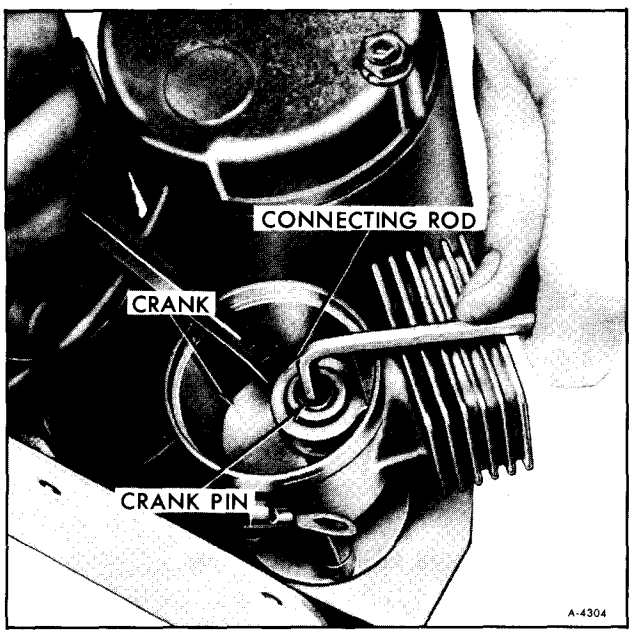


Figure 46—Crank Pin Removal

3. Remove exhaust and intake valves.

4. Remove crankpin, centered in lower end of connecting rod, with a hex key wrench. Hold the appropriate compressor pulley by hand or screwdriver while loosening crank pin (figure 46).

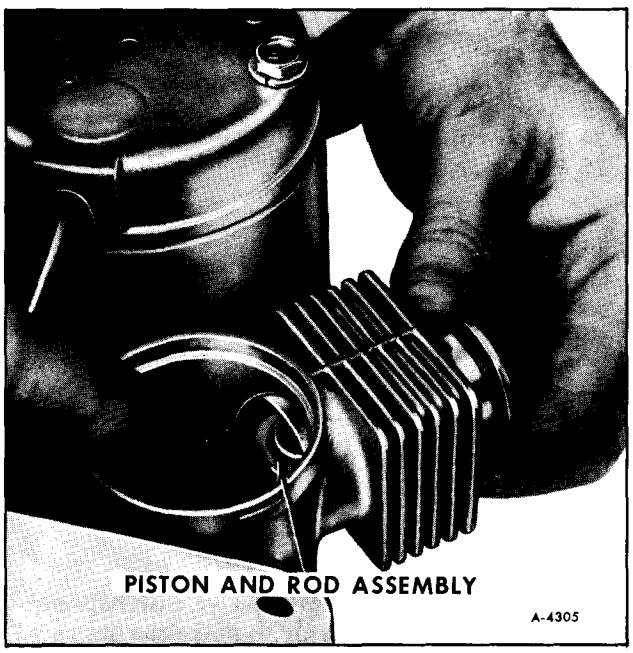


Figure 47—Piston and Rod Assembly Removal

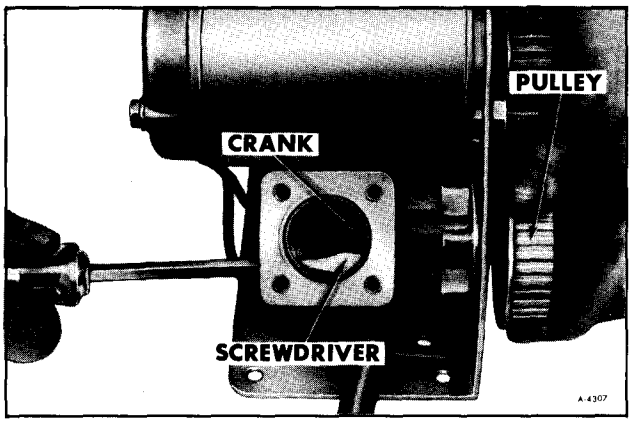


Figure 48—Removing Pulley Shaft From Crank

5. Push the piston and rod assembly through top of housing assembly (figure 47).

6. Use a screwdriver to wedge the crank inside the crankcase and unscrew the shaft and pulley assembly (figure 48).

7. Slide pulley and shaft assembly out of housing.

INSTALLATION

1. Install pulley and shaft assembly in housing with two black plastic hex thrust washers in respective recesses, inside and outside the housing.

2. Put piston and rod assembly through top of housing assembly. Bearing in lower end of connecting rod must be installed with printing outward. This is necessary for clearance.

3. Hold appropriate compressor pulley by hand and secure crank pin to lower end of connecting rod with hex key wrench.

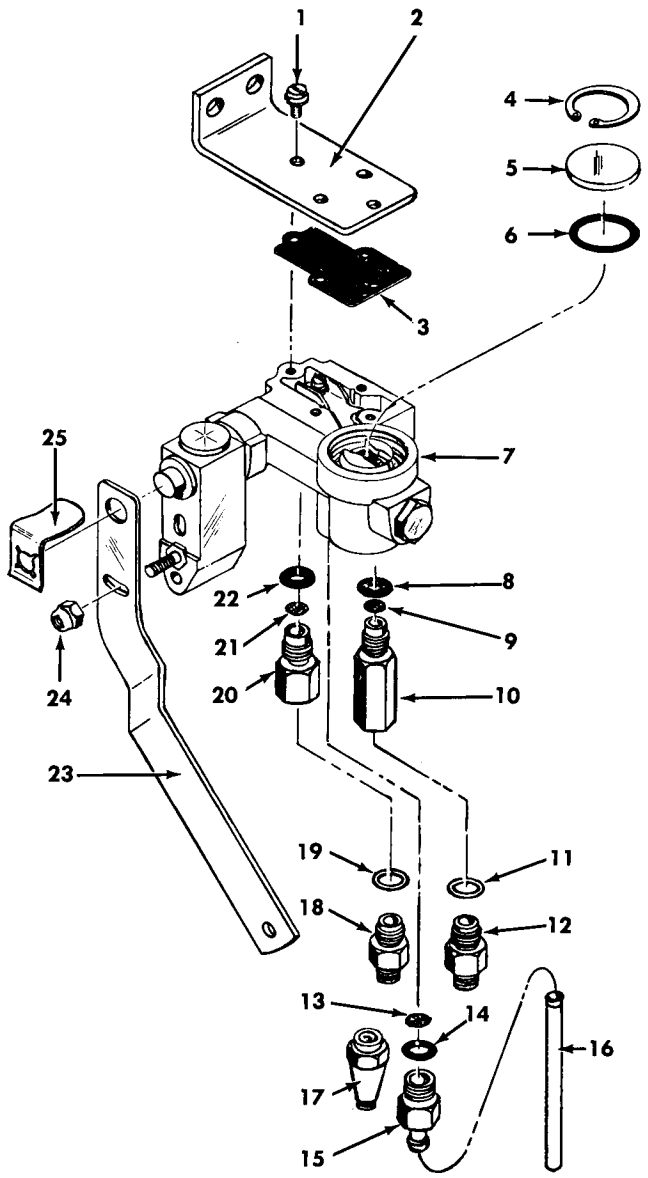
4. Install exhaust and intake valves.

5. Install intake assembly.

6. Install timing belt and belt guard.

HEIGHT CONTROL VALVE OVERHAUL

IMPORTANT: Height control valve-overhaul will be limited as shown in Figure 49. If repair procedures require replacement of valve body be sure to install new "O" rings and screens, as shown in Figure 49.



1 Screw, Cover Plate & Mounting Bracket
2 Cover Plate and Mounting Bracket
3 Gasket, Cover Plate & Mounting Bracket
4 Retaining Ring
5 Retainer, Delay Piston
6 "O" Ring
7 Valve Body
8 "O" Ring
9 Screen
10 Intake Valve Adapter Assembly
11 Gasket
12 Adapter
13 Screen
14 "O" Ring
15 Check Valve - Exhaust
16 Exhaust Tube
17 Tube Fitting
18 Adapter
19 Gasket
20 Adapter Assembly
21 Screen
22 "O" Ring
23 Arm
24 Nut, Arm Retaining
25 Fastener, Plug Retaining

Figure 49—Height Control Valve

HEIGHT CONTROL VALVE ADJUSTMENTS

GENERAL

To properly adjust the height control valve, it is ESSENTIAL that the following procedures be followed and in the sequence mentioned:

Three main adjustments are required:

1. Overtravel lever center position adjustment.

2. Air intake and exhaust valve lever gap adjustments.

3. Time delay check.

NOTE: The height control valve assembly must be removed from vehicle to make the above adjustments.

Instructions for checking the ride height dimensions are explained under "Ride Height Check and Adjustment."

IMPORTANT: The silicone fluid should be drained from control valve assembly before making the first two adjustments.

OVERTRAVEL LEVER CENTER POSITION ADJUSTMENT

1. Clean exterior of control valve assembly.

2. Remove cover and rubber O-ring from valve assembly, then drain off the Silicone fluid.

3. Remove exhaust fitting (15, figure 49) and exhaust screen (13, figure 49) from control valve.

4. Referring to Figure 51, scribe a line 1-3/8 inch from plug end of overtravel lever control body.

5. Place control valve assembly in vise as shown in Figure 53.

6. If vacuum source is available, attach supply hose to valve exhaust port (figure 50) using Sun Tester fitting #115-3 or equivalent. Do not apply vacuum at this time.

7. Attach air pressure supply hose to air inlet port (figure 50). Do not apply pressure at this time.

8. Locate dial indicator in position as shown in Figure 51. Move overtravel lever to full air exhaust position — TOP OF DELAY PISTON FLUSH WITH TOP OF BORE - without overtraveling (position "C," figure 52). Relocate indicator push rod to just contact 1-3/8-inch mark on control body and reset indicator dial to zero at this point (position "C", figure 42).

9. Move overtravel lever to full air intake position without overtraveling (position "A", figure 52) (delay piston at bottom of bore). Take indicator reading which may vary from 0.160" to 0.190".

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

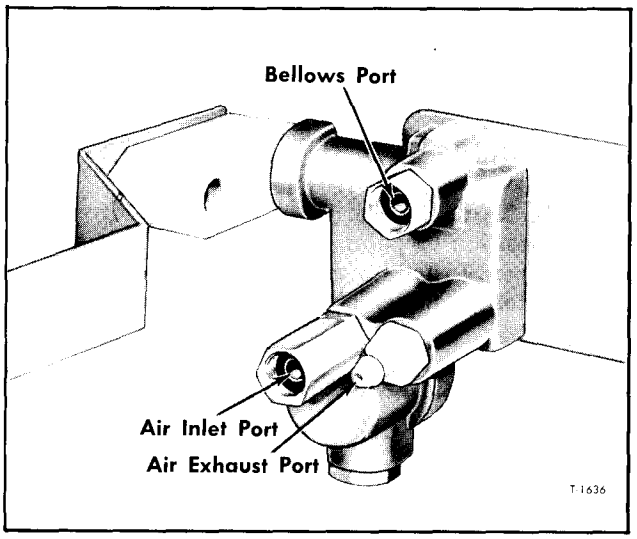


Figure 50—Height Control Valve Port Identification

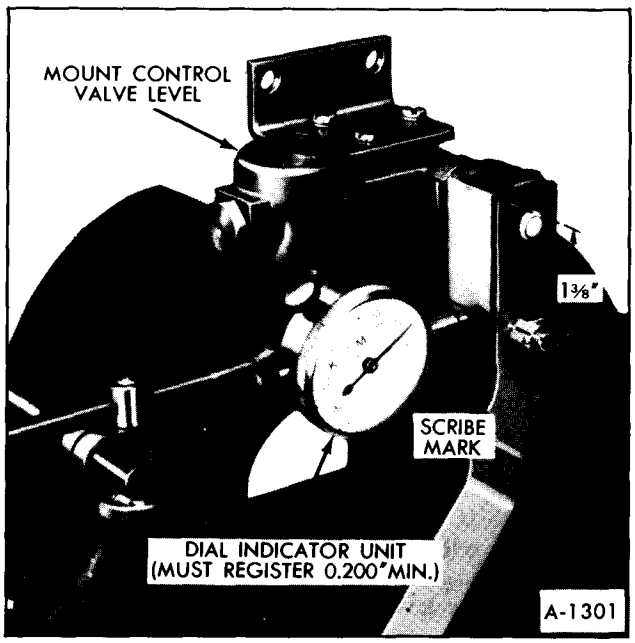


Figure 51—Dial Indicator Properly Installed

11. Divide the total travel dimension by two (example: 0.170" ÷ 2 = 0.085"), then move overtravel lever back this amount (0.085") to the center (position "B," figure 52).

IMPORTANT: Without disturbing lever center position, reset indicator dial to zero, which actually is 0.100" on indicator of type registering

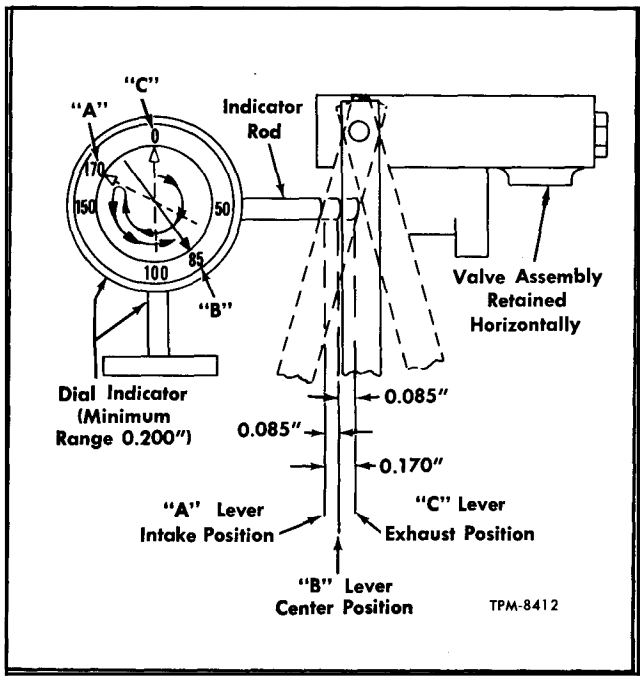


Figure 52—Locating Valve Overtravel Lever Center Position

0.100" for each revolution of indicator needle, then proceed with valve lever gap adjustments following:

AIR INTAKE AND EXHAUST VALVE LEVER ADJUSTMENTS

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

Two methods of adjustment are available:

1. Using Both Air Pressure and Vacuum.

NOTE: If vacuum source is available, this method will take less time to perform adjustment. Vacuum source is used to make the exhaust valve lever gap check only.

2. Using Air Pressure Only.

NOTE: 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.

Method Using Air Pressure and Vacuum

1. If air supply and vacuum lines were not connected to control valve assembly as directed previously when centering valve overtravel lever, connect lines.

2. Apply air pressure and regulate it to 80 to 110 psi. Apply vacuum and regulate it at approximately 15 inches.

3. Move overtravel lever fore and aft several times and then back to true center position.

4. Starting at true 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" to 0.027" from lever center position. Bend lever to correct setting. Refer to Figure 53.

5. Return overtravel lever to center position. Slowly move lever to exhaust side and at same time note the vacuum gauge reading. When vacuum just begins to fall off, the exhaust valve has opened. Valve should open when overtravel lever is moved 0.035" to 0.037" from center position. On both front and rear control valves, bend lever to correct setting. Refer to Figure 53.

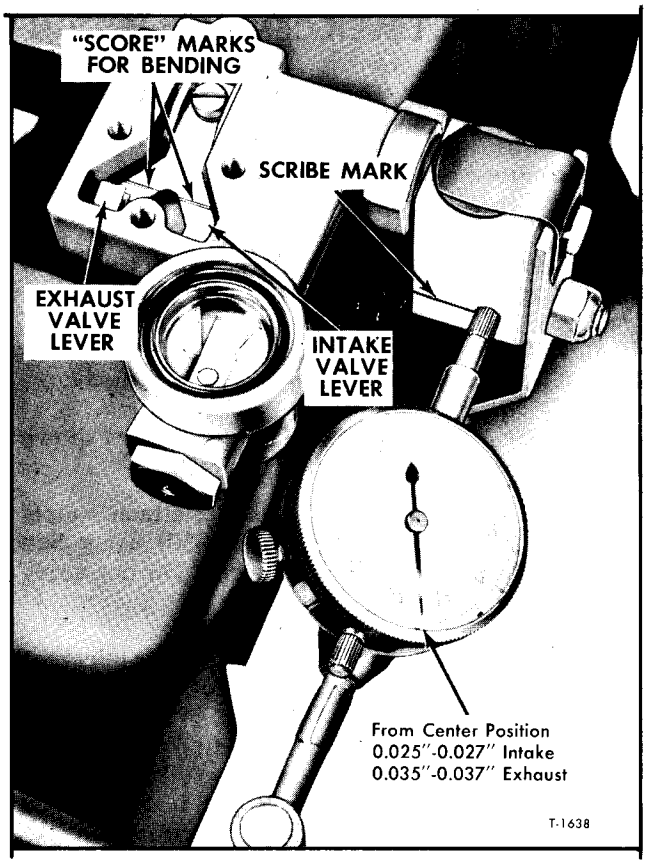


Figure 53—Method of Adjusting Air Valve Lever Gaps

6. Recheck intake and exhaust valve lever gaps, then proceed with "TIME DELAY CHECK" explained later.

Method Using Air Pressure Only

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

1. Connect air supply hose (80 to 110 psi) to air inlet port (figure 50).

2. To adjust air intake valve lever gap:

a. Move the overtravel lever slowly from true center position to point where intake valve just begins to open. Listen for escaping air. Note reading to dial at this point which should register 0.025" to 0.027".

b. Bend lever to correct setting. Refer to Figure 53.

3. To adjust air exhaust valve lever gap:

a. Install valve cover on the valve using the rubber gasket and four attaching screws.

b. Being careful not to disturb indicator setting, disconnect air supply from the air inlet port and connect it to the bellows port (figure 50).

c. Move overtravel lever slowly to open exhaust port while observing the indicator dial. Air should start to escape from exhaust port when indicator registers 0.035" to 0.037". If adjustment is necessary, shut off air pressure supply and remove valve cover. Bend lever to correct setting, then install cover and recheck valve opening dimension.

d. Recheck valve lever gaps, then proceed with "TIME DELAY CHECK" following:

TIME DELAY CHECK

Preliminary Procedures

After the valve lever gaps have been adjusted, do the time delay check. A 4 to 18 seconds delay from the closing of one valve to the opening of the other is recommended. Also, valves should close from full-open position within 4 seconds.

1. Pour 5.5 cc $\pm$ 0.25 cc of Silicone fluid (3,000 Centistokes viscosity at 25°C.) into delay piston bore. With valve body tilted slightly, as shown in Figure 54, 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 (figure 55).

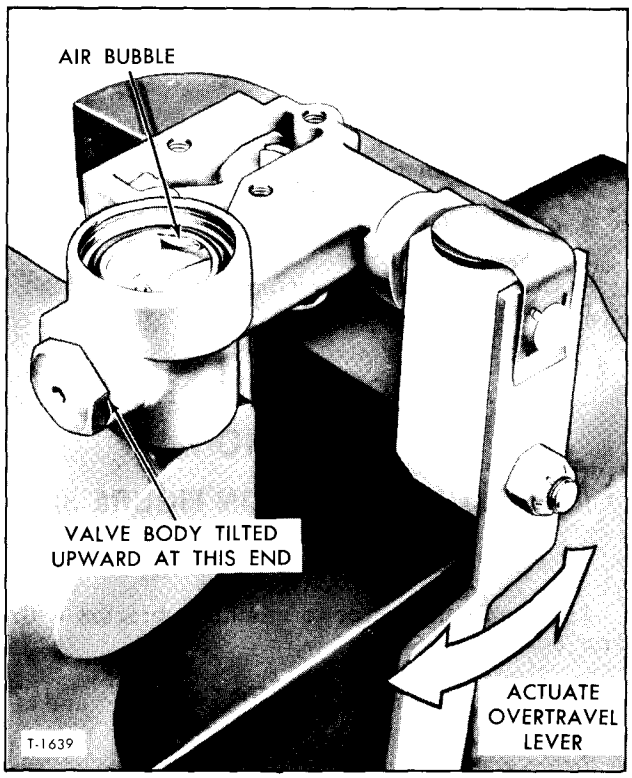


Figure 54—Venting Air From Silicone Fluid

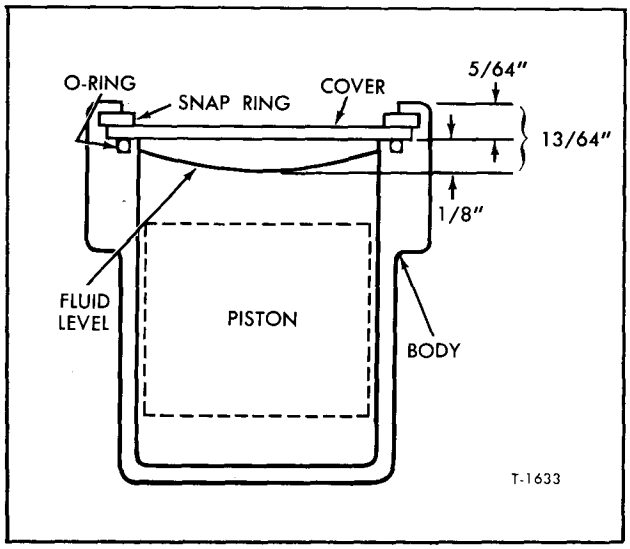


Figure 55—Silicone Fluid Level

IMPORTANT: With valve assembly level, take measurement from center of bore only. Add or Remove fluid to bring fluid to dimension shown in Figure 55. An eyedropper will serve for this purpose.

2. Place new delay piston cover O-ring in groove of valve body. Install cover with retainer.

3. Place valve assembly vertically in holding vise (figure 56).

4. Cycle arm up and down for approximately one minute.

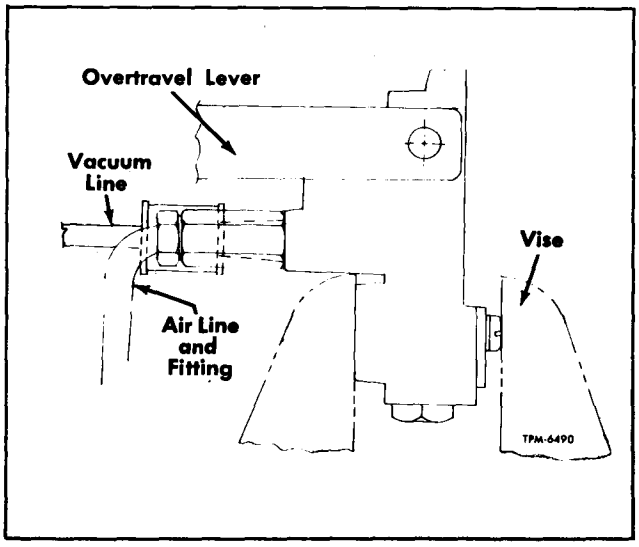


Figure 56—Valve Positioned for Time Delay Check

Air Inlet Time Delay Check

1. Connect air pressure supply hose to valve air inlet port (figure 50).

2. Move overtravel lever upward (quickly) approximately two inches and simultaneously start counting the number of of seconds before air starts to escape from bellows port. A delay of four to eighteen 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.

1. Method Using Vacuum

a. Connect vacuum hose to air exhaust port (figure 50). Adjust vacuum to 15 inches.

b. Move the overtravel lever downward (quickly) approximately two inches and simultaneously start counting the number of seconds before the vacuum gauge starts to drop off. A delay of ten to fifty seconds should exist. Repeat this check.

2. Method Using Air Pressure

a. Install valve cover with rubber gasket on valve assembly.

b. Connect air pressure supply hose to bellows port (figure 50).

c. Move overtravel lever downward (quickly) approximately two inches and simultaneously start counting the seconds before air starts to escape from the exhaust port. A delay of ten to fifty seconds should exist.

IMPORTANT: A time delay over fifty seconds could mean too large a valve lever gap adjustment and a time delay under ten seconds would mean too small a valve lever gap adjustment. If the time delay is not within ten to fifty seconds, first recheck the fluid level. If fluid level is satisfactory, the valve lever gap adjustment must be repeated, step by step.

NOTE: (Refer to figure 49.) After obtaining proper valve adjustments, install valve cover using new rubber gasket (3). Install new screen (21), in bellows port, then using new O-ring (22), install outlet adapter (20) into bellows port. If screen (13) was removed from exhaust port, install new screen and exhaust fitting (15).

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

COMPONENT INSTALLATION

PRESSURE SWITCH INSTALLATION

(FIGURE 8)

1. Connect switch to air line elbow on vehicle.

2. Connect two electrical wires to screws inside switch body.

3. Install switch cover and secure with screw.

AIR COMPRESSOR INSTALLATION

(BROWN, SINGLE PISTON FIGURE 2)

1. Secure compressor frame to mounting bracket with four screws.

2. Connect electrical wire at overheat switch in top of compressor body.

3. Connect hose at back of compressor.

4. Connect air line to piston dome.

AIR COMPRESSOR INSTALLATION

(DANA, DOUBLE PISTON FIGURE 3)

1. Secure compressor to mounting bracket with three bolts.

2. Connect air lines at back of compressor and at head of one piston.

3. Connect electrical wires at back of compressor motor.

AIR RESERVOIR INSTALLATION

(FIGURE 9)

1. Install mounting brackets, safety valve, and Schrader valve on air reservoir body. Install drain cock if used.

2. Install pressure switch to air line at front of air reservoir.

3. Install air reservoir in vehicle with two bolts and nuts through the front mounting bracket and two nuts and bolts through the rear mounting bracket.

4. Connect two air lines to side of reservoir.

5. Connect pressure switch wiring, and install switch cover.

HEIGHT CONTROL VALVE INSTALLATION

Before installing height control valve assembly, see that air line fittings are clean and undamaged.

NOTE: DO NOT USE SEALING COMPOUND ON THREADS. Sealer is unnecessary, and if used, may cause valves to stick. Absolute cleanliness is essential when installing height control valves. Dirt and sealing compound must be kept out of valves. Even minute particles of foreign matter may become lodged in valve cores or flapper valves and may seriously affect operation of suspension system.

1. Position height control valve at mounting studs on wheelwell. Attach with two nuts and tighten to 80-120 in. lbs. torque.

2. Connect air supply line to intake adapter, connect bellows air line to outlet adapter. Tighten air line connector nuts firmly.

3. Connect height control valve overtravel lever to valve link and tighten to 60-90 ft. lbs. Build up air pressure in system and test for leaks. Check ride height dimension and adjust if necessary as described later in this section.

AIR BELLOWS INSTALLATION

1. Place air bellows piston on floor, cone section pointing up. Place air bellows in piston, with open end pointing up.

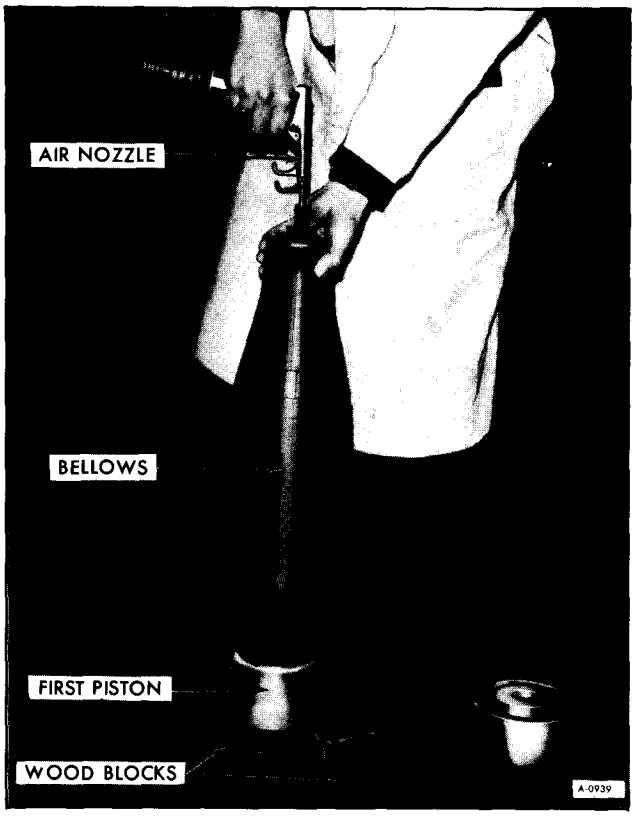


Figure 57—Applying Shop Air to Air Bellows

2. Referring to Figure 57, apply shop air to bellows while pushing down on bellows, release air pressure. The bellows will fold over the piston.

