

1940
PACKARD

Super Eight One-Sixty
Models 1803, 1804 and 1805

**Custom Super Eight
One-Eighty**
Models 1806, 1807 and 1808



**PRELIMINARY
SHOP MANUAL**

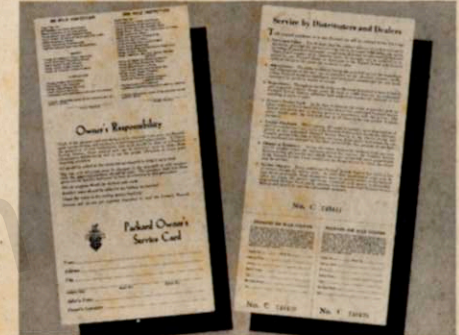
1803, 1804 and 1805 CARS BEGINNING ENGINE No. C-500,051
1806, 1807 and 1808 CARS BEGINNING ENGINE No. CC-500,051

As Soon as You Take Delivery



1. Please Make Sure the plate, located on the left side of the cowl, is stamped in the space marked Delivered by— City— Date—. If it is not, ask the dealer to take care of this at once. You will not receive the benefits of the Service Policy unless this plate is stamped.

2. Have you received your Packard Owner's Service Card shown at the right, with the two Inspection Coupons attached? This card should be made out by the seller of the car. It enables you to obtain the service described in the Service Policy, (which is printed on the preceding page) should you require this at other than the service station delivering your car.



New Car "Break-in"

The manner in which any new car is driven for **the first 250 miles** has a pronounced effect upon its subsequent operation and this applies to the brakes, gears, rear axle and other units, as well as to the engine.

All friction surfaces will burnish themselves to that high surface polish so essential to quietness, smoothness and durability, if not too highly stressed or loaded during the "break-in" period.

The best procedure is to refrain from even momentary wide-open throttle operation. Unless emergency demands it, do not fully open the throttle for acceleration or hill climbing and limit speed to 50 miles per hour until at least 250 miles have been driven. Observance of this advice will pay big dividends in ultimate satisfaction.

Lubrication-Inspection

Your Packard Dealer will be glad to explain the 10,000-mile Lubrication-Inspection Plan. It will save you money and be helpful in maintaining the quality and excellent performance built into your Packard.

It encourages regular attention which always means longer car life.

Avoids harmful lubrication; some assemblies are damaged by over lubrication. The right lubricant in the right amount at the right time.

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Starting the Engine

To start a **cold** engine proceed as follows:

1. Turn on ignition switch. Depress accelerator pedal once and allow it to return to the closed position. This engages the low-temperature idle control.
2. Depress clutch pedal fully, then press starter button located on the instrument panel.

NOTE: In cold starting, should excessive choking result from failure to turn on ignition—or from any other cause—hold the accelerator pedal in the wide-open position until engine starts, but do not allow cold engine to race.

To start a **hot** or **warm** engine proceed as follows:

1. Turn on ignition switch. Press starter button and hold accelerator pedal in wide-open position until engine starts. **Do not pump** accelerator pedal.

Ready Reference Data

Models 1803, 1803A, 1804, 1805, 1806, 1807, 1808

Capacities

Cooling system.....	20 quarts	Rear axle oil.....	6.0 pints
Crankcase oil.....	7½ quarts	Transmission.....	2.0 pints
Gas tank.....	21 gallons	Econo-Drive.....	1¼ pints

License Data and Miscellaneous

Car serial location.....	Plate, left side of cowl
Engine serial location.....	Stamped, upper left side of block between cyls. 3 & 4
Engine bore and stroke.....	3½" x 4⅝"
Engine horsepower A.M.A. rating.....	39.2
Engine piston displacement.....	356 cubic inches

	1803	1804	1805	1803A
	1806	1807	1808	
Over-all length.....	201¼"	212¼"	222¼"	234¼"
Over-all length with trunk rack.....	206"	217"	227"	—
Wheelbase.....	127"	138"	148"	160"
Tire pres.—front, normal minimum..	26	27	28	30
Tire pres.—rear, normal minimum...	28	29	32	36
Tire plies.....	4	6	6	6
Tire diameter.....	16"	16"	16"	16"
Tire width.....	All 7.00 inches			
Light fuses, location.....	Refer to page 33			
Spark plugs.....	AC-104 or Champion Y-4			
Spark plug gap.....	.028 inch + or - .002 inch			
Ignition timing, standard head.....	3½° to 5° B.T.D.C.			
Ignition timing 6.85 H.C. head.....	2½° to 4° B.T.D.C.			
Tappet clearance.....	Zero, automatic take-up			

Shipping Weights

1803 Touring Sedan—5-Pass.—No. 1372.....	3855 lbs.
1803 Club Coupe—2-4 Pass.—No. 1375.....	3760 lbs.
1803 Club Sedan—5-Pass.—No. 1376.....	4165 lbs.
1803 Business Coupe—2-Pass.—No. 1378.....	3735 lbs.
1803 Convertible Coupe—2-4 Pass.—No. 1379.....	3825 lbs.
1803 Convertible Sedan—5-Pass.—No. 1377.....	4000 lbs.
1803A Hearse chassis.....	3190 lbs.
1804 Touring Sedan—5-Pass.—No. 1362.....	4165 lbs.
1805 Touring Sedan—7-Pass.—No. 1371.....	4425 lbs.
1805 Touring Limousine—7-Pass.—No. 1370.....	4500 lbs.
1806 Club Sedan—5-Pass.—No. 1356.....	3900 lbs.
1807 Touring Sedan—5-Pass.—No. 1342.....	4210 lbs.
1807 Formal Sedan—5-Pass. No. 1332.....	4210 lbs.
1808 Touring Sedan—7-Pass.—No. 1351.....	4510 lbs.
1808 Touring Limousine—7-Pass.—No. 1350.....	4585 lbs.

If weight of car ready for road is desired, add 168 pounds to cover fuel and water.

Courtesy + Skill = Safety

Automobile engineering has always been devoted to safety and tremendous advances have been made. The modern motor car is, in itself, an amazingly safe machine—ininitely more safe than cars of a few years back and yet, in spite of this, automobile accidents continue to reach shocking totals. A moral seems to be pointed in the fact that in nearly all parts of the civilized world educational campaigns are being conducted to make the public—both motoring and pedestrian—safety conscious.

Undoubtedly there are many drivers who need improvement. In most cases, fortunately driving skill can be cultivated if there is any desire to become proficient. Deliberate indifference is an unfortunate attitude. Driving can be and is a lot of fun for those who do it well. Think of driving as a game—such as golf or tennis—and approach it with the same enthusiasm and expectancy. The ability to handle a motor car adroitly will give as much pleasure as does ability in any other sport.

Smooth Driving: Car operation can be smooth and graceful or it can be harsh and jerky. Acceleration and deceleration can be smooth even though rapid. Smooth operation is the mark of a finished driver.

Anticipation of what "the other fellow" is going to do may sound like a fanciful illusion but it can be developed to a remarkable degree and is valuable in promoting safety and smooth driving. It proceeds, of course, from the practiced habit of being highly alert for indications of what is likely to occur.

Speed: Modern cars perform so smoothly and quietly that there is no distinct sensation or impression of speed. Even at high speeds they seem to be "floating." Glance at—and be guided by—the speedometer.

Negotiating Curves: Inexpert drivers attempt to maintain speed right up to the entrance, close the throttle, apply the brakes and "man-handle" the car through the curve. This method involves the danger of complete loss of control and does not save any time. A more skillful driver approaches and enters the curve at reduced speed. When the car is safely in the turn, a slight throttle opening will give a stabilizing effect. From about the middle of the turn, the throttle opening can be gradually increased to give maximum acceleration out of the turn. The latter method is decidedly more safe, easier on tires and also faster.

Passing: This maneuver is a matter of judgment of speed and distance. Many drivers make but *one* observation of the respective distances between their own car, the car to be passed and the oncoming car. *One* observation is not enough. Develop the habit of making *numerous* careful appraisals of the gap (think of it in terms of feet or yards) between your car and the car to be passed and the gap between the car to be passed and the oncoming car. *Repeated* observations of the two gaps will tell you reliably whether you have room to pass. Persistence in this method will develop a fine sense of "pace and distance" that will add to the safety and pleasure of driving.

Mountains and Hills: Safety *demands* keeping always to the right side of the road. Do not "cut" curves and *never* pass a car at or near the brow of a hill. To attempt to do so is wantonly criminal.

Low or Soft Shoulders: On concrete highways these present definite hazards to fast drivers. To bring a car from such a shoulder back onto the pavement involves—in effect—*climbing a curbstone* and this cannot be done safely at speed. Under such conditions, cars are not responsive to light steering effort and the thoughtless driver who turns the steering wheel sharply in an effort to regain the pavement without first slowing down is courting serious disaster. Safety for passengers burdens the driver with the responsibility of being alert for any indication of a dangerous maneuver on the part of an oncoming driver.

Skidding: Turn the front wheels in the direction of the skid, *i. e.*, if the rear wheels are skidding to the right—turn the front wheels toward the right. To avoid a second though less violent skid in the opposite direction, the front wheels should be turned back gradually, as the speed of the rear wheel skid is diminishing, so that at the instant the rear wheel stops sliding, the front wheels will have been returned to the straight ahead position.

Oversteering is a fault common to nearly all drivers. Under certain conditions, over-steering is decidedly disadvantageous to say the least. The technique in skidding has been explained but most drivers seem unable to bring themselves to carry out the execution accurately. In the case of skidding, failure to bring the front wheels back as indicated usually results in a greater reverse skid than is necessary. A sharp turn of the wheel in climbing from a low or soft shoulder at speed is difficult to correct rapidly enough and may send the car directly across the road.

Tire Blow-Out: The best advice is to urge that nothing whatever be done until the necessity arises. The reason for this is that in many cases a blow-out produces nothing more than a mild tendency to skid and should be handled accordingly, but many persons suffer under the delusion that a blow-out demands heroic measures and proceed to make a harmless situation serious, or even dangerous. It is not possible to predict exactly what will happen in the event of tire failure because it depends entirely upon the conditions that exist at the time. Ordinarily, a blow-out results in skidding that may be mild or severe. If the car is intelligently handled, a blow-out is not apt to cause serious trouble.

Applying Brakes: Violent application imposes terrific strains on all parts of the car including brakes and tires and is never advisable unless emergency demands it. Where slippery pavement, skidding or tire blow-out is involved, brake application should be *very cautiously* made.

Dusty Road Ventilation: The admission of dust to the front and rear compartments may be quite effectively prevented by closing all the windows and opening the cowl ventilator.

Starting on Ice or in Mud or Sand: This can be more readily accomplished if care is taken not to spiff the wheels. Use second or even high gear and open the throttle only slightly. First speed may be necessary but don't open the throttle more than is necessary.

