

SERVICE MANUAL

SECTION IV BRAKES



Packard Motor Car Company
Detroit 32, Michigan

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SECTION IV

BRAKES

Description

The Packard 24th Series service brakes are of the servo or self-energizing type and are hydraulically operated. The principle of hydraulic brake operation is based upon Pascals' law of physics which states that: "pressure applied to a confined body of liquid is transmitted equally and undiminished in all directions throughout the liquid." Therefore, the foot pressure applied to the brake pedal is transmitted to each wheel equally, and all four brakes are applied with equal force.

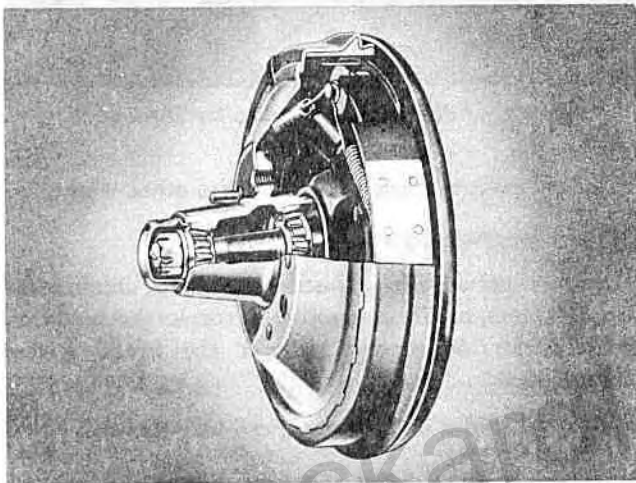


Figure 1—Packard Brakes Make Full Use of the Servo Principle

Packard brakes make full use of the servo or self-energizing principle. When the pedal pressure is applied and the brake shoes are forced against the drums, the turning of the drums tends to rotate the shoes in the same direction. This wrapping action of the shoes uniformly increases the pressure at every point around the braking surface, which increases the stopping ability with less physical effort required of the driver.

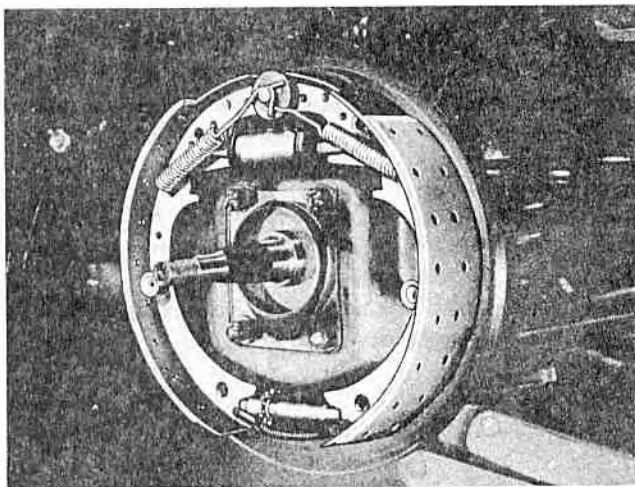


Figure 2—Front Wheel Brake with the Drum Removed

The essential units of the hydraulic brake system and their functions are:

The master cylinder supplies the hydraulic force.

The brake pedal applies the force to the master cylinder and multiplies the driver's effort.

The brake backing plate supports the brake parts at each wheel and transmits the braking force to the frame of the car.

The brake shoes support the lining and transmit the braking force to the backing plate.

The brake lining and brake drum produce the friction and convert the power of the moving car into heat.

The wheel cylinders actuate and apply the pressure to the brake shoes.

The steel tubes and flexible hoses transmit the hydraulic pressure from the master cylinder to each wheel cylinder.

Hand Brake

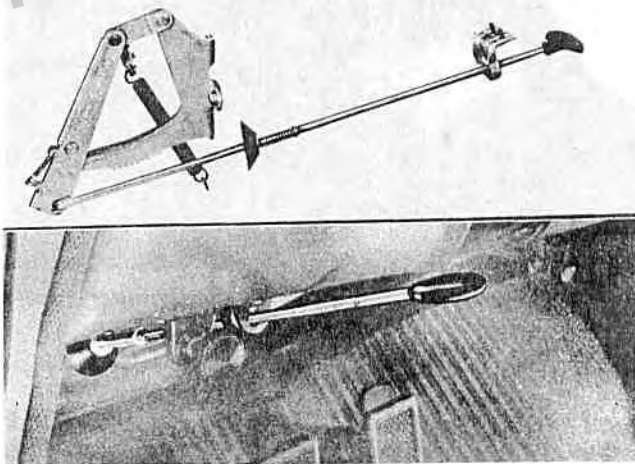


Figure 3—"T" Type Hand Brake Handle

The hand brake is a mechanical device that operates the shoes of the rear wheel brakes. The force is applied by a "T" type handle, which is pulled out to lock the rear wheels and is released by turning slightly counterclockwise. The hand brake lever is connected by the front steel cable to one end of the equalizer lever, whose fulcrum end operates in a slot in the frame "X" member. A single steel cable passes through an equalizer which is connected to the equalizer lever by a link. The ends of the rear cable are connected to a strut lever in each rear wheel brake.

BRAKES

SERVICING THE BRAKES

All Packard brakes have provisions for minor and major brake adjustments. Minor brake adjustments are made to compensate for brake lining wear. Major brake adjustment is necessary when:

- The brakes have been disassembled.
- The brake shoes have been relined or replaced.
- The brake drums have been reconditioned.

Important

It is important that the brake pedal be properly adjusted to make sure that the compensating port of the master cylinder is uncovered, so that the excess fluid can return from the lines to the master cylinder reservoir. There should be $\frac{1}{4}$ " brake pedal free play before the pressure stroke starts. A greater amount of free play will reduce the effective stroke of the master cylinder and in turn reduce the effectiveness of the brakes.

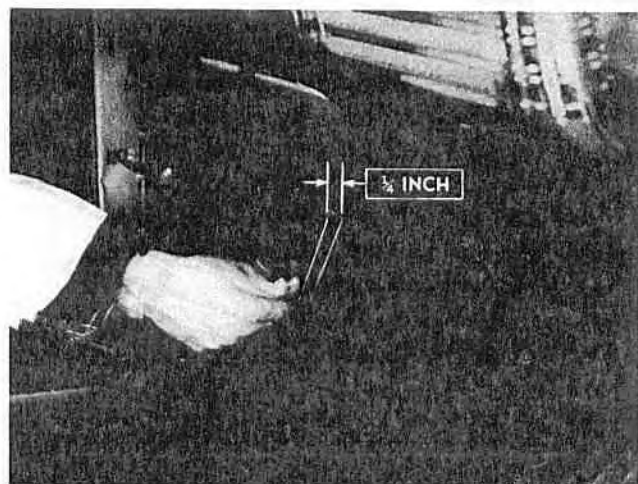


Figure 4—Checking the Master Cylinder Piston Free Play

Brake Pedal Adjustment

To adjust the brake pedal free play, loosen the lock nut on the master cylinder push rod. Turn the large hexagon nut "in" to decrease the brake pedal free play, and turn it "out" to increase the brake pedal free play. After the push rod is properly adjusted, tighten the lock nut.

Caution: Do not let the master cylinder boot twist when adjusting the pedal free play.

Minor Brake Adjustment

Raise the car on a hoist or by a jack until the four wheels are off the floor. Remove the adjusting hole covers from the backing plates.

Turn the clearance adjusting screw (star wheel) through the adjusting hole until the wheel can just be turned by hand. Then back off the adjusting screw until the wheel turns freely.

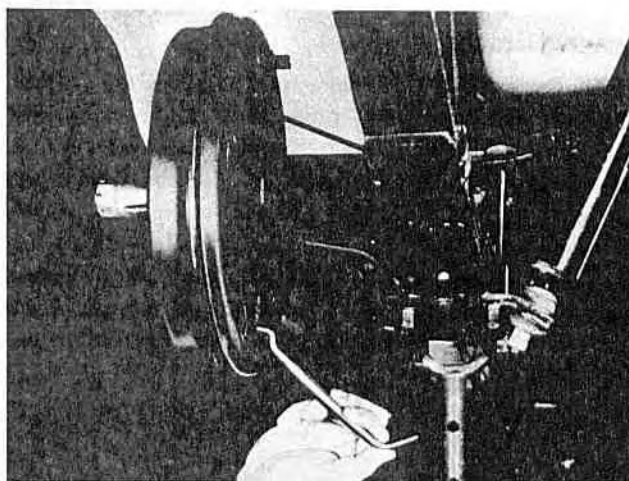


Figure 5—Adjusting the Brakes by Turning the Star Wheel

Repeat these operations on the three other wheels.

Brake Inspection

In the event a *minor* adjustment does not obtain satisfactory brakes, before attempting to correct the condition by a major adjustment, inspect the brake system thoroughly.

Check the fluid in the master cylinder reservoir.

Check the brake pedal free play and adjust if necessary.

Check the brake pedal for binding on the shaft. Free up and lubricate if necessary.

Check the front and rear wheel bearing adjustment. Brakes cannot be properly adjusted when the wheel bearings are loose, since the shoes will not remain centralized in the drum.

Remove at least one wheel to inspect for average condition of the linings. Remove the other wheels if necessary.

If the lining is loose on the shoe, grease soaked, or badly worn, the brakes should be relined. Linings are considered worn if the heads of the rivets are within $\frac{1}{32}$ " from the lining surface. Always reline with "Packard Precision Replacement Brake Lining Sets."

Inspect the condition of the front and rear wheel oil seals. Install new seals if necessary. Clean and repack the front wheel bearings with new lubricant. Clean the brake drums with kerosene and sandpaper. Dry the drums thoroughly before installation.

BRAKES

If the brake lining and the rest of the brake system meet inspection requirements, proceed with the major brake adjustment.

Major Brake Adjustment

Raise the car on a hoist or by a jack until the four wheels are off the floor. Remove the wheels and inspection covers from the brake drums. Remove the adjusting hole covers from the backing plates.

Disconnect the hand brake cable at the equalizer lever by removing the clevis pin.

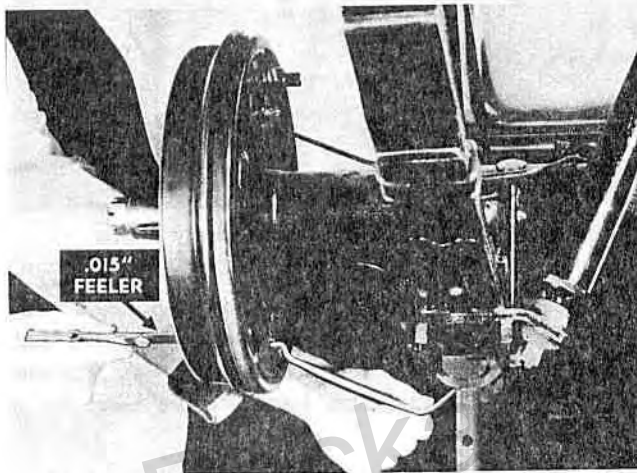


Figure 6—Adjusting the Star Wheel Until a Drag is Felt on the Feeler

Insert a .015" feeler through the drum inspection hole between the lining and drum about $1\frac{1}{2}$ " from the lower end of the secondary shoe. Expand the adjusting screw (star wheel) until a slight drag is felt on the feeler.