3. Place second piston over top of bellows and apply shop air again as shown in Figure 58. Push down on bellows and release air pressure. Bellows will fold over piston. Completed bellows assembly should appear as shown in Figure 39.

4. Raise rear wheels to bring top of control arms close together. Block control arm is shown in Figure 70. Place air bellows in position. Install star washers and lock nuts. Torque lock nuts to 50-60 ft.-lbs.

5. Connect air line and move height control valve arm up to apply air to bag.

6. Connect leveling valve link. Lower vehicle to ground and allow leveling valve to bring it to proper ride height.

CONTROL ARM INSTALLATION

1. With the aid of hammer as shown in Figure 60, tap two back hat section spacers in mounting bracket to provide more room for control arms in bracket.

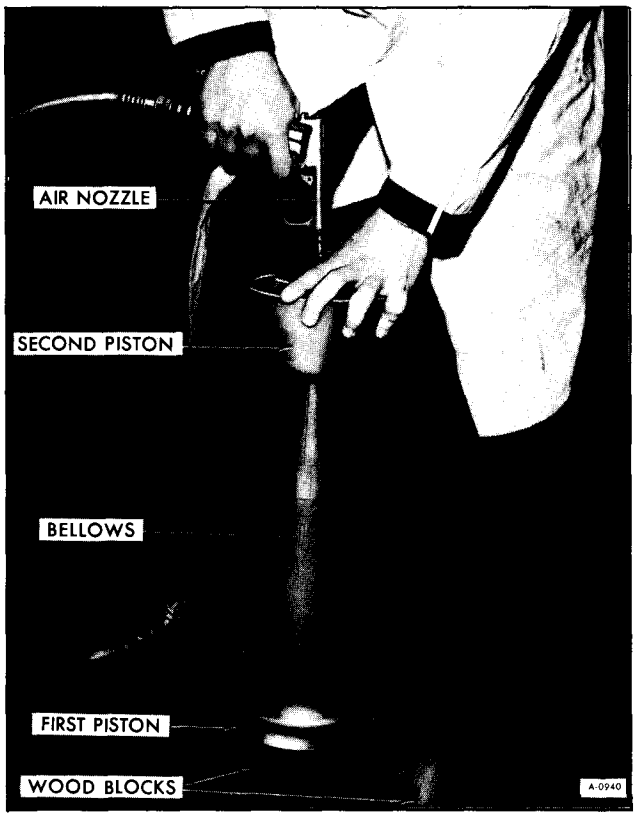


Figure 58—Installing Second Piston on Air Bellows

2. Place control arm in position in mounting bracket. Position thrust pack journal bearing between control arm and mounting bracket. (See figure 63).

3. Press bracket pins into proper position.

4. Install control arm lock nuts.

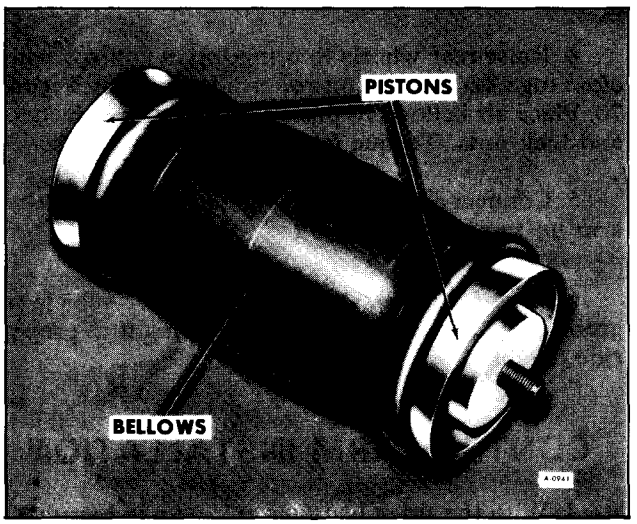


Figure 59—Air Bellows Assembly

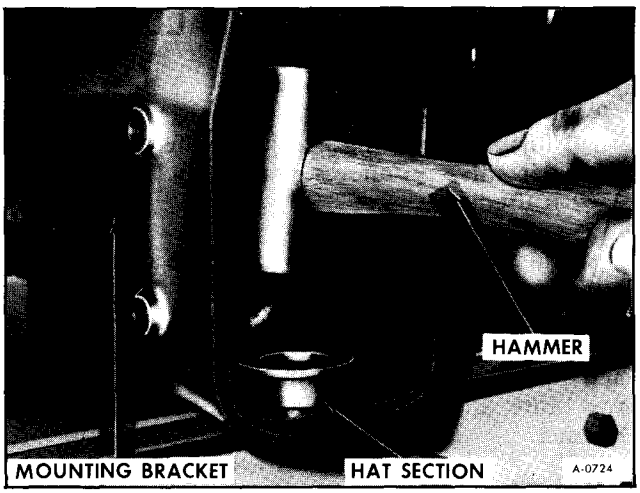


Figure 60—Repositioning Hat Section

5. Tighten control arm lock nuts until hat section spacers are firmly seated, then back off nut until control arm moves freely, and retorque nuts to 15-20 ft. lbs.

6. Install spindle with keyway up as shown in Figure 61 using bolts and nuts to draw spindle into suspension arm.

7. Remove spindle bolts and nuts.

8. Install backing plate assembly, new bolts, washers and nuts as shown in Figure 62. Torque bolts 35-45 ft. lbs.

9. Referring to Figure 21, position unit on vehicle and install four bolts from mounting bracket to frame rail. Install two bolts from mounting bracket to frame crossmember (See figure 20).

10. Referring to Figure 20, install brake backing plate by installing four bolts and nuts that secure plate to control arm.

11. Referring to Figure 18, install brake drums and hubs on spindle. Tighten castilated nut (figure 17) to 25-30 ft. lbs., back nut off one half turn and then finger tighten until cotter pin can be installed.

12. Install shock absorbers to control arms.

13. Install brake lines. Connect all mounting brackets and connect lines at brake backing plates and at control arm mounting bracket.

14. Referring to Figure 13, install air bellows.

15. Referring to Figure 11, connect leveling valve link and torque nut to 60-90 in. lbs.

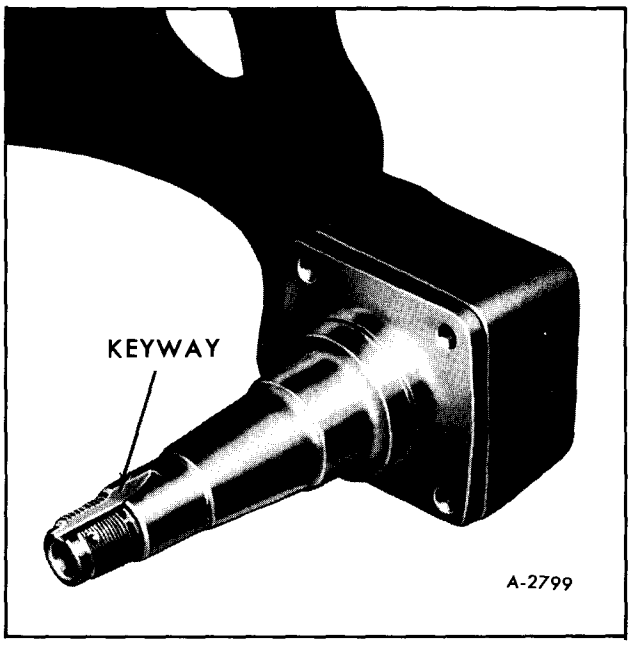


Figure 61—Spindle Installed

16. Apply air to bellows.

17. Install tire and wheels.

18. Lower vehicle to floor and allow leveling valve to bring vehicle to ride height.

19. Bleed brakes as described in Section 5 Brakes.

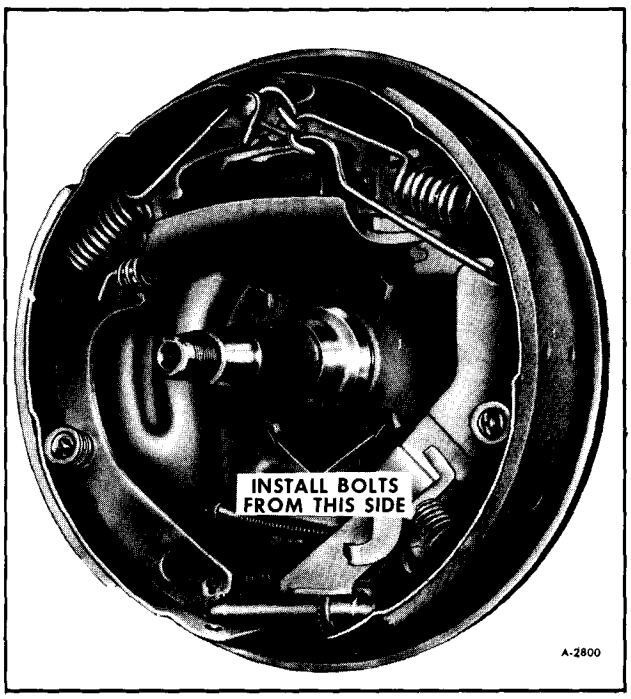


Figure 62—Backing Plate Installation

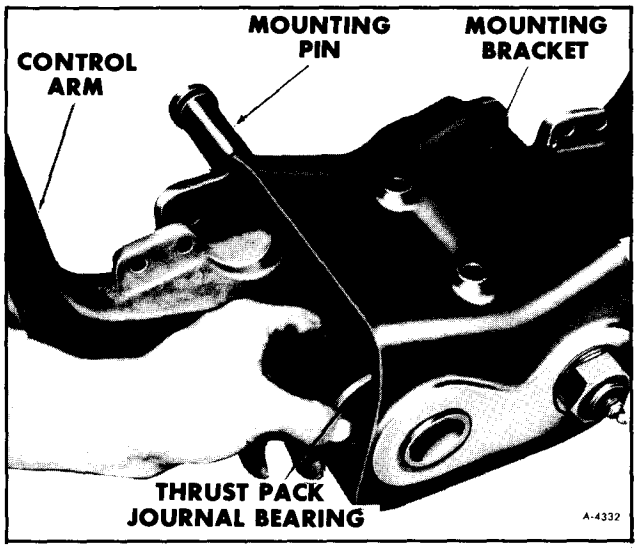


Figure 63—Installing Thrust Bearings

SHOCK ABSORBER INSTALLATION

Block control arms in an up position with a wooden block about one inch in thickness as shown in Figure 27. Install top of shock in upper control arm and secure with nut. Install bottom of shock on mounting bracket on frame rail, and secure with nut.

POWER LEVEL VALVE INSTALLATION

1. Wrap threads on air line fittings with teflon tape.

2. Install lines to back of valves, referring to Figure 66. On the right valve, red line goes to the port marked "MAN.," blue line goes to the port marked "OUT," and yellow lines goes to the port marked "AUTO." On left valve, red line goes to the port marked "MAN.," gray line goes to the port marked "OUT," purple line goes to the port marked "AUTO."

3. Install two screws holding valve to mounting panel (See figure 29).

4. Install four screws holding mounting panel to dash.

5. Install control knob using Allen Head screw in center of knob.

6. Close drain cock on air reservoir, place control knob in travel position, and operate compressor until suspension comes up to ride height. Check for air leaks.

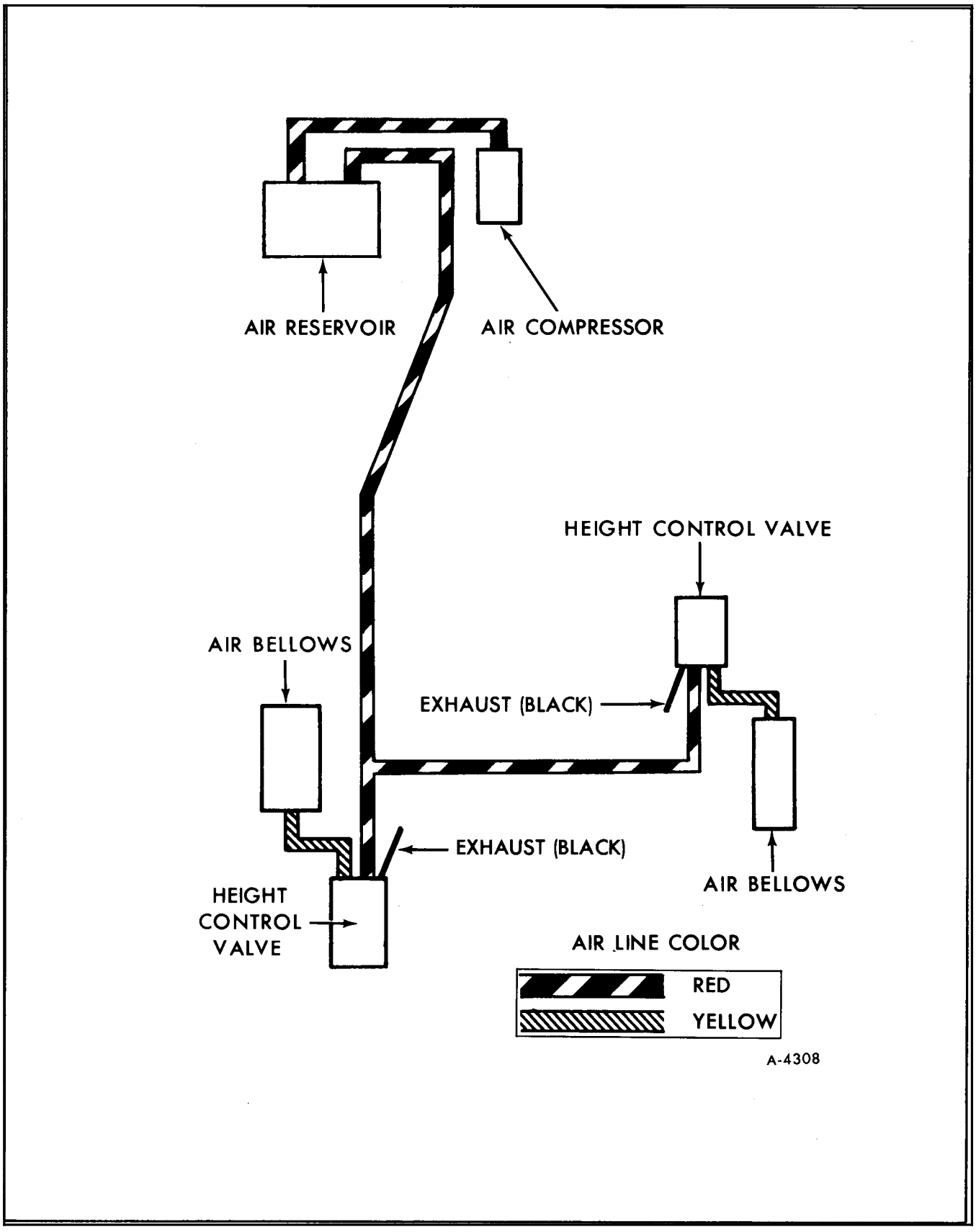


Figure 64—Standard Rear Suspension Schematic

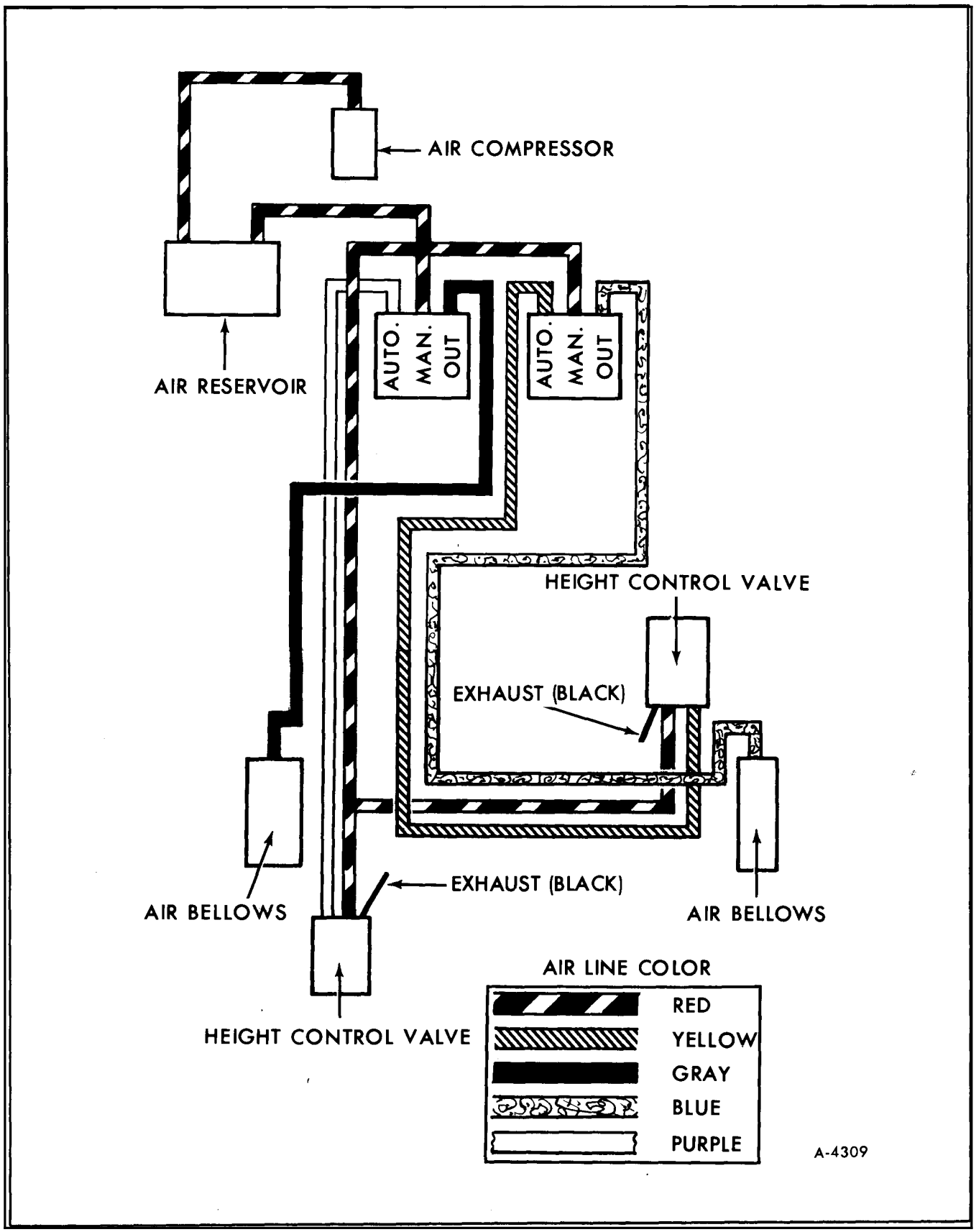


Figure 65—Rear Suspension Schematic (With Power Level)

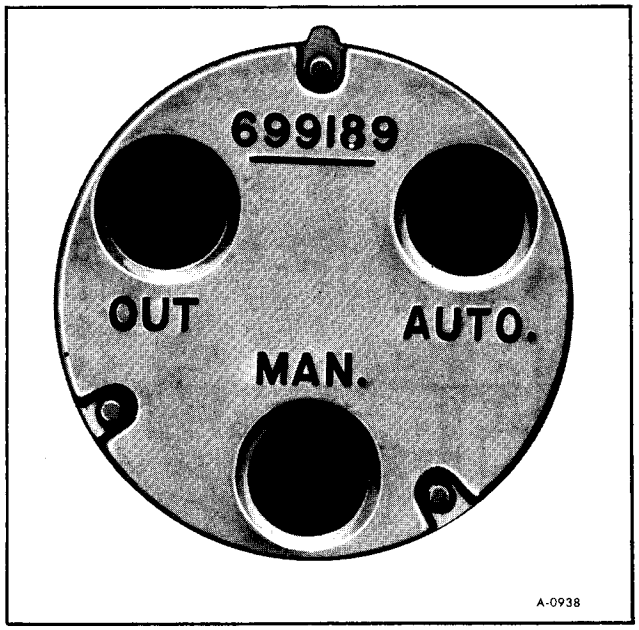


Figure 66—Power Level Valve Port Identification

AIR LINE INSTALLATION

Nylon tubing is used throughout the vehicle for rear suspension air lines as shown in schematics, Figures 64 and 65. It is flexible, durable and weather-resistant.

When installing nylon tubing make sure it is not routed close to a heat source, such as exhaust manifold or muffler. Tubing must be cut to required length and related fittings assembled.

IMPORTANT: Whenever threaded fittings on the rear suspension (excluding the height control valve, itself) are disassembled for any reason, be sure threads on male portion of fitting are wrapped with teflon tape or equivalent to avoid leakage.

1. Cut nylon tube to required length and be sure components are free of nicks or scratches.

2. Position nut and sleeve over tube.

3. Push tube insert into tube, then push tube and insert into fitting until firmly seated.

4. Seat sleeve into fitting, then tighten nut securely.

5. Install fitting at other end of nylon tube using the above procedure, then check for leaks.

6. If any trouble symptoms, such as slow suspension operation, indicates a restricted or clogged air line, disconnect suspected tube or hose at both ends and blow through it to make sure the passage is clear. Inspect tubing and hose for partial restrictions such as dents or kinks. If such condition is found, replace the tubing.

ON-VEHICLE ADJUSTMENTS

REAR WHEEL ALIGNMENT

Proper rear wheel alignment must be maintained to ensure correct handling and satisfactory tire life.

Before checking alignment the following inspections should be made.

1. Check that tires are inflated to 60 psi.

2. Check wheel bearing adjustment and correct if necessary.

NOTE: Rear wheel alignment requires the vehicle to be level while being checked. Full weight must be on wheels with vehicle empty.

TOE-IN MEASUREMENT

Toe-in may be measured from center of tire tread or from inside tires or rims. Measurements at both wheels must be made in same relationship (See "G" and "F," figure 67).

If measurement is to be made from center of tire treads, first hoist vehicle and spin wheels to obtain a center line on tire tread. Roll vehicle ahead several feet to where the inspection is to be made. This will remove any slack caused by looseness in wheel bearings.

Measure at point "F" and "G". The toe-in should follow the relationship: G = F $\pm$ .06".

TOE-IN ADJUSTMENT

If toe-in is not correct it must be shimmed as shown in Figure 68. Follow this procedure for adjustment.

1. Raise vehicle off floor.

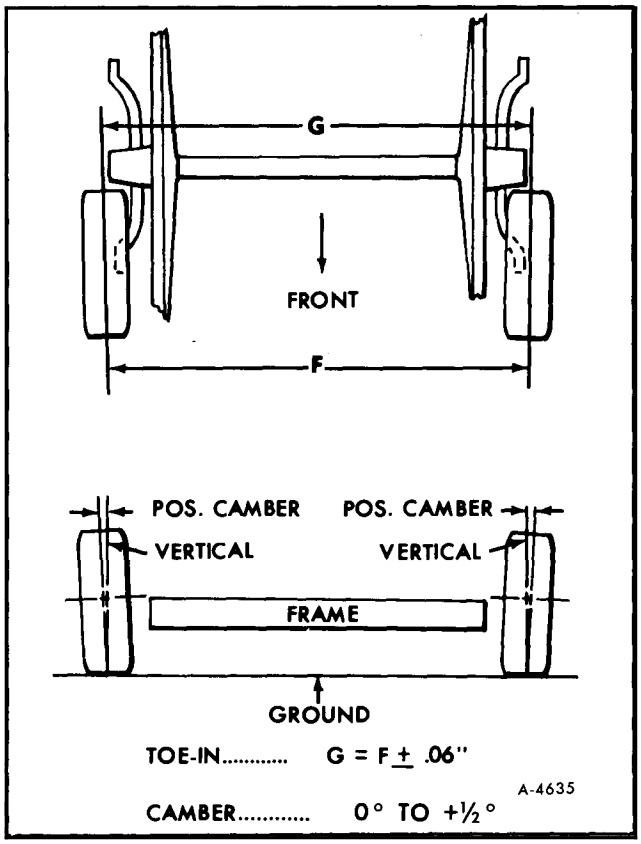


Figure 67—Rear Wheel Alignment Chart

2. Loosen six bolts on mounting bracket.

3. Insert proper shim as shown in Figure 68.

4. Tighten 4 retaining nuts on frame rail to 65-85 ft. lbs. torque. Tighten two retaining nuts on crossmember to 50-60 ft. lbs. torque.

5. Lower vehicle to floor and recheck alignment.

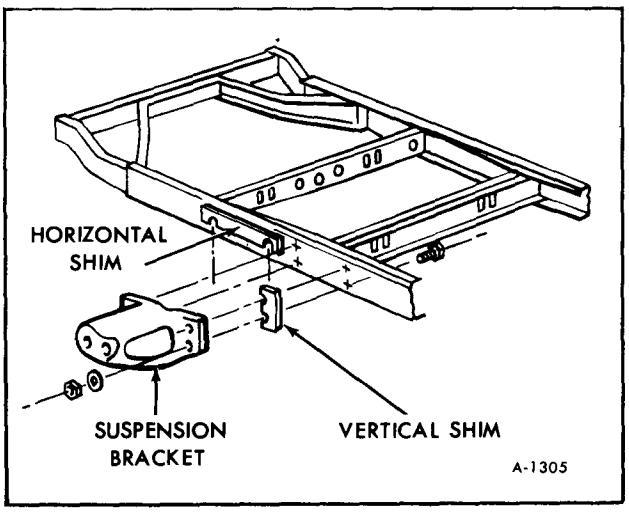


Figure 68—Rear Wheel Shim Location

REAR WHEEL CAMBER

The rear wheels are set with positive camber. Positive camber is outward inclination of wheels at top.

In checking camber, it is recommended that an accurate gauge be used. The camber should be set at 0° to +1/2° (See figure 67).

Excessive positive camber results in irregular wear of tires at outer shoulder. Negative or reverse camber causes wear at inner shoulders.

Camber is adjusted by shimming as shown in Figure 68. Following the same shimming procedure as that used before to set toe-in.

AIR COMPRESSOR PRESSURE SWITCH ADJUSTMENT

The switch is designed to maintain air pressure in the air reservoir between 100 and 120 psi. If the pressure in the reservoir drops to 100 psi the contact points will close and this will complete the circuit supplying electricity to the compressor. If the pressure raises above 120 psi the contact point will open the circuit to the compressor. This setting may be adjusted at the nut which is located on the end of the spring inside the cover, refer to Figure 69. The pressure will rise by tightening the spring. Both the cut-in pressure and the cut-out pressure will be affected by

Figure 69—Air Compressor Pressure Switch Adjustment

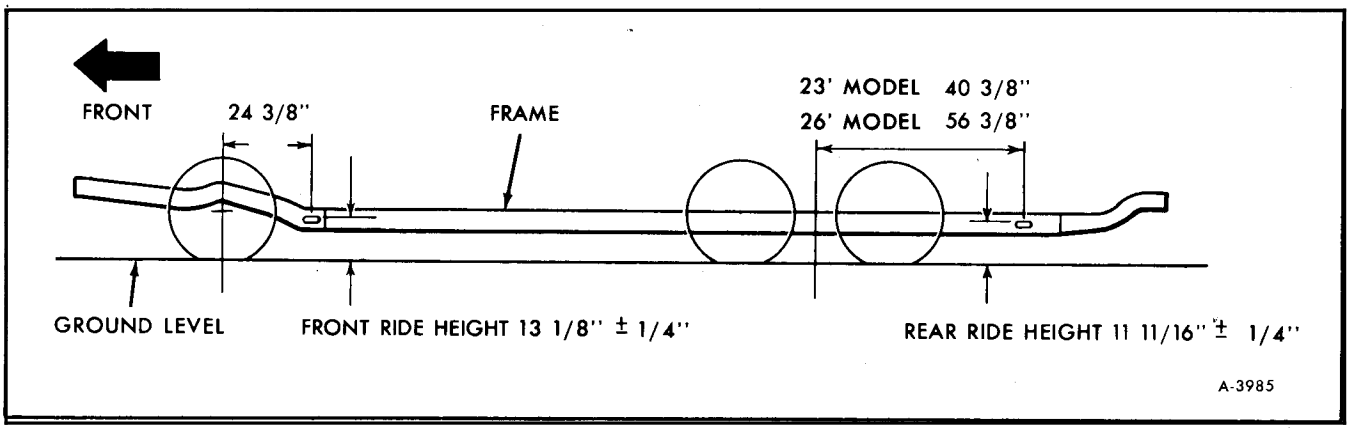


Figure 70—Checking Vehicle Ride Height

this adjustment. The pressure can be measured at the schrader valve on the reservoir.