Safety First: Public officials who shoulder the responsibility of motor car regulation quite logically look to the better class of drivers to set an example for others. May we, in the interest of all concerned, sincerely request that Packard owners "Always Drive Safely."

Washing and Polishing

Fine lacquers properly applied give Packard cars a finish of high luster that can be maintained indefinitely if given proper attention.

Washing: Periodic cleaning is, of course, necessary. Fine dust may be safely removed by dusting with a soft clean cloth but "scrubbing" a dirty car with dry cloths is almost certain to scratch polished surfaces.

Ordinarily, it is better practice to clean the car by washing with plenty of cold or lukewarm water. Soak the dirt off as much as possible and rinse sponges frequently to remove grit and dirt. Dry with a clean chamois. The use of an ordinary garden hose nozzle—adjusted to give a high velocity stream—will be very useful in removing dirt from the under side of the car and the inside of the wheels. A stiff brush may also be necessary. Avoid washing the car in the sun or at any time when the lacquered surfaces are hot. Never wash the car with hot water.

In sections where salt, calcium chloride or similar chemicals are used on the roads, frequent washing of the car is necessary to preserve the finish. Where cars are to be exposed to freezing temperatures immediately after washing, all water must be removed from the edges of the adjustable windows and doors to prevent sticking due to the formation of ice.

Polishing: Weathering and an accumulation of traffic film will produce a dull appearance that washing will not correct. The original high luster can be fully restored by a thorough cleaning with Packard Body Polish or any other properly formulated body polish. The presence of color on the rubbing cloths simply indicates the removal of chalked or dead surface pigment loosened by exposure. All body striping is applied on top of the lacquer and requires careful treatment. Prolonged, vigorous rubbing will damage or may even remove the striping.

Oil or grease spots may also be removed with body polish. With a clean cloth, apply polish to the area of the spot only and polish out with a dry soft clean cloth. Special preparations are available that will remove tar or road oil without damage to the lacquer. Hardened lumps of tar can be more readily removed if first softened with lard or butter. If tar remover dulls the finish, use body polish to bring back the luster. Any lacquered surface upon which alcohol solutions have been spilled should immediately be flushed with water.

Care of Glass: Plate glass although hard can quite easily be scratched. Cleaning a dirty windshield when dry by operation of the wiper blade or with dry cloths is apt to cause minute surface scratches that will increase eye strain. Wet or moisten glass before cleaning.

Chromium Plating: The ability of chromium to withstand exposure has created the impression that it requires no service attention. Actually, the finest chromium plating is subject to deterioration if neglected.

Among the more common elements that attack chromium plating are: sulphur dioxide present in the air, especially in large industrial centers, calcium chloride used on city streets to melt ice and on dirt roads to prevent dust, also the salt air of coastal territories. When plating is scratched or scuffed to the base metal, ordinary moisture becomes a damaging

agent. Rust, originating at the root of a scratch, will continue to spread *underneath* the plating unless attended to when it first appears.

Chromium plating is very easy to clean and frequent cleaning is all that is necessary to keep it in first-class condition. First, go over all plated surfaces with a clean cloth moistened with kerosene, follow this with a clean cloth wet with clear water and then rub dry with a soft clean cloth. The rough treatment given car bumpers is apt to damage the plating. Should rust appear, use a mild scouring compound to remove every trace of rust and prevent further oxidation by applying a coat of wax, varnish or clear lacquer over the damaged area.

Interior: It is particularly important from the standpoint of personal comfort that the inside of the car be kept clean. Occasionally, the interior should be given a thorough vacuum cleaning.

Cleaning Upholstery

Where the use of cleaning fluid is indicated, use Packard Fabric Cleaner or a cleaning fluid in which carbon tetrachloride is the principal ingredient. To avoid rings, work from the outside toward the center.

Battery Acids: These destroy upholstery if allowed to remain. Neutralize the acids as soon as possible by pouring enough household ammonia water directly on the spot to saturate the fabric as far as the acid extends. Give the ammonia water a full minute to neutralize the acid and then rinse the fabric with a wet clean cloth. Use cold water.

Blood Stains: Rub with a clean cloth wet with cold water.

Candy or Fruit: Stains should be rubbed with a clean cloth wet with very hot water. If chocolate is present in the candy stain, use lukewarm water. After drying, sponge with a clean cloth wet with cleaning fluid.

Gum: Moisten with cleaning fluid and remove with a dull knife.

Ice Cream: Rub with a clean cloth wet with very hot water. If this is not satisfactory, use a cloth wet with warm soap suds and rinse with a cloth wet with cold water. After drying, sponge with cleaning fluid.

Lipstick: Pour cleaning fluid directly on spot and immediately after hold a clean blotter on the stain. Repeat until clean.

Shoe Polish: For black or tan polish, use a cloth wet with cleaning fluid. If white polish cannot be brushed off, wet with cold water, allow it to dry and then brush off.

Grease or Oil: Spots should be rubbed with a cloth wet with cleaning fluid. If a considerable amount of grease or oil is present, pour cleaning fluid on stained area and blot with clean blotters.

Tar: Moisten with cleaning fluid and remove with dull knife. Sponge with cloth wet with cleaning fluid.

Paints and Lacquers: Rub with a cloth wet with turpentine and then sponge with a cloth wet with cold water.

Water Spots: Sponge the entire panel with a cloth dampened with cold water then sponge the spots with a cloth moistened with cleaning fluid.

Controls and Instruments

Controls

Familiarize yourself with the operation of controls and learn how to interpret the instrument readings before driving your car. The following paragraphs will help you. Refer to Fig. 1 on page 10.

The gearshift control mounted on the steering column directly below the hand wheel provides the same standard "H" shift as the former vertical lever. The various gear positions are as follows: *reverse*, lift up on knob and more forward; *low*, lift up and more rearward; *second*, push down and move forward; *high*, push down and move rearward.

The ignition lock is located at the lower right of the center panel. Make it a habit to withdraw key when leaving car.

The starter button is of the remote control type and is located at the lower left of the center panel.

The hand throttle is located at the lower right of the center panel.

The foot accelerator should be held in the wide open position when starting a hot engine *but do not pump* the pedal.

Note: On cars with Econo-drive the level road maximum speed is obtained *before* the pedal is all the way down. If the pedal is pushed all the way down when Econo-drive lock-out knob is "in" it will cause the Econo-drive mechanism to shift from 4th into 3rd speed.

The light control switch is located at the lower left of the center panel. It is of the push-pull type having 3 positions. Pulling out to the first notch provides parking and map reading lights, second notch city or country driving lights. There is also a foot control switch located on the toe-board to the left of the clutch pedal. With the light switch in second notch, depressing the toe-board switch raises both beams to "Country Drive" while a subsequent depression tilts both beams for city driving. A tell-tale light on the face of the speedometer indicates when country driving beam is in use.

Instrument lighting is controlled by a combination switch and rheostat located to the right of the speedometer. With the main light switch "on", instrument illumination can be regulated in small steps by turning the rheostat knob, which also controls the map reading light.

On Econo-Drive equipped cars the knob carries a signal jewel which, when illuminated, indicates that the overdrive unit should be engaged. Refer to next page for further details.

The windshield wiper control is mounted on top of the panel above the ash tray. Turn the knob to start wiper and regulate its speed. Do **not** pull up on the knob.

The rear view mirror is eccentrically mounted on a friction type ball and socket swivel and may be adjusted for height or angle.

Front seat adjustment is controlled by a latch located at the left end of front seat. Nine separate positions are available. Moving the seat forward elevates the cushion and decreases the seat-back inclination to provide greater comfort and better vision for persons of small stature.

Sun visors are swiveled in such a manner that they can be moved to shade either the windshield or the front doors.

Duplicate sets of keys are provided with each car. One set fits the ignition and right front door locks, the other set fits the package compartment and rear trunk locks. For greater protection against car theft, lock-cylinders are not numbered. *A record of key numbers* should be made by every owner to facilitate purchase of duplicate keys from Packard dealers in event original keys are lost.

Optional Econo-Drive Transmission—The Econo-Drive lock-out knob is mounted on the bottom of the instrument panel to the right of the steering gear column.

To bring the Econo-Drive into operation, proceed as follows: Push the lock-out knob all the way "in" towards front of car. Now shift gears in the normal manner and when the car speed is above 22 miles per hour, which will be indicated by the illumination of a signal light in knob of the instrument board lighting switch, momentarily remove the foot from accelerator pedal, then return the foot and resume normal driving. The shift into Econo-Drive occurs during the momentary closing of the throttle and car will remain in Econo-Drive until the speed falls below about 17 miles per hour, or until the foot accelerator is pushed all the way down to the extreme limit of its travel. Either of these conditions will cause the Econo-Drive to become temporarily inactive and to bring it into action again it is only necessary to momentarily remove the foot from accelerator pedal whenever the car speed is above 22 miles per hour.

To obtain the full fuel economy advantages of the Econo-Drive form the habit of bringing it into engagement by momentarily lifting your foot from the accelerator as soon as the signal jewel is illuminated.

To lock out the Econo-Drive or make it inoperative at all speeds, use the following method: Depress clutch pedal fully and pull knob out at any speed under 60 miles per hour. It should be remembered that the Econo-Drive control knob should not be pulled "out" when the car is stationary.

Convertible coupe tops are power operated by engine vacuum and controlled by a knob at the lower flange on left side of instrument panel. To lower the top proceed as follows with engine idling:

Unlock top from windshield. Pull and hold out knob of control valve on instrument panel until top has moved into folded position, then release the control knob.

To raise the top proceed as follows:

With engine idling, push and hold in knob on instrument panel until top moves up and rests on top of windshield, then release the knob. Lock top to windshield.

CAUTION—The top should not be lowered or raised while the car is in motion. Best results will be obtained with engine running at idling speed.

Instruments

The **oil pressure gauge** is mounted with the temperature gauge at the left of the speedometer. This gauge does *not* indicate the quantity of oil in the engine. Normal reading is 50 at 45 miles per hour. CAUTION: Failure of the gauge to show pressure while engine is running indicates either a lack of oil or some derangement that should be corrected to avoid serious damage to the engine. Refer to Fig. 1.

The **water temperature gauge** is located with the oil pressure gauge at the left of the speedometer. Most efficient operating temperature is between 150 and 185 degrees or when the hand is at or just slightly to the right of the center dot on face of instrument. The water in the cooling system is boiling when indicator hand is at the 3rd dot. When this occurs stop the car and check the water level in radiator and the condition of fan belt, etc. Water at sea level boils at 212 degrees but at 5000 feet altitude, boiling occurs at approximately 202 degrees.

The **battery charge indicator** is located with the fuel gauge at the right of the speedometer. This gauge indicates whether the battery is being charged or discharged. The generator regulator is so designed that the indicator will be nearly at *zero* when battery is *fully charged*. To determine whether generator is charging, turn on the headlights for 10 minutes with engine stopped or turn off the ignition switch, press the starter button and allow the starter motor to crank the engine for about 20 or 30 seconds. Now turn on the ignition switch and run engine at a speed equivalent to 30 miles per hour. If the indicator hand now moves to "Charge" side of dial, the generator is charging.