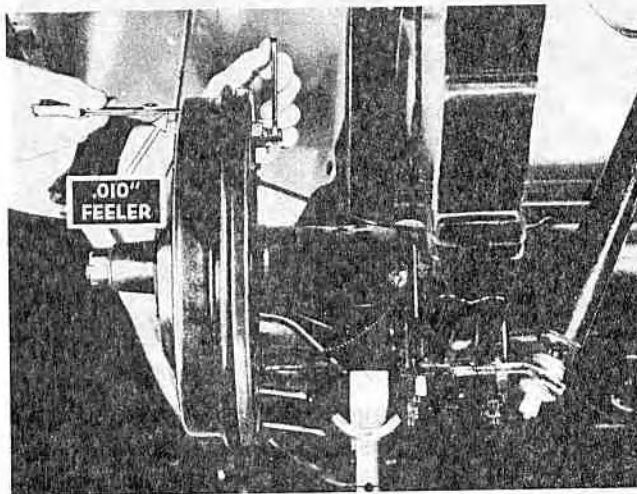


Figure 7—Adjusting the Brake Anchor Pin

Insert a .010" feeler through the drum inspection hole between the drum and lining, about $1\frac{1}{2}$ " from the upper end of the secondary shoe. If this clearance is not within

limits, loosen the anchor pin lock nut and adjust the anchor pin. Turn the anchor in the direction of the forward wheel rotation to decrease this clearance. Turn the anchor in the opposite direction to increase the clearance. At the same time, readjust the adjusting screw to maintain the .015" clearance at the lower end of the shoe. Holding the anchor in the set position, tighten the lock nut. Repeat this operation on the three other brakes.

Turn the clearance adjusting screw (star wheel) until the drum can just be turned by both hands. Then back off the adjustment until the drum turns freely. Repeat this operation on the three other brakes.

Install the drum inspection hole covers and wheels. Install the front backing plate adjustment hole covers.

Hand Brake Adjustment

At the rear wheels only: Tighten the adjusting screws until the wheel can just be turned by hand.

Pull the hand brake lever to the first notch of the ratchet sector.

Pull the rear wheel brake cables forward to remove all slack or lost motion. Adjust the clevis of the hand brake cable so that the clevis pin can be easily installed, without any slack in the cable. Release the hand brake.

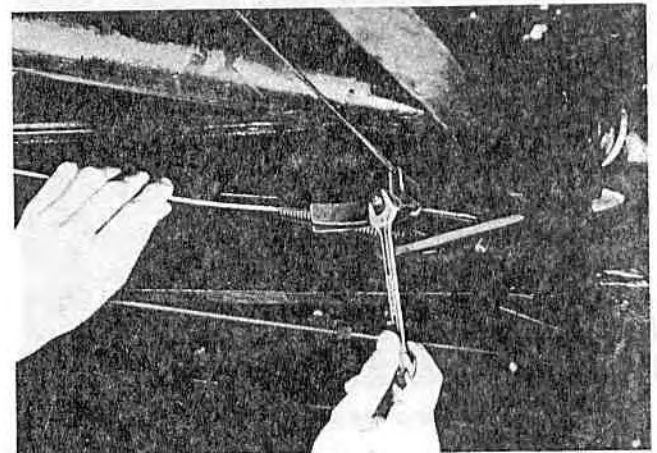


Figure 8—Adjusting the Hand Brake Cable Clevis

Back off the adjusting screws at each rear wheel until the wheel turns freely.

Apply the hand brake and check equalization by turning the rear wheels by hand. To equalize, loosen the tighter brake. Install the adjusting screw hole covers. Lower the car to the floor.

The brakes are now ready to be road tested.

Brake Shoe Removal

Raise the car on a hoist or by a jack until the four wheels are off the floor. Remove the wheels and hubs.

BRAKES



Figure 9—Removing the Rear Wheel from the Hub

Block the brake pedal in the released position to prevent any downward movement.

Remove the brake shoe hold-down springs and cups. Remove the brake shoe return springs using tool KMO-526.

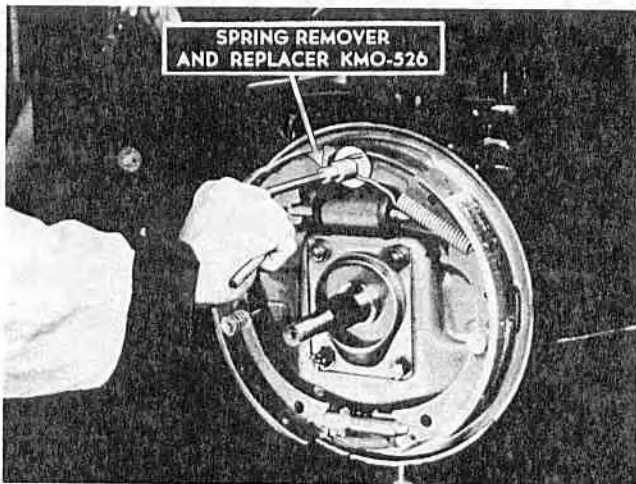


Figure 10—Removing the Brake Shoe Return Springs

Spread the shoes to release them from the brake shoe actuating pins, and lift off both shoes. Unhook the adjustment spring and remove the adjusting screw. The shoes are now separated and may be relined.

Install the wheel brake cylinder clamp KMO-145 on each of the wheel cylinders to prevent the pistons from coming out of the wheel cylinders.

Relining

Caution: When relining Packard brake shoes, be sure to use the Packard Precision Lining Set specified for that model car. Be sure the linings marked secondary are installed on the secondary shoes. This is important since the coefficient of friction of

the primary and secondary linings is different. Recondition the drums if necessary.

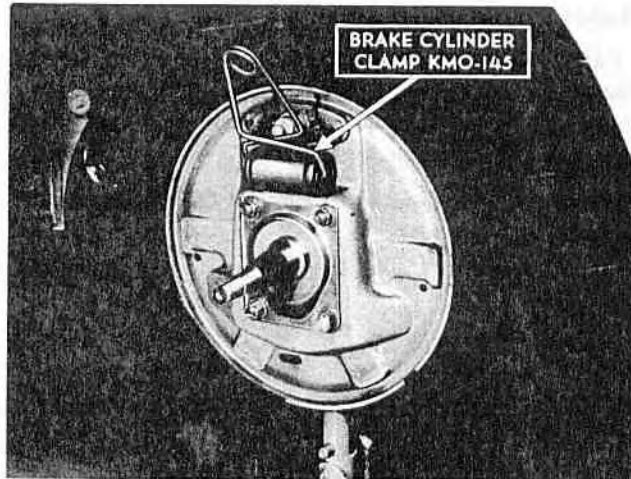


Figure 11—Wheel Cylinder Clamp Holds the Wheel Cylinder Parts in Place

Be sure all backing plate ledges are lubricated with "Lubriplate." Lubricate the adjusting screw, nut and socket. Lubricate the outer end of the actuating pins and the hold-down spring cups. Lubricate the hand brake strut and lever.

Caution: Do not get any lubricant or brake fluid on the lining surfaces by dripping or soiled hands.

Brake Shoe Installation

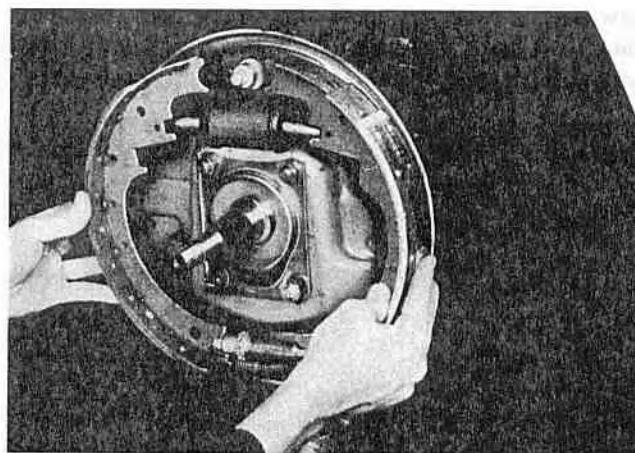


Figure 12—Installing the Brake Shoes

After the shoes are relined, pair them off, one primary shoe with one secondary. Turn the adjusting screw into the pivot nut and install the adjustment assembly between the lower ends of the shoes. On the left wheel brakes, the adjusting screw nut is toward the secondary shoe. On the right wheel brakes, the adjusting screw nut is toward the primary shoe. Connect the adjusting screw spring.

BRAKES

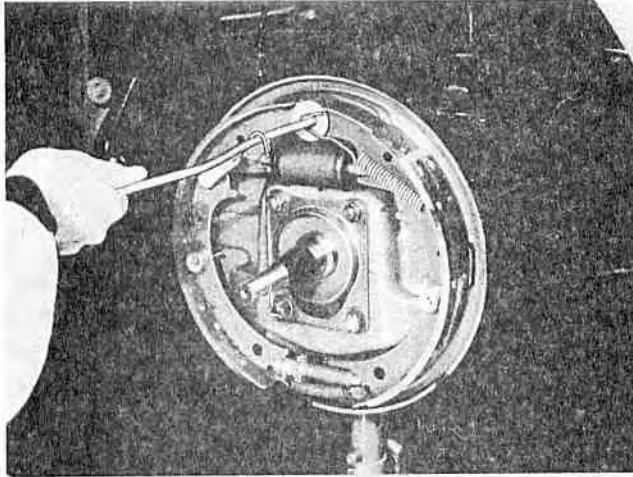


Figure 13—Installing the Brake Shoe Return Springs

Spread the upper ends of the shoes and slip them in place into the actuating pin slots. Connect the brake shoe return springs, using tool KMO-526.

Caution: Be sure the springs are in their correct positions. The orange spring is used on the primary shoe, and the yellow spring is used on the secondary shoe.

Remove the wheel cylinder clamps. Install the brake shoe hold-down springs and cups.

Clean and repack the front wheel bearings. Install new oil seals if necessary. Install the wheel hubs.

Bleed the brake lines and perform a major brake adjustment as previously described.

Master Cylinder Removal

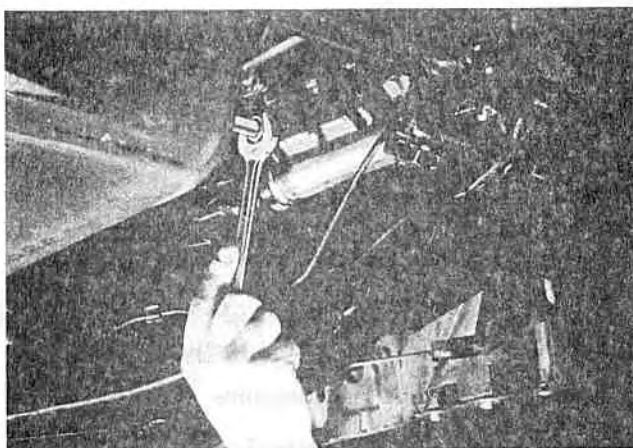


Figure 14—Removing the Master Cylinder

Disconnect the brake lines from the master cylinder. Disconnect the push rod at the pedal. Remove the gear-shift selector linkage bell crank from the mounting bolt stud. Remove the mounting bolts and remove the master cylinder.

Master Cylinder Disassembly

Remove the push rod link and boot.

Remove the piston stop snap ring and washer.

Remove the piston, primary cup and return spring.

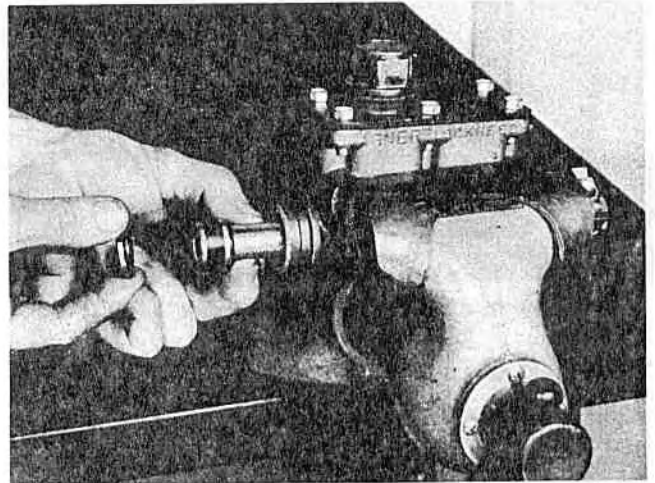


Figure 15—Removing the Master Cylinder Piston

Remove the check valve. Do not attempt to remove the plug at the forward end of the master cylinder.