RIDE HEIGHT ADJUSTMENT

Measure the rear suspension ride height at the elongated slot on the frame rail. Refer to Figure 70.

To adjust ride height loosen adjustment nut on height control valve (See figure 71). The valve arm has an elongated hole at the adjustment nut. This allows the valve arm to move in relation to the valve itself, and thus allows the ride height to change. Intake and exhaust valves of height control valve can then be operated independently of linkage. When proper ride height is reached tighten nut to 70-80 in. lbs.

Height control valve lever will move 3/16 inch up or down from neutral position (free travel) without causing any valve action. If amount of adjustment required falls within these limits, adjust lever the required amount. However, frame will not raise or lower until load is increased or decreased to actuate height control valve.

If any one of the height control valves does not function properly with the lever correctly adjusted,

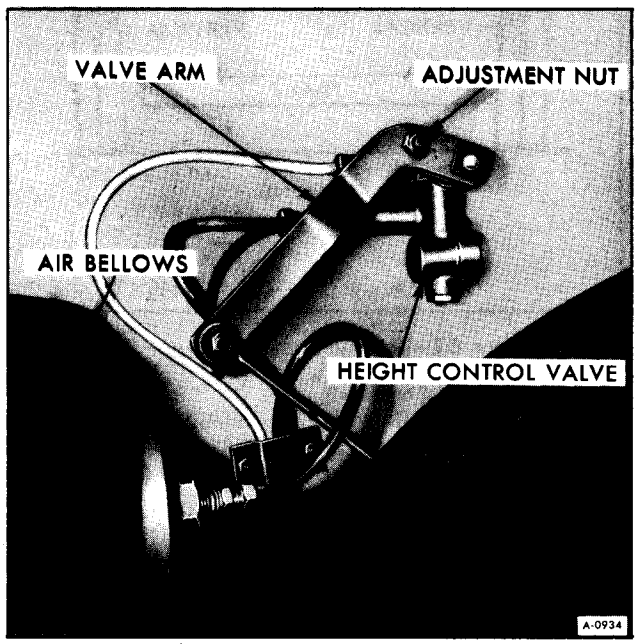


Figure 71—Location for Rear Ride Height Adjustment

check for restricted air lines. If valve still does not hold frame at normal ride height with lever properly adjusted, and with no restriction in air line, valve should be overhauled or replaced with a new or rebuilt unit.

PERIODIC MAINTENANCE

AIR COMPRESSOR FILTER REPLACEMENT

BROWN, SINGLE PISTON

The air filter on the compressor should be cleaned or replaced every six months or 6,000 miles.

Remove retainer at end of compressor to remove filter screen and element. Wash element in soap and water, and dry completely before replacing.

DANA, DOUBLE PISTON

The air filter on the compressor should be cleaned or replaced every six months or 6,000 miles.

Remove tubing at back of each housing assembly. Remove filter retainer and pull intake assembly off and carefully take filter out from behind inside retainer (figure 42). Wash filter with soap and water, and dry completely before replacing.

AIR RESERVOIR

Condensation should be drained at least once a month. To drain reservoir properly, leave Schrader valve or drain cock if so equipped, open until all air escapes and draining stops.

Air tank mounting bolts, and brackets should be checked at regular intervals for looseness. Tighten if necessary. Air reservoir may be cleaned inside using steam or hot water. If corrosion or other damage has weakened tank it must be replaced.

LUBRICATION

Details on lubrication of rear suspension components are covered in Section 0 at the beginning of this manual.

REAR SUSPENSION TORQUE SPECIFICATIONS

LOCATION	TYPE OF PART	TORQUE
Center mounting bracket to frame rail nuts (4)	Nut	65-85 lbs.-ft.
Center mounting bracket to crossmember nuts (2)	Nut	50-60 ft.-lbs.
Height control valve mounting Bolt	Bolt	80-120 in.-lbs.
Height control valve link		
Link to arm nut	Nut	60-90 ft.-lbs.
Link to control arm nut	Nut	60-90 ft.-lbs.
Control arm lock nut	Nut	15-20 ft.-lbs.

SPECIAL TOOLS

J-25520	Air Line Crimp Tool

SECTION 5
BRAKES

Contents of this section are listed below:

CAUTION: *All brake system fasteners are important attaching parts in that they could affect the performance of vital components and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of these parts.*

GENERAL INFORMATION

The vehicle is equipped with disc brakes on the front wheels, and has drum brakes on the rear wheels. They are hydraulically powered by a split hydraulic system.

When the brake pedal is depressed, the piston in the master cylinder forces fluid under pressure to a wheel cylinder at each wheel, which in turn, pushes the brake shoes against the brake drum. As the shoes contact the drum, the friction between the shoes and the rotating drum moves the primary shoe downward against the adjusting screw which acts as a link to transmit the force of the primary shoe to the lower end of the secondary shoe. With the upper end of the secondary shoe being held by the stationary anchor pin, the secondary shoe is wedged against the drum. This wedging action, due to frictional force impacts the self-energizing action to the braking effort and thereby decreases the effort required by the driver to stop the vehicle.

SELF-ADJUSTING BRAKE

The vehicle is equipped with self-adjusting brakes. The self-adjusting brake mechanism consists of an actuating link, adjuster lever, adjuster lever return spring, override spring and override pivot.

OPERATION (DRUM TYPE)

The self-adjusting brake mechanism operates only when the brakes are applied while the vehicle is moving rearward and only when the secondary shoe moves a predetermined distance toward the brake drum.

As the vehicle moves rearward and the brakes are applied, friction between the primary shoe and the drum forces the primary shoe against the anchor pin. Hydraulic pressure in the wheel cylinder forces the

upper end of the secondary shoe away from the anchor pin. As the secondary shoe moves away from the anchor pin, the upper end of the adjuster lever is prevented from moving by the actuating link. This causes the adjuster lever to pivot on the secondary shoe forcing the adjuster lever against the adjusting screw sprocket. If the brake linings are worn enough to allow the secondary shoe to move the predetermined distance, the adjuster lever will turn the adjusting screw sprocket one or two teeth, depending on lining wear. If the secondary shoe does not move the predetermined distance, movement of the adjuster lever will not be great enough to rotate the adjusting screw sprocket.

When the brakes are released, the adjusting lever return spring will move the adjuster lever into the adjusting position on the sprocket.

An override feature is built into the self-adjusting brake which allows the secondary shoe to be applied in reverse in the event the adjusting screw becomes "frozen" preventing the self-adjuster from operating.

When the vehicle is moving forward and the brakes are applied, the upper end of the secondary shoe is forced against the anchor pin due to the self-energizing action of the brakes and the self-adjuster does not operate.

OPERATION (DISC TYPE)

The significant feature of the single piston caliper operation is that it is free to slide on the two mounting bolts which thread into the support bracket.

At application of the brakes, the hydraulic pressure behind the piston increases. Pressure is exerted equally against the bottom of the piston and also against the bottom of the piston bore. The pressure applied to the piston is transmitted to the inboard shoe and lining, forcing the lining against the inboard disc surface. The pressure applied to the bottom of the piston bore forces the caliper to slide or move inboard on the mounting bolts. Since the caliper is one piece, this movement toward the vehicle causes the outboard section of the caliper to apply pressure against the back of the outboard shoe and lining assembly, forcing the lining against the outboard disc surface. As hydraulic pressure builds up, the shoe and lining assemblies are pressed against the disc surfaces with increased force, bring the vehicle to a stop.

In actual practice, the application and release of the brake pressure causes a very slight movement of the piston and caliper. Upon release of the braking effort, the piston and caliper merely relax into a released position. In the released position, the shoes do not retract any appreciable distance from the disc surfaces.

As the brake lining wears, the piston moves out of the caliper bore and the caliper repositions itself on the mounting bolts and equal distance inboard. In this manner the caliper assembly maintains the inboard and outboard shoe and lining in the same relationship with the disc surface throughout the full life of the lining.

MASTER CYLINDER

DESCRIPTION

The dual master cylinder is designed so that the front and rear brakes have separate hydraulic systems. The hydraulic pressure developed in both systems is equal at all times since the front piston is balanced between the hydraulic pressure in each system.

Malfunction in either system has no effect on the other system but is immediately evident to the driver because of the additional pedal travel required to actuate the remaining half of the dual brake system. Also, a pressure differential sensing switch in the system actuates a warning light on the instrument panel.

OPERATION

Two brake fluid reservoirs are cast integrally with the master cylinder and supply fluid to the areas ahead of the primary seals through the compensating ports and between the primary and secondary piston seals through by-pass ports in the casting.

Within the bore of the master cylinder is the rear piston assembly, which is composed of the piston, return spring, retainer, spacer and screw. Also in the bore is the front piston with a primary and two secondary piston seals are a front piston return spring and retainer.

Fluid is directed to the wheels through two hydraulic outlets, one for the front brakes and one for the rear brakes.

In the event the engine stalls, the vacuum chambers within the power cylinder provide adequate vacuum reserve for two or three brake applications. If the vacuum check valve is defective or braking has depleted the vacuum reserve, the driver can still operate the brakes in a conventional manner but more effort is required due to the loss of power assist.

WHEEL CYLINDER

OPERATION

Each wheel cylinder contains two pistons and

two rubber cups which are held in contact with the pistons by a central coil spring with cup expanders to provide a fluid-tight seal. The wheel cylinder cups are of a special heat resisting rubber. Cups of this material must have an expander to hold the lips of the cup out against the wheel cylinder bore. These cup expanders are crimped on each end of the wheel cylinder spring. The inlet port for brake fluid is located between the pistons so that when fluid pressure is applied, both pistons move outward toward the ends of wheel cylinders. The pistons impart movement to the brake shoes by means of connecting links which seat in the pistons and bear against webs of the shoes. Rubber boots enclose both ends of the cylinder to exclude foreign matter. A valve for bleeding the brake pipes and wheel cylinder is located above the inlet port.

COMBINATION VALVE

A combination is incorporated into the brake system. It performs three functions; a balance function, a metering function, and a warning switch.

METERING VALVE FUNCTION

The metering section of the combination valve operates to "hold off" hydraulic flow (pressure) until about 130 psi has been built up in the system before applying the front brakes. The pressure then blends to full line pressure at approx. 400-600 psi line pressure. There is no flow restriction when the brakes are released.

BALANCE FUNCTION OR WARNING SWITCH

The fluid from front and rear systems is separated by a hydraulically balanced sealed piston. A spring loaded switch plunger rides in a groove in the switch piston. Any pressure differential sufficient to overcome the switch plunger spring and friction causes a shift of the piston in the direction of reduced pressure, causing the switch plunger to ride up out of its groove and the switch to make contact and light the warning light. (100-300 psi differential is required).

In addition, this piston is designed to hydraulically recenter itself once the pressure balance is restored (leak is fixed.)

PARKING BRAKE

OPERATION

The parking brake control system, which applies the four rear brakes, uses a hand operated lever, cables and brake shoe levers and struts. The front cable runs from the hand lever along the underbody to the front equalizer. The intermediate cable then runs to outside of each frame rail, and back to an intermediate equalizer. From this point a cable runs to each of the four brake drums. Each of these cables connects to the free lower end of a brake shoe lever. These levers (one in each rear brake shoe assembly) pivot on the secondary shoes. Struts are mounted between the brake shoe lever and the primary shoes. When the parking brake lever is raised, all cables are put in tension and the rear brake shoes are expanded against the drums.

POWER CYLINDER

The Power Brake Unit is a self-contained hydraulic and vacuum unit, utilizing manifold vacuum and atmospheric pressure for its power.

This unit permits the use of a low brake pedal as well as less pedal effort than is required with the conventional (nonpower) hydraulic brake system. The unit is mounted on the front side of the dash panel and directly connected to the brake pedal.

A power brake is used with the brake system to reduce the braking effort required by the driver. A combined vacuum and hydraulic unit, which utilizes engine manifold vacuum and atmospheric pressure, is used to provide power assisted application of vehicle brakes.

The unit is used in conjunction with a conventional brake system. From the master cylinder connection outward to the wheel units, there is no other change in the brake system.

In addition to the master cylinder connections, the unit requires a vacuum connection to the engine intake manifold (through a vacuum check valve) and a mechanical connection to the brake pedal. This unit is self-contained.

The vacuum power unit contains the power piston assembly, which houses the control valve and reaction mechanism, and the power piston return spring. The control valve is composed of the air valve (valve plunger), the floating control valve assembly, and the push rod. The reaction mechanism consists of a hydraulic piston reaction plate and a series of levers. An air filter, air silencer, and filter retainer are assembled around the valve operating rod filling the cavity inside the hub of the power piston. The push rod or valve operating rod, which operates the air valve, projects out of the end of the power unit housing through a rubber dust guard. A vacuum check valve assembly is mounted in the front housing assembly for connection to the vacuum source.

BRAKE SYSTEM TROUBLE DIAGNOSIS

TESTING FOR LEAK IN HYDRAULIC SYSTEM

NOTE: If there is any evidence of air in system, brakes must be bled before making this test.

1. Apply brakes manually, holding as steady a force as possible.

2. If pedal sinks slowly toward floor, a leak is indicated. Check for location of the leak by examining all lines, connections and wheel cylinders. If external leak is not found, remove master cylinder, disassemble and inspect parts. Leaks will usually be past primary piston cup due to porous or damaged cup or cylinder bore.

MASTER CYLINDER, WHEEL CYLINDER AND DRUM BRAKES TROUBLE DIAGNOSIS CHART

SPRINGY, SPONGY PEDAL

Cause	Remedy
Air trapped in hydraulic system.	Remove air by bleeding (check compensating port for clearance of cup to provide full open port).
Brake adjustment not correct.	Adjust brakes.
Bent shoes	Replace.
Compensating port closed.	See ALL BRAKES DRAG.
Improper brake fluid.	Flush and bleed system using GM Hydraulic Brake Fluid Supreme No. 11 (or equivalent).
Improper lining thickness or location.	Install new lining or replace shoe and lining.
Drums worn too thin.	Replace drums.
Master cylinder filler vent clogged.	Clean vent or replace cap; bleed brakes.

LOW PEDAL

Cause	Remedy
Hydraulic System Failure.	Check master cylinder for empty reservoir. Check for leak at master cylinder, wheel cylinder, hoses, metal pipes, and all connections.
Self adjustors not working.	Inspect for incorrect installation or frozen adjuster screw and correct as necessary.
Low fluid level in master cylinder reservoir.	Low fluid level in reservoir will permit air to be pumped into hydraulic lines. This necessitates refilling reservoir and bleeding lines. Find cause of low fluid and correct.
External leak in hydraulic system, or leak past master cylinder primary piston cup.	Check for leak in system as outlined above.
Air trapped in hydraulic system.	Air trapped in hydraulic system gives pedal a very soft feel at the beginning of travel. Bleed brakes.
Incorrect fluid.	Incorrect fluid may boil at high temperature. Flush system and refill with Brake Fluid No. 5464831 or equivalent.
Excessive clearance between linings and drum.	Adjust brakes.

*BRAKES FADE

Cause	Remedy
1. Incorrect lining.	1. Replace with new lining.
2. Thin drum.	2. Replace drums.
3. Dragging brakes.	3. Adjust or correct cause.

*Fade is a temporary reduction of brake effectiveness resulting from heat.

ONE WHEEL DRAGS

Cause	Remedy
Improperly adjusted parking brake cables or stuck cable.	Adjust parking brake cables and lubricate.
Weak or broken brake shoe return springs.	Replace defective brake shoe springs and lubricate brake shoe ledges and shoe contact at anchor pin with brake lubricant No. 1050110 or equivalent.
Brake shoe to drum clearance too small.	Readjust brakes.
Wheel cylinder piston cups swollen or distorted or piston stuck.	Replace inoperative or damaged parts. Look for evidence of dirt in hydraulic system which could cause damage to the cylinders or cups. See first item under ALL BRAKES DRAG.
Obstruction in line.	Obstruction in line may be caused by foreign material or flattened or kinked tube. If dirt is found in line, remove obstruction and flush hydraulic system with fresh brake fluid. If tube is flattened or kinked, replace damaged parts.
Backing plate shoe pad grooved.	Grind or file pads smooth and lubricate with brake lubricant No. 1050110 or equivalent.
Incorrect brake shoe radius.	Replace malfunctioning brake shoe.

BRAKES DO NOT AUTOMATICALLY ADJUST

Cause	Remedy
Worn, bent or distorted adjuster lever.	Replace adjuster lever.
Improper secondary lining to drum clearance.	Adjust clearance.
Brake linings excessively worn.	Install new linings.

VEHICLE PULLS TO ONE SIDE

Cause	Remedy
Grease or fluid on lining.	Replace with new linings. Linings with even a slight trace of grease or fluid may effect the operation of the brakes and can seldom be salvaged by cleaning. Correct cause of grease or fluid reaching linings.
Improper lining contact with drum.	Grind or replace lining.
Wheel bearings excessively loose.	Adjust wheel bearings.
Loose backing plate.	Tighten backing plate.
Linings not to specifications, or primary and secondary shoes reversed. New and used linings mixed on one end of vehicle.	Various kinds of linings have different frictional effects on the drums and on each other. Each wheel must have similar linings. The primary and secondary linings must not be interchanged. Use only factory specified linings.
Tires not properly inflated or unequal wear of tread. Different tread design.	Inflate tires to specified pressures. Rearrange tires so that a pair with non-skid tread surfaces of similar design and equal wear will be installed on front wheels and pairs with like tread will be installed on rear wheels.
Linings charred or drums scored.	Sand surfaces of linings and drums. Remove particles of metal that have become embedded in surfaces of linings. Seriously charred linings should be replaced.
Wheel cylinder link off shoe.	Check boot for holes. Check for burrs on wheel cylinder piston caused by piston forced against stop. Reinstall link.
Defective wheel cylinder.	Repair or replace as required.
Obstruction in line.	Clear or replace as required.
Water, mud, etc., in brakes.	Remove any foreign material from all brake parts and the inside of drums. Lubricate shoe ledges and rear brake cable ramps with grease. Examine support assembly for damage.
Loose steering gear, etc.	Adjust steering gear, etc.
Incorrect geometry setting of front suspension.	Adjust geometry so that vehicle does not have a tendency to lead when driven on a level road.
Weak or broken retracting springs.	Check springs-replace bent, open-coiled or cracked springs.
Out-of-round drums.	Resurface or replace drums in left and right hand pairs (both front and both rear).
Clogged or crimped hydraulic line.	Repair or replace line.

EXCESSIVE PEDAL PRESSURE REQUIRED TO STOP VEHICLE

Cause	Remedy
Brake adjustment not correct.	Adjust brakes.
Improper lining.	Install factory specified shoes.
Improper shoes.	Install factory specified shoes.
Grease or fluid soaked linings.	Correct cause and replace linings, if necessary.
Rusted wheel cylinder.	Replace.
Wheel cylinder link incorrectly aligned.	Check wheel cylinder piston and boot for damage. Install link.
Compensating port not cleared.	Check pedal linkage, stop light switch adjustment.
Brake pedal binding on shaft.	Lubricate with Delco Brake Lube #5450032 (or equivalent).
Glazed linings.	Sand surface of linings.
Bellmouthed, barrel-shaped or scored drums.	Replace or resurface drums in left and right hand pairs.

CRUNCH OR GROAN, HOLDING VEHICLE ON HILL

Cause	Remedy
Brake dust and possibly linings which have been overheated.	Sand linings and remove dust from brakes.

HIGH PITCH SQUEAK WHILE BRAKES OPERATE

Cause	Remedy
New linings not yet fully burnished.	Burnish further or sand off high spots of linings.
Persistent squeak-no apparent cause.	Sand linings for temporary cure or mild cases. Install drum springs for stubborn cases of high pitch squeak.

REAR BRAKES DRAG

Probable Cause	Remedy
1. Maladjustment.	1. Adjust brake shoes and parking brake mechanism.
2. Parking brake cables frozen.	2. Lubricate with Delco Brake Lube #5450032 (or equivalent).

ALL BRAKES DRAG OR PEDAL BUILDS UP WITH USE AFTER ADJUSTMENT IS CHECKED AND FOUND TO BE CORRECT

Cause	Remedy
Mineral oil, etc., in system.	The presense in the hydraulic system of any mineral oil, kerosene, gasoline, shock absorber or transmission fluid, or carbon tetrachloride will cause swelling of rubber piston cups, and valves, so they become inoperative. This is first noticed in the master cylinder. Brakes will not release freely if master cylinder primary piston cup has swollen sufficiently to obstruct the compensating port. Flush system thoroughly with a good grade of clean brake fluid and replace all internal rubber parts in brake system.
Pedal does not return freely.	Lubricate pedal linkage and make certain no bind exists. See that stop light switch is not defective, incorrectly adjusted, or that switch plunger is not binding on pedal due to lack of lubrication.
Compensating port of master cylinder closed.	The compensating port in master cylinder must be completely clear when pedal is in released position. 1. See that pedal returns freely and is not stopped by contact with stop light switch body or pedal bracket. 2. See that compensating ports are not plugged by dirt. To check compensating port, remove master cylinder reservoir cover and watch the fluid in the cylinder as the brake pedal is moved. A "geyser" should be seen as the pedal is first depressed. If no geyser is seen, the compensating port is blocked. 3. Inspect master cylinder primary piston cup and if found to be swollen or elongated, flush system and replace damaged parts.

LOUD LOW PITCH SQUEAL AT END OF HIGH RATE STOP

Cause	Remedy
New linings not fully burnished.	Check adjustment. Sand lining high spots.
Angle on shoe web at adjusting screw notch.	File straight.
Bent backing plate. Top of shoe webs should be in line with each other looking down on them.	Straighten or replace.
Check after pushing shoes toward backing plate at top.	
Incorrect adjustment.	Adjust brakes. (NOTE: Drum springs not effective against low pitch squeal or howl.)

PEDAL THROB AT LIGHT APPLICATIONS AT LOW SPEED

Cause	Remedy
Drum out-of-round or off center.	Turn drum.

ROUGH FEEL DURING HIGH RATE STOPS FROM MODERATE SPEED

Cause	Remedy
Tool chatter. Look for faint light and darker stripes running across the braking surface.	Turn drum.

LIGHT PEDAL PRESSURE— BRAKES TOO SEVERE

Cause	Remedy
Brake adjustment not correct.	Adjust brakes.
Loose support assembly.	Tighten rear backing plates. Adjust brakes.
Small amount of grease or fluid on linings.	Correct cause and replace linings.
Charred linings or scored drums.	Sand surfaces of linings and drums. Clean loose dust from brake. In severe cases replace shoes. Warn owner regarding abuse of brakes.
	Remove all particles that have become imbedded in surfaces of linings. Slightly scored drums do not require replacing or turning.
Improper linings.	Install factory specified linings.

SQUEAK IN BRAKE WITH VEHICLE STATIONARY (SOMETIMES MISTAKEN FOR PEDAL SQUEAK)

Cause	Remedy
Shoe pads on backing plates dry and rusty.	Pry shoes out with screwdriver-apply grease sparingly to shoe pads with feeler stock.

CREAK WHEN BRAKES ARE APPLIED AT LOW VEHICLE SPEED

Cause	Remedy
Anchor pins dry.	Grease anchor pins where shoes bear.

SCRAPE IN BRAKES AS PEDAL IS APPLIED, VEHICLE STATIONARY

Cause	Remedy
Hold-down nail heads dry.	Lubricate. Although adjusting brakes temporarily changes these noises, lubrication will remedy.

PEDAL SQUEAK

Cause	Remedy
Dry pedal bushings or stop light switch rubbing pedal.	Lubricate.

CLICKS DURING HIGH RATE STOPS, USUALLY ONCE PER WHEEL REVOLUTION IN ONE WHEEL ONLY

Cause	Remedy
Threaded drum.	Cross sand.

CHATTER AT HIGH SPEED

Cause	Remedy
Drum out-of-round with two or more distinct high spots in circumference.	Turn drum.

CLICK FIRST APPLICATION AFTER REVERSING

Cause	Remedy
Shoes out from anchor pins.	File shoe pads on backing plates; lubricate. Although adjusting brakes temporarily changes these noises, lubrication will remedy.

SINGLE PISTON DISC BRAKES TROUBLE DIAGNOSIS CHART

PULLS

Cause	Correction
Incorrect tire pressures.	Inflate evenly on both sides to the recommended pressures.
Front end out of line.	Check and align to specifications.
Unmatched tires on front of vehicle.	Tires with approximately the same amount of tread should be used on the same axle.
Restricted brake tubes or hoses.	Check for soft hoses and damaged lines. Replace with new hoses and new double-walled steel brake tubing.
Malfunctioning caliper assembly.	Check for stuck or sluggish pistons, proper lubrication.
Defective or damaged shoe and lining (grease or brake fluid on lining or bent shoe).	Install new shoe and lining in complete axle sets.
Malfunctioning rear brakes.	Check for inoperative auto adjusting mechanism, defective lining (grease or brake fluid on lining) or defective wheel cylinders. Repair as necessary.
Loose suspension parts.	Check all suspension mountings.
Loose calipers.	Check and torque bolts to specifications.

BRAKE ROUGHNESS OR CHATTER (PEDAL PULSATES)

Cause	Correction
Excessive lateral runout.	Check and replace or machine the rotor, if not within specifications.
Parallelism not within specifications.	Check and replace or machine the rotor, if not within specifications.
Rear drums out of round.	Check runout and, if not within specifications, turn the drums (not over maximum of 0.060" on the diameter).
Shoe reversed (steel against iron).	Replace shoe and lining and machine rotor within specifications.

EXCESSIVE PEDAL EFFORT

Cause	Correction
Malfunctioning power brake.	Check power brake and repair if necessary.
Partial system failure.	Check front and rear brake system and repair, if necessary. Also check brake warning light, if a failed system is found and light did not function, repair as necessary.
Excessively worn shoe and lining.	Check and replace in axle sets.
Piston in caliper stuck or sluggish.	Remove caliper and rebuild or replace.
Fading brakes due to incorrect lining.	Remove and replace with original equipment lining.

EXCESSIVE PEDAL TRAVEL

Cause	Correction
Partial brake system failure.	Check both front and rear system for a failure and repair. Also, check warning light. It should have indicated a failure.
Insufficient fluid in master cylinder.	Fill reservoirs with approved brake fluid. Check for leaks. Check warning light.
Air trapped in system.	Bleed system.
Rear brake not adjusting.	Adjust rear brakes and repair adjusters.
Bent shoe and lining.	Replace axle set of shoe and lining.

GRABBING OR UNEVEN BRAKING ACTION

Cause	Correction
All conditions listed under "PULLS."	All corrections listed under "PULLS."
Malfunction of combination valve.	Replace and bleed system.
Malfunction of power brake unit.	Check operation and repair, if necessary.

DRAGGING BRAKES

Cause	Correction
(NOTE: A very light drag is present in all disc brakes immediately after pedal is released.)	
Master cylinder pistons not returning correctly.	With reservoir cover off, check for fluid spurt at bypass holes as pedal is depressed. Check power cylinder push rod, if necessary, or rebuild master cylinder.
Restricted brake tubes or hoses.	Check for soft hoses or damaged tubes and replace with new hoses and new double-walled steel brake tubing.
Incorrect parking brake adjustment on rear brakes.	Check and readjust to correct specifications.