The **gasoline gauge** with the ammeter is located at the right of the speedometer. The gauge is electrically operated and will register only when the ignition switch is "On."

A **100 mile speedometer** is located in the center of the left instrument panel. Fuel consumption at 60 miles per hour is approximately 50 per cent greater than at 20 miles per hour.

The rectangular plate directly below the ash tray and the medallion in right hand panel are removable to permit installation of a radio and clock respectively.

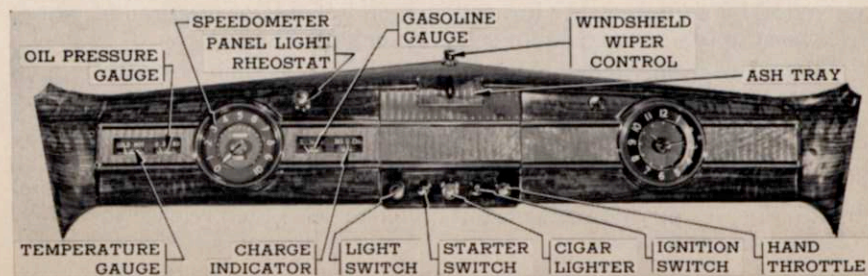


Fig. 1—Front View of Instrument Board

General Lubrication

The subject of lubrication of the complete automobile should be given careful attention. It is important that the lubrication schedule be followed and that the proper lubricant be used if the car is to give quiet and efficient performance. The use of high grade lubricants will prolong the life of the wearing parts and prove most economical in the long run.

It is now common practice of oil companies to designate their oil by the S. A. E. classification, instead of the old method of designation as light, medium or heavy. The application of the S. A. E. viscosity number to a lubricant is intended only to indicate the body or fluidity of the oil and has no bearing on the quality of the product. Only high quality oils furnished by reputable companies should be used and for accuracy they should be ordered by S. A. E. numbers.

It is essential to add oil, as required, to maintain the correct oil level.

Choose the proper viscosity from the following table in accordance with the lowest temperature expected to be encountered.

Engine Oil Viscosity

Below minus 10°F.....	10-W plus 10% kerosene
Minus 10°F.....	10-W
Plus 10°F.....	20-W
32°F.....	S. A. E. 30
90°F. extreme summer temperature.....	S. A. E. 40

The best performance of the engine will be obtained by using the correct body (S. A. E. number) of engine oil in the engine crankcase as specified in the above table. The oil should be of a low S. A. E. number in cold weather to provide proper starting and a higher number in warm weather to provide economical consumption.

When Should Oil Be Changed

Obviously the time between crankcase drains depends entirely upon the driving conditions. In considering the following factors as to when to change the oil it should be kept in mind that good lubrication is low priced insurance against high maintenance costs.

The first change should be made preferably at the end of the first 500 miles, thereafter, 1,000 to 2,000 mile changes are recommended as that most closely approximating average conditions, but the changes should be controlled by the driving conditions as pointed out below.

The engine oil should be changed in accordance with temperature variations rather than according to seasons. In some localities variations in temperature are so extreme that several grades may be required during the course of a year.

Low maintenance costs, long engine life and best performance will be insured by changing the crankcase oil when it becomes contaminated. Driving over dusty roads or through dust storms with dirt-clogged air cleaners introduces abrasive material in the crankcase. If this is not removed immediately by draining the crankcase, harmful engine wear may result.

Hard driving in warm weather causes chemical changes in the oil. Accumulation of the products of these changes is undesirable and may prove harmful to the engine.

In winter, water accumulates in the crankcase from condensation of moisture produced by the burning of the fuel and may freeze and interfere with proper oil circulation. It also promotes rusting and causes clogging of oil screens and passages. While on long continuous drives this water may be removed by the crankcase ventilator, draining is a safer procedure. Light oils should be used for easy starting but very hard driving may thicken them and cause starting trouble.

Engine Oil Pan and Filter

To prevent the accumulation of sludge which is injurious to the engine, the lower oil pan and screen should be removed and cleaned at least once a year.

The optional equipment external oil filter cartridge should be renewed every 8,000 miles—in no case should it be used beyond 10,000 miles.

Air Cleaner

The carburetor air cleaner should be serviced every 5,000 miles or as often as every day if car is driven on extremely dusty roads.

Clutch Shifter Bearing

The clutch shifter thrust bearing is packed with lubricant and permanently sealed by the bearing manufacturer. It requires no further lubrication.

Brake Pedal, Relay and Equalizer

The clutch and brake pedal bearings are lubricated by a single pressure gun fitting. The clutch relay lever shaft is also equipped with a gun fitting. The hand brake equalizer should be sprayed with engine oil at each 1000 mile chassis lubrication.

Universal Joints

The roller bearing type universal joint journals are packed with lubricant and sealed. Every 30,000 miles the joints should be taken apart, repacked with No. 2½ cup grease and new cork seals installed. Lubricate slip yoke spline with pressure gun every 1,000 miles.

Rear Axle

Oil should be changed each Fall. A special passenger car duty hypoid oil of S. A. E. 90 viscosity is necessary for hypoid gears as the use of alternate lubricants may ruin the gear set. See Packard Dealer for a list of approved lubricants or have him attend to this important responsibility.

Rear Wheel Bearings

Unless a leak develops at the oil seals, bearings will not require lubrication for at least 30,000 miles. At this mileage the shafts should be removed and the bearings packed with No. 3 fibre grease.

Distributor

Refill and turn grease cup every 1,000 miles. Apply one drop of oil to the breaker arm pivot, a few drops to the wick under the rotor and a small amount of vaseline to the breaker cam.

Transmission and Econo-Drive

Recommended lubricant for transmission and Econo-Drive is a high grade straight transmission oil of S. A. E. 140 viscosity in warm weather and S. A. E. 90 in cold weather or S. A. E. 80 in extremely cold weather.

The oil level in the transmission should be checked separately from the Econo-Drive unit and maintained flush with the filler plug opening "B", Fig. 2, on the side of the transmission housing.

The Econo-Drive unit is equipped with its own drain and overflow plugs and should be checked separately from the transmission. Oil level in this unit is higher than in the transmission and should be flush with the combination filler and overflow opening "C" on the side of the Econo-Drive housing. Avoid overoiling the transmission by removing plug "B" when filling the Econo-Drive unit.

Steering Gear

The oil level in the steering gear should be maintained flush with the bottom of filler plug opening. Use S. A. E. 140 straight transmission oil for warm weather and S. A. E. 90 in cold weather, or dilute the summer lubricant with kerosene if desired. Change oil in the Spring.

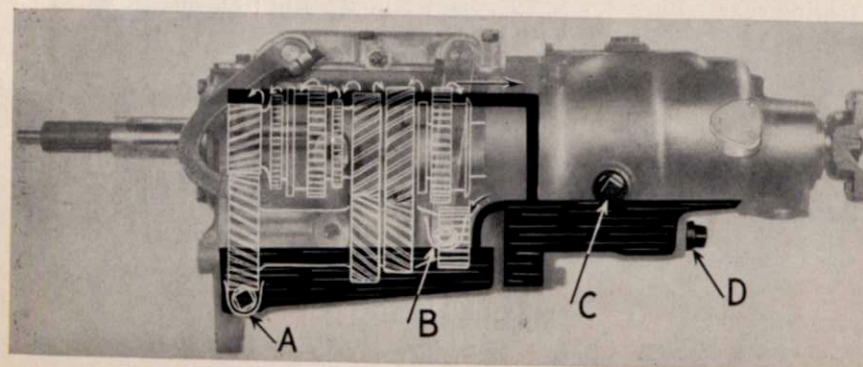


Fig. 2—Note Difference in Oil Levels. Remove Transmission Plug "B" When Filling Econo-Drive to Prevent Overoiling Transmission

Lubrication Schedule

1000 Miles

Knuckle pins	Pressure gun grease	2 lubrication connections
Steering connecting rod	Pressure gun grease	2 lubrication connections
Steering cross tubes	Pressure gun grease	4 lubrication connections
Universal yoke spline	Pressure gun grease	1 lubrication connection
Generator	S. A. E. 30 or 20-W	2 oilers
Starter motor	S. A. E. 30 or 20-W	2 oilers
Distributor	No. 3 cup grease	Refill cup and turn
Clutch and brake pedal	Pressure gun grease	1 lubrication connection
Clutch relay lever	Pressure gun grease	1 lubrication connection
Steering crank	Pressure gun grease	1 lubrication connection

Add a few drops of light oil to the clevis pins, door hinges, dovetails and locks. Grease hood lacing and hinges as needed. Spray hand brake equalizer with engine oil.

Crankcase—refer to "When Should Oil Be Changed" on page 11.

10,000 Miles

Support arm outer pins	Pressure gun grease	4 lubrication connections
Front wheel bearings	Fibre grease	(2) Repack
Transmission and Econo-Drive	See Transmission and Econo-Drive on preceding page	Fill to levels
Steering gear	S.A.E. 140—Dilute with kerosene or use S.A.E. 90 for winter if desired.	Fill to level
Rear axle	See note	Drain and refill

NOTE: Rear axle gears require a special passenger car duty hypoid lubricant. See Packard dealer for list of approved hypoid lubricants.