Cleaning and Inspection

Clean all brake parts in alcohol. Do *not* wash or soak them in gasoline or cleaning fluid.

Inspect piston for wear, scores and pitting.

Inspect the cups for wear, scores and swelling. Inspect the check valve for swelling.

Inspect the cylinder bore for wear, scores and pitting, especially near the fluid inlet port. If the cylinder is scored or pitted, install a new cylinder. Do *not* attempt to hone the cylinder, since honing the surface will increase cup and piston wear, and oversize pistons are not available.

Install new parts wherever necessary.

Master Cylinder Assembly

Dip all master cylinder parts in Packard Brake Fluid. Be sure the parts are kept clean.

Install the check valve and piston return spring.

Install a new primary cup, piston, and secondary cup. Be careful that the cups are not damaged in installation.

Install the piston stop and snap ring. Install the push rod link and boot.

Install the master cylinder and bleed lines as described under "Bleeding the Hydraulic System."

BRAKES

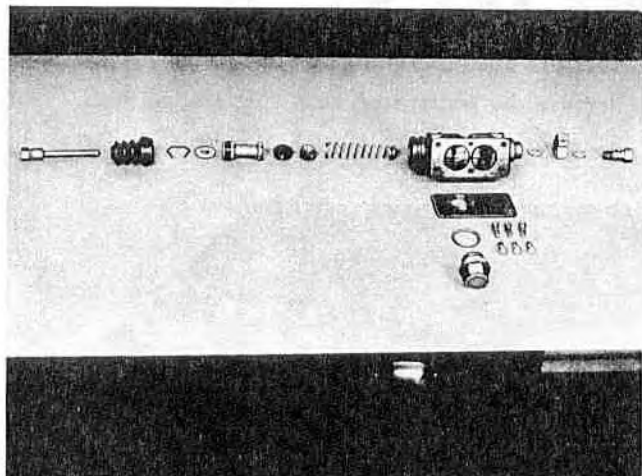


Figure 16—A Disassembled Master Cylinder

Wheel Cylinder Removal

Remove the wheel having the faulty cylinder.

Disconnect the wheel cylinder brake line.

Disconnect the brake shoe return springs, using tool KMO-526, and spread the shoes.

Remove the two cap screws and lift off the wheel cylinder.

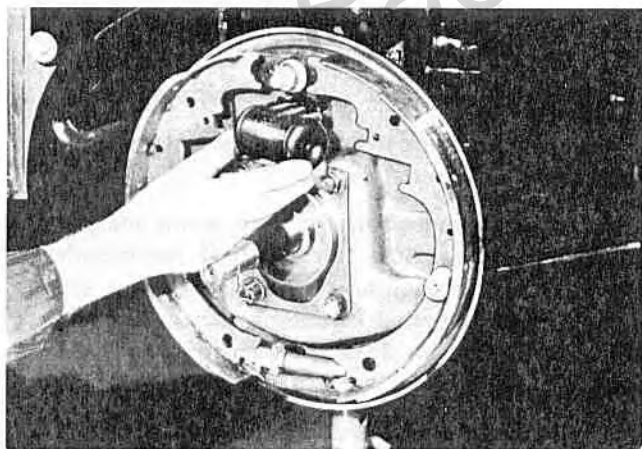


Figure 17—Removing the Wheel Cylinder

Disassembly

Remove the wheel cylinder actuating pins and boots.

Remove the pistons, cups and spring.

Cleaning and Inspection

Clean all wheel cylinder ports in alcohol. Do *not* wash or soak them in gasoline or cleaning fluid.

Inspect the pistons for wear, scores and pits.

Inspect the cups for wear, scores, and swelling.

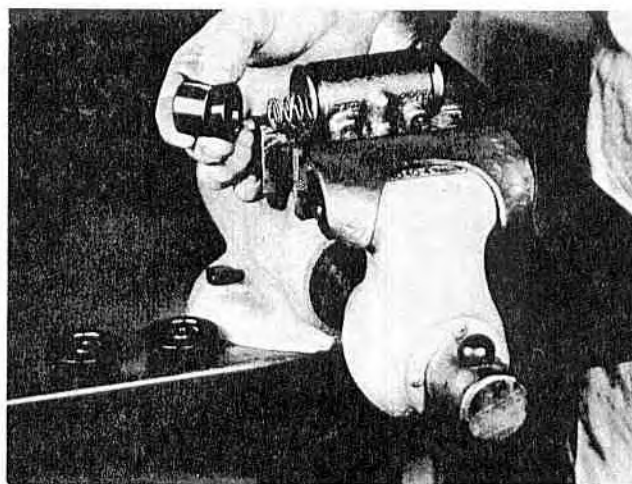


Figure 18—Removing a Wheel Cylinder Piston and Cup

Inspect the cylinder bore for wear, scores, and pits. If the cylinder bore is scored or pitted, install a new wheel cylinder.

Wheel Cylinder Assembly

Dip all wheel cylinder parts in Packard Brake Fluid. Be sure the parts are clean.

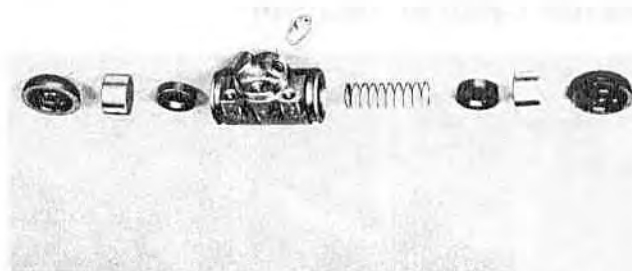


Figure 19—A Disassembled Brake Wheel Cylinder

Install the spring, new cups, and pistons. Be careful that the cups are not damaged in the installation.

Install the boots and actuating pins.

Wheel Cylinder Installation

Install the wheel cylinder on the backing plate and attach it with the two cap screws.

Engage the brake shoes in the actuating pins and connect the brake shoe return springs.

Connect the brake line and install the wheel.

BRAKES

Bleed the brake lines according to the instructions of "Bleeding the Hydraulic System."

Bleeding the Hydraulic System

Since the efficient operation of hydraulic brakes requires a "solid body" of liquid in the system, the presence of air in the system will give faulty brake operation. The brake pedal pressure will feel "spongy."

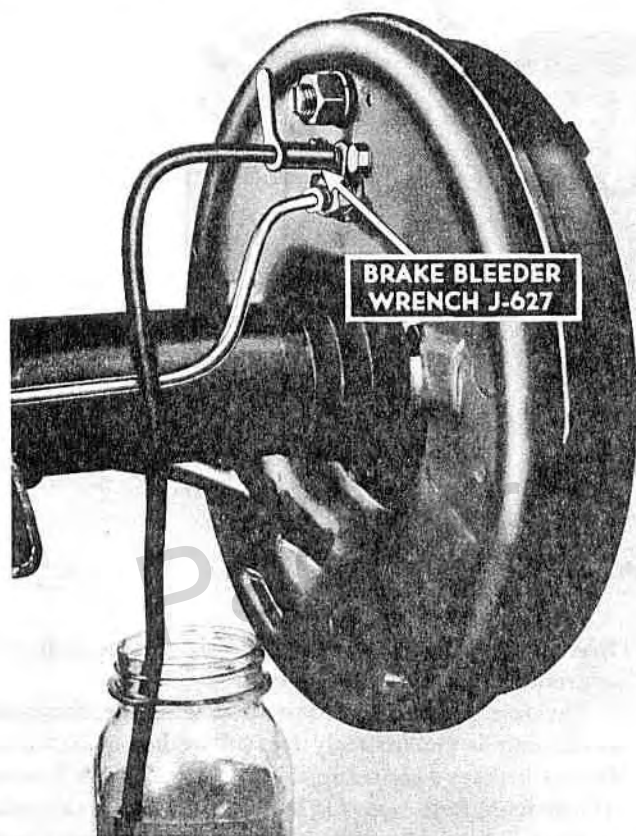


Figure 20—Bleeding the Brake Hydraulic System

At any time a unit, line, or connection of the hydraulic system is removed or disconnected, it is possible for air to enter the system. Another cause for air in the system is the failure to maintain the proper fluid level in the master cylinder reservoir. Whenever the fluid in the system is to be replaced with new fluid, bleed the brakes in the following procedure:

Remove the master cylinder filler plug and insert the master cylinder filler J-713 with the jar filled with brake fluid. If the filler is not used, care should be taken that the master cylinder is not pumped dry, as this would admit air into the system.

Remove the screw from the bleeder connection at the backing plate side of the wheel cylinder. Install the bleeder wrench J-627 over the bleeder valve. Connect the bleeder tube J-747 to the bleeder valve and allow the other end to hang into a clean container. Open the bleeder valve $\frac{3}{4}$ turn.

Depress the brake pedal slowly by hand. Allow the pedal to return slowly. Continue this operation until no more bubbles appear from the end of the hose. Close the bleeder valve.

Remove the bleeder hose and wrench. Install the screw in the bleeder valve.

Repeat these operations at the three other wheels.

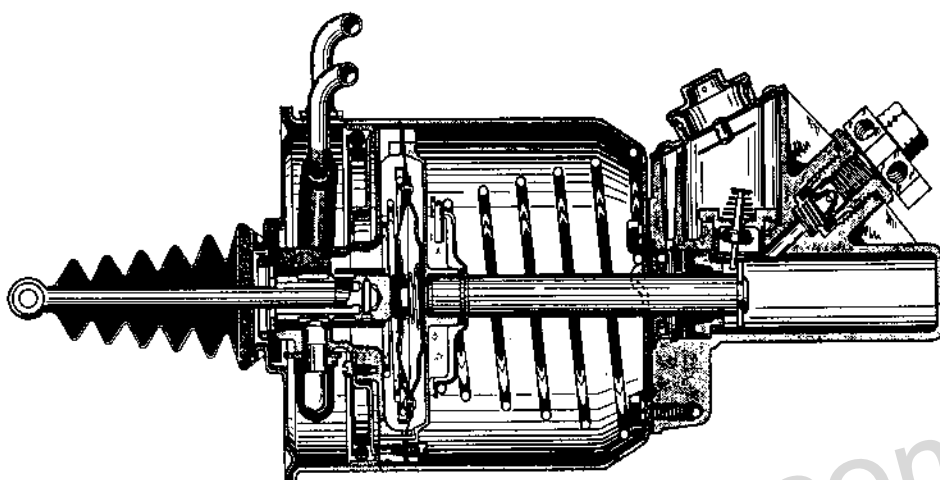
Caution: If the master cylinder filler is not used, check the master cylinder fluid level after bleeding each wheel cylinder and refill.

Pressure bleeding may be accomplished by using the pressure bleeder J-1532 attached to the master cylinder filler. The pressure bleeder admits fluid into the master cylinder under pressure. The service man bleeds each wheel cylinder as previously described, except that it is not necessary to operate the brake pedal.

SECTION IV

PART 2

EASAMATIC POWER BRAKE



RELEASED POSITION

Figure 21—Cross Section of the Easamatic Power Unit

Description

Packard cars equipped with Easamatic Power Brakes provide an outstanding safety feature by having positive brake action available for the driver the instant the brake foot pedal is depressed.

The Easamatic unit is a combined vacuum and hydraulic unit for power braking, utilizing engine intake manifold vacuum and atmospheric pressure for its operation. It is a self contained unit having no external rods or levers exposed to dirt and moisture.

Packard Easamatic Power Brakes have a triple safety factor for providing brake action at all times—vacuum from the engine manifold, an emergency vacuum reserve

tank that provides vacuum should the engine stall, and conventional brake pedal action.