POWER CYLINDER TROUBLE DIAGNOSIS CHART

Before checking the power brake system for the source of trouble, refer to the trouble diagnosis of drum and disc brakes. After these possible causes have been eliminated, check for the cause as outlined in the following chart:

BRAKES FAIL TO RELEASE

Cause	Correction
Blocked passage in diaphragm plate	Inspect and repair or replace as necessary.
Air valve sticking shut.	Check for proper lubrication of air valve "O" ring.
Broken piston return spring.	Replace.
Broken air valve spring.	Replace.
Tight pedal linkage.	Repair or replace as necessary.

HARD PEDAL

Cause	Correction
Broken or damaged hydraulic brake lines.	Inspect and replace as necessary.
Vacuum Failure.	Check for: Faulty vacuum check valve or grommet-replace. Collapsed or damaged vacuum hose-replace. Plugged or loose vacuum fitting-repair. Faulty air valve seal or support plate seal-replace. Damaged control valve-replace. Bad stud welds on front or rear housing or power head-replace, unless easily repaired.
Defective diaphragm.	Replace.
Restricted air filter element.	Replace.
Worn or badly-distorted reaction disc.	Replace reaction disc.
Incorrect reaction disc.	Replace with correct disc.

GRABBY BRAKES
(Apparent Off-On Condition)

Cause	Correction
Broken or damaged hydraulic brake lines.	Inspect and replace as necessary.
Insufficient fluid in master cylinder	Fill reservoirs with approved brake fluid, check for leaks.
Defective master cylinder seals.	Repair or replace as necessary.
Cracked master cylinder casting.	Replace.
Leaks at front disc brake calipers or rear wheel cylinders in pipes or connections.	Inspect and repair as necessary.
Air in hydraulic system.	Bleed system.

ON-VEHICLE SERVICING

BLEEDING BRAKE SYSTEM

A bleeding operation is necessary to remove air whenever it is introduced into the hydraulic brake system. Since air is compressible and hydraulic fluid is not, the presence of air in the system is indicated by a springy, spongy feeling of the brake pedal accompanied by poor braking action.

Air can be introduced into the hydraulic system if the brake pedal is operated when the fluid is too low in master cylinder reservoir. Air will also enter the system whenever any part of hydraulic system is disconnected.

It may be necessary to bleed the hydraulic system at all six wheels if air has been introduced through low fluid level or by disconnecting brake lines at master cylinder. If the brake line is disconnected at any wheel cylinder, then only that wheel cylinder need be bled. If lines are disconnected at any fitting located between master cylinder and wheel cylinders, then all wheel cylinders served by the disconnected line must be bled.

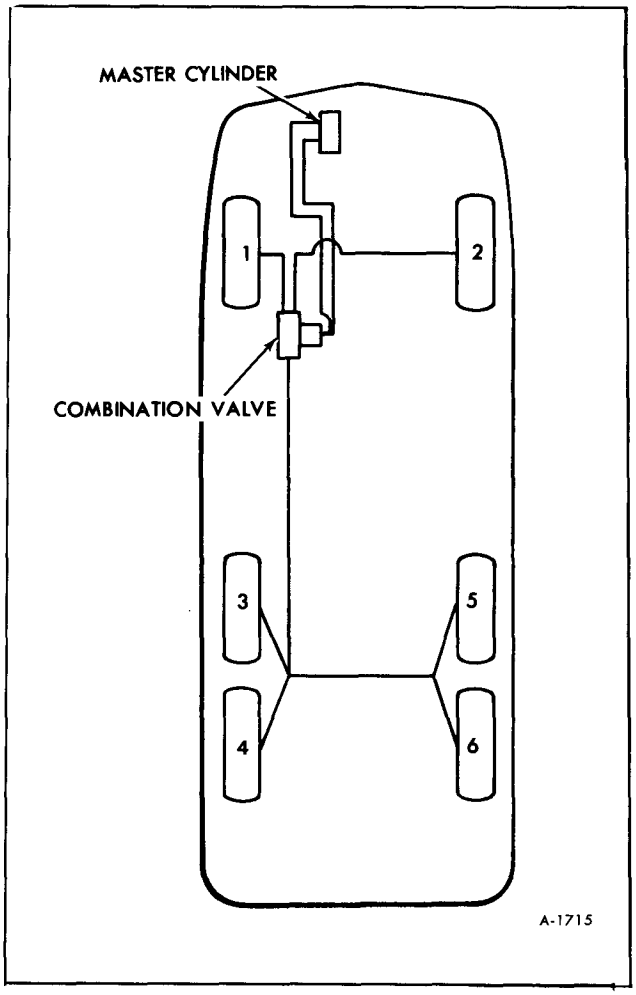


Figure 1—Brake Bleeding Sequence

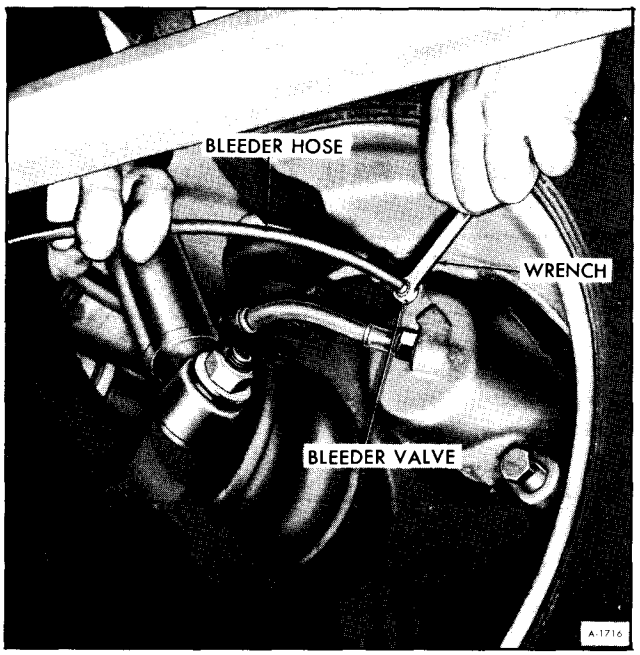


Figure 2—Brake Bleeder Wrench and Hose

SEQUENCE FOR BLEEDING WHEEL CYLINDERS

It is advisable to bleed one wheel cylinder at a

Figure 3—Tool J-23709 Installed

time to avoid allowing fluid level in reservoir to become dangerously low. For the proper sequence refer to Figure 1.

Do not perform bleeding operation while any brake drum or disc pad is removed.

BLEEDING WHEEL CYLINDER WITHOUT PRESSURE TANK

1. Fill master cylinder.

2. Install bleeder wrench on bleeder valve. Slip a brake bleeder hose over ball of wheel cylinder bleeder valve (See figure 2). Place lower end of bleeder tube in a glass jar that is partially filled with clean brake fluid. Position end of tube so that it will remain submerged under fluid during bleeding operation. Unscrew bleeder valve 3/4 of a turn.

Attach J-23709 to the combination valve (figure 3) to hold the push rod in and allow the pressure in the line to flow through the valve requiring less pressure to bleed the front cylinders.

3. Depress brake pedal a full stroke, close bleeder valve, then allow pedal to return slowly to released position. Allowing pedal to return quickly may draw air into system. Continue operating pedal in this manner until fluid flows from bleeder tube into glass jar in a solid stream that is free of air bubbles, then close the bleeder valve securely and remove bleeder tube and wrench.

4. Frequently check master cylinder to make sure that it contains fluid. Allowing reservoir to be emptied will cause air to be drawn into hydraulic system.

5. When bleeding operation is completed at all wheel cylinders where needed, make sure that fluid level is no more than 1/4" below lip of reservoir, then install rubber diaphragm and cover.

6. Discard the brake fluid deposited in glass jar during bleeding operation.

BLEEDING WHEEL CYLINDER WITH PRESSURE TANK

When using a pressure tank, air bubbles may form in the tank and enter the brake hydraulic system. To avoid this, observe the following points when handling a pressure tank: (1) Do not shake or agitate the pressure tank after air pressure has been added or is being added. (2) Allow pressure tank to stand in one position as much as possible and bring air hose over to tank when adding head of air. (3) Make certain the valves on the pressure tank lines are not defective, allowing air to be sucked in when fluid passes through the lines. (4) Pressure tank should be kept at least 1/3 full of fluid to avoid air bubbles forming. (5) If pressure tank is full of air bubbles, release air pressure and those bubbles will increase in size, be forced to top of fluid and escape.

It is recommended that pressure bleeding equipment must be of the diaphragm type; that is, it must have a rubber diaphragm between the air supply and the brake fluid to prevent air, moisture, oil, and other contaminants from entering the hydraulic system.

1. Thoroughly clean master cylinder reservoir cover and surrounding area; then remove cover and diaphragm.

2. Make sure that pressure tank is at least 1/3 full of specified brake fluid and that hose and master cylinder reservoir are filled with fluid. Attach hose to master cylinder reservoir adapter.

3. Install Bleeder Wrench on bleeder valve. Slip a brake bleeder tube over ball of wheel cylinder bleeder valve (figure 2). Place lower end of bleeder tube in a clean glass jar. Unscrew bleeder valve 3/4 of a turn.

Attach J-23709 to the combination valve to hold the push rod in and allow the pressure in the line to flow through the valve (figure 3).

4. Open pressure tank hose valve to apply fluid to master cylinder under pressure that does not exceed 35 pounds. It is not necessary to pump the brake pedal when using pressure tank.

5. When fluid flows from bleeder tube into glass jar in a solid stream that is free of air bubbles, that particular cylinder and line are bled; tighten bleeder valve securely and remove bleeder tube.

6. When bleeding operation is completed at all wheel cylinders, where needed, make sure that fluid level is 1/4" from the lowest portion of the top of each reservoir. Install rubber diaphragm and cover.

FLUSHING BRAKE HYDRAULIC SYSTEM

It is recommended that the entire hydraulic system be thoroughly flushed with clean brake fluid whenever new parts are installed in the hydraulic system.

Flushing is also recommended if there is any doubt as to the grade of fluid in the system or if fluid has been used which contains the slightest trace of mineral oil.

Flushing is performed at each wheel cylinder in

turn, and in the same manner as the bleeding operation except that bleeder valve is opened 1-1/2 turns and the fluid is forced through the pipes and wheel cylinder until it emerges clear in color. Approximately two quarts of fluid is required to flush the hydraulic system thoroughly.

When flushing is completed at all wheel cylinders, make certain that master cylinder reservoir is filled to proper level.

PARKING BRAKE ADJUSTMENT

Normal driver adjustment of the parking brake can be done at the parking brake lever. The knob on top of the lever can be used to increase or decrease the tension on the cable (figure 4).

If the tension on the cable cannot be adjusted at the lever it should be adjusted at the intermediate equalizer.

1. Turn the adjusting knob on top of parking brake lever counterclockwise until it comes up against stop.

2. Apply and release parking brake lever.

3. Jack up rear wheels.

4. Loosen lock nut at intermediate cable equalizer as shown in Figure 5.

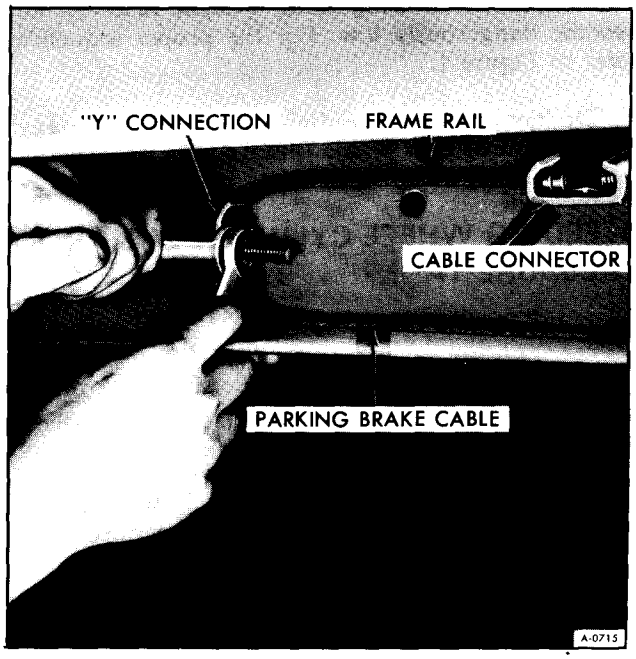


Figure 5—Loosening Intermediate Adjusting Nuts

5. Back off front nut until drag is just removed and lock.

6. Apply lever and re-adjust parking brake lever knob to give a definite snap-over-center feel.

7. Fully release parking brake and rotate rear wheels. No drag should be present.

8. Lower vehicle to floor.

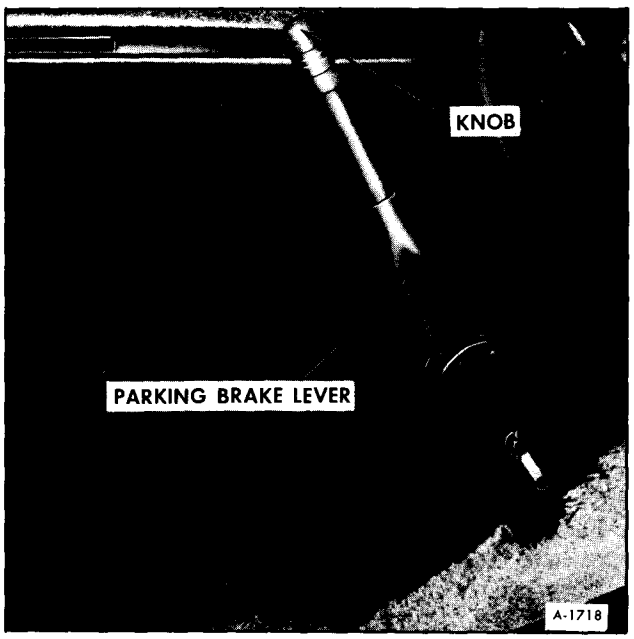


Figure 4—Parking Brake Lever Knob

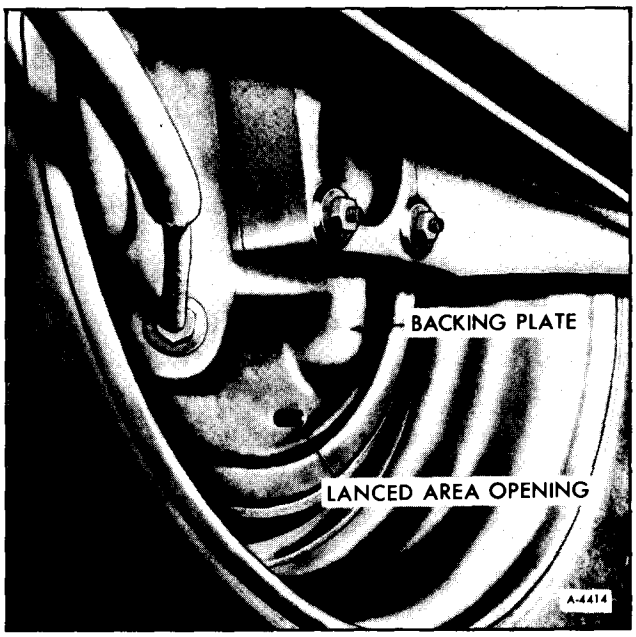


Figure 6—Lanced Area in Backing Plate

BRAKE SHOE ADJUSTMENT (DRUM INSTALLED)

1. If shoes are being adjusted for the first time, use a suitable punch to knock out lanced area in brake backing plate, refer to Figure 6. If done with drum installed, the drum must then be removed and all metal cleaned out of the brake assembly. Be sure to install a new hole cover in the backing plate after adjustment to prevent dirt and water from getting into brakes. Use J-4735 to turn brake adjusting screw; expand brake shoes at each wheel until the wheel can just be turned by hand. The drag should be equal at all wheels.

2. Back off brake adjusting screw (figure 7) at each wheel 30 notches. If shoes drag lightly on drum, back off adjusting screw one or two additional notches.

NOTE: Brake should be free of drag when screw has been backed off approximately 12 notches. Heavy drag at this point indicates tight parking brake cables.

3. Install adjusting hole cover in brake backing plate when adjustment is completed.

4. Check parking brake adjustment as described earlier in this section.

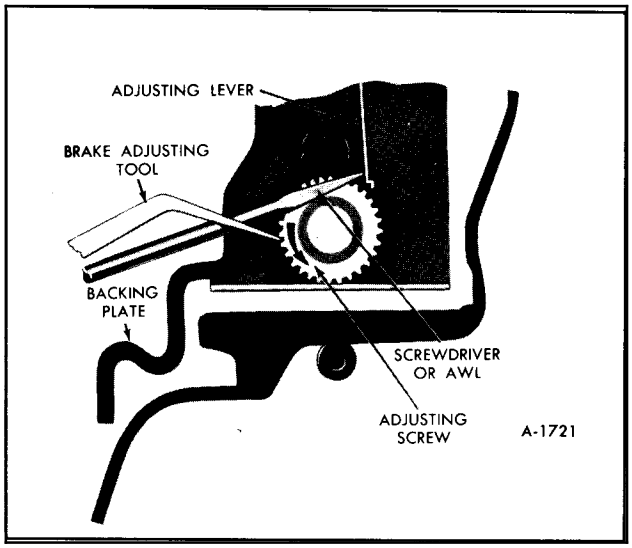


Figure 7—Backing Off Brake Adjustment

DISC BRAKE ADJUSTMENT

The disc brakes on the front of the vehicle require no periodic adjustment. They are adjusted with each brake application. As the piston in the caliper compensates for wear of the brake lining it requires more fluid. For this reason the master cylinder fluid level should be checked frequently.

COMPONENT REMOVAL

BRAKE DRUM REMOVAL

1. Hoist rear wheels off ground.

NOTE: It may be necessary to back off the brake shoe adjustment before the brake drum can be removed. To back off brake shoe adjustment, refer to Figure 7.

2. Remove wheel and tire.

3. Remove outer dust cap as shown in Figure 8, and then inner cap.

4. Remove cotter pin and castillated nut from hub as shown in Figure 9.

5. Hub and drum assembly can now be removed. See Figure 10.

Figure 8—Removing Dust Cap

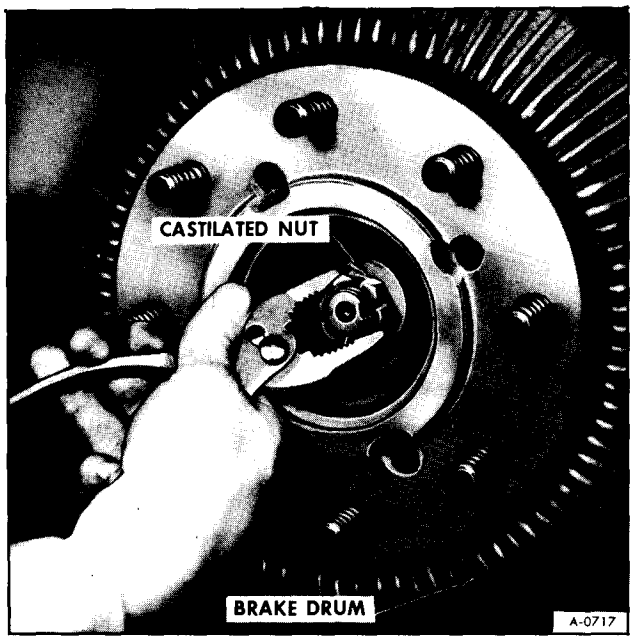


Figure 9—Removing Castillated Nut

Figure 10—Removing Hub and Drum

REAR BRAKE SHOE REMOVAL (FIGURE 11)

1. Hoist vehicle. Remove wheel and brake drum.

2. Remove the brake shoe return springs actuating link and guide.

3. Remove the brake shoe hold-down springs, adjuster lever, return spring and parking brake lever strut and spring.

4. Spread shoes to clear wheel cylinder links then remove the brake shoes as an assembly.

5. Disconnect the parking brake cable from the operating lever.

DISC BRAKE SHOE REMOVAL

1. Remove caliper as described later in this section under "Disc Removal."

2. Remove inboard shoe.

3. Remove outboard shoe.

4. Remove pad support spring from inboard shoe.

5. Remove sleeves from inboard ears of caliper.

6. Remove the rubber bushing from the grooves in each of the four caliper ears (figure 12).

COMBINATION VALVE REMOVAL (FIGURE 13)

No attempt should be made to disassemble or repair the valve. If any failure should occur, the complete valve should be replaced.

1. Disconnect all brake lines at valve. Plug lines to prevent loss of fluid and entrance of dirt.

2. Disconnect warning switch wiring connector from valve switch terminal.

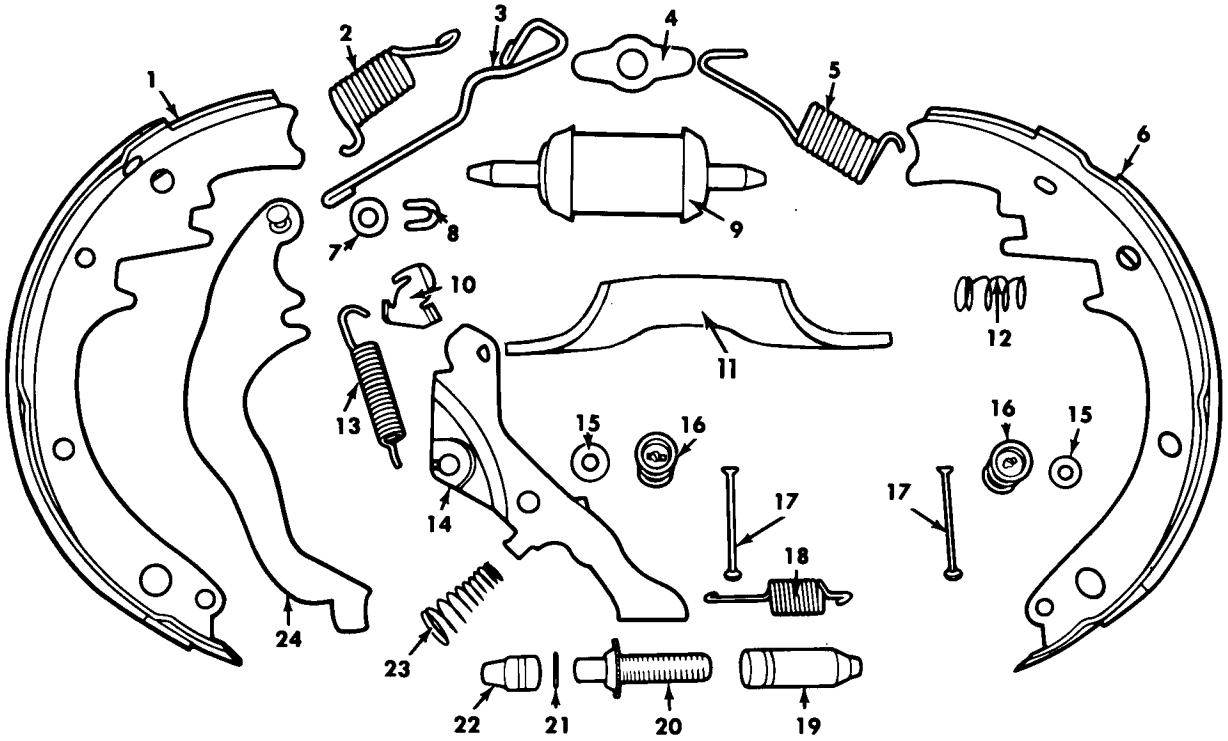
3. Remove valve assembly from mounting bracket.

MASTER CYLINDER REMOVAL

The master cylinder can be removed without removing the power cylinder.

1. Be sure area around master cylinder is clean, then disconnect the hydraulic lines at the master cylinder (Refer to figure 14). Plug or tape ends of lines to prevent entrance of dirt or loss of brake fluid.

2. Remove two master cylinder attaching nuts and remove master cylinder as shown in Figure 15.



1. Secondary Shoe And Lining
2. Return Spring
3. Actuating Link
4. Guide Plate
5. Return Spring
6. Primary Shoe And Lining
7. Washer
8. Clip
9. Wheel Cylinder
10. Pivot
11. Strut
12. Spring
13. Override Spring
14. Adjuster Lever
15. Washer
16. Hold Down Spring
17. Pin
18. Spring
19. Nut
20. Adjusting Screw
21. Washer
22. Socket
23. Return Spring
24. Lever

Figure 11—Brake Assembly (Rear)

DISC REMOVAL

1. Siphon approximately two-thirds of the brake fluid from the front reservoir of the master cylinder. Discard fluid.

NOTE: Do not empty front reservoir or it will be necessary to bleed the brake system.

2. Hoist vehicle and remove wheel.

3. Remove cotter pin, and drive axle nut and washer.

4. Position Tool J-22269 on caliper as shown in Figure 16.

5. Tighten screw of tool until caliper moves outboard far enough to push piston to bottom of piston bore. This will allow the shoes to back off from disc surface. Remove Tool J-22269.