30,000 Miles

Rear wheel bearings	No. 3 fibre grease	(2) Repack
Universal journals	No. 2½ cup grease	(8) Repack

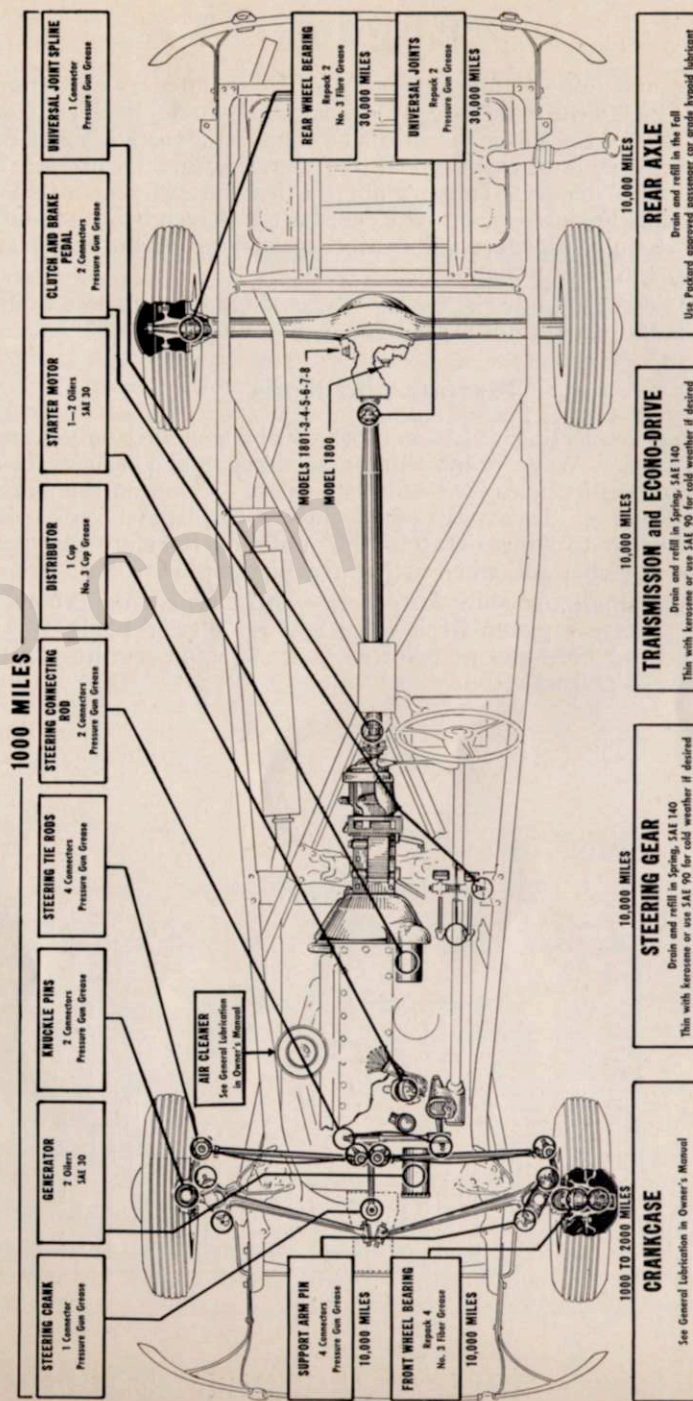


Fig. 3—Lubrication Diagram Showing Points to Lubricate and Types of Lubricants Needed

Engine

Cylinders and upper crankcase are cast as an integral unit from an iron alloy of high wear resistance. The cast iron cylinder head is attached to the top face of the block by means of studs. Valves are actuated by pressure lubricated mushroom type lifters operating directly in guide holes machined in the block. Tappets are the hydraulically operated self-adjusting, zero clearance type. The camshaft is driven by a non-adjustable silent chain at the forward end of the engine. Compression ratio 6.45 standard, 6.85 optional.

Cylinder head stud nut tightening torque should be not less than 740 inch-pounds but should not exceed 760 inch-pounds.

Pistons and Rods

Piston and connecting rod assemblies can be removed only from the top of the block. When re-installing assemblies, make certain the connecting rod oil squirt holes "O" and piston slots "S" are on the camshaft side of the engine. To avoid possible injury to piston bosses, pistons should be heated to approximately 160° Fahrenheit before dismantling from connecting rods and when fitting new piston pins.

Pistons are aluminum alloy Autothermic strut type, cam ground and tin plated. Correct piston fit is when a .0015" feeler blade 1/2" wide inserted between bore and non-slotted face of piston requires 12 to 18 pounds upward pull to withdraw.

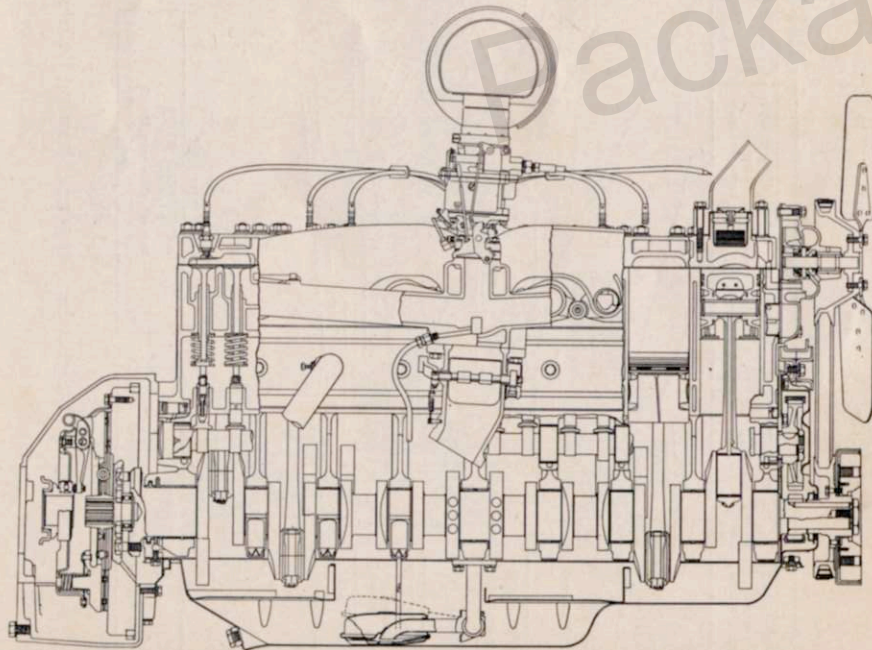


Fig. 4—Side Section of Packard Super Eight Engine. Valve Spring Keepers are Slot and Key Type

Floating type piston pins should be a finger push fit in piston bosses with piston heated to 160° Fahrenheit and a similar fit in rod bushings at room temperature. The split type pin bushings **must** be expanded to a tight fit in rod with a suitable burnisher bar before reaming the bushings to final size. Pin diameter all models .875 inch standard, over-sizes .003 and .006 inch.

Bearings

The camshaft, crankshaft and connecting rod bearings are all of the shimless, precision, steel backed, babbitt lined type. They are non-adjustable and should be renewed whenever inspection shows excessive clearance. Crankshaft bearing upper and lower halves may be renewed from below without removing the crankshaft. Any connecting rod bearing may be renewed from below without removing the rod and piston. Diameter of main bearings 2 3/4 inch; crankpins 2 1/4 inch nominal. Rod bearing end play on crankpin .004 to .010 inch, crankshaft end play .003 to .008 inch controlled by center bearing.

Piston Rings

Standard piston ring equipment—, one 3/2 inch No. 200 compression ring with Ferrox finish .165 to .175 inch thick, one No. 70 compression ring with Ferrox finish 1/8 inch wide by .140 to .150 inch thick and one 3/16 inch wide by .122 to .130 inch thick X-90 spring expander type oil ring per piston. Top and 2nd compression ring should have .0025" to .003" up and down groove clearance; oil ring .0015" to .002" clearance. Assemble top and oil ring with gap away from camshaft. Install the No. 200 top ring with bevel on inside edge pointing up.

Timing Chain

Chain is a two sprocket non-adjustable type with 62 links 1 1/4 inches wide by .375 inch pitch. On timing chain jobs, remove both fenders and radiator as one assembly. Remove chain and both sprockets together. Valve timing is correct when sprocket marks are aligned as shown in Fig. 5.

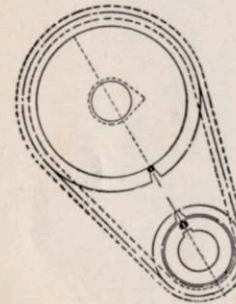


Fig. 5—Sprocket Marks Should Align as Shown

Valves and Tappets

Valve tappets are of the automatically adjusted hydraulic type operating with zero clearance. They require no care on the part of the owner except that he should use a high grade oil of proper S. A. E. viscosity rating and refrain from carrying more than the normal 7 1/2 quarts of oil in the crankcase.

Notes for the Mechanic—Operation of the automatic hydraulic take-up mechanisms is evident from a study of Fig. 7 where it will be

seen that the light weight coil spring "K" keeps the engine valve stem in constant contact (zero clearance) with the end of the plunger "C" and that the valve is both lifted and lowered by a column of oil inside the hydraulic cylinder "B." The units are supplied with oil under pressure from the regular oiling system via drilled passages in the block which feed into a drilled register hole "H" in each tappet or lifter body.

Each of the hydraulic assemblies comprising plunger, spring, check ball and cylinder, must be removed as a unit when grinding valves.

The cylinder and the plunger of each assembly are matched units and must be so treated if separated from each other for any reason. This is **extremely important** because each plunger is matched with the selected cylinder not entirely on the basis of diametral clearance but on the amount of oil leakage between plunger and cylinder under a certain amount of pressure exerted for a certain period of time.

The cylinders and plungers are not marked in production so it is recommended this be done at time of disassembly using pencil or paint marks. The likelihood of getting the parts mixed will also be considerably reduced if one hydraulic unit is completely serviced and reassembled before proceeding to the next.

The following hints will be helpful in servicing the hydraulic units:

1. As much as one hour of running may be necessary after a valve grind to fill all of the units with oil.
2. Tappet noises persisting after more than an hour of operation

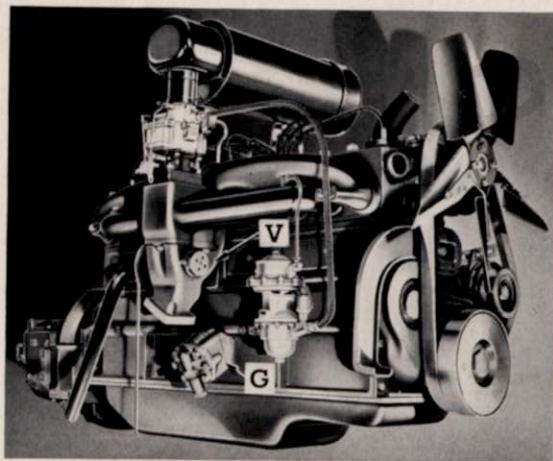
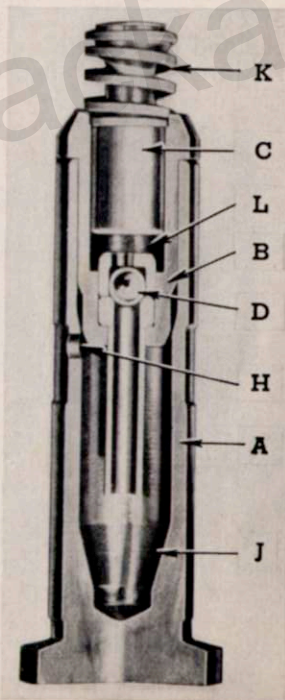


Fig. 6 Above—Thermostatic Spring on Heat Valve "V" Should Have $\frac{3}{4}$ of a Turn Wind-up Cold

Fig. 7—(Right)—Valve Lifter Sectioned to Show Zero-Lash Tappet Details

- | | |
|---------------|---------------------|
| A—Lifter Body | H—Oil Hole |
| B—Cylinder | J—Supply Chamber |
| C—Plunger | K—Plunger Spring |
| D—Ball Check | L—Adjusting Chamber |



indicate either a lack of oil supply to the units or a derangement in the units proper such as dirt, scoring, or mismatching of plungers and cylinders.