The foot brake pedal unit used with the Easamatic brake unit is conveniently located by being suspended from a bracket attached to the dash panel. This location allows more foot room for the driver, as the brake pedal is three inches nearer to the floor in the released position than a car equipped with conventional brakes. This reduced pedal travel brings the height of the pedal down to the approximate height of the accelerator pedal, permitting the driver to shift his toe from one pedal to the other without lifting his heel from the floor. Lighter pedal pressures are required to apply the brakes.

SERVICING

Some repair work may be performed on the Easamatic power unit in its installed position in the vehicle such as cleaning of the vacuum valve, replacement of the vacuum valve assembly or the valve rod boot.

More extensive repair work may be performed with partial disassembly of the unit in its installed position by removing the toe board panel. This includes replace-

ment of the vacuum hose, reaction diaphragm, counter-reaction spring, piston return spring, etc.

It is recommended, however, that the following complete disassembly procedure be studied before minor repair work is attempted on the unit in its installed position.

EASAMATIC POWER BRAKE

Removal From Vehicle

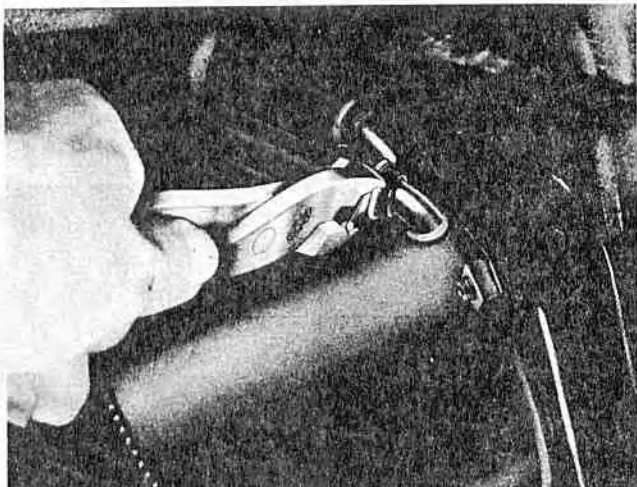


Figure 22—Releasing the Atmospheric Line Hose Clamp

Disconnect the vacuum and atmospheric lines, hydraulic lines, and the stop light switch wires from the power unit.

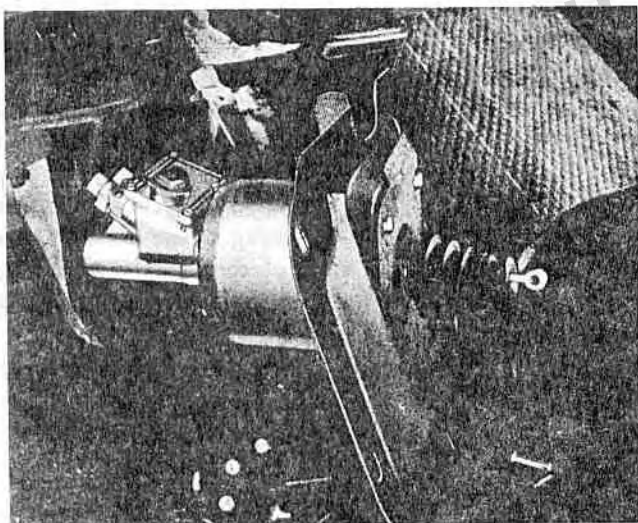


Figure 24—Power Unit and Toe Board Plate Are Removed as an Assembly

Remove the cotter pin and clevis pin connecting the pedal to the valve rod. Disconnect the accelerator pedal.

Remove the two screws holding the steering column grommet and slide the grommet up out of the way. Remove the floor mat screws and fold back the floor mat.

Remove the toe board plate to toe board mounting screws. Lift the power unit and toe board plate assembly from the vehicle.

Remove the toe board plate to power unit mounting screws and separate the unit from the toe board plate.

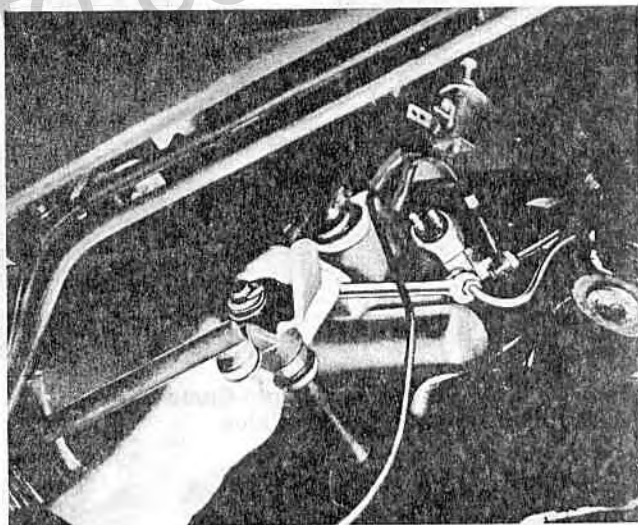


Figure 23—Disconnecting Hydraulic Line

DISASSEMBLY

Clean all dirt from the outside of the unit using care not to allow any of the dirty solvent to enter the unit.

Remove the hydraulic fluid reservoir filler cap and filler cap gasket and empty the fluid from the reservoir.

Scratch alignment marks on the cylinder shell and the

shell end plate, on the cylinder shell and the hydraulic cylinder casting, and on the reservoir cover and the hydraulic cylinder casting. Scratch alignment marks between the tube fitting and on the hydraulic cylinder casting. See figure 25.

EASAMATIC POWER BRAKE

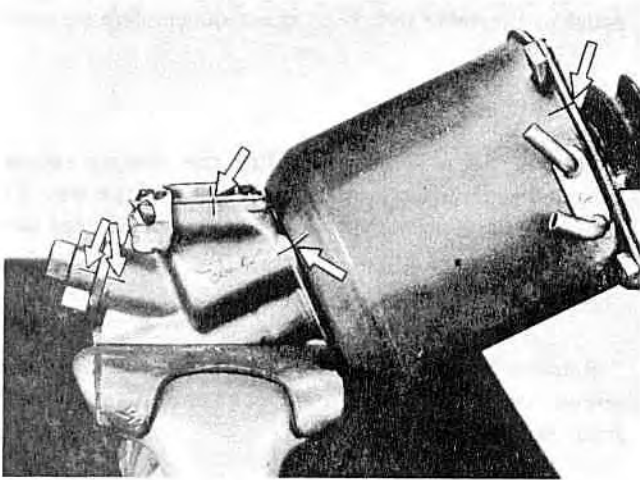


Figure 25—Arrows Indicate Alignment Marks

With the reservoir casting held between lead jaws in a vise, and having the unit at its normal mounting angle, remove the six reservoir cover screws, the cover and the cover gasket.



Figure 26—Removing the Compensator Port and Valve

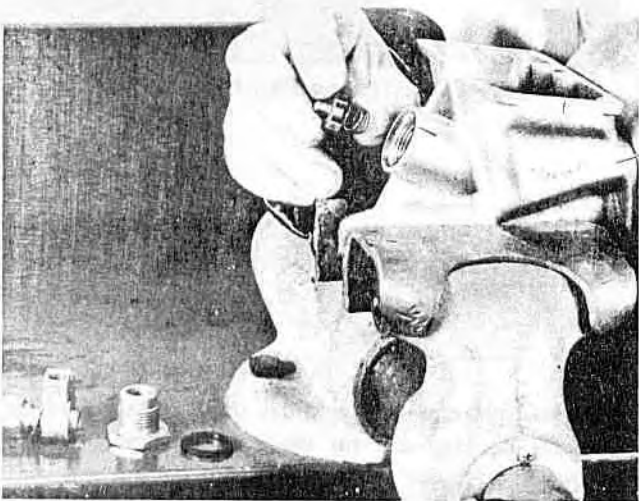


Figure 27—Check Valve and Spring Removed

Unscrew the compensator port and valve assembly using a $1\frac{1}{8}$ " thin-wall wrench. See figure 26. Remove the rubber seal ring from the compensator port fitting.

Unscrew the hydraulic output fitting bolt and output fitting. Remove the rubber seal ring from the output fitting. Remove the check valve assembly and the check valve spring.

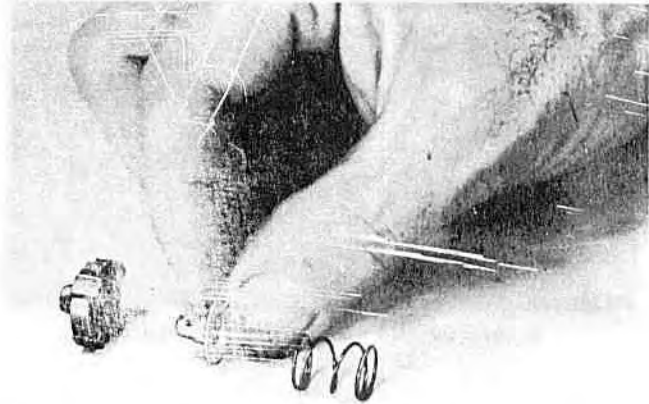


Figure 28—Valve Cup Separated from the Retainer

Separate the check valve rubber cup and cup retainer of the check valve assembly. See figure 28.

Remove the unit from the vise and empty the remaining fluid from the reservoir and hydraulic cylinder. Replace the unit in the vise.

Release the lip of the valve rod boot from the shell end plate and slip the boot off over the end of the valve rod. Remove felt washer from the valve rod.

Remove the screws holding the cylinder end plate and gasket to the cylinder body. Using a pair of small nose pliers to compress the ends of the valve stop washer snap ring, pry the opposite side of the snap ring out with a small screw driver.

Remove the snap ring, and the rod and valve assembly.

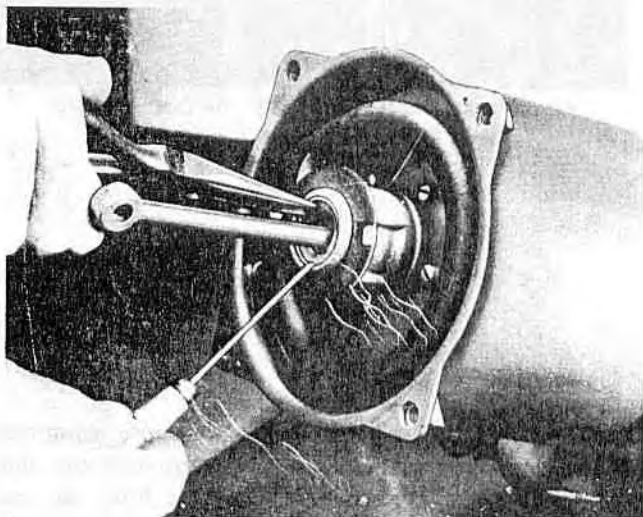


Figure 29—Releasing Valve Stop Washer Snap Ring

EASAMATIC POWER BRAKE

Caution: Take care to protect the polished surfaces of the vacuum valve.



Figure 30—Removing Vacuum Valve Screen

Remove the screen from the valve.

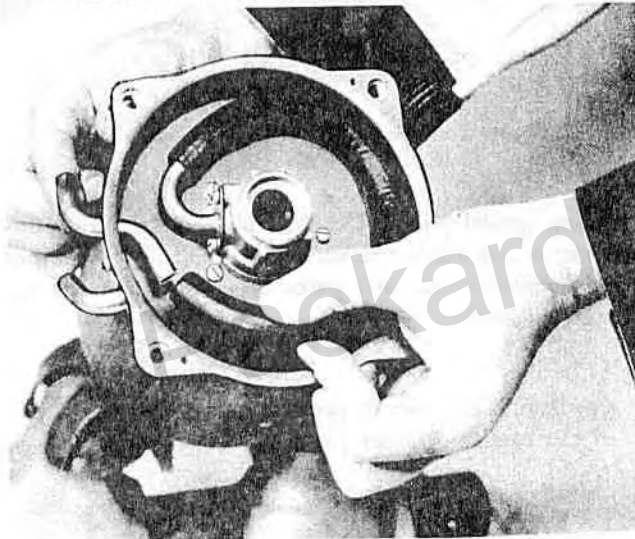


Figure 31—Removing Hose from Inlet Tube

Remove the hose from the vacuum inlet tube at the shell.