6. Remove the two caliper to knuckle attaching bolts.

7. Carefully lift caliper assembly from disc and position so that brake hose is not kinked or stretched.

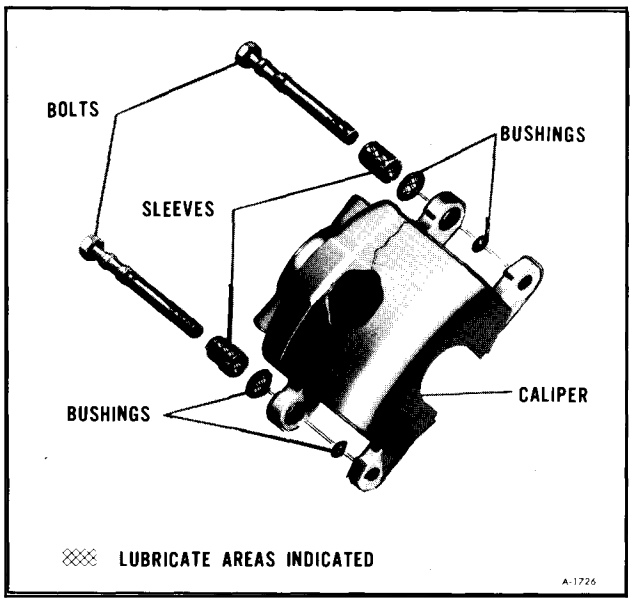


Figure 12—Caliper Sleeve and Bushing Location

8. Loosen uniformly and remove the three bolts securing the retainer to the knuckle (figure 17).

9. Position tool No. J-24717 on hub as shown in Figure 18.

10. Operate slide hammer, tool No. J-2619, until assembly is free of knuckle.

11. Remove slide hammer and tool No. J-24717.

12. Assemble tool No. J-23345 to tool No. J-8433-1.

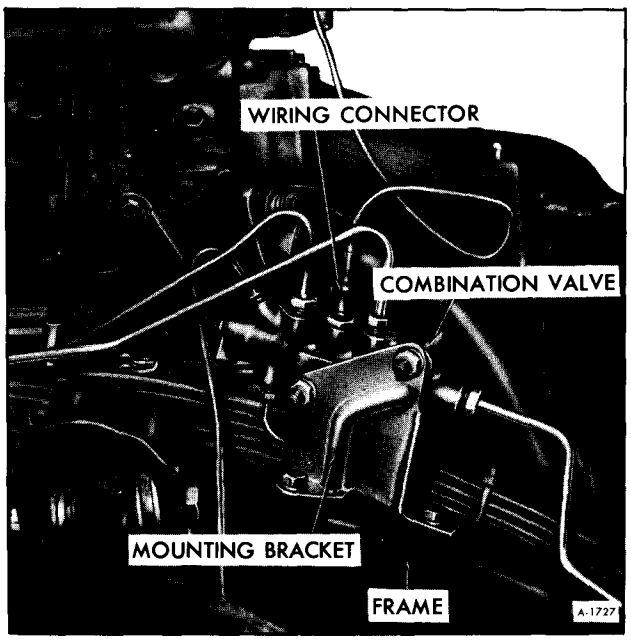


Figure 13—Combination Valve Mounting

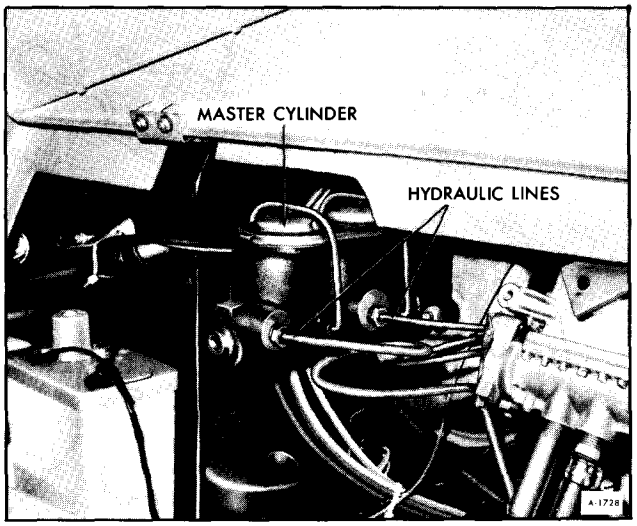


Figure 14—Hydraulic Lines at Master Cylinder

13. Position tool assembly as shown in Figure 19.

CAUTION: *The gripping or pulling edge of the tool must be under the inner race. If the tool slips up to the bearing cage, the bearing will be seriously damaged and need to be replaced.*

14. With tool No. J-22214-6 in place, and a clamp in position tighten center screw until bearing is free of hub.

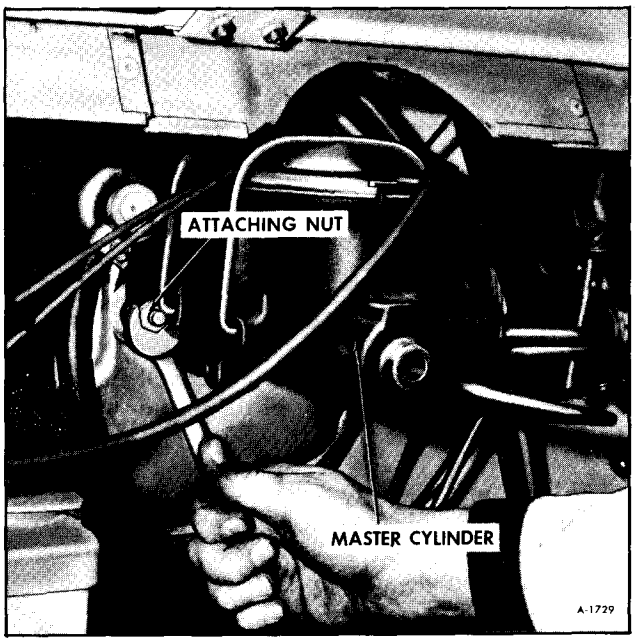


Figure 15—Removing Master Cylinder

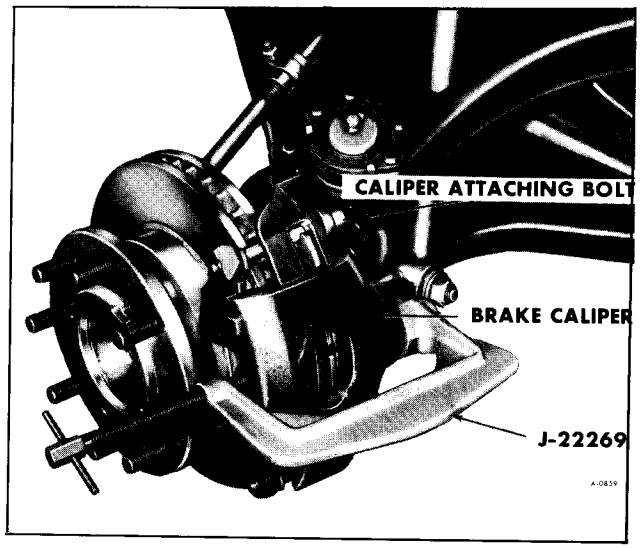


Figure 16—Tool J-22269 on Caliper

15. Clean bearing then inspect for wear or damage. If bearing condition is good repack with bearing grease GM No. 1051344 or equivalent.

16. Remove seal and retainer.

17. Remove four bolts and separate disc from hub as shown in Figure 58.

POWER BRAKE BOOSTER REMOVAL

1. Remove four screws from power level control panel.

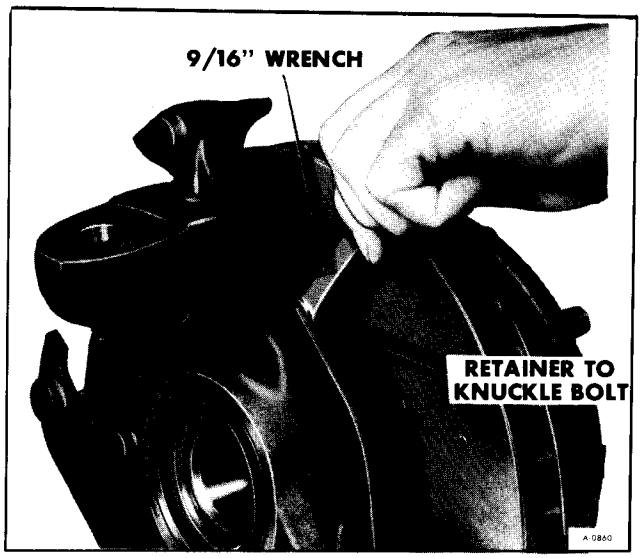


Figure 17—Removing Retainer from Knuckle

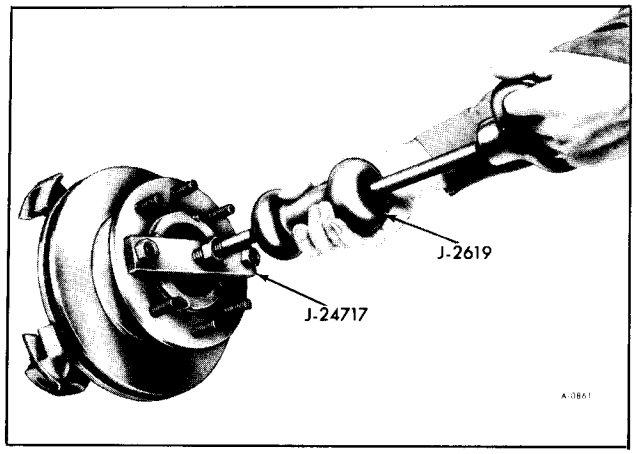


Figure 18—Installing Tool J-24717

2. Pull panel and valve assemblies out of the way, as shown in Figure 20.

3. Remove clevis pin from brake pedal (Refer to figure 21).

4. Remove master cylinder, see "Master Cylinder Removal" earlier in this section.

5. Remove master cylinder bracket by removing two bolts from top of bracket.

6. Remove vacuum line to power brake booster.

7. Remove four nuts retaining booster assembly to firewall, as shown in Figure 22.

8. Remove booster assembly through left front access door.

PARKING BRAKE LEVER REMOVAL

1. Remove four nuts and bolts retaining lever to toe board (Refer to figure 23).

2. Remove two nuts and bolts on cable retaining bracket, as shown in Figure 24.

3. Remove pin from bracket retaining cable end.

4. Remove one screw holding switch to parking brake lever.

5. Remove lever.

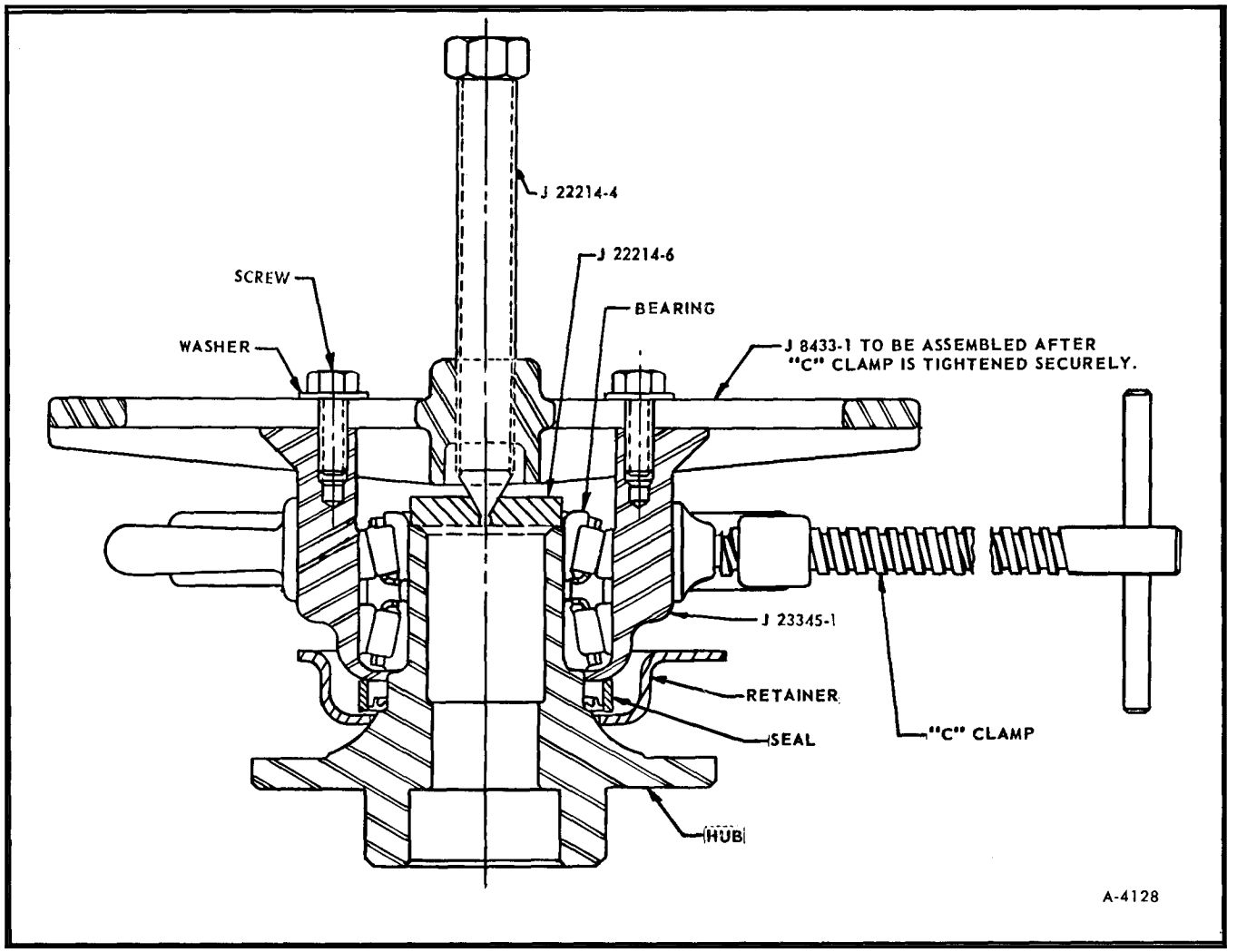


Figure 19—Bearing Removal

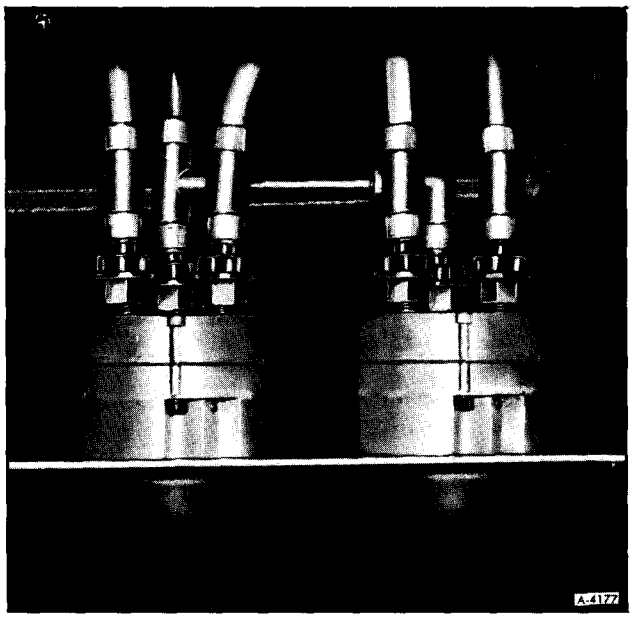


Figure 20—Power Level Panel Removed

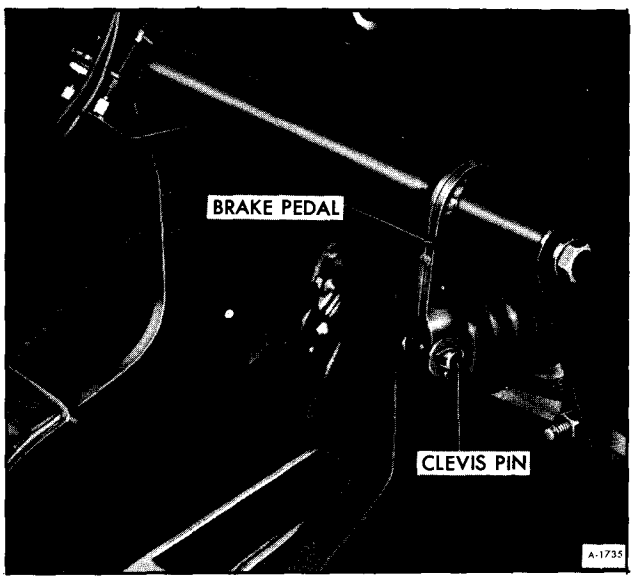


Figure 21—Clevis Pin Location

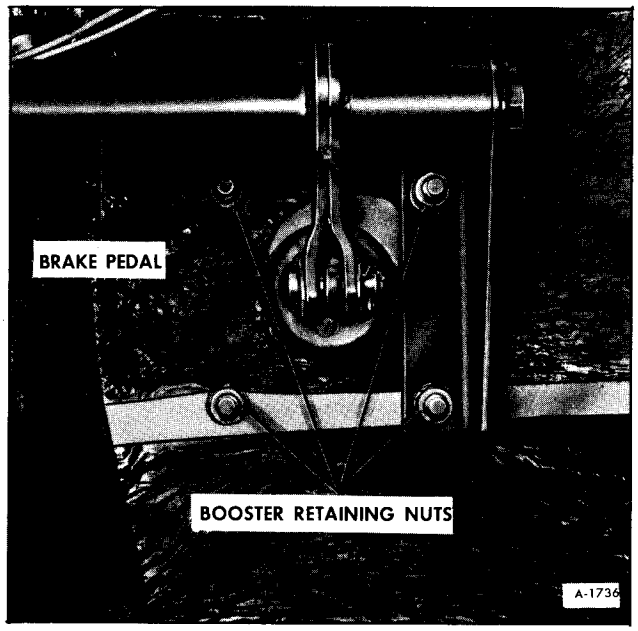


Figure 22—Booster Assembly Retaining Nuts

FRONT PARKING BRAKE CABLE REMOVAL

1. Raise vehicle with suitable lifting device.

2. Remove lock nut and adjusting nut from front equalizer (Refer to figure 25).

3. Remove cable clip at shift relay bracket.

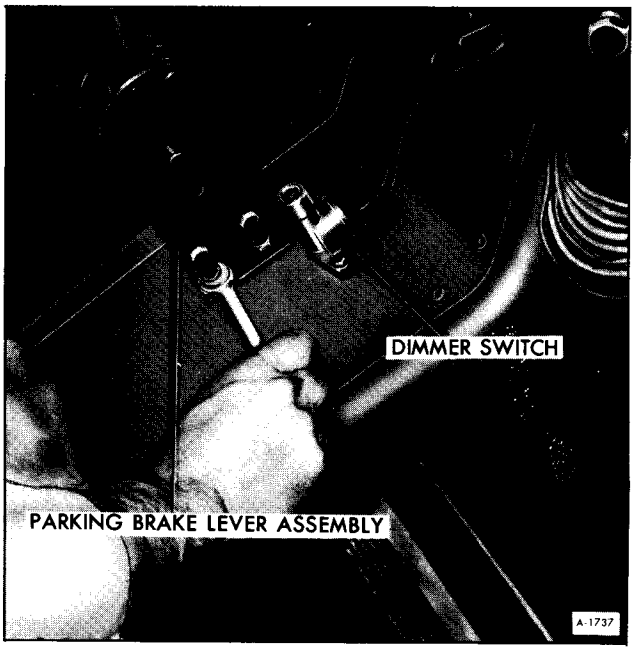


Figure 23—Removing Parking Brake Lever Retaining Nuts

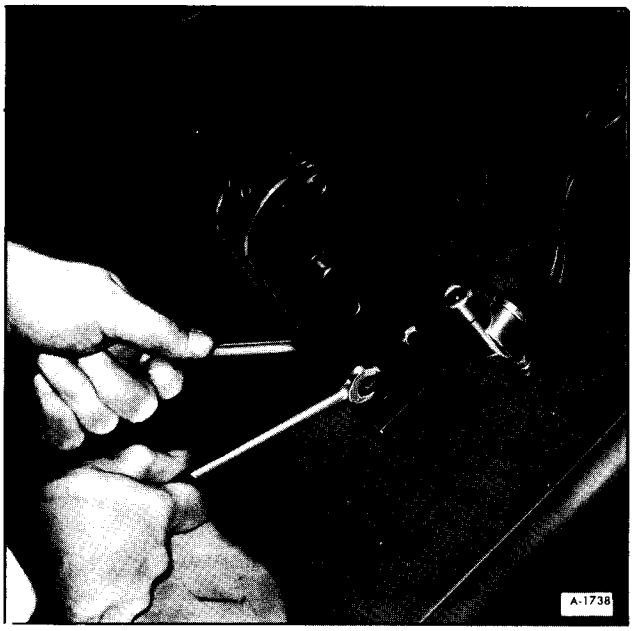


Figure 24—Removing Cable Retaining Bracket

4. Remove retaining pin in parking brake lever.

5. Remove cable.

INTERMEDIATE PARKING BRAKE CABLE REMOVAL

1. Hoist vehicle.

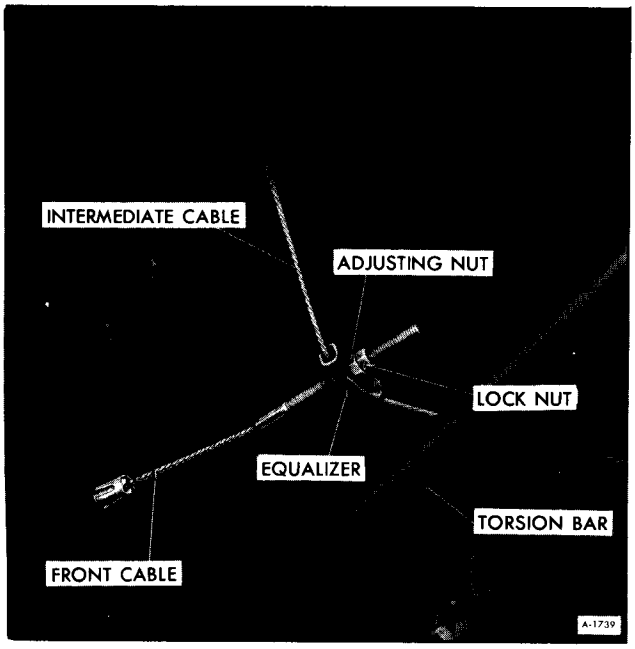


Figure 25—Parking Brake Cable

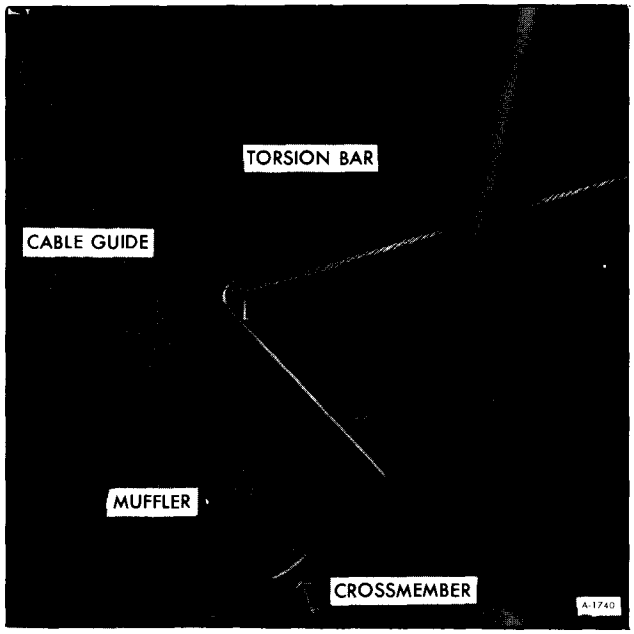


Figure 26—Cable Guide on Crossmember

2. Remove lock nut and adjusting nut from two intermediate equalizers on the outside of each frame rail (Refer to figure 5).

3. Remove lock nut and adjusting nut from front equalizer as shown in Figure 25.

4. Disconnect cable from guide on frame crossmember (figure 26).

5. Disconnect cable from guides at points where cable passes through frame rails as shown in Figure 27.

6. Remove cable.

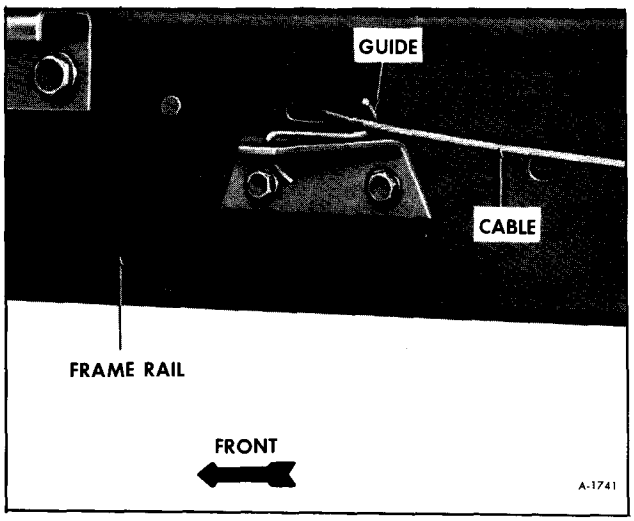


Figure 27—Cable Guide on Frame Rail

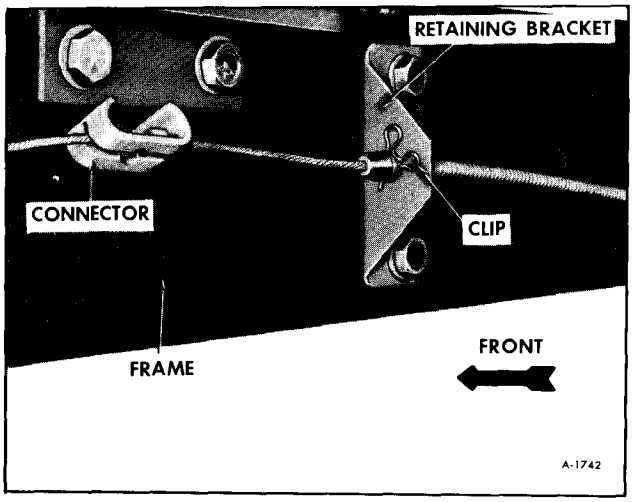


Figure 28—Clip on Frame Rail Retaining Bracket

REAR PARKING BRAKE CABLE REMOVAL

1. Disconnect intermediate equalizer by removing locking and adjusting nuts (figure 5).

2. Pull wire clips at retainers on frame rails (See figure 28).

3. Remove ends of cables from cable connectors. Feed ends of cables through retainers on frame rails.

4. Remove hubs and drums.

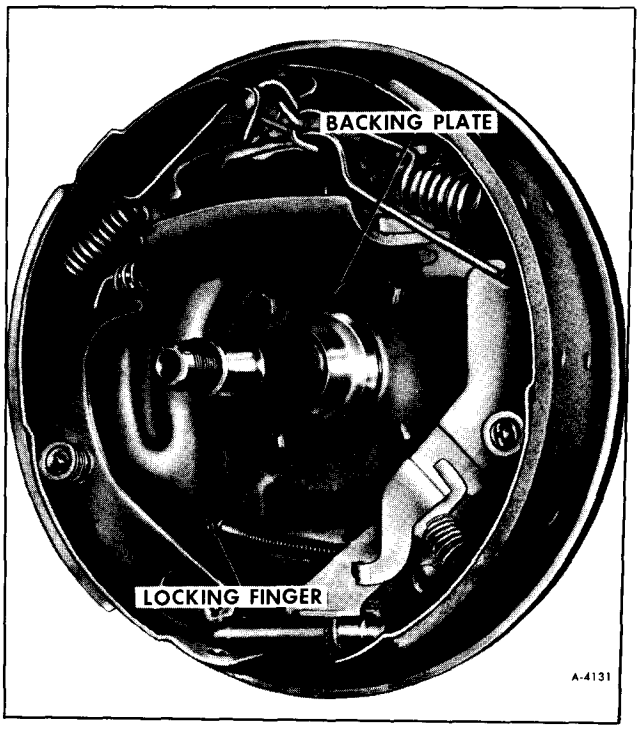


Figure 29—Locking Finger

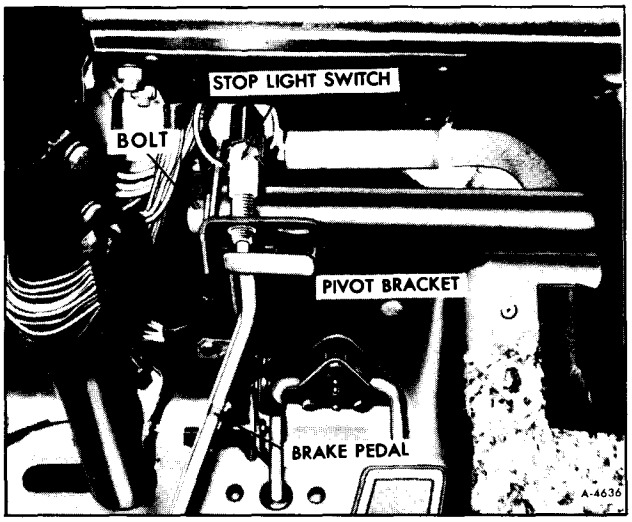


Figure 30—Brake Pedal Assembly (Left Side)

5. Release end of cable from parking brake lever.

6. Compress the locking fingers and pull the rear cable from the backing plate refer to Figure 29.

BRAKE PEDAL REMOVAL

1. Remove four screws from power lever control mounting panel, and pull valves and panel out (figure 20).

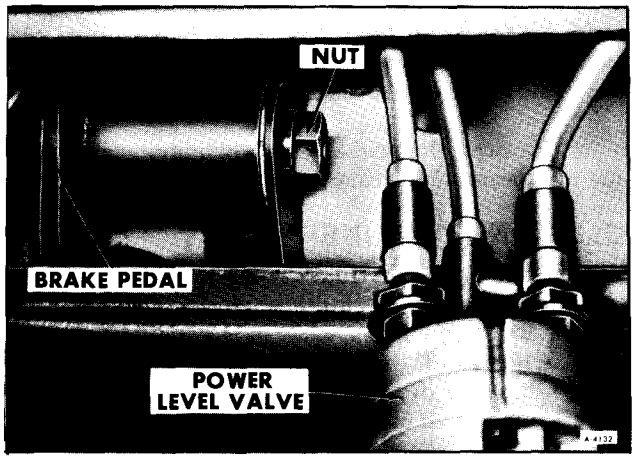


Figure 31—Brake Pedal Assembly (Right Side)

2. Remove stop light switch from top of brake pedal. If equipped with cruise control remove the switch next to the stop light switch (figure 30).