3. Noisy tappets can be located with a feeler gauge.
4. If all or most of the tappets are noisy look for restricted oil supply. If one or a few are noisy remove and check the individual hydraulic units.
5. Before examining a suspected hydraulic unit wash same thoroughly in clean gasoline, kerosene or solvent and dry with air pressure, then check the following points:
 - A. Renew hydraulic unit if plunger or cylinder is scored or pitted.
 - B. The check ball and seat must be clean and ball must move freely.
 - C. If unit passes tests "A" and "B" release spring from cylinder and with all parts dry raise plunger as high as possible without losing its guide in cylinder. Now push plunger down quickly and release. If plunger does not tend to bounce back renew the hydraulic unit.
6. If it is known that the plungers and cylinders have become mixed install a new set of units and return the old ones to the factory for re-matching.
7. The take-up reserve of each hydraulic unit should be checked whenever the valve and seats are recut. To make this check the hydraulic unit and the tappet body must be emptied of oil. Clearance between end of valve stem and end of hydraulic plunger when engine valve is on its seat should be not less than .030 inch and not more than .070 inch. The plunger may be bottomed with a screwdriver when making this test. If feeler shows less than .030 inch clearance grind off end of valve stem until .030 to .070 inch of clearance is obtained.

Valve spring pressure should be 147 to 157 pounds at $1\frac{3}{8}$ inches or with valve wide open. Valve seat angles 30° inlet, 45° exhaust. Valve lift .340 inch nominal. Valve stems are .340 inch diameter and guides are straight reamed. Recommended stem to guide clearance, inlet .001 inch to .003 inch; exhaust .003 inch to .005 inch. Removal of mushroom tappets requires removal of camshaft. Tappets furnished in oversizes of .001, .002 and .005 inch. Ream for .005 inch oversize tappets with Packard reamer S. T. 5101. Nominal tappet diameter $\frac{5}{8}$ inch.

Valve spring pressure should be 147 to 157 pounds at $1\frac{3}{8}$ inches or with valve wide open. Valve seat angles 30° inlet, 45° exhaust. Valve lift .340 inch nominal. Valve stems are .340 inch diameter and guides are straight reamed. Recommended stem to guide clearance, inlet .001 inch to .003 inch; exhaust .003 inch to .005 inch. Removal of mushroom tappets requires removal of camshaft. Tappets furnished in oversizes of .001, .002 and .005 inch. Ream for .005 inch oversize tappets with Packard reamer S. T. 5101. Nominal tappet diameter $\frac{5}{8}$ inch.

Valve Timing

Exhaust valve should just close 10° after top center with a drained hydraulic unit built up with feeler stock between plunger and end of valve stem to produce zero clearance when plunger is bottomed and engine valve is seated. It is not necessary to check the valve closing point as just described if the "O" marks on camshaft and crankshaft sprockets are together and aligned through shaft centers as in Fig. 5.

Oil Pump and Filter

Normal oil pressure is 50 pounds at 45 miles per hour.

The oil pump pressure relief valve is not adjustable. Spring pressure $17\frac{1}{2}$ to $18\frac{1}{2}$ pounds at $1\frac{7}{8}$ inches. Use new gaskets "G" when installing pump on engine and place slot in gear as near parallel with lengthwise centerline of camshaft as possible when the number one piston is at top center on firing stroke. Punch mark on gear should be on top when assembling.

Cartridge of the external oil filter should preferably be renewed every 8,000 miles—in no case should it be used beyond 10,000 miles.

Cooling System

To drain system remove pipe plug in left side of cylinder block ahead of starter and the valve in the front face of lower radiator tank.

The cooling system should be reverse flushed each Spring and Fall and always before adding anti-freeze, to remove a probable accumulation of rust particles and sediment. Half a pint of soluble oil added after flushing will delay subsequent accumulation of rust.

Anti-Freeze Solutions

Anti-freeze solutions of alcohol and water, ethylene glycol and water, or glycerine and water may be used. Alcohol solutions have a lower boiling point than water and are subject to evaporation. The hazard of injuring the car finish with alcohol is reduced by the location of the radiator filler under the bonnet. When alcohol solutions are used, half a pint of soluble oil should be added as a rust inhibitor. A good grade of soluble oil is obtainable from Packard dealers. Ethylene glycol (Prestone) and glycerine (G. P. A.) contain soluble oil and therefore none need be added. Trade marked anti-freezes are also often sold mixed with water and rust inhibitors. When these are used, follow directions on the containers.

Do not save Prestone from one winter to the next. Use new material each year.

It is advisable to shellac the inside of the hose connections when ethylene glycol or glycerine is used, as otherwise there may be a tendency to seep at the joints.

The table below indicates quantity, in quarts, of anti-freeze required for protection in the range from 20° above zero to 30° below zero Fahrenheit. Quantities shown are based on a system capacity of 20 quarts.

Pure Methyl Alcohol	Denatured Alcohol	Prestone (E. Glycol)	Radiator Glycerine	Freezing Point Approximate
2.5	3.5	3.5	7.5	20°F. Above zero
4.0	5.5	5.0	11.0	10°F. Above zero
5.5	7.0	6.5	14.0	Zero
6.5	8.0	8.0	16.0	10°F. Below zero
7.5	9.5	9.0	18.5	20°F. Below zero
8.0	10.5	9.5	20.0	30°F. Below zero

Caution: Do not use a calcium chloride or an alkaline solution or any anti-freeze compounded from these materials. Such solutions will surely corrode the radiator core and are liable to clog the cooling system.

The special radiator filler cap permits a vapor pressure of 7 pounds in the system and raises the water boiling point to about 230° F. To avoid personal injury do not remove cap when water is boiling.

Fan Belt Adjustment

Premature failure of either the belt or the pump and generator bearings results from too little or too much belt tension. Recommended tension is 25 pounds measured with a spring scale hooked to the generator in such a manner as to provide a straight pull. If a scale is not available, adjust belt tension to provide one-half inch of thumb pressure deflection between generator and water pump pulleys.

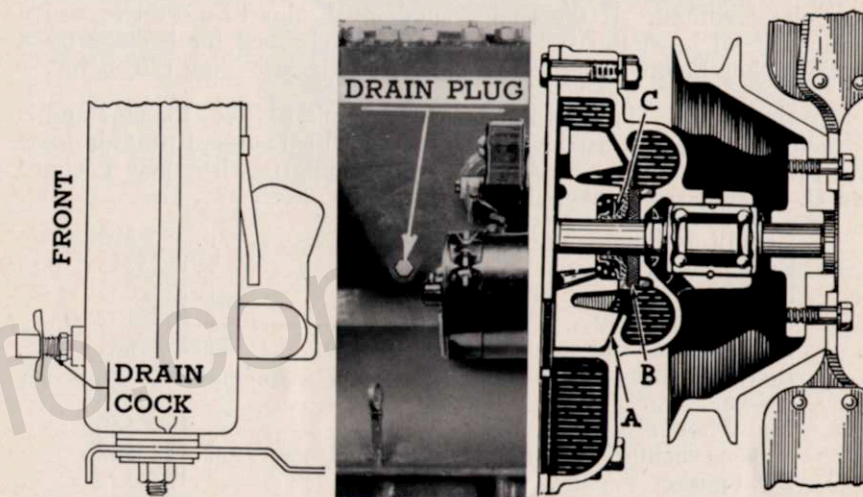


Fig. 8—(Left and Center)—Radiator and Cylinder Block Drain Points. Both Must be Opened to Drain All of the Water from Cooling System

Fig. 9—(Right)—Water Pump is Permanently Lubricated and Incorporates a Spring Loaded Water Seal

Water Pump

The permanently lubricated pump is of the "packless" type employing a spring loaded sleeve type synthetic rubber seal "C" and a composition thrust and sealing washer "B," Fig. 9. If pump leaks, remove the assembly and renew the sealing elements "B" and "C" or install an exchange factory rebuilt unit.

Notes for the Mechanic—To avoid breakage, pump body should be supported when pressing impeller off shaft. Installation will be facilitated by heating impeller in water just under boiling point and by coating shaft and seal with engine oil. Machined face on pump body against which the washer rides must be smooth and flat. If scored, renew the body or resurface if adequate tools are available. Clearance between impeller and housing at "A" should be .012" to .074". Both gaskets should be coated with Perfect Seal grade A paste or equivalent. When installing the composition thrust washer be sure that the smoother face of washer is nearest the fan blades.

Fuel System

Combination Fuel and Vacuum Pump

Except for occasional draining of the sediment chamber the fuel pump requires no attention on the part of the owner.

Excessive engine oil consumption is sometimes traceable to a leaky vacuum pump diaphragm permitting oil to be sucked from the crankcase into inlet manifold. If the engine suddenly begins to use an excessive amount of oil have the vacuum diaphragm checked for leakage by a qualified shop before going to the expense of disassembling the engine.

Repair Notes—The pump is a series AJ unit AC No. 1523867 and is a duplicate of the unit used on 1939 model 1701 cars except that air dome No. 1523319 has been added. List of repair parts with their Packard and U. M. S. parts numbers is shown below:

Rebuilt exchange pump.....	508
Rocker arm.....	1523215
Rocker arm pin.....	1522023
Oil seal assembly.....	1523122
Body and oil seal assembly, fuel section.....	1523631
Body, vacuum section.....	1523799
Cover.....	1523828
Metal bowl.....	1523130
Screen, vacuum section.....	1523802
Bowl gasket.....	1523128
Link, fuel section.....	1522077
Diaphragm, fuel section.....	1523132
Diaphragm, vacuum section.....	1523809
Rocker arm spring.....	1521427
Valve and cage assembly.....	1523108
Valve cage gasket.....	1521953
Valve plate screw.....	132900

To disassemble rocker arm and its related parts it is first necessary to drill out the counterbored end of the rocker pin. When reassembling place links, rocker arm bushing, link spacer washers and rocker arm spring in position in body and oil seal assembly. Hold these parts in position with special rocker arm assembling pin, United Motors Service No. 1521581 inserted through rocker arm pin hole in body:

When installing valve and cage assemblies in valve cage seats in cover, make sure that large diameter is placed against the gasket on the inlet side of cover and that the small diameter is assembled into the outlet hole in the cover, thus permitting shoulder of the cage to fit properly against the gasket. **This is important.**

When placing valve cage retainer in position be sure that the curved end of two of the legs fits snugly against each valve cage.

Test Data—Pressure 4 lbs. max. Should prime in 22 seconds at 60 r.p.m. of shaft and by-pass one pint or more of fuel in 45 seconds attached to engine running at a speed equivalent to 35 m.p.h. road speed.