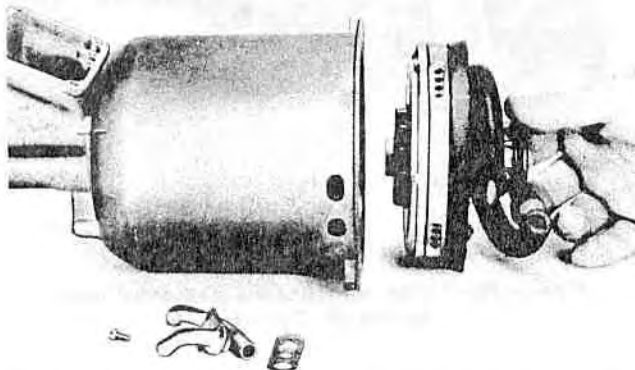


Figure 32—Vacuum Piston Assembly Removed from Shell

Holding the vacuum piston into the shell about $\frac{1}{2}$ " , remove the inlet tube assembly screw and the inlet tube assembly and gasket. Lift out the vacuum piston assembly.

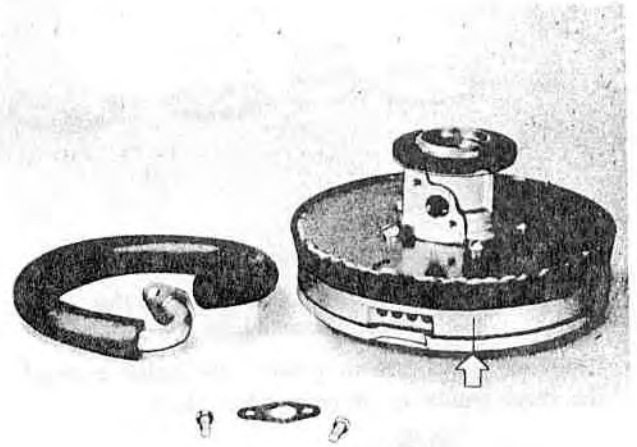


Figure 33—Alignment Marks on Edges of Piston Plates

Remove the two vacuum tube mounting screws and remove the tube and hose assembly and gasket. Scratch alignment marks on the front and rear piston plates.



Figure 34—Details Removed from the Rear of Rear Piston Plate

Remove the piston steel and rubber stop washers. Remove the five packing plate screws, retain plate, expander spring, wicking, vacuum piston seal retainer and seal. See figure 34. Turn the unit over on the bench.

Remove the five piston plate screws, separate the front and rear piston plates, the diaphragm assembly, counter-reaction spring, gasket, and vacuum valve return spring.

EASAMATIC POWER BRAKE

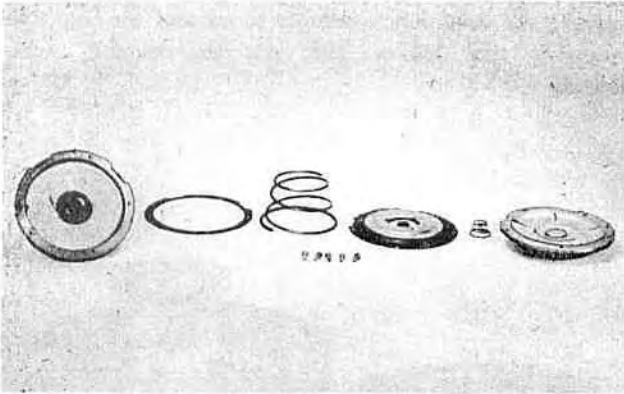


Figure 35—Details Removed with the Front Piston Plate

Caution: Take care to protect the inside bore of the valve sleeve in the rear piston plate.

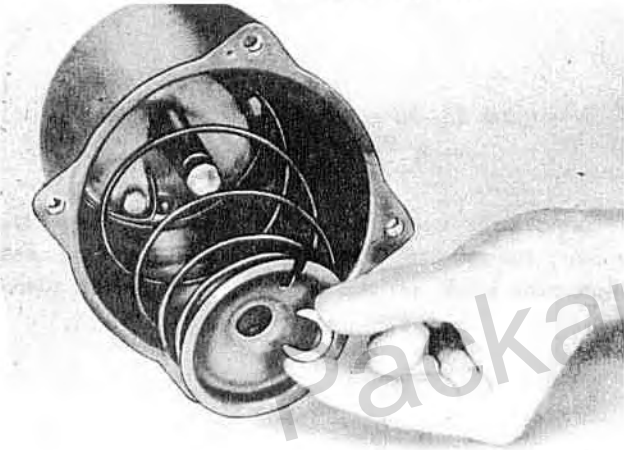


Figure 36—Removing the Vacuum Piston Return Spring

Using care not to push the master cylinder piston from its released position, compress the piston return

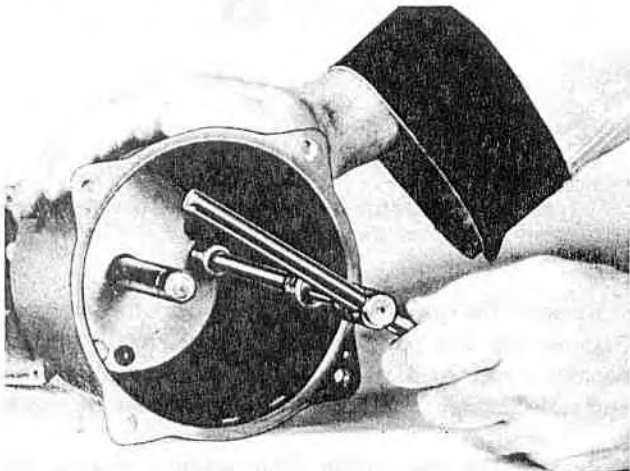


Figure 37—Removing the Vacuum Cylinder Shell Cap Screws

spring about $\frac{1}{2}$ " and remove the return spring seat retainer, spring seat, and return spring.

Remove the three cylinder shell mounting bolts and lockwashers, cylinder shell, gasket, rubber seal ring, and metal encased leather vacuum seal.

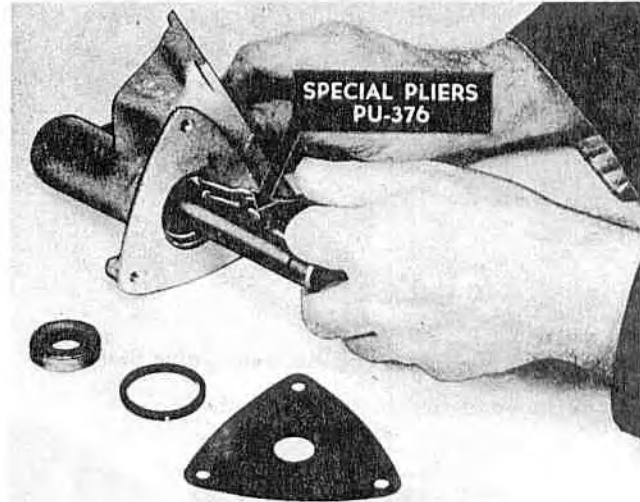


Figure 38—Retaining Ring Is Removed With Snap Ring Pliers

Using special pliers PU-376, remove the master cylinder piston cup washer retaining ring and lift the master cylinder piston and seal parts as a unit from the hydraulic cylinder.

Caution. Take care to protect the polished surface of the master cylinder piston.

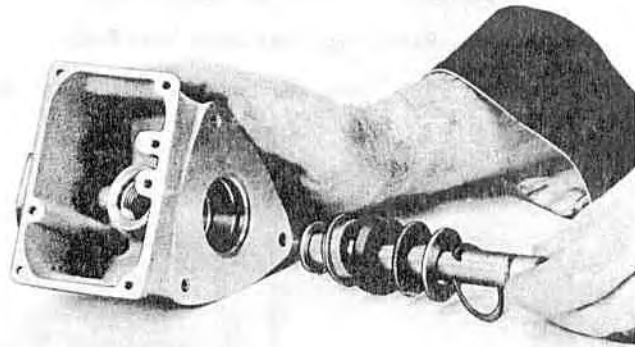


Figure 39—Piston and Details Removed from Hydraulic Cylinder

Remove the steel backup washer, phenolic guide washer, master cylinder piston seal, and seal retainer from the master cylinder piston.

EASAMATIC POWER BRAKE

CLEANING AND INSPECTION

Wash all parts thoroughly in alcohol and wipe dry. Blow the dirt and cleaning fluid out of the internal passages. If the inside of the vacuum cylinder shell is corroded or rusted, clean the surface with fine emery cloth and finish with crocus cloth.

Caution: It is important that the cleaned parts be placed on clean paper or cloth prior to assembly, to prevent the possibility of dirt getting into the Easamatic power unit.



Figure 40—Power Unit Details Laid Out After Cleaning

Inspection

In addition to replacement of parts contained in "Easamatic Repair Kit," inspection of parts should be made as follows and parts replaced as necessary.

Inspect the cylinder shell for scoring, pitting, dents, nicked edges or damaged threads. Replace if necessary.

Examine the hydraulic cylinder bore 1" from the open end. The surface must be free from scores, deep scratches, or corrosion, and be satisfactory for sealing with the rubber hydraulic seal. Gasket surfaces at the reservoir cover and the compensator port and hydraulic output fitting must be free of scoring, pitting, dents and nicked edges. Check for cracks and damaged threads.

Replace if necessary.

The surface on the face at the small end of the hydraulic output fitting must be free from scores, deep scratches to provide proper sealing surface with the rubber check valve seat. Replace if necessary.

Make sure the braze on the vacuum inlet tube is secure and the tube and mounting plate are not distorted. Replace either part if necessary.

Examine the rear piston plate for cracks or damaged threads. The sleeve must be securely pressed into the piston plate. Replace the assembly if the bore of the sleeve has scores, deep scratches, or corrosion.

Caution: Do not refinish the outside diameter of the valve as excessive clearance between the valve and the sleeve bore will cause serious vacuum leakage. Replace the vacuum valve assembly if it is found scored or damaged.

Inspect the hydraulic master cylinder piston for scoring, pitting, or nicks.

Caution: Do not attempt to refinish the piston as an undersize piston may cause serious hydraulic leakage. Replace the hydraulic master cylinder piston if it is scored or damaged.

The operating rod must pivot freely in the vacuum valve, but without noticeable end play. Inspect the vacuum valve for scoring, pitting, or nicks on the outside diameter.

Caution: Do not refinish the sleeve bore as excessive clearance between the sleeve and the vacuum valve will cause serious vacuum leakage. Replace the vacuum piston rear plate assembly if the sleeve bore is found excessively worn or scored.

Examine the vacuum cylinder and plate for cracks or distortion. Replace any other parts that do not come up to inspection standards.

EASAMATIC POWER BRAKE

ASSEMBLY

Note. All parts, tools, work area, etc., must be free from grease, oil, or dirt before reassembly is started.