3. Remove cotter pin from pin retaining power booster clevis to brake pedal. Remove clevis pin (figure 21).

4. Remove bolts from each end of pedal assembly (figure 31).

5. Loosen left-hand brake lever pivot bracket.

6. Remove brake pedal assembly.

COMPONENT OVERHAUL

MASTER CYLINDER OVERHAUL

DISASSEMBLY (FIGURE 32)

1. Remove the small secondary piston stop screw from the bottom of the front fluid reservoir of the master cylinder.

2. Place the master cylinder in the vise so that the lock ring can be removed from the small groove in the I.D. of the bore. Remove the lock ring and primary piston assembly. Remove the secondary piston, secondary piston spring and retainer by blowing air through the stop screw hole. If air is not available, a piece of wire may be used. Bend approximately 1/4" of one end of the wire into a right angle. Hook this end under the edge of the secondary piston and pull the secondary piston from the bore.

NOTE: The brass tube-fitting insert need not be removed unless visual inspection indicates the insert is damaged.

3. To replace a defective insert or check valve, the following procedure should be practiced:

a. Place the master cylinder in a vise, so that the outlet holes are up. Enlarge the outlet holes in the tube seats using a 13/64" drill. Tap a 1/4"—20 thread in these holes. Place a heavy washer over the outlet on the master cylinder and thread a 1/4"—20 x 3/4" hex head bolt into the tube seat. Tighten the bolt until the tube seat is unseated.

b. A more preferable way to remove a defective insert involves use of a self-tapping screw and a claw hammer. With a box-end or socket wrench, thread a #6—32 x 5/8" long self-tapping screw into the tube-fitting insert. Using the claw end of the hammer, remove the screw and insert.

4. Remove the casting from the vise and inspect the bore for corrosion, pits and foreign matter. Be

sure the outlet ports are clean. Inspect the fluid reservoirs for foreign matter. Check the bypass and compensating ports to the master cylinder bore to determine if they are restricted.

5. Remove the primary seal, primary seal protector and secondary seals from the secondary piston.

CLEANING AND INSPECTION

Use clean brake fluid to thoroughly clean all reusable brake parts. Immerse in the cleaning fluid and brush metal parts with hair brush to remove foreign matter. Blow out all passages, orifices and valve holes. Air dry and place cleaned parts on clean paper or lint free clean cloth. If slight rust is found inside either the front or rear half housing assemblies, polish clean with crocus cloth or fine emery paper, washing clean afterwards.

CAUTION: *Be sure to keep parts clean until reassembly. Re-wash at re-assembly if there is any occasion to doubt cleanliness—such as parts dropped or left exposed for eight hours or longer.*

IF there is any suspicion of contamination or any evidence of corrosion, completely flush the vehicle hydraulic brake system. Failure to clean the hydraulic brake system can result in early repetition of trouble. Use of gasoline, kerosene, anti-freeze, alcohol or any other cleaner, with even a trace of mineral oil, will damage rubber parts.

Rubber Parts

Wipe fluid from the rubber parts and carefully inspect each rubber part for cuts, nicks or other damage. These parts are the key to the control of fluid or air flow. If the unit is in for overhaul, or if there is any question as to the serviceability of rubber parts, REPLACE them! Inspect in accordance with the following table. The table is organized by power brake unit groups. Badly damaged items, or those which would take extensive work or time to repair, should be replaced. In case of doubt, install new parts. Do not rely on the brake unit being overhauled at an early or proper interval. New parts will provide more satisfactory service, even if the brake unit is allowed to go beyond the desired overhaul period.

MASTER CYLINDER INSPECTION CHART

Part	Inspect For:	Corrective Action:
Master cylinder body.	Scratches, scores, pits, other damage affecting sealing or sliding action of piston seals in master cylinder bore. Damaged threads. Cracks, structural damage. By-pass and compensating holes to be open.	Polish light damage smooth with crocus cloth; replace piece, if damage does not clean up quickly. Clean up or replace. Replace. Open and clean passage.
Spring retainers.	Check for cracks, deformation.	Replace.
Master cylinder primary and secondary pistons.	Nicks, scratches, corrosion on finished O.D. surfaces. Small holes in end open. Try fit in master cylinder to be free with slight play.	Do not repair; replace. Clean. Replace piston cylinder or both if tight or sloppy.
Master cylinder reservoir diaphragm.	Hardness, holes, punch marks, cuts or abrasion.	Replace.

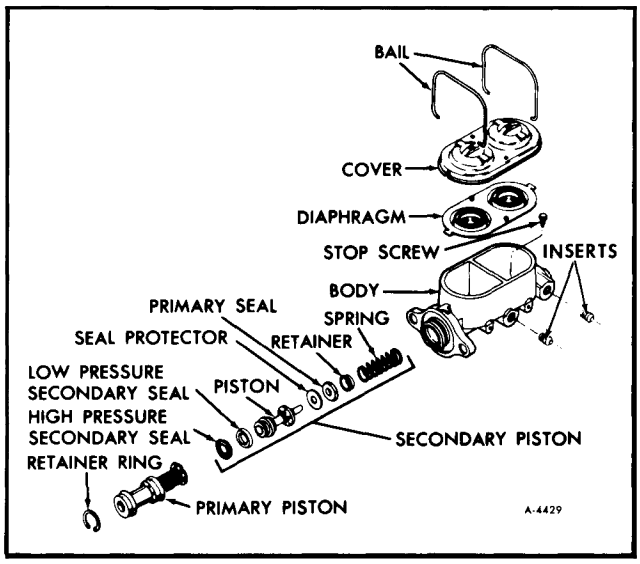


Figure 32—Master Cylinder (Exploded View)

ASSEMBLY (FIGURE 32)

If the brass tube inserts were removed, place the master cylinder in a vise so that the outlet holes are up. Position the new brass tube inserts in the outlet holes, making sure they are not cocked. The recommended method of seating these inserts is to thread a spare brake line tube nut into each outlet hole and turn the nuts down until the insert bottoms. (Remove the tube nut and check the outlet hole for loose brass burrs, which might have been turned up when the insert was pressed into position.)

Each vehicle application of these cylinders is designed to produce the correct displacement of fluid from both the front and rear chambers under normal, failed and partially failed conditions. Delco Moraine dual cylinders are designed so that this variable displacement requirement is controlled within each bore size by the dimensions A and C on the secondary piston.

Because the pistons vary in length, it is necessary to mark them with identification rings. It is imperative that exact replacements be made when servicing the master cylinders.

With all of the variables to be found in master cylinders, which look similar externally, it is important that the complete assemblies be properly identified. For this purpose a two-letter metal stamp will be found on the end of each master cylinder. This two-letter stamp indicates the displacement capabilities of a particular master cylinder. It is, therefore, mandatory that when master cylinders are replaced, they are replaced with cylinders bearing the same two-letter stamp.

1. Place new secondary seals in the two grooves in the flat end of the secondary piston assembly. The seal which is nearest the flat end will have its lips facing toward this flat end. The seal in the second groove should have its lips facing toward the end of the secondary piston which contains the small compensating holes.

2. Assemble a new primary seal and primary seal protector over the end of the secondary piston opposite the secondary seals, so that the flat side of the seal seats against the flange of the piston which contains the small compensating holes.

3. In order to insure correct assembly of the primary piston assembly, a complete primary piston assembly is included in the repair kits.

4. Coat the bore of the master cylinder with clean brake fluid. Coat the primary and secondary seals on the secondary piston with clean brake fluid. Insert the secondary piston spring retainer into the secondary piston spring. Place the retainer and spring down over the end of the secondary piston so that the retainer locates inside the lips of the primary seal.

5. Holding the master cylinder with the open end of the bore up or down, push the secondary piston into the bore so that the spring will seat in against the closed end of the bore. Use a small wooden rod to push the secondary piston to seat.

6. Place the master cylinder in a vise with the open end of the bore up. Coat the primary and secondary seals on the primary piston with clean brake fluid. Push the primary piston, secondary piston stop first, into the bore of the master cylinder. Hold the piston down and snap the lock ring into position in the small groove in the I.D. of the bore.

7. Continue to hold the primary piston down. This will also move the secondary piston forward and will insure that the secondary piston will be forward far enough to clear the stop screw hole, which is in the bottom of the front fluid reservoir. The stop screw is now positioned in its hole and tightened to a torque of 25-40 inch-pounds.

8. Install a new reservoir diaphragm in the reservoir cover and install the cover on the master cylinder. Assemble the bail wires into position to retain the reservoir cover.

WHEEL CYLINDER OVERHAUL

DISASSEMBLY

1. Pull boots from cylinder ends and discard boots.

2. Remove and discard pistons and cups.

CLEANING AND INSPECTION

1. Inspect cylinder bore for scoring or corrosion. It is best to replace a corroded cylinder.

NOTE: Staining is not to be confused with corrosion. Corrosion can be identified as pits or excessive roughness.

2. Polish any discolored or stained area with crocus cloth by revolving cylinder on cloth supported by a finger. Do not slide cloth in a lengthwise manner under pressure.

Do not use any other form of abrasive or abrasive cloth.

3. Rinse cylinder in Declene or equivalent.

4. Shake excessive rinsing fluid from cylinder. Do not use a rag to dry cylinder, as lint from the rag cannot be kept from cylinder bore surfaces.

ASSEMBLY

1. Lubricate cylinder bore and counterbore with clean brake fluid and insert spring expander assembly.

2. Install new cups. (Be sure cups are lint and dirt free). Do not lubricate cups prior to assembly.

3. Install new pistons in the "as received" condition—do not lubricate pistons with brake fluid.

4. Press new boots into cylinder counterbores by hand. Do not lubricate boots prior to assembly.

CALIPER OVERHAUL

DISASSEMBLY

Before beginning disassembly, thoroughly clean the exterior of the caliper using clean Declene or equivalent. Place the caliper on a clean work surface.

Remove the brake hose from the caliper, discarding the copper gasket. Check the hose for worn spots, cracks or other signs of deterioration. Discard the hose, if damaged, replace with a new hose at reassembly. Drain brake fluid from the caliper.

WARNING: DO NOT PLACE THE FINGERS IN FRONT OF THE PISTON IN AN ATTEMPT TO CATCH OR PROTECT IT WHEN APPLYING COMPRESSED AIR. THIS COULD RESULT IN SERIOUS INJURY.

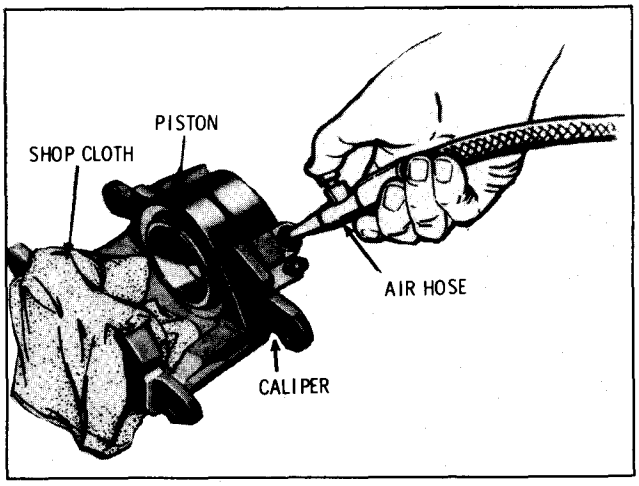


Figure 33—Removing Piston

Remove the piston by directing compressed air into the caliper inlet hole. As shown in Figure 33.

CAUTION: *Use just enough air pressure to ease the piston out of the bore. If the piston is blown out-even with padding provided—it may become damaged.*

Use a screwdriver to pry the boot out of the caliper. Extend the screwdriver across the caliper bore, under the boot, and pry up. Be careful not to scratch the caliper bore (figure 34).

Use a piece of wood or plastic to remove the piston seal from its groove in the caliper bore. DO NOT USE A METAL TOOL OF ANY TYPE FOR THIS OPERATION.

Remove the bleeder valve from the caliper.

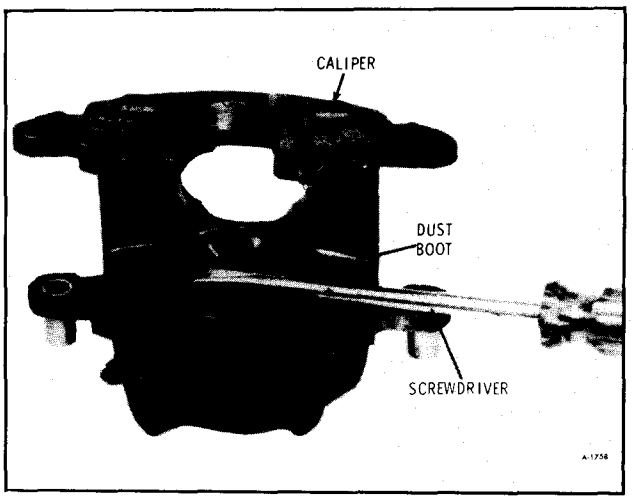


Figure 34—Removing Boot from Caliper

CLEANING AND INSPECTION

The boot, piston seal, rubber bushings and sleeves are to be replaced each time the caliper is overhauled.

Clean all other parts in clean Declene or equivalent. Use dry, filtered compressed air to dry parts and blow out all passages in the caliper and bleeder valve.

WARNING: THE USE OF LUBRICATED SHOP AIR WILL LEAVE A FILM OF MINERAL OIL ON THE METAL PARTS. THIS MAY DAMAGE RUBBER PARTS WHEN THEY COME IN CONTACT AFTER REASSEMBLY.

Check the mounting bolts for corrosion, breaks in the plating or other damage. Do not use abrasives in an attempt to clean the bolts. If bolts are damaged, replace them.

Carefully examine the piston OD for scoring, nicks, corrosion and worn or damaged chrome plating. If any surface defects are detected, replace the piston.

NOTE: The piston OD is the primary sealing surface in the caliper assembly. It is manufactured and plated to close tolerances. Refinishing by any means or the use of any abrasive is not acceptable.

Check the bore in the caliper for the same defects as the piston. The piston bore is not plated and stains or minor corrosion can be polished with crocus cloth. Do not use emery cloth or any other form of abrasive. Thoroughly clean the caliper after the use of crocus cloth. If the bore can not be cleaned up in this manner, replace the caliper.

ASSEMBLY

Lubricate the bore in the caliper and the new piston seal with clean brake fluid. Position the seal in the caliper bore groove. Lubricate the piston with clean brake fluid and assemble a new boot into the groove in the piston so that the fold faces the open end of the piston. Insert the piston into the caliper bore, using care not to unseat the seal and force down to the bottom in the bore. This will require a force of 50 to 100 pounds.

Position the OD of the boot in the caliper counterbore and seat with Tool J-22904 (figure 35).

Check the boot installation to make sure that the retaining ring molded into the boot is not bent and that the boot is installed fully-below the caliper face —and evenly all around. Otherwise dirt or moisture may enter the bore and cause damage or corrosion.

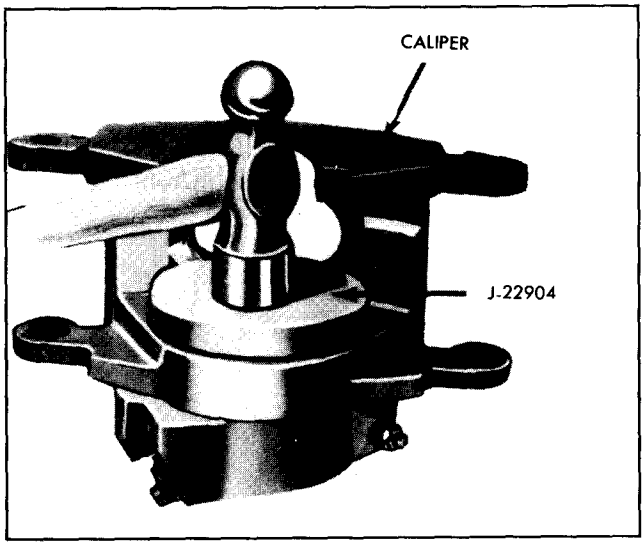


Figure 35—Boot Installation

Install the brake hose in the caliper inlet using a NEW copper gasket.

POWER BRAKE BOOSTER OVERHAUL

DISASSEMBLY

CAUTION: *Care must be used in handling the diaphragm of power piston assembly. Guard diaphragm against grease, oil, foreign matter and nicks or cuts.*

1. Scribe front and rear housing.

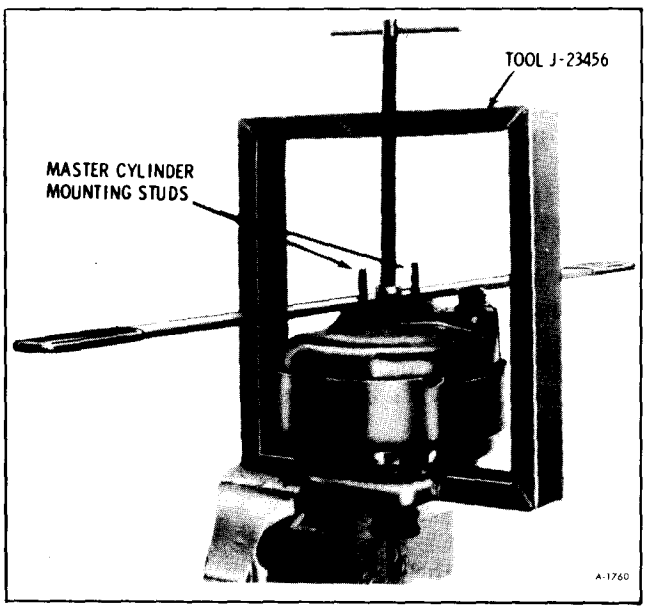


Figure 36—Separating Halves

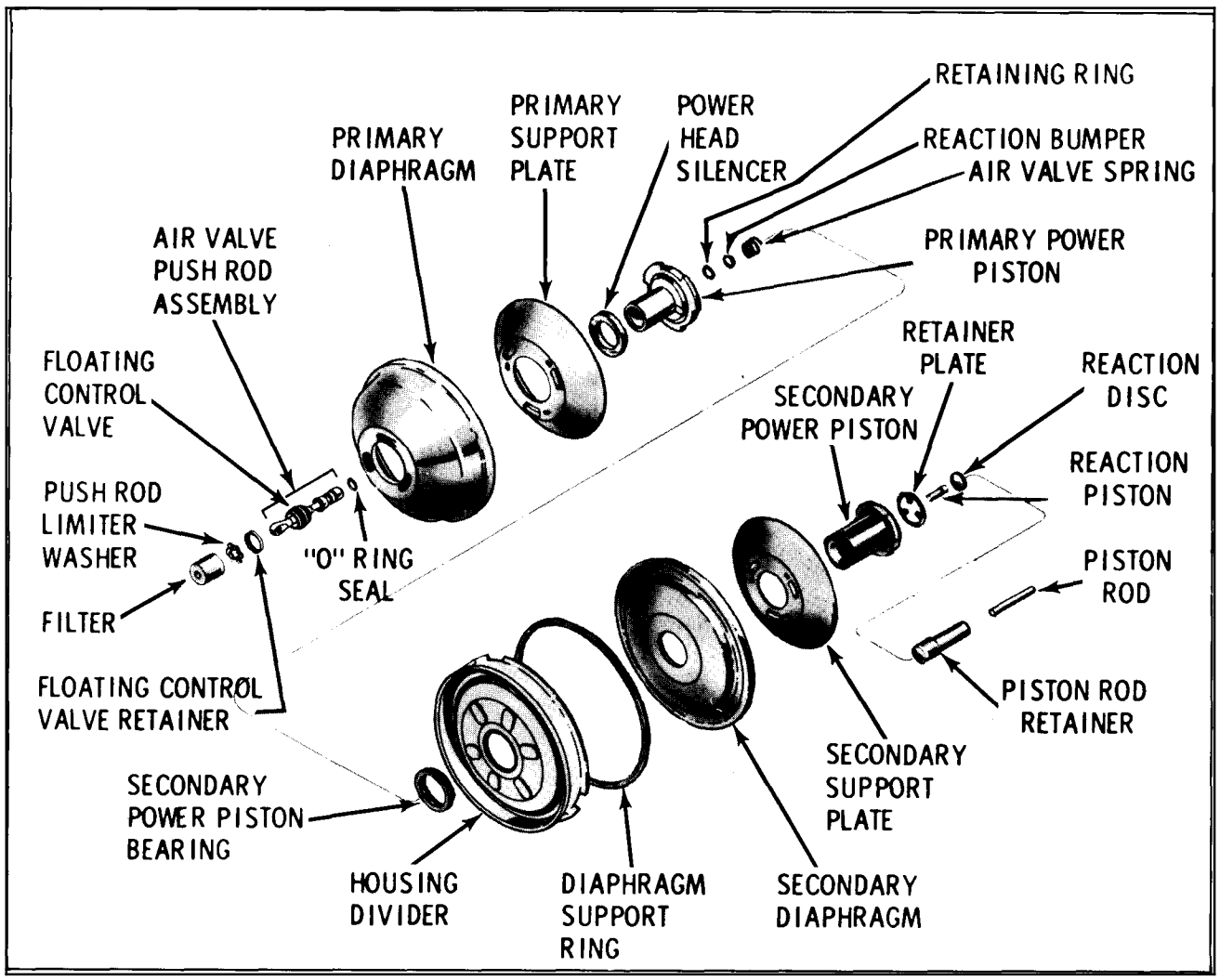


Figure 37—Exploded View of Power Piston

2. Remove master cylinder attaching nuts and remove master cylinder from front housing.

3. Remove front housing seal and master cylinder piston push rod.

4. Install Tandem Diaphragm Separating Tool J-23456 as shown in Figure 36.

5. With cylinder clamped slightly, rotate bar counterclockwise and unlock shells.

6. Back off hold down sufficiently to remove front shell, return spring retainer plate and piston rod retainer.

7. Remove assembly from tool and remove tool from vise.

8. Remove the dust boot retainer and boot from the rear housing and push rod. Remove the felt silencer from inside the boot.

9. Remove the power piston assembly from the rear shell and remove the primary power piston bearing from the center opening of the rear shell.

10. Lift the bead on the outside diameter of the secondary diaphragm and remove the support ring. (figure 37)

11. Mount Piston Unlocking Tool, J-23101, in a vise with wide jaws up. Position the secondary power piston so that the two radial slots in the piston fit over the jaws of the tool. (figure 38)

12. Fold back primary diaphragm from the outside diameter of the primary support plate. Grip the edge of the support plate and rotate counterclockwise to unscrew the primary power piston from the secondary power piston. (figure 39)

NOTE: It is possible that the primary support plate will unlock from the primary piston before

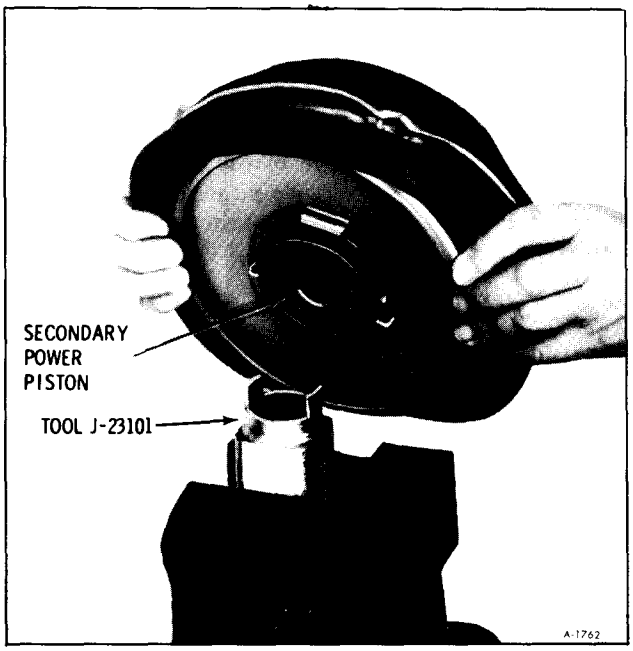


Figure 38—Positioning Secondary Power Piston

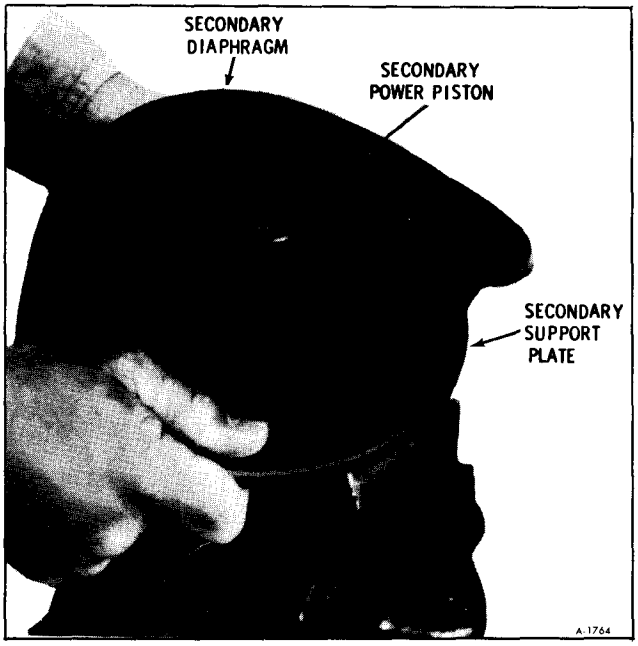


Figure 40—Removing Secondary Diaphragm

the primary piston unscrews from the secondary piston. If this happens, continue to turn the primary support plate counterclockwise. Tabs ("stops") on the primary support plate will temporarily lock the primary support plate to the primary power piston and permit continued counterclockwise rotation to unscrew the primary power piston from the secondary power piston.

13. Remove the housing divider from the secondary power piston. Remove the secondary power piston bearing from the housing divider.

14. The secondary power piston should still be positioned on Tool J-23101. Fold back secondary diaphragm from O.D. of secondary support plate. Grip the edges of the support plate and rotate clockwise to unlock the secondary support plate from the secondary power piston. (figure 40).