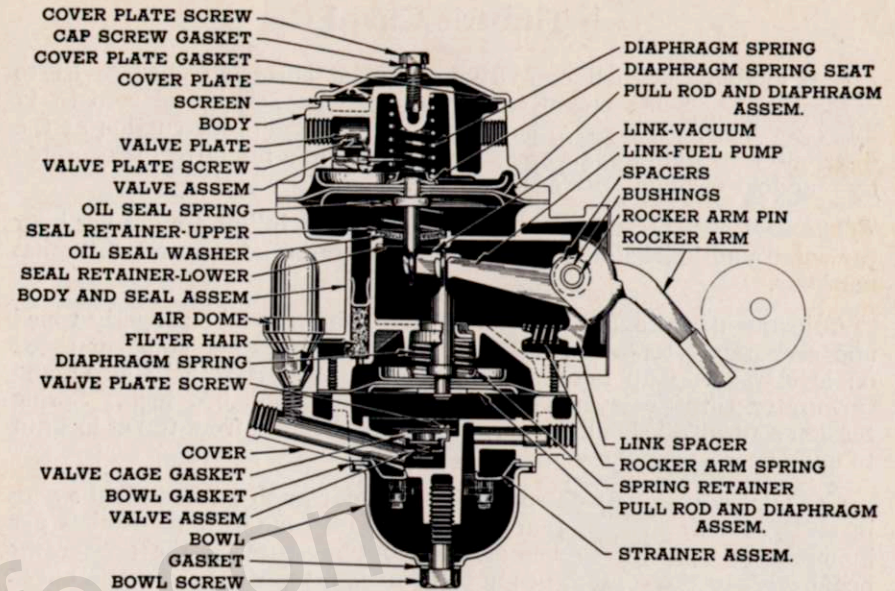


Fig. 10—The Combination Fuel and Vacuum Booster Pump Carries an Air Dome

Air Cleaner and Silencer

Under ordinary conditions, the unit should be cleaned and refilled every 5,000 miles, or as often as every day where all of the driving is done on extremely dusty roads. Definite mileage intervals cannot be stated due to the natural variation in conditions. The safe procedure in very dusty territory is to check the unit daily and clean if necessary.

Procedure for cleaning the regular equipment cleaner is as follows: Remove wing nut at top of unit, withdraw metallic gauze filter element and plunge up and down in a vessel containing clean gasoline or kerosene. After filter is clean allow to dry then dip in engine oil and reinstall.

To clean the heavy duty oil bath type unit which is recommended for use on cars operating in dusty territory first dismount the assembly from the carburetor. Remove metallic gauze filter element and clean as outlined in preceding paragraph. Empty the oil reservoir and clean thoroughly, then refill to level line with approximately a pint of S. A. E. 50 engine oil in summer, or S. A. E. 30 in winter.

Crankcase Ventilation

Air inlet for the crankcase ventilation system is through the oil filler tube. The cap of this filler tube is fitted with a copper mesh type of air cleaner to prevent dust from entering the crankcase. The cap filter element should be cleaned every 2,000 miles or oftener by plunging up and down in a container of clean gasoline or kerosene. Allow filter to dry, then saturate with S. A. E. 50 engine oil and reinstall.

Throttle Guard

Cars equipped with Econo-Drive carry the Throttle Guard device to reduce stalling when operating in the road speed range of zero to 17 miles per hour. The guard is of basically the same construction as the distributor vacuum advance mechanism and, like the latter, is operated by manifold vacuum. Refer to Fig. 11.

The device is correctly adjusted when it "cuts in" at 4 miles per hour car speed and "kicks out" or becomes inoperative at a speed of 9 miles per hour.

Adjustment procedure is as follows: Engine must be properly tuned and carburetor stop-screw adjusted to give 6 miles per hour car speed on level road. Gap between end of diaphragm rod "A", Fig. 11, and carburetor throttle lever should be approximately .020 inch. Spring tension screw "B" should be turned in until distance from top of locknut to end of screw is approximately $\frac{7}{32}$ inch.

Get final adjustment on road with lock-out knob pushed all the way in and gearshift in high gear position. Pull car down to 4 miles per hour slowly with the brakes and without pressure on the accelerator pedal. When the 4 miles per hour point is reached, the throttle guard should "cut-in" and temporarily bring the car speed up to 9 miles per hour, then "kick out."

Opening of carburetor throttle can be noted by observing the foot accelerator which will move down slightly when the "cut in" speed is reached.

If the "kick out" occurs at higher than 9 m.p.h. increase the gap between diaphragm rod "A" and throttle lever; decrease the gap if the kick out occurs below 9 miles per hour. Similarly, if the "cut-in" occurs above 4 m.p.h., decrease the spring tension by turning screw "B" out slightly and if the "cut-in" occurs below 4 m.p.h. increase the spring tension.

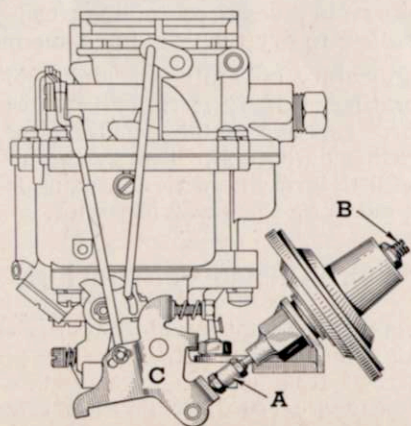


Fig. 11—Throttle Guard Used on Cars Equipped with Econo-Drive Reduces Stalling in Free Wheeling Range

Carburetor and Choke

Carburetor

The regular equipment carburetor is a type AAV-26 Stromberg plain tube model with fixed main metering orifices, twin floats, a vacuum controlled economizer or power by-pass and a self-contained type of automatic choke with automatic fast idle control. The data in the following paragraphs applies to carburetors with the Packard code identification "10-40" stamped on the top of the float chamber cover.

1. Main Discharge Jet
2. High Speed Bleeder
3. Idle Air Bleeder
4. Idle Tube
5. Vacuum Power Passage
6. Vacuum Power Piston
7. Pump Fulcrum Arm
8. Pump Piston Link
9. Felt Dust Washer
10. Retainer Washer
11. Dust Washer Spring
12. Spring Retainer Washer
13. Pump Duration Spring
14. Pump Piston
15. Expansion Spring
16. Pump Relief Valve
17. Pump By-Pass Jet
18. Pump Inlet Check
19. Pump Inlet Strainer
20. Power By-Pass Jet
21. Discharge Jet Plug
22. Main Metering Jet
23. Sec. Idle Air Bleed
24. Idle Needle Valve
25. Idle Discharge Holes
26. Vacuum Spark Conn.
27. Throttle Valve
28. Primary Venturi
29. Auxiliary Venturi
30. Float
31. Float Lever
32. Float Valve Clip
33. Float Fulcrum Pin
34. Float Needle Valve
35. Float Valve Seat
36. Float Hanger Gaskets
37. Float Hanger
38. Gasoline Inlet Conn.
39. Gasoline Strainer
40. Float Chamber Vent
41. Choke Valve
42. Choke Vacuum Passage
43. Thermostat
44. Screen
45. Hot Air Tube Conn.
46. Pump Dis. Tube
47. Throttle Stop Screw
48. Pump Rod
49. Fuel Level Sight Plug
50. Fast Idle Rod

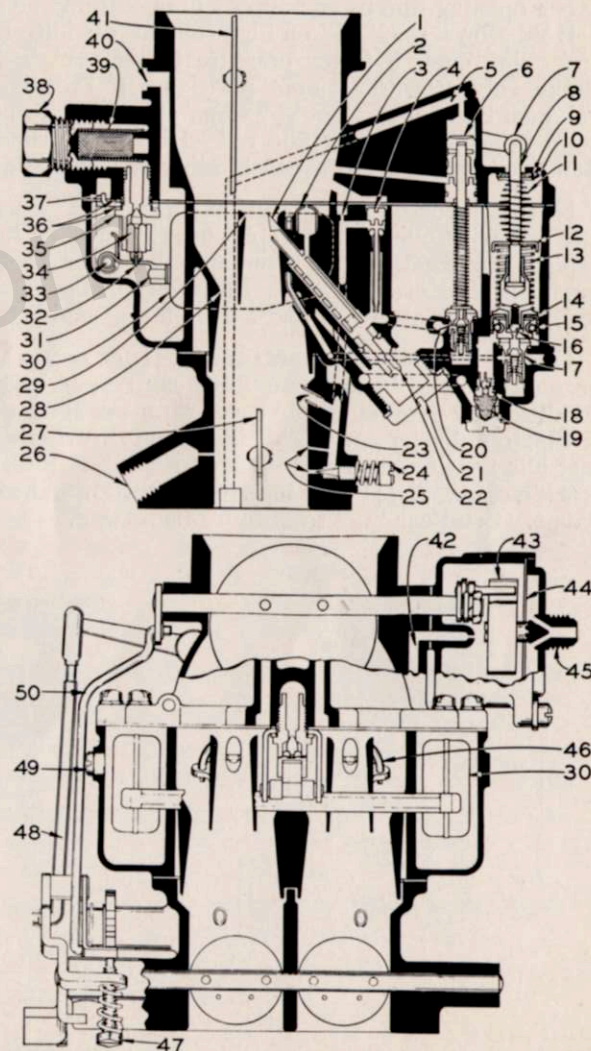


Fig. 12—Stromberg AAV-26 Carburetor Which Has a Vacuum Operated Power (Economizer) Jet

Idle Mixture Adjustment—Turn idle mixture adjusting needles "24", Fig. 12, out for richer idling mixture. Standard adjustment $1\frac{1}{2}$ to $1\frac{3}{4}$ turns open.

Throttle Stop Screw—Normal or warm idling speed is controlled by stop screw "47", Fig. 13. Adjust screw to produce a car speed of not less than 6 miles per hour with a warm engine and wide open choke valve.

Fast or Cold Idle Speed—The fast idle speed is automatically controlled by the lift of the fast idle cam and is therefore non-adjustable. If however the fast idle behavior is unsatisfactory check the amount of choke opening due to vacuum kick as outlined below.

Hold stop screw "47" on high lobe of fast idle cam as shown in Fig. 13 and using enough finger pressure to remove slack from linkage, move choke valve towards closed position. If the distance between edge of valve and air horn is not $\frac{3}{32}$ " when checked with a drill of this diameter, bend upper end of fast idle rod "IR" until this dimension is obtained. Bend rod carefully to avoid binding the fast idle cam mechanism.

Note: Hook on end of torsion spring "TS" must be assembled to fast idle rod with one end of hook engaging groove in rod and tip butting against the small ear of lever and the other hooked into small hole in large ear of lever as at "Z." Be sure to install bushing "RB" in fast idle rod, but do so after rod and spring are assembled to lever.

Choke Unloader Adjustment—If for any reason the engine should become "flooded" the choke valve can be partially opened to relieve the condition by depressing the accelerator pedal all the way down.

Choke unloader ear "G", Fig. 14, on throttle lever should contact the fast idle floating lever and open choke valve .156" to .187" when throttle is wide open. A $\frac{1}{64}$ " drill inserted as shown makes an excellent checking gauge. Bend ear "G" to obtain this setting.