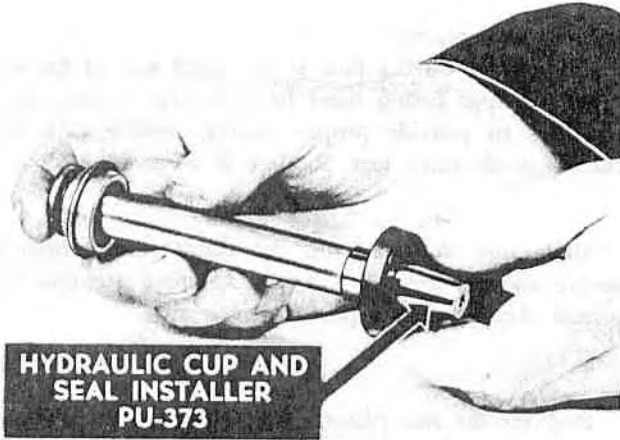


Figure 41—Installing Seal Using Hydraulic Cup and Seal Installer PU-373

Dip the hydraulic cylinder piston and cup in brake fluid. Install the cup retainer on the master cylinder piston with the end having the smaller diameter facing the washer on the end of the piston. Slip the Hydraulic Cup and Seal Installer PU-373 over the end of the master cylinder piston and install the lip side of the cup on the cup retainer.

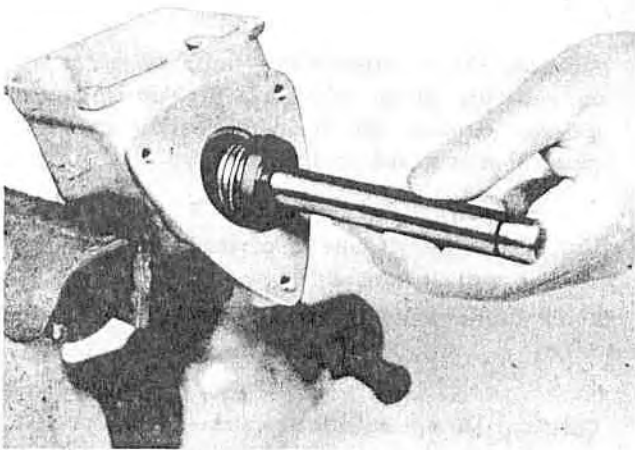


Figure 42—Starting Piston, Retainer, and Seal Into the Cylinder

Place the piston-retainer-cup sub-assembly in the hydraulic cylinder. See figure 42.

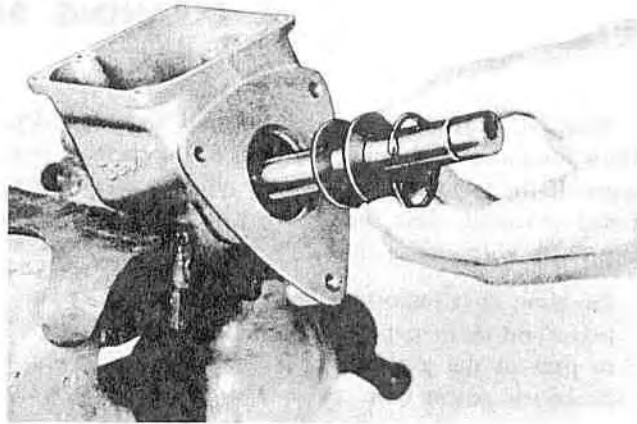


Figure 43—Adding Washers and Retaining Ring After Piston and Seal Installation

Care must be used not to damage the cup lip as it enters the cylinder bore. Put the phenolic washer and piston cup steel stop washer in place and install the retaining ring.

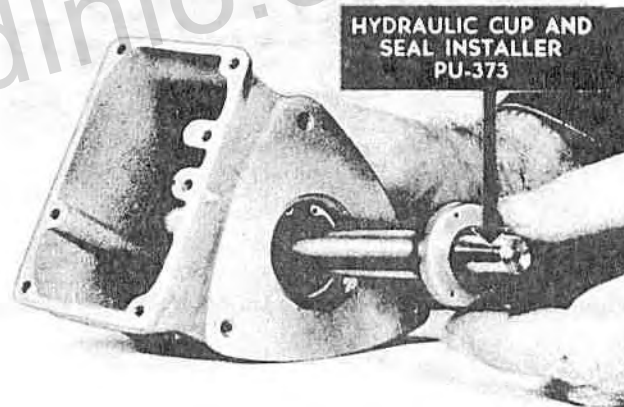


Figure 44—Lip of Seal Must Be Toward Hydraulic Cylinder

Holding the hydraulic master cylinder piston in its outward position, and using the Hydraulic Cup and Seal Installer Tool No. PU-373, install the master cylinder leather seal with the seal lip toward the hydraulic cylinder.

Install the master cylinder rubber seal ring and the cylinder gasket. Match the vacuum cylinder shell and the hydraulic cylinder casting alignment marks, and fasten with mounting bolts and lockwashers. Torque tighten to 4 to 5 foot pounds.

EASAMATIC POWER BRAKE

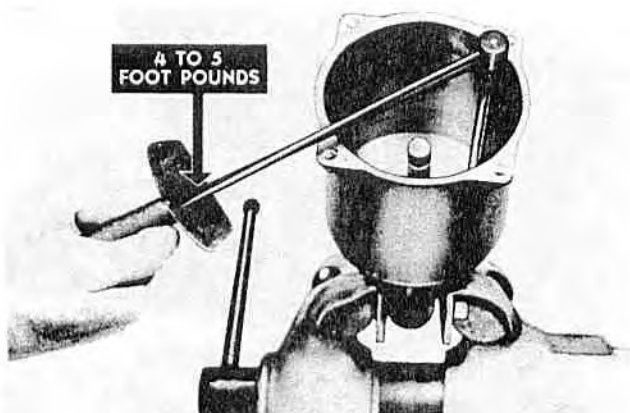


Figure 45—Torque Tightening the Cylinder Shell Cap Screws

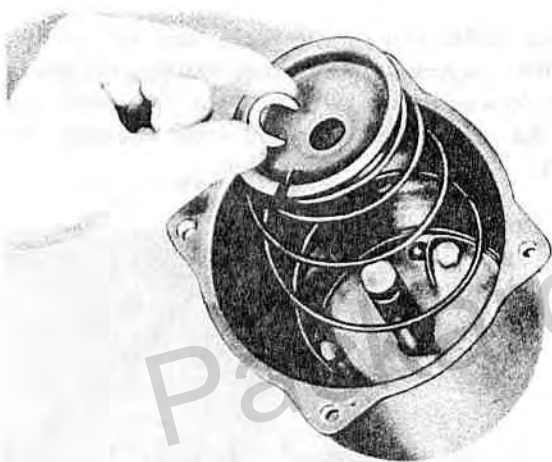


Figure 46—Installing Piston Return Spring

Install the piston return spring engaging the hooked end of the large end of the spring between a mounting bolt and a small hump in the shell, (any one of the three positions should be satisfactory). Place the spring

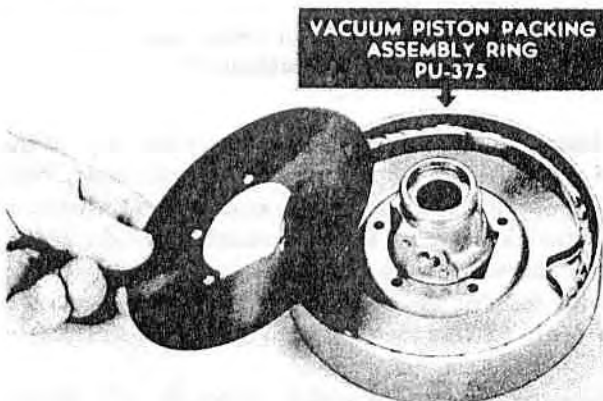


Figure 47—Installing Piston Seal Parts Using Special Assembly Ring

retainer over the piston engaging the hooked end of the small end of the spring in the slot of the retainer. Install the retainer washer.

Place the rear piston plate on the bench, the rear side facing up. Using the Vacuum Piston Packing Assembly Ring No. PU-375 install it over the piston plate. Install the vacuum piston leather seal making certain that the seal seats in the recess of the piston plate. Install the vacuum piston packing seal retainer, wicking, wick retaining expander spring, wick retaining plate and five screws.



Figure 48—Assembling Diaphragm Side of Piston

Care must be used when installing these screws to apply sufficient downward pressure on the screw driver to partially compress the packing seal and thoroughly engage the screw threads to prevent stripping the threads.

Turn the vacuum piston rear plate assembly over on the bench with the valve sleeve assembly side facing the bench. Install the five Diaphragm Installation Guide Pins PU-374 into the screw holes.

Place the counter-reaction spring, small end down, on the piston plate. Place the reaction diaphragm and then the gasket over the locating pins. The large diaphragm plate must be toward the rear piston plate. Align the two air passage cutouts. Install the valve return spring, the small end into the reaction diaphragm. (This will be over the back of the rubber pad.) Install the front piston plate, again align the air passage cutouts or alignment marks. See figure 48. Press down, compressing the spring. Remove one guide pin at a time replacing each with a screw. Be sure to obtain uniform tightness. Following assembly, saturate the new wicking and wipe the leather seal with a maximum of two teaspoons full of shock absorber oil.

Fasten the vacuum tube and hose assembly and gasket to the rear piston plate with two screws.

Apply a thin film of shock absorber oil to the inside wall of the cylinder shell. Insert the piston assembly into the shell and align the open end of the hose with the center of the large elongated hole in the cylinder shell.

EASAMATIC POWER BRAKE

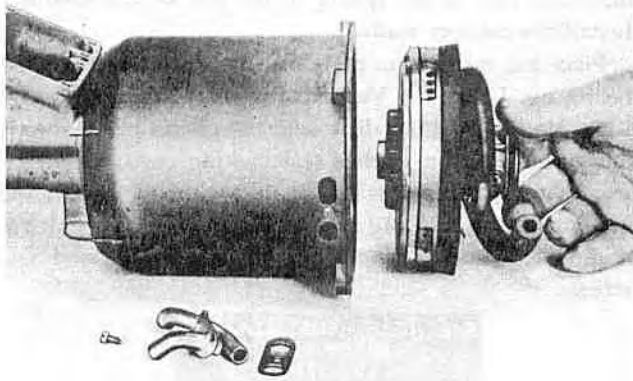


Figure 49—Insert the Piston Assembly into the Shell

Push the piston assembly into the shell. Make sure that the bore of the vacuum cylinder piston front plate fits over the end of the master cylinder piston. Rotate the piston assembly clockwise 20° to 30° and then 20° to 30° counterclockwise; then move the piston assembly through its full stroke several times *to make certain* that, after the piston finds its normal working position, the open end of the vacuum hose is aligned with the large elongated hole in the cylinder shell.

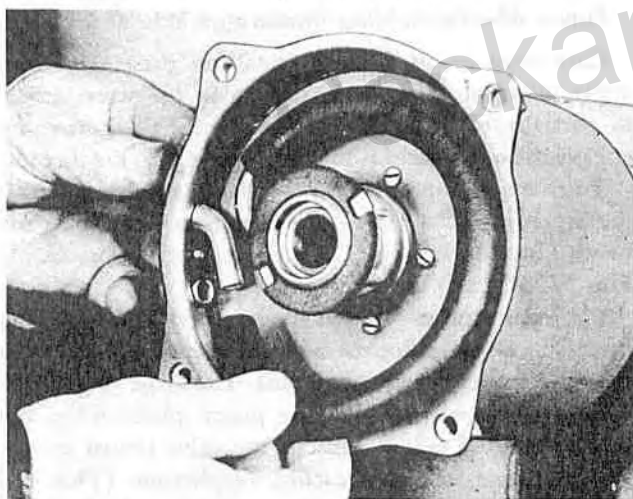


Figure 50—Sliding the Hose on the Vacuum Tube

Install the tube assembly, gasket, and screw on the cylinder shell. Tighten the screw firmly. Slip the hose on the tube connection. Again push the piston into the cylinder to its full stroke permitting it to come back by itself. Do this several times. Watch if the piston return spring causes the piston to rotate. If it rotates enough to cause the coiled hose connection to rub against the inlet connection, correct as follows:

Remove the piston and move the piston return spring 120° . In other words, this will be moving the large looped end of the spring to the next bolt and hump position.