15. Remove the secondary diaphragm from the secondary support plate.

Figure 39—Unlocking Power Piston

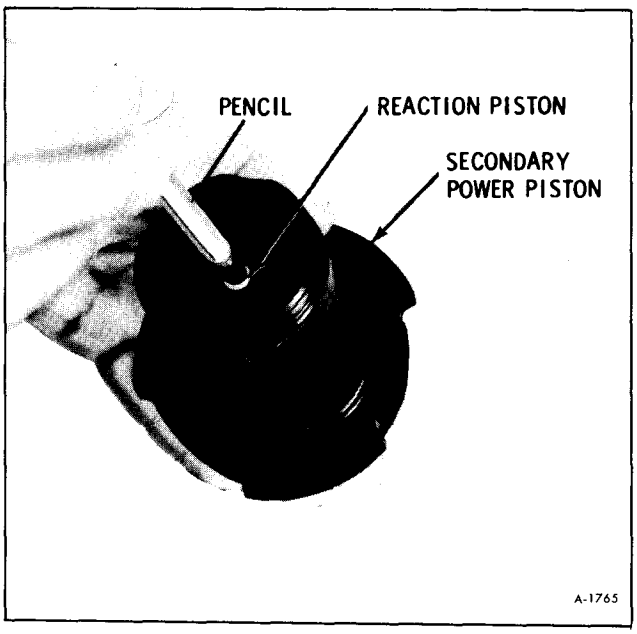


Figure 41—Removing Reaction Piston

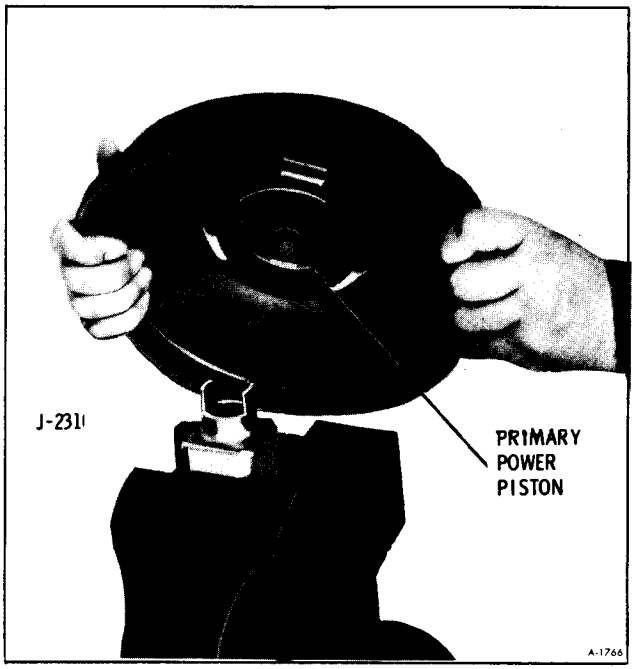


Figure 42—Positioning Primary Power Piston

16. Remove the reaction piston and reaction disc from the center of the secondary power piston by pushing down on the end of the reaction piston with a small object, such as a pencil, wooden dowel or metal rod. (figure 41)

17. Remove the air valve spring from the end of the air valve.

18. Mount Tool J-23101 in a vise with small jaws up. Position the primary power piston so that the two radial slots in the piston fit over the jaws of the tool. (figure 42)

19. Fold back primary diaphragm from the support plate. Grip the edge of the support plate and rotate in a counterclockwise direction to unlock the primary support plate from the primary power piston. (figure 43)

20. Remove the primary diaphragm from the primary support plate.

21. Remove the air filter and push rod limiter washer from the tubular section of the primary power piston.

22. Remove the power head silencer from the neck of the power piston tube.

23. Remove the rubber reaction bumper from the end of the air valve.

24. Remove the snap ring from the air valve. (figure 44)

25. Remove the air valve-push rod assembly from the tube end of the primary power piston by pulling on the primary power piston. (figure 45)

26. Removal of the air valve push rod assembly will disassemble the floating control valve retainer.

27. Remove the "O" ring seal from the air valve.

28. The air valve push rod assembly will be ser-

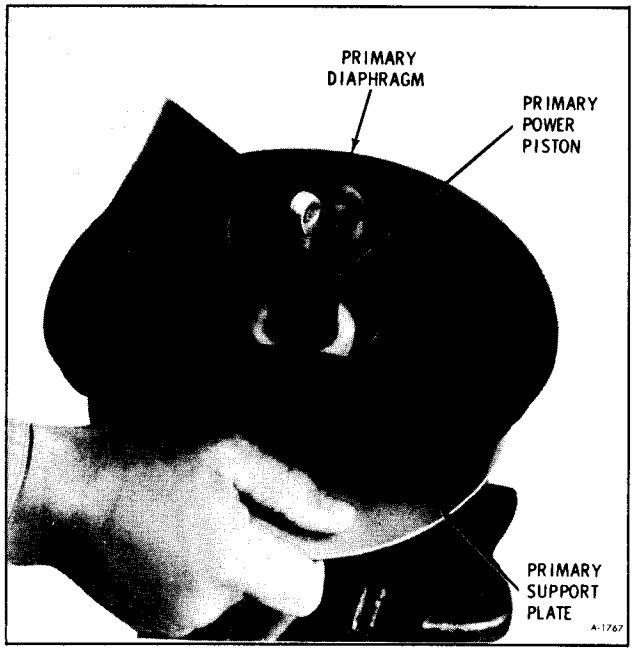


Figure 43—Removing Primary Diaphragm

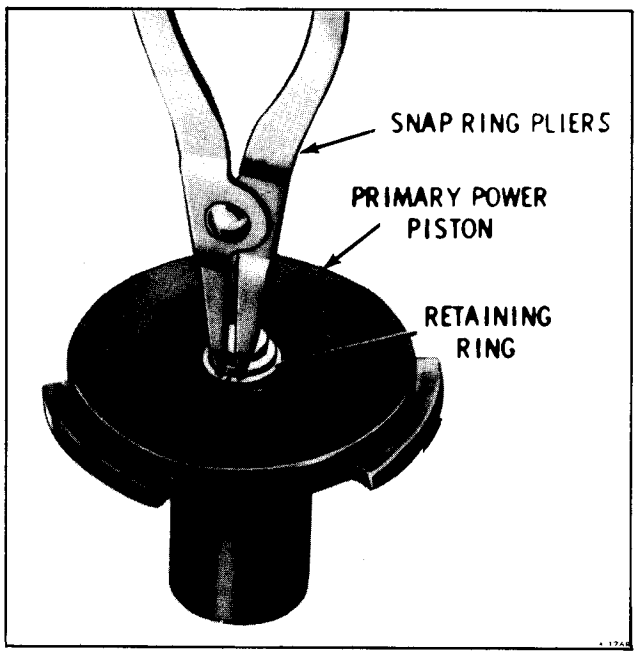


Figure 44—Removing Snap Ring from Air Valve

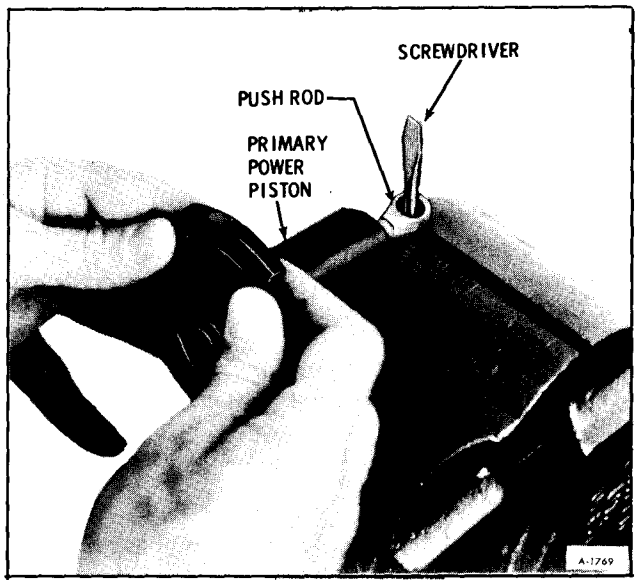


Figure 45—Removing Air Valve Push Rod Assembly

viced using a complete assembly, since the floating control valve cannot be removed over the eye end of the push rod.

CLEANING AND INSPECTION

CAUTION: *If there is any suspicion of contamination or any evidence of corrosion, completely flush the hydraulic brake system. Failure to clean hydraulic brake system can result in early repetition of trouble. Do not use gasoline, kerosene, anti-freeze alcohol or any other cleaner with even a trace of mineral oil.*

After disassembly, immerse all metal parts in metal cleaner. Plastic parts, as well as the rubber power diaphragms, should be cleaned in Declene or equivalent. Care should be taken to avoid chipping or damaging plastic parts in handling. After parts have been thoroughly cleaned, those parts which come in contact with hydraulic brake fluid (that is, all master cylinder parts and the power section push rod) should be thoroughly washed in Declene or equivalent before assembly. Use air to blow out dirt and cleaning solvent from recesses and internal passages. DISCARD ALL RUBBER PARTS EXCEPT THE POWER DIAPHRAGMS.

ASSEMBLY

NOTE: During assembly, when a lubricant is specified, use either the lubricant furnished with the repair kit or Seal Lubricant No. 1050169 or equivalent.

1. Lubricate the "O" ring seal, Figure 37 and place on the air valve.

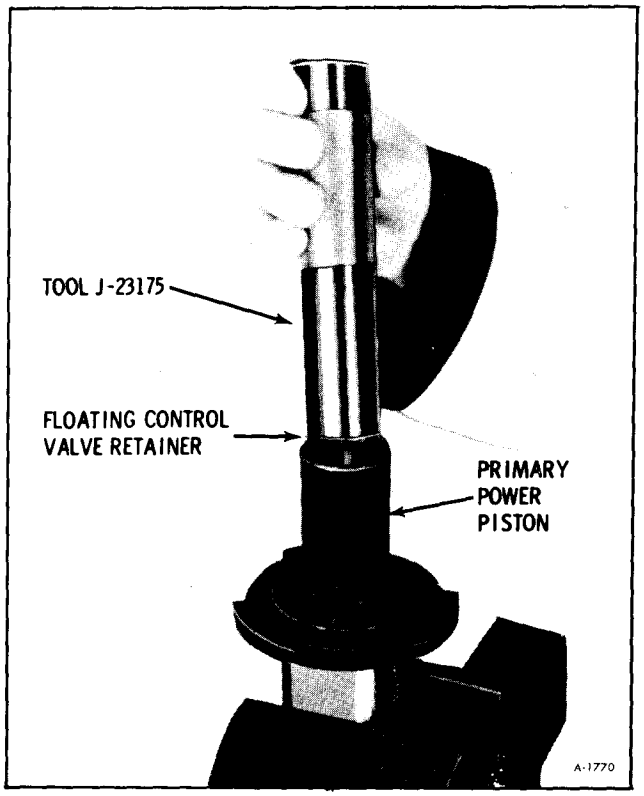


Figure 46—Installing Retainer Ring

2. Wipe a thin film of lubricant on the large and small O.D. of the floating control valve.

3. If the floating control valve needs replacement, replace the complete air valve push rod assembly.

4. Place the air valve end of the air valve push rod assembly into the tube of the primary power piston. Manually press the air valve push rod assembly so that the floating control valve bottoms on the tube section of the primary power piston.

5. Place lip of retainer on the O.D. of Tool J-23175. (figure 46) Manually press the retainer until seated in the primary power piston tube. (figure 47)

6. Place the push rod limiter washer over the push rod and position on the floating control valve.

7. Install filter element over the push rod eye and press into the primary power piston tube.

8. Using snap ring pliers, place the snap ring into the groove in the air valve.

9. Install the rubber reaction bumper on the air valve.

NOTE: Tolerances of component parts affecting output of the tandem power brake are very critical. To maintain correct power brake output, the

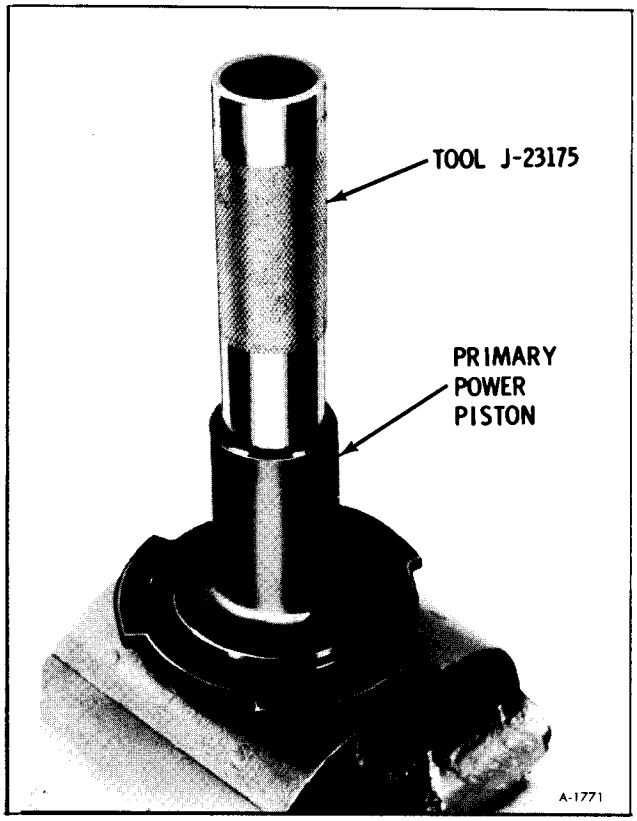


Figure 47—Retainer Ring Seated

power piston assembly is serviced as an assembly which includes a pre-selected REACTION PISTON, PRIMARY POWER PISTON, and SECONDARY POWER PISTON. NO gauging operation is required when power piston service package is used.

10. Assemble the primary diaphragm to the primary support plate from the side of the support plate opposite the locking tangs. Press the raised flange on the I.D. of the diaphragm through the center hole of the support plate. Be sure that the edge of the support plate center hole fits into the groove in the raised flange of the diaphragm. Lubricate the diaphragm I.D. and the raised surface of the flange (that fits into a groove in the primary power piston) with a light coat of lubricant.

11. Mount Tool J-23101, in a vise, small jaws up. Position the primary power piston so that the two radial slots in the piston fit over the jaws of the tool. (figure 42)

12. Fold the primary diaphragm away from the O.D. of the primary support plate.

13. Holding the edges of the support plate, with the locking tangs down, place the primary support plate and diaphragm assembly over the tube of the primary power piston. The flange on the I.D. of the primary diaphragm will fit into a groove in the primary power piston.

14. Grip the edges of the primary support plate, press down, and rotate clockwise until the tabs on the primary power piston contact the stops on the support plate. (figure 43)

15. Place the power head silencer on the tube of the primary power piston so that the holes at the base of the tube are covered.

16. Apply a very light film of lubricant to the O.D. of the primary power piston tube.

17. Remove the primary piston assembly from Tool J-23101.

18. Assemble the secondary diaphragm to the secondary support plate from the side of the support plate opposite the locking tangs. Press the raised flange on the I.D. of the diaphragm through the center hole of the support plate. Be sure that the edge of the support plate center hole fits into the groove in the raised flange of the diaphragm. Apply a thin coat of lubricant to the I.D. of the secondary diaphragm and the raised surface of the flange (that fits into a groove in the secondary power piston.)

19. Mount Tool J-23101 in a vise with large jaws up. Position the secondary power piston so that the radial slots in the piston fit over the jaws of the tool. (figure 38) Apply a light coat of lubricant to the tube of the secondary power piston.

20. Fold the secondary diaphragm away from the O.D. of the secondary support plate.

21. Holding the edges of the support plate, with the locking tangs down, place the secondary diaphragm and support plate assembly over the tube of the secondary power piston. The flange on the I.D. of the secondary diaphragm will fit into the groove in the secondary piston.

22. Grip the edges of the secondary support plate, press down, and rotate counterclockwise until the tabs on the secondary power piston contact the stops on the support plate. (figure 40) Fold the secondary diaphragm back into position on the secondary support plate. Leave the secondary power piston assembly on Tool J-23101 in the vise.

23. Apply a light coat of lubricant to the bead on the O.D. of the secondary diaphragm. This will facilitate assembly of front and rear housings.

24. Place the secondary diaphragm support ring on the secondary power piston assembly so that it rests on the edge of the diaphragm.

25. Hold the housing divider so that the formed lip (that holds the primary diaphragm) of the divider faces down. Place the secondary bearing in the I.D. of the divider so that the extended lip of the bearing faces up. (figure 48)

26. Lubricate the I.D. of the secondary bearing.

27. Position Tool J-23188, on the threaded end of the secondary power piston. (figure 49)

28. Hold the housing divider with the formed lip (that holds the primary diaphragm) facing up. Press the divider down over the tool and onto the secondary power piston tube where it will rest against the diaphragm support ring. Remove Tool J-23188 from secondary power piston. Do not remove the secondary power piston subassembly from Tool J-23101.

29. Pick up the primary power assembly and position the small end of the air valve return spring on the air valve so that it contacts the air valve retaining ring.

30. Fold the primary diaphragm away from the O.D. of the primary support plate.

31. Position the primary power piston on the tubular portion of the secondary power piston, making sure that the air valve return spring seats down over the raised center section of the secondary piston.

32. Grip the edge of the primary support plate, press down, and start the threads on the secondary power piston into the threaded portion of the primary power piston by rotating in a clockwise direction. (figure 39)

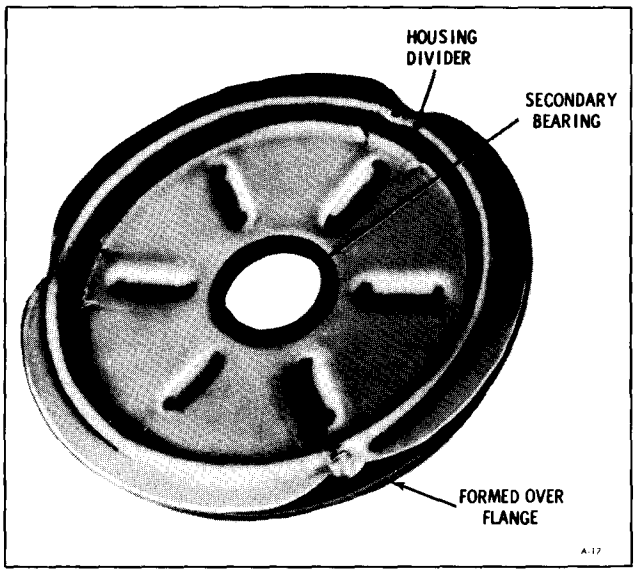


Figure 48—Installing Secondary Bearing

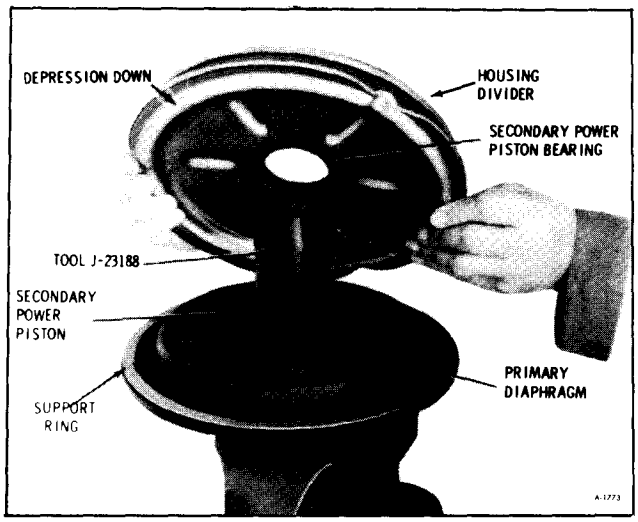


Figure 49—Installing Housing Divider

33. Continue to tighten the primary power piston until it is securely attached to the secondary power piston.

34. Fold the primary diaphragm back into position on the primary support plate and pull the diaphragm O.D. over the formed lip of the housing divider. Check that the bead on the diaphragm is seated evenly around the complete circumference.

35. Wipe a thin film of lubricant on the O.D. of the piston rod retainer. Insert the master cylinder piston rod retainer into the cavity in the secondary power piston so that the flat end bottoms against the rubber reaction disc in the bottom of the cavity.

36. Place the primary power piston bearing in rear housing center hole so that the formed flange of

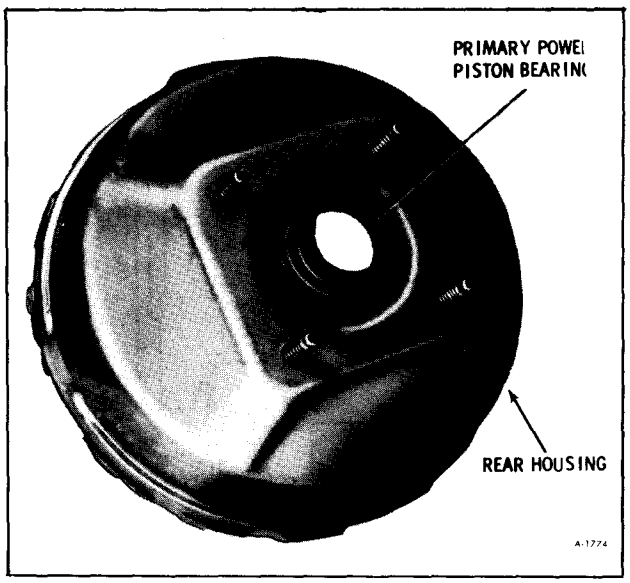


Figure 50—Installing Primary Power Piston Bearing

the housing center hole fits into the groove of the primary power piston bearing. The thin lip of the bearing will protrude to the outside of the housing. (figure 50)

37. Coat the I.D. of the primary power piston bearing with a thin film of lubricant.

38. Assemble the power piston assembly to the rear shell by pressing the tube of the primary power piston through the rear housing bearing. Press down until the housing divider seats in the rear shell and the primary power piston bottoms against the shell.

39. Mount Tool J-23456 in vise and position rear shell in tool.

40. Place piston rod retainer plate on the end of the power piston and install power piston return spring.

41. Lower front shell over rear shell and position bar on front shell with bearing.

42. Tighten down on front shell and fit the tangs in the appropriate slots on the rear shell.

43. Rotate the bar clockwise into the locked position and remove power head from Tool J-23456.

44. Place the filter in the power head boot. Stretch the boot over the push rod and over the flange of the rear housing and install boot retainer.

45. Place the power head assembly in a vise with the front shell facing up. Insert the master cylinder piston rod, flat end first, into the piston rod retainer.

46. Press down on the master cylinder piston rod to be sure it is properly seated.

NOTE: To assure that no vacuum is in the power head while gauging, front housing seal must not be installed at this time.

47. Place gauge J-23337 over the piston rod in a position which will allow the gauge to be moved to the left or right without contacting the studs. (Figure 51)

48. Position gauge over piston rod. The adjustment is correct if the lower step contacts the piston rod and the upper step clears the piston rod.

49. If the push rod is not within specifications and the push rod does not have an adjusting screw, a new service adjustable push rod must be installed and adjusted to specification. If the push rod being checked has an adjusting screw, adjust the push rod to specification.

50. Wipe a thin film of lubricant on the I.D. of the front housing seal and position seal in the depression in the housing.

51. Position the master cylinder assembly on the front housing. Install the locknuts on the studs and torque to 28 ft. lbs.

52. Install power unit into vehicle.

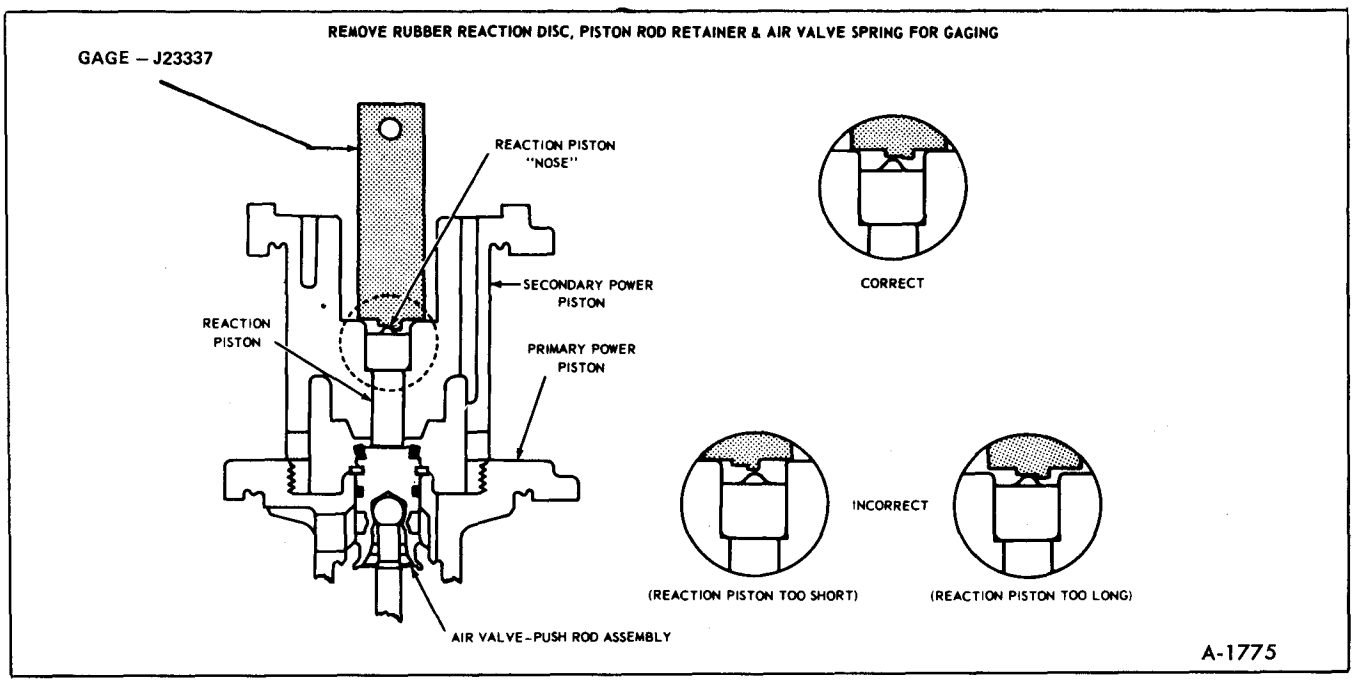


Figure 51—Gauging Piston Rod

TESTING OF POWER BRAKE UNIT

1. Road test brakes by making a brake application at about 20 mph to determine if vehicle stops evenly and quickly. If pedal has a spongy feel when applying brakes, air may be present in hydraulic system. Bleed system as described in BLEEDING SYSTEM.

2. With engine stopped and transmission in neutral, apply brakes several times to deplete all vacuum reserve in system. Depress brake pedal, hold light-foot pressure on pedal and start engine. If vacuum system is operating, pedal will tend to fall away under foot pressure and less pressure will be required to hold pedal in applied position. If no action is felt, vacuum system is not functioning.

3. Stop engine. Again deplete all vacuum reserve in system. Depress brake pedal and hold foot pressure on pedal. If pedal gradually falls away under foot pressure, hydraulic system is leaking internally or externally.

4. If brake pedal travels to within one inch of toeboard, brake shoes are not adjusting or require relining.

5. Start engine with brakes off and transmission in neutral. Run engine to medium speed and turn off ignition. Immediately close throttle. This builds up vacuum. Wait no less than 90 seconds, then try brake action. If not vacuum-assisted for two or more applications, vacuum check is faulty or there is a leak in vacuum system.

MAJOR COMPONENT INSPECTION

COMBINATION VALVE

No attempt should be made to disassemble or repair either valve. If any failure should occur, the complete valve should be replaced.

REAR BRAKE SHOES AND BACKING PLATE

1. Inspect linings for wear. If linings are worn nearly flush with rivets new linings should be installed.

2. Check wheel cylinder for leakage by removing the link. If leak exists, remove wheel cylinder for service or replacement.

3. Clean inner surfaces of brake backing plates and all shoe contacting points.

4. Clean exposed portions of parking brake cables.

5. Disassemble the adjusting screw assembly. Clean and inspect as follows:

a. Check thrust washer and mating surfaces for burrs of excessive wear.

b. Inspect teeth on sprocket for wear.

c. Remove all foreign material from adjusting screw and nut. Nut must rotate freely on threads.

6. Check the foot of the adjuster lever for wear. Replace if necessary.

7. Check the override pivot for wear or deformed parts.

8. Check brake drum inner diameter for build-up of rust and dirt. Remove build-up so that drums can be installed over pre-adjusted linings. Check drum for cracks and out-of round condition.

DISC BRAKE SHOE AND LINING

LINING INSPECTION

Inspect the brake linings any time that the wheels are removed (tire rotation, etc.). Check both ends of the outboard shoe by looking in at each end of the caliper. These are the points at which the highest rate of wear normally occurs. At the same time, check the lining thickness on the inboard shoe to make sure that it has not worn prematurely. Look down through the inspection hole in the top of the caliper to view the inboard shoe. Whenever the thickness of any lining is worn to the approximate thickness of the metal shoe, all shoe and lining assemblies should be replaced.

Front disc brakes have a wear indicator that makes a noise when the linings wear to a degree where replacement is required. (figure 52) The spring clip is an integral part of the inboard shoe and lining. When the lining is worn the clip contacts the rotor and produces a warning noise.

Check flatness of brake pads. Place inboard and outboard pad surfaces together and check for gap between pad surfaces. If more than .005" gap is measured at middle of pad (midway between attaching lugs), pad must not be used. This applies to new or used brake pads.