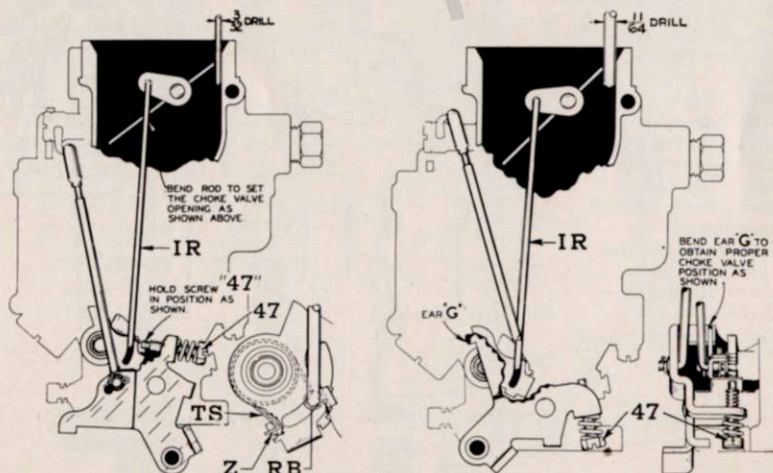


Fig. 13—(Left)—Method of Checking Amount of Choke Valve Opening During Fast Idle Operation

Fig. 14—(Right)—Checking the Choke Unloader Adjustment

Fuel Level—Recommended fuel level is $\frac{5}{8}$ inch below top surface of float chamber which corresponds with lower edge of sight plug hole "51." **IMPORTANT**—Fuel level should be checked only when engine is idling. To avoid danger of fire do not start engine with air horn removed.

Because two floats are used more than ordinary care should be exercised in the setting procedure. Use service tool Packard No. S. T. 5154 or Stromberg T-24971. With tool held in place on top of the float chamber gasket adjust floats until they are flush with the top of the vertical guides and parallel with and just free of the sides of these guides. If tool is not available set floats to bring top of each $1\frac{1}{32}$ inch below cover gasket.

Calibration—The calibration and parts data below applies to carburetors code "10-40" and includes Stromberg and Packard parts numbers. The code designation is stamped on the top of float chamber.

	Part No.	Size
Metering jet, standard.....	P-19442	.050"
Economizer or power jet.....	P-21192	No. 54
High speed air bleeder.....	P-23985	No. 70
Idle air bleeder in main body.....	P-23536	No. 52
Idle air bleed in throttle body.....		No. 36
Secondary bleeder.....	None	No. 36
Idle tube assembly.....	P-23527	No. 64
Idle discharge holes.....	None	Nos. 52-56
Accel. pump piston assembly.....	P-24639	No. 65
(size is for blow-off hole)		
Pump discharge tubes.....	—	No. 65
Pump check valve.....	P-18144	None
Main discharge jet.....	P-23567	No. 32
Float needle and seat.....	P-22499	.101"
Holes in throttle valves.....	None	No. 56
Pump by-pass jet.....	P-24636	No. 63
Complete set gaskets.....	J-24519	None
Choke thermostat assembly.....	P-24004	None

Repair Notes—Leaking economizer valve, Fig. 12 will cause excessive fuel consumption. A sure method of checking economizer is to close off with a plug the passage connecting the jet "20" with the main discharge jet. If the mileage per gallon at 30 m.p.h. constant speed is greater with the passage closed the economizer is leaking and should be renewed.

Needle valve should be installed with one corner of triangle down.

Accelerating pump should deliver 22 c.c. to 25 c.c. of fuel per 10 slow strokes.

If the tip of main discharge jet or nozzle "1" is wet when engine is idling the fuel level is too high.

If engine will idle with idle needle valve closed or almost closed look for obstructed idle bleeder or too high fuel level.

It is important that the manifold heat control valve operate freely at all times. Poor idling and delayed action of the automatic choke will result if the valve is frozen in the open position. If frozen in closed position the engine may lack power and will be hard to start when warm.

Automatic Choke

If a check of the starting and warm-up behavior shows definitely that the carburetor mixture is either too rich or too lean during this period first make sure that index line on choke housing is in register or alignment with the graduation marked "Λ" on cover then proceed as follows:

1. Remove carburetor air cleaner and thermostat cover assembly Fig. 15 and test operation of choke valve. When closed by hand it should drop open freely without the slightest lag. If valve does not drop freely remove and clean the vacuum piston and cylinder with alcohol or acetone and do the same to choke valve shaft and bearings if necessary. Do not remove the vacuum piston unless the setting gauge Packard S. T. 5155 or Stromberg T-25046 is available. Clean all of the choke passages with compressed air.

CAUTION—Do not oil any part of the piston, cylinder or shaft.

2. Reinstall vacuum piston in cylinder with piston slot **down** and attach lever to choke stem. Place setting gauge on choke housing with the small hole "H" fitting over the pin of the choke lever and with indicator mark on rim of tool aligned with the projection on choke housing.

Holding tool in this position insert a No. 70 drill between choke valve and air horn then assemble the serrated washer, lockwasher and lock nut, finger tight. Now remove drill and tighten locknut using special Packard, or Stromberg T-25047 socket wrench, if available.

3. Reassemble remainder of choke parts and if mixture is still too lean or too rich during warm-up period, decrease or increase the thermostat spring tension $\frac{1}{2}$ graduation at a time after loosening the pipe and cover screws. If satisfactory results are not obtained by changing adjustment not more than two graduations either way from the original setting renew the thermostat and cover assembly.

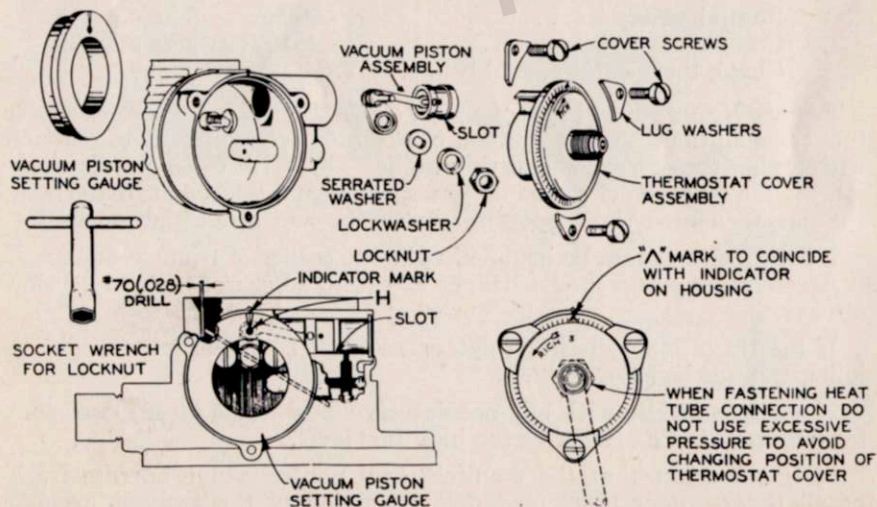


Fig. 15—If Choke Vacuum Piston is Removed it Must be Reset With a Special Gauge

Electrical System

Battery

The positive battery cable is grounded to the frame and the negative wire connects the battery with the starter motor. The battery is located in a protected cradle under the front seat and can easily be serviced by removing the cushion and floor plate.

The electrolyte in the battery should always be maintained at the proper level. Distilled water, or if not available, rain water, should be added to each battery cell until the solution is $\frac{1}{4}$ " above the top of the plates. Use a hydrometer to gauge the condition of the battery. When fully charged the hydrometer reading will be 1.275 to 1.285. The battery is discharged when the reading falls below 1.190.

Starting Motor

The starting motor is fitted to the front face of the flywheel housing on the left side of the engine. It is controlled by a solenoid and relay on top of the starting motor, operated by a remote push-button on the instrument board. Operation of the instrument board push-button energizes the starter mounted solenoid which shifts the starter motor pinion into engagement with a steel ring gear shrunk on the flywheel. The starter motor pinion is not attached to the armature shaft but is driven by it through reduction gears at $\frac{1}{3}$ armature speed. An extra set of contacts in the generator cut-out relay grounds the instrument board button to prevent starter engagement when the engine is running above the generator cut-in speed. There are 140 teeth in the starter ring gear on flywheel.

The reduction gear housing should be filled with a heat resisting grease inserted through the pipe plug opening just behind the rear oil cup.

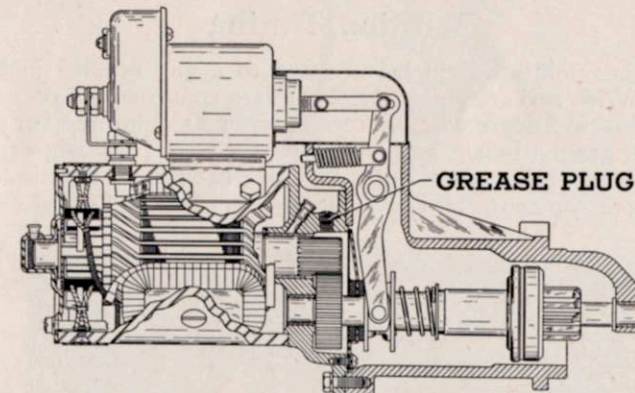


Fig. 16—Auto-Lite MAX-4041 Starter Used on Super Eight Models

Repair Data—The starter is a two-pole, reduction gear type Auto-Lite model MAX-4041 with magnetically shifted pinion. Stalled torque 45.9 pounds-feet at 906 amperes and 4 volts. Running free at 2695 pinion shaft r.p.m. 77 amperes at 5.5 volts. Armature shaft maximum end play $\frac{1}{16}$ inch. Refer to Fig. 16.

Spark Plugs

Spark plugs are either AC-104 or Champion Y-4, size 10 m.m. Tightening leverage should not exceed 50 inch-pounds. Gap should be .028 inch plus or minus .002 inch for all cars.

Ignition Distributor

The distributor shown in Fig. 19 is of the full automatic advance single breaker type employing a centrifugal governor and manifold vacuum for timing control. The centrifugal governor advances the spark as the speed of the engine is increased. The vacuum advance mechanism being connected to the inlet manifold at the carburetor throttle advances the spark according to the power load imposed on the engine. The vacuum advance is additional to that provided by the governor thereby reducing fuel consumption by advancing the spark at part throttle operation.

Test and repair data for the Auto-Lite IGT-4102 distributor are: Breaker point spring tension 17 to 20 ounces. Breaker point gap .015 inch. Governor advance starts at just above 250 distributor r.p.m.; 6° at 700 r.p.m. and attains a maximum of $11\frac{1}{2}$ distributor degrees at 1800 distributor r.p.m. These figures should be obtained with vacuum advance disconnected. A variation of $\frac{3}{4}$ of a degree above or below these figures is allowable. The vacuum advance starts with vacuum of 8 inches of mercury and attains a maximum of $5\frac{1}{2}$ distributor degrees at 16 inches of vacuum. The condenser of .20 to .25 Mfd. capacity is located on outside of housing.