Figure 51—Installing the Compensator Port and Valve

Dip the rubber seal ring in brake fluid and place it around the compensator port fitting. Holding the piston assembly forward in the cylinder about $1/2''$, install and tighten the compensator port and valve assembly. See figure 51.



Figure 52—Output Fitting and Check Valve Installation

Assemble the residual check valve rubber cup on the cup retainer after dipping the cup in brake fluid. Position the spring and cup-retainer assembly on the hydraulic output fitting lower face at the small end of the fitting. Invert the unit and screw the fitting into place, using care to see that the parts remain in correct alignment. See figure 52. Torque tighten to 30-42 foot pounds.

Assemble the copper gasket, hydraulic tube fitting, and copper gasket over the fitting bolt. Screw the parts into the output fitting, having the fitting outlets in correct position as indicated by alignment marks.

EASAMATIC POWER BRAKE

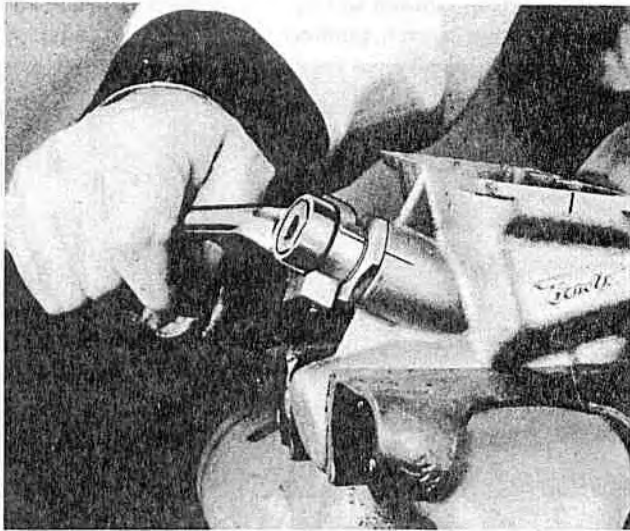


Figure 53—Tightening the Output Fitting Bolt

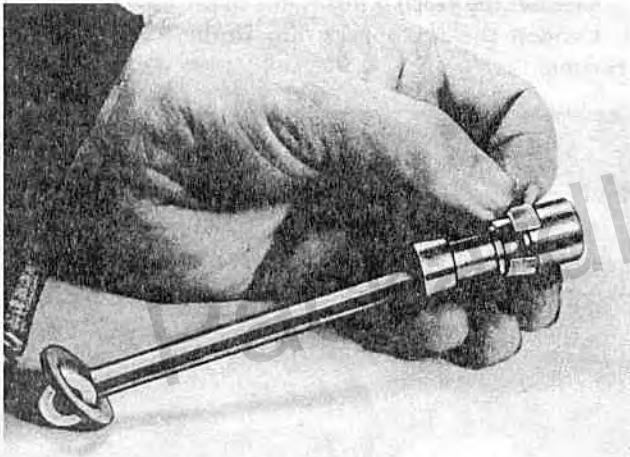


Figure 54—Installing Screen Over Port in Vacuum Valve

Place the piston steel stop washer and the piston rubber stop washer in place. Install the gasket and the cylinder shell end plate using the two screws, matching the alignment marks. Tighten the screws.

Movement of the vacuum piston $\frac{3}{32}$ " to $\frac{7}{32}$ " from its full release position should allow the compensator port to close. If this dimension does not check, recheck the unit for faulty assembly.

Install the screen over the grooved port in the vacuum valve. Carefully insert the valve assembly in the vacuum piston with the phenolic washer on the rod and install the snap ring. Install the felt washer. Install the valve rod rubber boot.

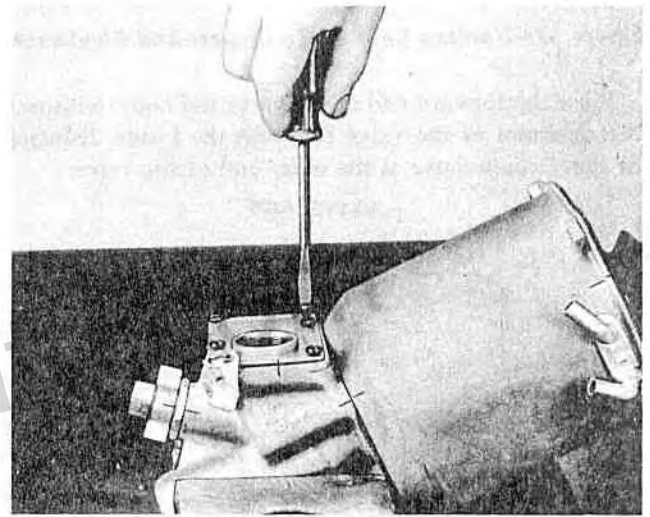


Figure 55—Installing Fluid Reservoir Cover

Match the fluid reservoir cover alignment marks and install the gasket and cover with six screws. Install the filler cap and gasket.

INSTALLATION

The Easamatic power unit is mounted on the underside of the toe board and is installed from inside the driver's compartment.

At the bench, mount the unit on the toe board plate with four screws and lockwashers with the unit positioned so that the fluid reservoir filler cap will be upward when installed in the vehicle.

Holding the pedal up to give clearance, install the unit and toe board plate sub-assembly in place on the toe board.

Install two toe board plate screws, tightening them only enough to hold the plate in place during alignment.

Fasten the pedal and the valve rod with the clevis pin. Do not install the cotter pin at this time.

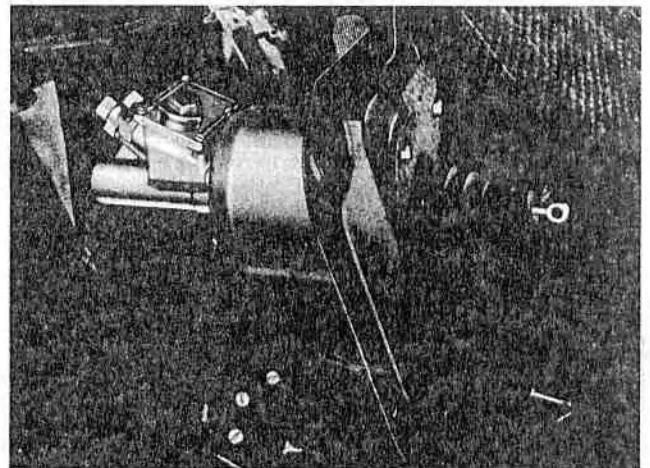


Figure 56—Power Unit and Toe Board Plate Ready for Installation

EASAMATIC POWER BRAKE

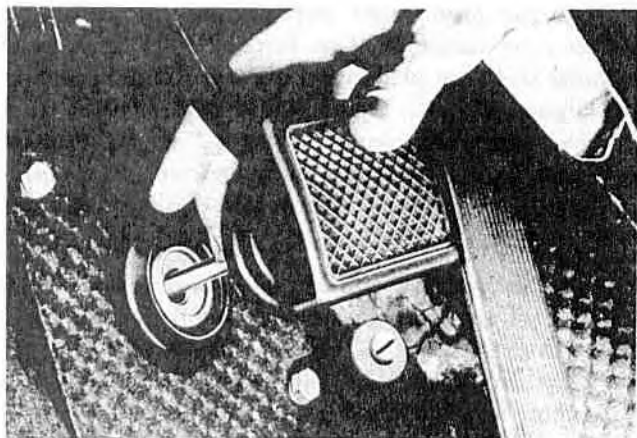


Figure 57—Holding Boot Up To Inspect Rod Clearance

Raise the forward end of the valve rod boot to inspect the clearance of the valve rod with the inside diameter of the vacuum valve at the outer end of the valve.

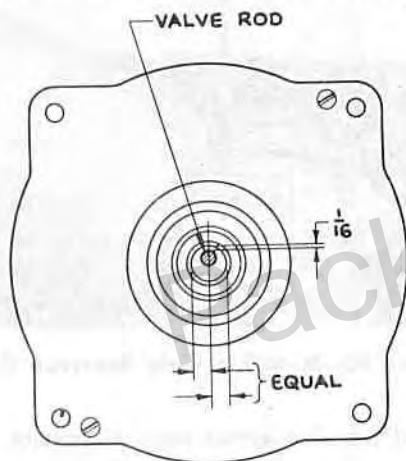


Figure 58—Showing Desired Valve Rod Clearance

The toe board plate should be positioned so that the valve rod has equal clearance on the left and right, but with slightly less clearance above than below. A clearance of $\frac{1}{16}$ -inch should be allowed between the rod and upper edge of the inside diameter of the valve. See figures 57 and 58. If additional movement for alignment is necessary, the pedal support bracket on the dash can be loosened and repositioned slightly.

Important Precaution: Stroke the unit manually through its full stroke a number of times to check that no bind exists due to misalignment. Both the piston and vacuum valve must return freely to their full release positions.

If alignment is satisfactory, install and tighten the remaining toe board plate to toe board hold down screws. Replace the valve rod rubber boot.

Remove the clevis pin and install the floor mat. Reinstall the clevis pin and the cotter pin. Slide the grommet

on the steering column down to its normal position and install the two screws. Connect the accelerator pedal.

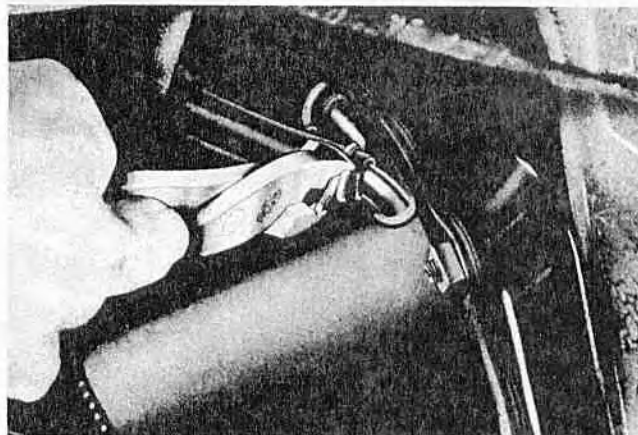


Figure 59—Installing Atmospheric Line Hose Clamp

Connect the vacuum line to the upper hose connection. Connect the atmospheric line to the lower hose connection.

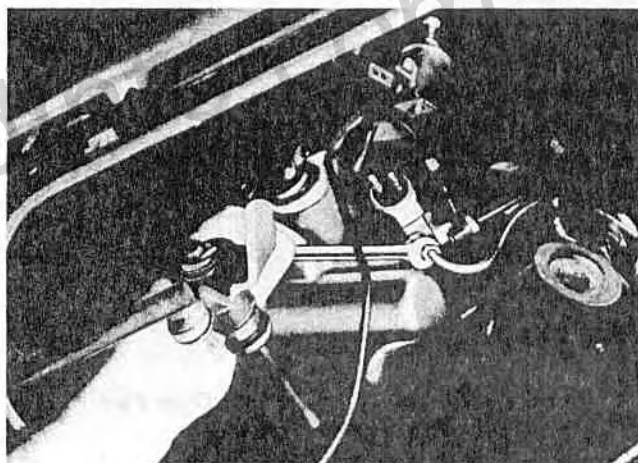


Figure 60—Connecting Hydraulic Line

Connect the hydraulic lines, two leading to the front wheel cylinders and one to the rear wheel cylinders. Connect the stop light switch wires.

Bleeding

The Easamatic brake system bleeding may be done manually or with a pressure bleeder in the conventional manner.

Note: Only new, clean, Packard hydraulic brake fluid should be used.

Clean any dirt from around the hydraulic reservoir filler cap, then remove the cap. Fill the reservoir and maintain fluid in the reservoir during the bleeding operation.