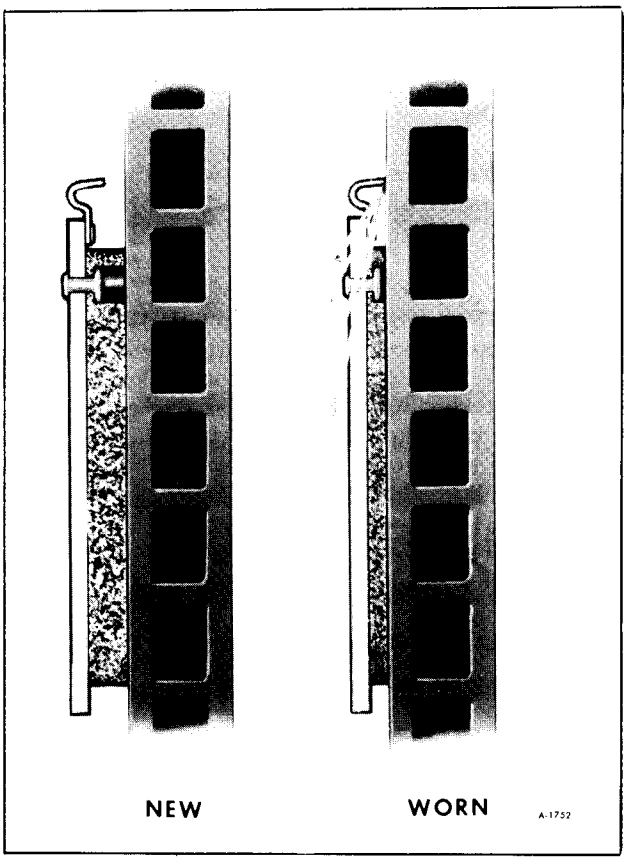


Figure 52—Wear Indicators

CLEANING AND INSPECTION

1. Thoroughly clean the holes and the bushing grooves in the caliper ears. Wipe all dirt from the mounting bolts. Do not use abrasives on the bolts since this will damage the plating. If the bolts are corroded, or damaged, they should be replaced.

2. Examine the inside of the caliper for evidence of fluid leakage. If leakage is noted, the caliper should be overhauled. Wipe the inside of the caliper clean, including the exterior of the dust boot. Check the boot for cuts, cracks or other damage. Make sure that the boot is properly engaged in the groove in the piston and also in the caliper counter-bore. (figure 53)

CAUTION: *Do not use compressed air to clean the inside of the caliper since this may cause the dust boot to become unseated.*

DISC INSPECTION

Light scoring .010-.020 inch deep, of the disc braking surface will normally occur during brake application, turning is not required unless they are

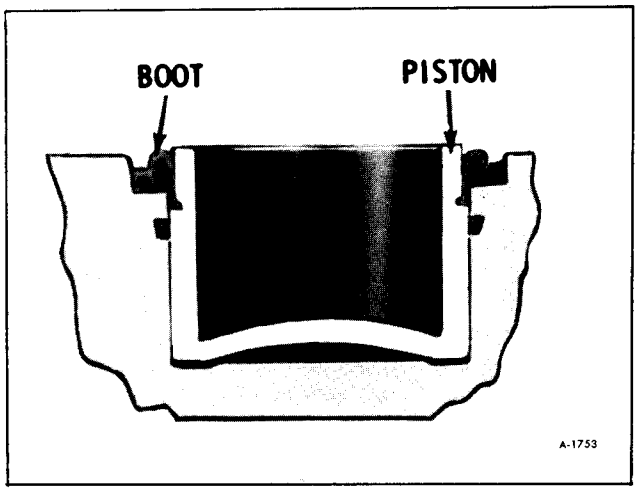


Figure 53—Boot Installation

severely scored. It is not necessary to remove all score marks when turning. Precision equipment must be used when turning discs and the following specifications must be carefully observed. DO NOT reduce total thickness of the braking surface anymore than the turning dimension of 1.185". If too much is removed, even maximum pedal travel will not apply the brakes if pads are worn.

Disc runout can be checked by clamping a dial indicator to the caliper or plain arm so that the stylus touches the disc about an inch from its outer edge. Rotate disc and check indicator reading. If the lateral runout exceeds specifications the disc should be replaced or refinished.

After turning, brake surface thickness must not vary more than .0005". Lateral runout must not exceed specifications. Surface finish must be non-directional and smoothness maintained at 30-50 micro inches.

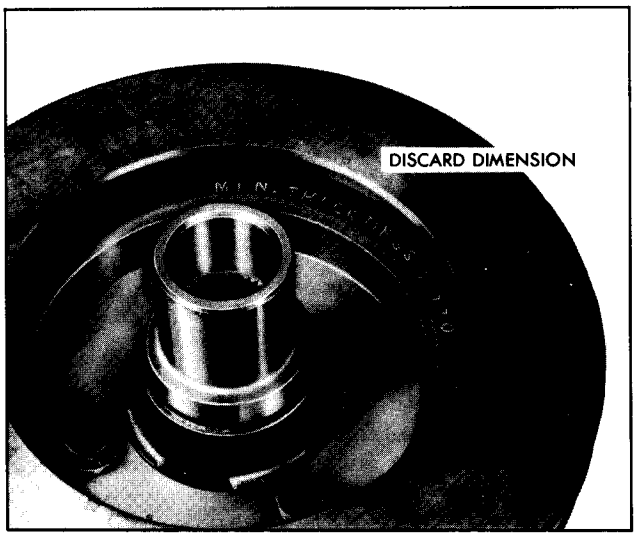


Figure 54—Discard Dimension (Disc)

If only one disc requires turning, the disc on the opposite wheel should be sanded with 60 or 80 grit emery cloth to give braking surfaces a non-directional surface.

A discard dimension 1.170" is stamped on all production installed brake disc's (See figure 54). This is the allowable wear dimension and NOT the allowable turning dimension. There must be .015" left for wear after turning disc's.

BRAKE DRUMS

INSPECTING AND RECONDITIONING BRAKE DRUMS

Whenever brake drums are removed, they should be thoroughly cleaned and inspected for cracks, scores, deep grooves and out-of-round. Any of these conditions must be corrected since they can impair the efficiency of brake operation and cause premature failure of other parts.

CRACKED, SCORED, OR GROOVED DRUM

NOTE: A cracked drum is unsafe for further service and must be replaced. Do not attempt to weld a cracked drum.

Smooth up any slight scores by polishing with fine emery cloth. Heavy or extensive scoring will cause excessive brake lining wear, and it will probably be necessary to rebore in order to true up the braking surface.

If the brake linings are slightly worn and the drum is grooved, the drum should be turned just enough to remove grooves. The ridges in the lining should be lightly removed with a lining grinder.

If brake linings are to be replaced, a grooved drum should be turned for use with oversize linings. A grooved drum, if used with new lining, will not only wear the lining, but will make it difficult, if not impossible to obtain efficient brake performance.

OUT-OF-ROUND OR TAPERED DRUM

An out-of-round drum makes accurate brake shoe adjustment impossible and is likely to cause excessive wear of other parts of brake mechanism due to its eccentric action. An out-of-round drum can also cause severe and irregular tire tread wear as well as a pulsating brake pedal. When the braking surface of a brake drum exceeds the factory specification limits in taper (and/or) being out-of-round, the drum should be turned to true up the braking surface.

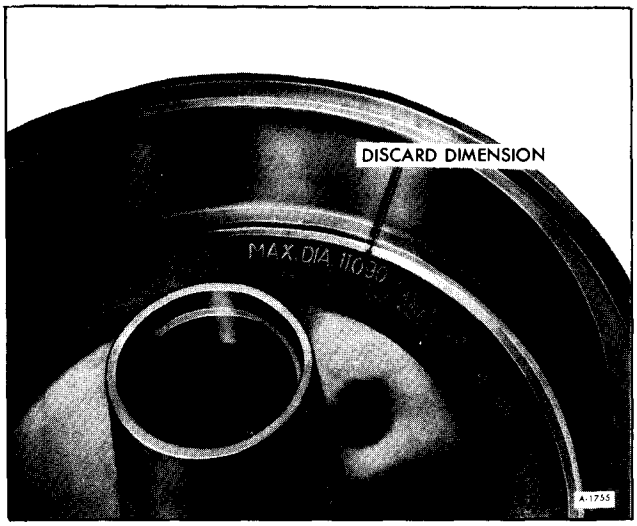


Figure 55—Discard Dimension (Drum)

Drum out-of-round can be measured with a dial indicator and extension rod. Out-of-round measurements exceeding .006", (total indicator reading) require turning or replacement of drum.

TURNING DRUMS

If irregularities in the braking surface of the drum cannot be removed with emery cloth or out-of-round exceeds .006" (total indicator reading), the drum can be turned to .060" greater than the original inside diameter. If a drum has smooth score marks .010" to .020", it is serviceable without turning.

If a drum is turned to a diameter less than .030" standard replacement linings may be used. Over .030" oversize linings should be used.

A discard dimension 11.090" (figure 55) is stamped on all production installed brake drums. This is the allowable wear dimension and NOT the allowable turning dimension. There must be .030" left for wear after turning drums. The maximum turning diameter is 11.060".

REPLACING DRUMS

Whenever new drums are to be installed, the braking surface of the drum must be thoroughly cleaned with lacquer thinner to remove the rust-proof coating.

COMPONENT INSTALLATION

BRAKE DRUM INSTALLATION

1. Install hub and drum assembly (figure 10).

2. Install flat washer and castillated nut on hub while rotating hub and drum assembly.

3. Tighten castillated nut to 25-30 lbs. ft. torque to position bearings. (Be sure drum is rotating while tightening nut).

4. Back off nut 1/2 turn.

5. Retighten nut finger tight, secure if possible with cotter pin.

6. If unable to secure at finger tight, back off nut to first securing position.

7. Check end play between hub and spindle it should be .001 to .005 inch.

8. Replace inner and outer dust caps.

REAR BRAKE SHOE INSTALLATION

1. Lubricate the adjusting screw threads, thrust washer mating surfaces and backing plate ledges with brake lubricant, such as Part No. 1050110 or equivalent.

2. Assemble the adjusting screw.

3. Attach the primary to secondary shoe spring to the shoes and install the adjusting screw. The primary to secondary shoe spring must not contact the adjusting screw sprocket.

4. Position shoe assembly on the backing plate. Be sure wheel cylinder links are properly positioned in the shoe notches.

5. Position the upper end of the actuating link on the brake shoe guide.

6. Engage the actuating link with the override pivot. Then position the adjuster lever and return spring on the secondary shoe. Position sleeve in the hole in secondary shoe and fasten to backing plate with hold-down spring assembly and pin.

7. Install the remaining primary hold-down spring, washer and pin.

8. Install the primary and secondary brake shoe return springs.

9. Adjust brake shoes as outlined under BRAKE SHOE ADJUSTMENT.

10. Install the hub and drum assembly. Adjust wheel bearings.

11. If wheel cylinder was removed, bleed brakes.

12. Check fluid level in master cylinder. Fluid level should be no more than 1/4" below the reservoir opening at rear.

DISC BRAKE SHOE INSTALLATION

1. Using Silicone Lube, No. 1050018, or equivalent, lubricate new sleeves, on all surfaces. Lubricate new rubber bushings, bushing grooves and the small ends of bushings in all four caliper ears. Install rubber bushings in all four caliper ears.

CAUTION: *It is essential that the new sleeves and rubber bushings be used and that lubrication instructions be followed in order to insure the proper functioning of the sliding caliper design.*

2. Install the sleeves. Position the sleeves so that the end toward the shoe and lining assemblies is flush with the machined surface of the ear.

3. Install the shoe support spring by placing the single tang end of the spring over the notch in the

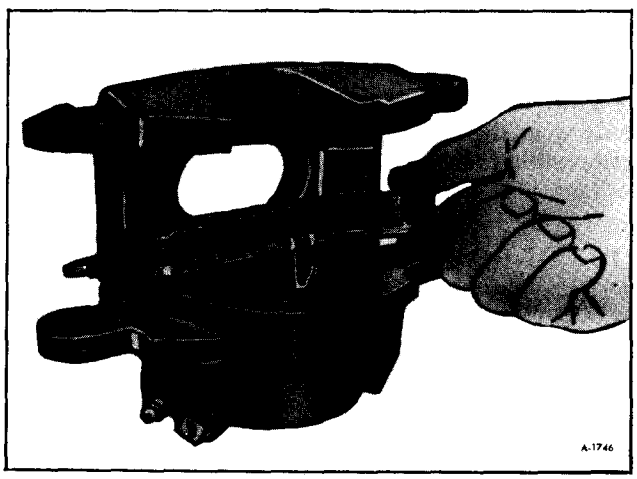


Figure 56—Installing Inboard Shoe

center of the edge of the shoe. Then press the two tangs at the spring end of the inboard shoe spring over the bottom edge of the shoe so that they engage the shoe securely.

4. Position the new inboard shoe and lining assembly (with spring attached) in the caliper so that the ear end of the shoe and lining is down and the bottom end up at an angle with the spring resting on the piston I.D. (figure 56). Press down on both ends of the shoe until the shoe is in a flat position, resting on the piston. The spring end of the inboard shoe support spring should be resting on the I.D. of the piston.

NOTE: If the shoe support spring is not installed correctly, a low or no brake pedal could occur.

5. Insert new outboard shoe into caliper with no clearance between shoe and caliper face. (figure 57)

6. Position the caliper over the disc, aligning the holes in the caliper ears with the holes in the mounting bracket.

Make sure that the brake hose is not twisted or kinked. Start the bolts through the sleeves in the inboard caliper ears and through the mounting bracket making sure that the ends of the bolts pass under the retaining ears on the inboard shoe. Push bolts on through to engage the holes in the outboard shoes and the outboard caliper ears at the same time threading the bolts into the mounting brackets. Torque the bolts to 35 ft. lbs.

7. Fill master cylinder reservoir with new brake fluid No. 5464831 or equivalent to within 1/4" of top of reservoir.

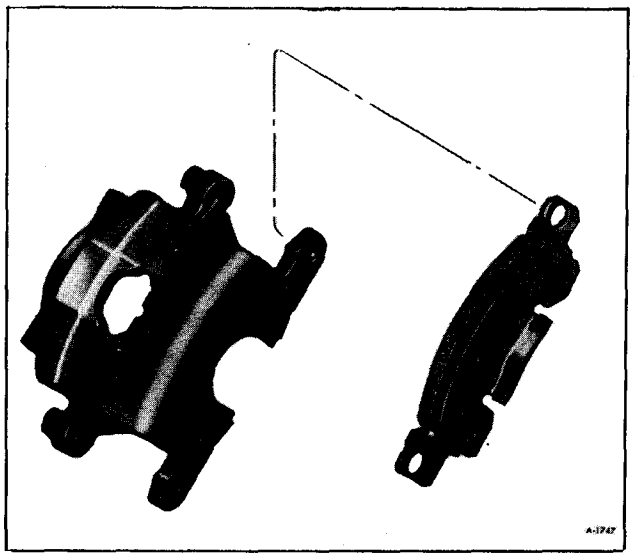


Figure 57—Installing Outboard Shoe

8. Depress brake pedal to seat linings against rotor.

9. Clinch upper ears of outboard shoe by positioning channel lock pliers with one jaw on top of upper ear and one jaw in notch on bottom of shoe, opposite upper ear.

10. After clinching, ears must be flat against caliper housing with no radial clearance.

11. If radial clearance exists, repeat clinching procedure.

12. Replace the shoe and linings on the other front wheel disc brake in the same manner. Relining is to be done in full sets only.

NOTE: Right and left calipers must not be interchanged. When installed properly, the bleed screw will be on top.

13. When completed, reinstall the wheel and tire assemblies. Lower the vehicle to the floor. Add brake fluid to the master cylinder reservoirs to bring the level up to within 1/4" of the top.

NOTE: Do not move vehicle until firm brake pedal is obtained.

Whenever the front wheel disc brakes are relined, the rear drum brakes should be checked also.

COMBINATION VALVE INSTALLATION (FIGURE 13)

1. Install valve on mounting bracket.

2. Connect wiring to switch terminal on valve.

3. Connect all brake lines to valve.

4. Bleed entire brake system. Refer to "BLEEDING BRAKE SYSTEM" as described earlier in this section.

MASTER CYLINDER INSTALLATION

1. Position master cylinder on power cylinder so push-rod enters cavity in master cylinder piston.

2. Install two attaching nuts (figure 15).

3. Connect two hydraulic lines to master cylinder and tighten fittings securely. (figure 14).

4. Fill master cylinder reservoir with brake fluid, No. 5464831, and bleed all wheel cylinders as outlined under "BLEEDING BRAKE SYSTEM".

DISC INSTALLATION

1. Install four hub to disc attaching bolts, and torque to 35 ft. lbs. (figure 58). See caution on page 1 of "FRONT SUSPENSION" section 3A.

2. Position retainer over hub.

3. Lubricate seal lips with Special Seal Lubricant No. 1050169 or equivalent then position seal over hub with metal end toward retainer.

4. Install bearing as shown in Figure 59.

Lubricate O.D. of bearing with E.P. chassis grease.

The outer race of the bearing is a snug fit into knuckle. Light tapping on the hubs outer surface, not the disc, will aid assembly. Clean bearing seat on knuckle of rust and dirt that may fall in during removal.

Care must be used when installing hub assembly over drive axle splines so that splines are in correct alignment.

5. Install three bolts attaching bearing retainer to knuckle. Torque to 35 ft. lbs.

6. Install drive axle washer and nut. Torque nut to 110 ft. lbs. If necessary to align cotter pin slot, tighten nut and install NEW cotter pin and crimp. Torque not to exceed 280 ft. lbs.

NOTE: Do not back off nut to install cotter pin.

Figure 58—Hub to Disc Bolts

POWER BRAKE BOOSTER INSTALLATION

1. Position booster assembly on firewall and install four retaining bolts. (figure 22).

2. Connect vacuum line to booster assembly.

3. Install master cylinder mounting bracket from booster assembly to firewall.

4. Install master cylinder, refer to "Master Cylinder Installation".

5. Install clevis pin retaining brake pedal to brake booster assembly clevis. Secure with cotter pin refer to Figure 21.

6. Install power level control panel and secure with four screws.

PARKING BRAKE LEVER INSTALLATION

1. Position lever on toe board.

2. Position cable in its retaining bracket and install pin.

3. Install parking brake switch.

4. Install two nuts and bolts holding cable retaining bracket to lever base (figure 24).

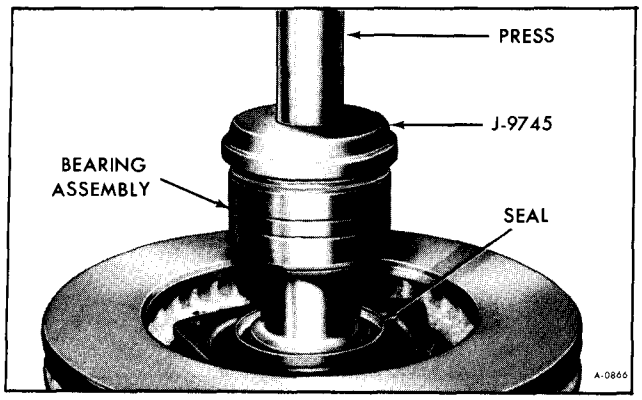


Figure 59—Installing Bearing

5. Install four nuts and bolts holding lever to toe board (figure 23).

FRONT PARKING BRAKE CABLE INSTALLATION

1. Position cable through toe board.

2. Install retainer and retainer pin on end of cable through lever.

3. Install clip to retain cable at shift relay bracket.

4. Install end of cable in front equalizer with front cable on top of intermediate cable. Install adjusting nut and lock nut (figure 25).

5. Adjust parking brake as described earlier in this section.

INTERMEDIATE PARKING BRAKE CABLE INSTALLATION

1. Position cable through frame rails.

2. Place cable in guides at frame rails (figure 27).

3. Place cable in guide at crossmember (figure 26).

4. Install cable at front equalizer with intermediate cable under front cable. Install adjusting nut and lock nut (figure 25).

5. Install intermediate equalizers including adjusting and lock nuts (figure 5).

6. Adjust parking brake as described earlier in this section.

REAR PARKING BRAKE CABLE INSTALLATION

1. Install the rear cable through the backing plate and connect the ball to the lever. Make sure the locking fingers are fully expanded on the backing plate (figure 29).

2. Install hubs and drums as described under "Brake Drum Installation".

3. Feed ends of cables through brackets on frame rails and install clips (figure 28).

4. Connect ends of cables and install intermediate equalizer, with intermediate cable on top of rear cable (figure 25).

5. Adjust parking brake as described earlier in this section.

BRAKE PEDAL INSTALLATION

1. Properly position brake pedal assembly.

2. Install two bolts (torque 30-35 ft. lbs.), one at each end of pedal assembly (figure 30 & 31).

3. Tighten left hand brake lever pivot bracket.

4. Insert clevis pin into clevis and brake pedal assembly. Secure with a cotter pin (figure 21).

5. Install brake light switch.

6. Install power level valve mounting panel and secure with four screws.

BRAKE LINE TUBING INSTALLATION

WARNING: DOUBLE FLARING TOOL MUST BE USED AS SINGLE FLARING TOOLS CANNOT PRODUCE A FLARE STRONG ENOUGH TO HOLD THE NECESSARY PRESSURE.

Hydraulic brake tubing is a double layer annealed steel terne plate tubing which resists corrosion and has the physical strength to stand up under

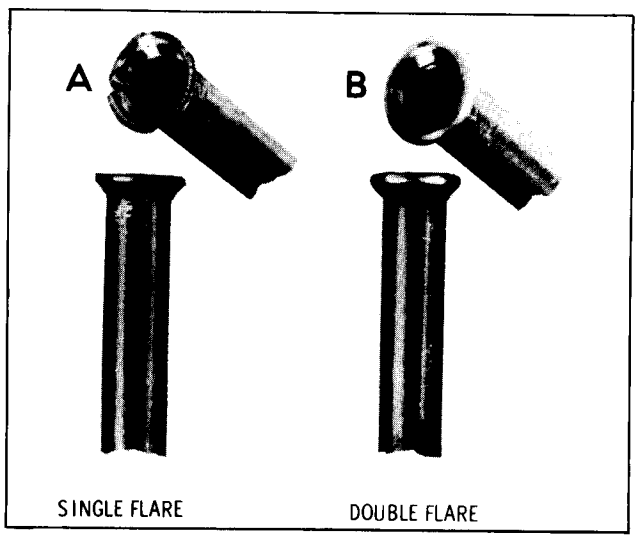


Figure 60—Single and Double Lap Flare

the high pressures which are developed when applying the brakes. In making up hydraulic brake pipes, it is important that the proper flaring tool be used to flare the ends of tubing for the compression couplings. Unless the tubing is properly flared, the connections will leak and the brakes will become ineffective.

WARNING: NEVER USE COPPER TUBING BECAUSE COPPER IS SUBJECT TO FATIGUE CRACKING WHICH WOULD RESULT IN BRAKE FAILURE.

Steel tubing must be double-lap flared at the ends in order to produce a strong leakproof joint.

Special tools are available from tool companies for making double-lap flares. Do not attempt to flare steel tubing without proper tools. Figure 60 shows a single and a double-lap flare, note the split in the single-lap flare. The double-lap is well formed and unbroken due to the reinforcement of the double wall.

Refer to Figure 61 for brake line routing and attachment.

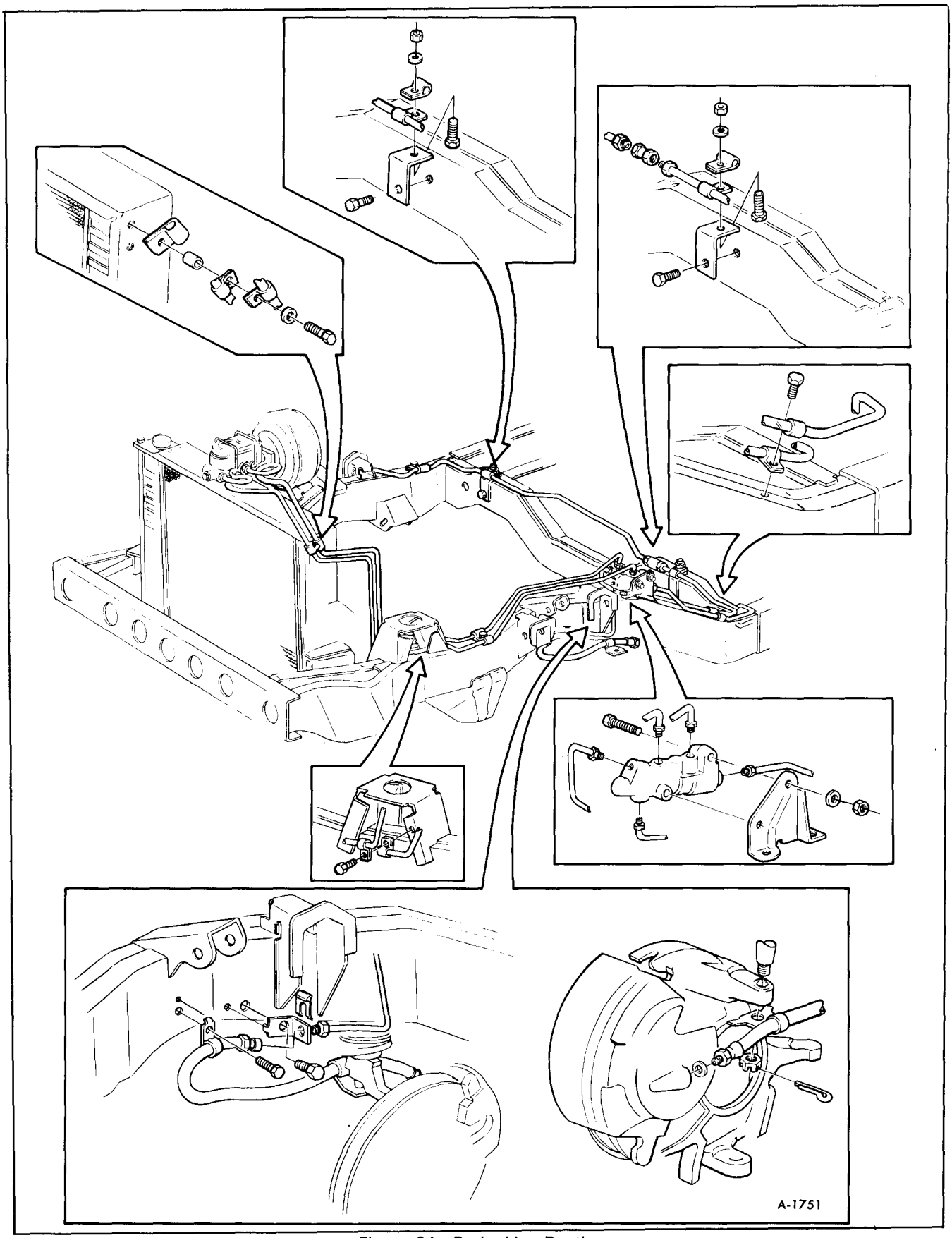


Figure 61—Brake Line Routing

SPECIFICATIONS

Drums	
Inside Diameter	
Original	11″
Maximum	11.090″
Max. Out-of-Round	(Total Indicator Reading .006″)
Discs	
Outside Diameter	11″
Lateral Runout	.005″
Thickness Variation	.0005″
Disc Thickness	
Original	1.200″
Minimum	1.170″
Linings	
Drums	
Length-Primary	8.90″
Length-Secondary	11.60″
Width	2.0″
Thickness-Primary	.200″
Thickness-Secondary	.290″
Discs	
Length	5.4″
Thickness-Inner	.43″
Thickness-Outer	.40″
Fluid Type	Delco Supreme 11 or DOT-3 fluid or equivalent

TORQUE SPECIFICATIONS

Combination Valve to Mounting Bracket	
Nut Torque	8-12 ft. lbs.
Combination Valve Mounting Bracket to Frame Rail	
Screw Torque	72 in. lb. min. (Fully Driven not Stripped)
Power Cylinder to Firewall	
Nut Torque	12-16 ft. lbs.
Master Cylinder Bracket to Firewall	
Bolt Torque	15-20 ft. lbs.
Brake Lever Pivot Bolt	
Bolt Torque	30-35 ft. lbs.
Brake Lever Pivot Bracket to Firewall	
Nut Torque	25-30 ft. lbs.
Power Cylinder to Master Cylinder	
Nut Torque	28 ft. lbs.
Hub to Drum Bolt Torque	70-85 ft. lbs.
Drum to Spindle Nut Torque	25-30 ft. lbs.

BRAKE SPECIAL TOOLS

J-22904	Dust Boot Seal Installer
J-23101	Diaphragm Plate Separator
J-23175	Control Valve Installer
J-23188	Secondary Power Piston Bearing Seal Protector
J-23337	Reaction Piston Gauge
J-23456	Brake Booster Separating Fixture
J-23518	Tandem Brake Bleeder Adapter
J-23709	Combination Valve-Metering Valve Actuator