EASAMATIC POWER BRAKE

Slip the bleeder hose over the bleeder valve on the wheel cylinder furthest from the reservoir. Place the other end of the hose in a container having sufficient fluid to submerge the end of the hose.

Open the bleeder valve by turning $\frac{3}{4}$ turn counter-clockwise and watch the flow of fluid at the end of the bleeder hose while depressing the brake pedal slowly. Close the bleeder valve and allow the pedal to return slowly to the released position. This operation should be repeated several times. When the air bubbles cease to appear, depress the brake pedal and close the bleeder valve by turning it clockwise.

Repeat the above procedure at the remaining wheel cylinders, bleeding the shortest line last.

After bleeding the system, fill the hydraulic fluid reservoir to within $\frac{1}{2}$ " of the top of filler cap opening and replace the filler cap. Fluid bled from the system should not be used again.

Lubrication

The Easamatic piston packing seal is lubricated at the time of original assembly and needs no further lubrication.

Caution: Do not lubricate the vacuum valve under any circumstances.

System Tests

Road test the brakes by making a brake application at about 20 MPH to determine if the vehicle stops evenly and quickly. If the pedal has a spongy feel when applying the brakes, air is present in the hydraulic system. Bleed the system as previously described.

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

Stop the engine and again exhaust all vacuum in the system. Depress the brake pedal and hold foot pressure on the pedal. If the pedal gradually falls away under foot pressure, the hydraulic system is leaking.

If the brake pedal travels to within 1 inch of the toe board, the brake shoes require re-adjustment or relining.

Easamatic Repair Kit

Whenever an Easamatic unit is disassembled it is recommended that the parts listed in the Easamatic Repair Kit be obtained prior to the disassembly. The parts listed in the kit include perishable parts such as rubber seals and gaskets as well as parts that probably cannot be used again due to mutilation, such as snap rings, etc.

BRAKES

TROUBLE SHOOTING AND CORRECTIVE MEASURES

CONDITION	POSSIBLE CAUSE	CORRECTION
1. Brake pedal goes to floor board. Brakes do not hold.	(a) Normal wear of lining. Clearance between lining and drums too great.	(a) Perform minor brake adjustment.
	(b) No fluid in the master cylinder reservoir.	(b) Fill the master cylinder reservoir and bleed the brake lines.
	(c) A leak in the hydraulic system will permit the brake pedal under pressure to go to the floor board gradually.	(c) Locate and correct the leak in the system. Bleed the brake lines. Fill the master cylinder reservoir.
	(d) Air in the hydraulic system will cause the brake pedal under pressure to feel "spongy."	(d) Bleed the brake lines. Fill the master cylinder reservoir.
	(e) Excessive brake pedal free play will reduce the effective stroke of the master cylinder.	(e) Adjust the master cylinder push rod so that the brake pedal has $\frac{1}{4}$ " free play before the pressure stroke starts.
	(f) Brake shoe anchor pins improperly set, allowing the shoes and drums to spring.	(f) Perform the major brake adjustment.
2. Brakes on all wheels drag.	(a) Brake pedal improperly set. Master cylinder rod adjusted too tight, not allowing the master cylinder compensating port to be uncovered.	(a) Adjust the master cylinder push rod so that the brake pedal has $\frac{1}{4}$ " free play, before the pressure stroke starts.
	(b) Master cylinder primary cup swollen, not allowing the compensating port to be uncovered.	(b) Recondition the master cylinder, install new piston and cups. Adjust the push rod properly.
	(c) Faulty master cylinder check valve will cause master cylinder pressure to build up and will not let the fluid return to the master cylinder reservoir.	(c) Recondition the master cylinder. Install new piston, cups, and check valve. Adjust push rod properly.
	(d) Mineral oil in the hydraulic system will cause all cups and fluid lines to swell, causing pressure to build up.	(d) Recondition the master cylinder and all wheel cylinders. Install all new cups and rubber parts. Flush the hydraulic system with alcohol and fill with new Packard Hydraulic Brake Fluid.
	(e) Insufficient clearance between the drum and lining.	(e) Perform minor brake adjustment.
3. Brake on one wheel drags.	(a) Broken or weak shoe return springs.	(a) Install new shoe return springs.
	(b) Brake adjusted too tight.	(b) Perform minor brake adjustment.

BRAKES

TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
3. Brake on one wheel drags. (Continued)	(c) Brake shoe anchor improperly set.	(c) Perform major brake adjustment.
	(d) Frozen hand brake cable (on rear wheel).	(d) Free up and lubricate hand brake cable. Readjust the brakes.
	(e) Hand brake cable improperly adjusted (on rear wheel).	(e) Perform hand brake adjustment.
	(f) Swollen wheel cylinder cups will retard the return action of the shoes and cause the brake to drag.	(f) Recondition the wheel cylinder, bleed lines, and perform minor brake adjustment.
	(g) Loose wheel bearings (front wheels).	(g) Adjust the wheel bearings and perform minor brake adjustment.
4. Spongy brake pedal. Brakes do not hold satisfactorily.	(a) Brake shoes improperly adjusted.	(a) Perform major brake adjustment.
	(b) Air in the hydraulic system.	(b) Bleed the lines and fill the master cylinder reservoir.
5. Hard pedal. Brakes do not hold satisfactorily.	(a) Brake shoes improperly adjusted.	(a) Perform major brake adjustment.
	(b) Excessively worn lining.	(b) Reline the brakes and perform major brake adjustment.
	(c) Improper lining.	(c) Reline the brakes with Packard Brake Lining Set. Major adjustment.
	(d) Oil or grease on lining.	(d) Clean the lining and drums. Reline the brakes if the lining is soaked. Perform major brake adjustment.
6. Severe brakes. Brakes grab.	(a) Oil or grease soaked lining.	(a) Reline the brakes and perform major adjustment.
	(b) Brake shoes improperly adjusted.	(b) Perform the major brake adjustment.
	(c) Loose backing plates.	(c) Tighten the backing plates and perform the major brake adjustment.
	(d) Improper brake lining. (Coefficient of friction too great).	(d) Reline the brakes with the Packard Brake Lining Set. Major adjustment.
7. Car swerves to one side when the brakes are applied.	(a) Oil or grease soaked lining on one wheel.	(a) Reline the one brake with the same type of lining as other wheels. Major brake adjustment.

BRAKES

TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
7. Car swerves to one side when the brakes are applied. (Continued)	(b) Brake shoes improperly set.	(b) Perform the major brake adjustment.
	(c) Loose backing plates.	(c) Tighten the backing plates. Perform the major brake adjustment.
	(d) Improper brake lining on one or more wheels.	(d) Reline the brakes with the Packard Brake Lining Set. Perform the major brake adjustment.
	(e) Tires improperly inflated.	(e) Inflate all tires to the recommended pressure.

EASAMATIC POWER BRAKE

TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

Brake troubles may be easily diagnosed if the complaint is understood. The trouble will show up in one or more of the ways listed. Related parts of the power brake system should be checked before dismantling the Easamatic when a malfunctioning brake system is experienced.

CONDITION	POSSIBLE CAUSE	CORRECTION
8. Hard Pedal (Vacuum failure).	(a) Faulty vacuum check valve.	(a) Clean if dirty or sticky. Replace if damaged.
	(b) Collapsed vacuum hose.	(b) Replace the hose.
	(c) Plugged vacuum fittings.	(c) Clean the fittings. Locate where foreign matter is coming from and eliminate source.
	(d) Leaking vacuum reserve tank.	(d) Replace the tank.
9. Hard Pedal (Easamatic Unit trouble).	(a) Internal vacuum hose loose or restricted.	(a) Attach the hose if loose. If the hose is faulty, replace it. Be sure the inside of the cylinder is clean.
	(b) Jammed master cylinder piston.	(b) Locate cause of jamming and correct, replacing damaged parts.
	(c) Vacuum leaks in unit caused by loose piston plate screws.	(c) Tighten the screws.
	(d) Faulty diaphragm rubber stop in reaction diaphragm.	(d) Replace the diaphragm rubber stop.
	(e) Loose piston wick.	(e) The spring retainer is not in place. Reinstall the spring, or replace spring if necessary.
	(f) Faulty vacuum piston seal.	(f) Replace the piston seal.

EASAMATIC POWER BRAKE

TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
10. Hard Pedal (Mechanical condition).	(a) Glazed linings.	(a) Clean off the glaze with sandpaper. Perform major brake adjustment.
	(b) Grease or brake fluid on the linings.	(b) Locate and stop the source of the grease or fluid leak. Clean the linings off with alcohol. If soaked replace the linings. Perform major brake adjustment.
	(c) Binding pedal pivot.	(c) Free up the pivot.
11. Grabbing brakes.	(a) Grease or brake fluid on linings.	(a) Clean the linings. If soaked, reline the brakes. Perform major brake adjustment.
	(b) Scored drums.	(b) If it is very slight dress up with fine emery cloth. If it is deep reface in a lathe. See the Shop Manual for additional information.
	(c) Reaction diaphragm leakage.	(c) Replace the diaphragm.
	(d) Broken counter-reaction spring.	(d) Replace the spring.
	(e) Restricted diaphragm passage.	(e) Clean the passage.
	(f) Sticking vacuum valve action.	(f) Clean up valve lightly with crocus cloth. Do not oil as it needs no oiling.
12. Pedal goes to floor (or almost to floor).	(a) Brakes need adjustment.	(a) Perform major brake adjustment.
	(b) Air in hydraulic system.	(b) Bleed the lines and refill the master cylinder.
	(c) Hydraulic leak.	(c) Locate and correct leak, bleed lines. Refill master cylinder.
	(d) Fluid reservoir needs replenishing.	(d) Fill reservoir. Bleed the brake lines, and refill the master cylinder reservoir.
	(e) Cracked drum.	(e) Replace the drum. Perform minor brake adjustment.
	(f) Compensating valve leak.	(f) Replace compensating valve assembly. Bleed lines. Refill the reservoir.
	(g) Hydraulic piston seal leak.	(g) Recondition master cylinder. Bleed lines. Refill reservoir.
	(h) Compensating port on output fitting seal leak.	(h) Replace the seal. Bleed lines. Refill reservoir.

EASAMATIC POWER BRAKE

TROUBLE SHOOTING AND CORRECTIVE MEASURES—Continued

CONDITION	POSSIBLE CAUSE	CORRECTION
13. Brakes fail to release (or slow release).	(a) Bound up brake pedal pivot.	(a) Free up the pedal pivot.
	(b) Brakes improperly adjusted.	(b) Perform major brake adjustment.
	(c) Faulty residual check valve.	(c) Replace the check valve. Refill the reservoir. Bleed the lines.
	(d) Excessive hydraulic plunger seal friction.	(d) Replace the seal. Refill reservoir. Bleed lines.
	(e) Compensator port plugged.	(e) Clean the port. Refill the reservoir. Bleed the lines.
	(f) Restricted air passage.	(f) Eliminate restriction. Check air cleaner to see if the washers have been installed behind it. If not install two.
	(g) Piston stroke interference.	(g) Be sure that coiled vacuum line at vacuum connection to valve is not striking the intake end. Push piston in and out several times if it has tendency to creep and foul up, relocate the piston return spring by moving 120°.
	(h) Sticky vacuum valve.	(h) Touch up lightly with crocus cloth. Do not oil.
	(i) Sticky compensating valve.	(i) Replace the valve. Refill reservoir. Bleed the lines.
	(j) Broken piston return spring.	(j) Replace the broken spring.
14. Flutter felt at brake pedal at light application.	(a) Restriction in air cleaner or hose.	(a) Replace air cleaner if blocked by dirt. Replace hose if restricted.
	(b) Dirty or restricted screen on vacuum valve.	(b) Clean valve screen on vacuum valve.
		(c) If (a) or (b) do not correct the flutter, replace the old diaphragm assembly, with a new one using part number 436412.