The governor control spring part No. IGE-36 must be assembled with its working side against the weight controlled by the weaker weight spring.

Ignition Timing

The breaker points should be adjusted to a gap of .015 inch before retiming. With fuel compensator set at zero spark should occur in No. 1 cylinder $3\frac{1}{2}$ to 5 degrees before top center or a similar number of vibration damper graduations ahead of the mark "UDC1" as shown in Fig. 17. High compression heads of 6.85 ratio should be timed $2\frac{1}{2}$ to 4 degrees before top center. The firing order is 1-6-2-5-8-3-7-4.



Fig. 17—Each Crankshaft Damper Graduation Equals One Degree

Generator

The Auto-Lite GEA-4802A generator is a shunt wound, two pole machine of clockwise rotation at the drive end. Current and voltage control is by means of an external regulator mounted on the dash. The maximum output is 35 amperes at 8 volts. Test specifications are as follows: Brush spring tension 42 to 53 ounces with scale hooked into small hole in the turned up lip of the brush spring arm directly above where it rests on the brush. Field current 1.57 to 1.75 amperes at 6 volts. Motoring free 4.45 to 4.9 amperes at 6 volts. Because of the danger of armature burning out do not run the generator on open circuit above 1500 revolutions per minute.

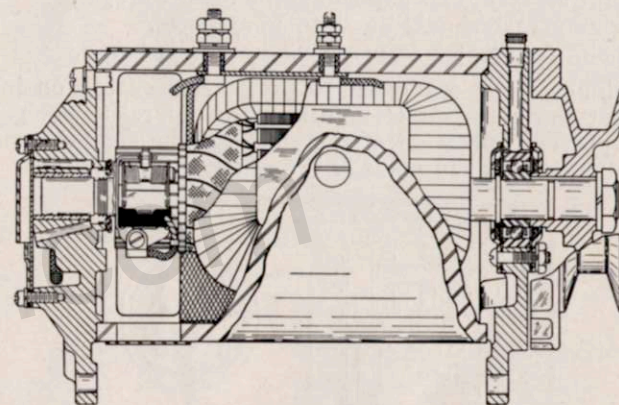


Fig. 18—The Generator is a 35 Ampere Shunt Wound Unit

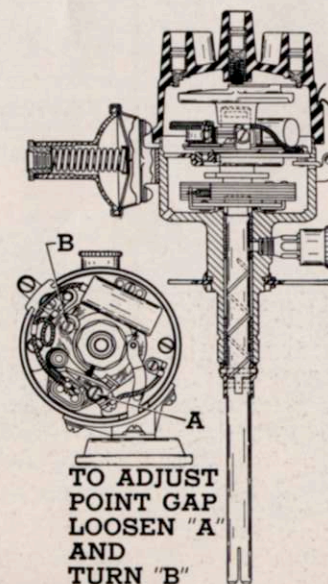


Fig. 19—The Auto-Lite IGT-4102 Distributor and Vacuum Advance Unit

Generator Regulator

The Auto-Lite VRP-4003A vibrating type current and voltage regulator shown in Fig. 21 is combined under one cover with the cut-out relay and is mounted on the engine side of the dash.

Adjustment of the VRP-4003A regulator is the same as shown for the 1939 Super Eight unit VRB-4012A on page 95 of the 1938-1939 Shop Manual except that the specifications shown below should be followed on the VRP-4003A.

Voltage unit armature air gap should be .048" to .052".
 Operating voltage should be 7.36 to 7.66 volts.
 Current unit armature air gap should be .034" to .038".
 Operating amperage should be 34 to 36 amperes.
 Cut-out points open at 6 amperes maximum discharge.

The terminal "T" is connected to the starter button on instrument board so that the extra set of points in cut-out relay will ground the circuit and prevent operation of the starter while engine is running at any speed above the cut-in point of the generator.

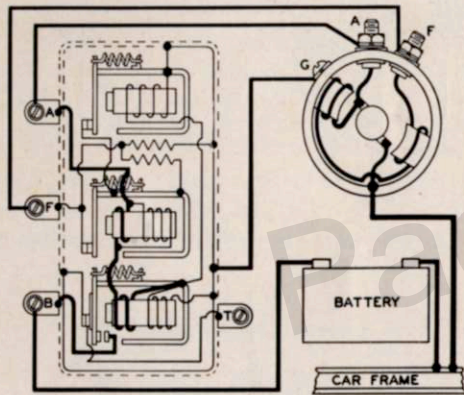


Fig. 20—Internal Wiring VRP-4003A Generator Regulator

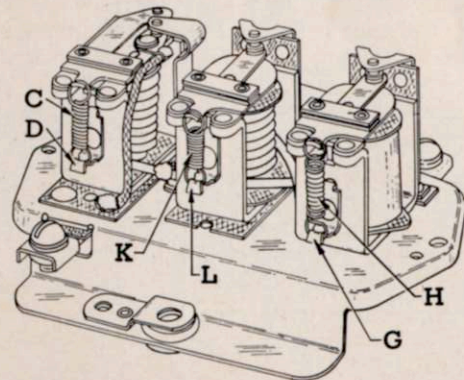


Fig. 21—Spring Hanger "D" Controls Cut-Out Voltage. Hanger "L" controls Generator Amperage and Hanger "G" Charging Voltage

Fuses and Circuit Breaker

A thermostatic type of overload relay or circuit breaker is attached to the lower side of the lighting switch shown in Fig. 22. It protects the headlamp wiring circuit in case of overload or short circuit.

Two 20 ampere fuses mounted in clips on the switch frame protect the dome light and accessories circuit (cigar lighter, heater, spotlight, etc.) and a similar fuse enclosed in a socket in the tail lamp line near the light switch acts as a safeguard for the tail lamp circuit. If the tail lamp fuse blows, the instrument light is extinguished. Clock and radio are protected by separate 2 ampere and 14 ampere fuses respectively. These are located in the feed wire to each unit.

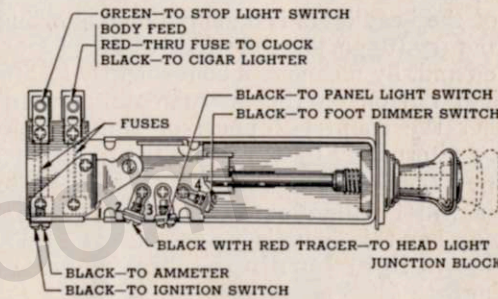


Fig. 22—Main Lighting Switch and Wiring Connections

Horns

Sparks Withington electric air horns are mounted on the engine and operated by a relay attached to the horn bracket. To remove the horn button, press down, rotate either to the right or left and lift out.

For complete data on minor and major horn adjustments turn to section 37, page 22 of the 1938-39 Shop Manual.

Headlamps

The 1940 Packard cars carry a new headlighting system known as "Sealed Beam" in which the light source, the reflector, the lens and the gasket are all assembled in one securely sealed unit. When the filament burns out the entire unit is discarded and a new one installed, thereby assuring maximum lighting efficiency throughout the entire life of the car.

This lighting system represents the coordinated effort of the automobile and headlamp manufacturers and has the endorsement and approval of the American Association of Motor Vehicle Administrators, Society of Automotive Engineers, Automobile Manufacturers' Association and organizations interested in National Safety.

"Sealed Beam" headlamps provide two separate and distinct beams, giving considerably more light than has been produced in the past:—

1. A country (upper) beam designed to illuminate the road evenly for a considerable distance ahead of the car. 'This beam is for use on the open highway when no other vehicles are approaching.

2. A traffic or lower beam is also provided which is low enough on the left side to avoid glare in the eyes of the oncoming drivers. It is intended for use on heavily traveled highways and should always be used when meeting other vehicles. This beam is designed so that it does not throw any dazzling light into the eyes of the approaching driver under any condition of car loading. At the same time the distribution of light is such that the right side of the road is illuminated as far ahead as is practicable without causing glare on curves.

These headlamps have been designed to insure the motorist of maximum safety and comfort for night driving, but to obtain this safety for himself and for others the motorist must be willing and anxious to use his headlighting equipment in the manner intended. Good drivers are always courteous.

The operation of the headlights is a simple one, allowing the motorist to use either the country (upper) or the traffic (lower) beam, as traffic and road conditions demand, by means of a conveniently located foot switch. By pulling the light button on the instrument board to the second or last position, either the country (upper) or traffic (lower) headlamp beams are obtained alternately by operating the foot switch.

When the country (upper) beams are lighted a red pilot bulb in the instrument cluster will be illuminated, making it convenient for the driver to determine when this beam is in use. **Never pass an approaching car with this red light burning.** Always use the traffic (lower) beam when meeting.

By pulling the light button to the first position the parking lamps on the fenders, license plate light and both tail lights are lighted. The parking lamps consume a very small amount of current.

Renewal of Light Unit—Two types of "Sealed Beam" headlamp units are available. One of these types is made entirely of hard glass and the other is a composite unit consisting of a metal reflector and a glass lens. Both are completely interchangeable from the standpoint of electrical connections, beam patterns and physical dimensions.

No dust or moisture can get inside the "Sealed Beam" headlamp unit because the reflector and lens are sealed together permanently. This feature eliminates cleaning except for wiping off the outside of the lens and provides proper focusing and maximum light efficiency during the life of the car. The reflector units in both the right and left-hand headlamps are identical and are so designed that they cannot be installed improperly, nor can the electrical connections be attached in any but the right way. This feature makes replacement of a unit extremely simple, as follows:—

1. Remove headlamp door rim as shown in Fig. 23.
2. Loosen but do not remove the three screws holding the retaining ring as in Fig. 24. Do not disturb the aiming screws at the top and on the left side of the unit.
3. Remove retaining ring as shown in Fig. 25 by rotating to the left, allowing the reflector unit to be removed.
4. Remove the reflector plug from the reflector unit. Refer to Fig. 26.
5. Install a new unit by reversing above operations.



Fig. 23—Removing the Headlamp Outer Rim



Fig. 24—Three Screws Hold the Retainer Ring in Place

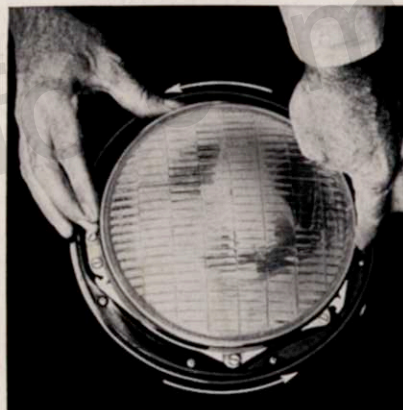


Fig. 25—Turn Retainer Ring Slightly to Release



Fig. 26—Reflector Unit is Now Free from Lamp Body

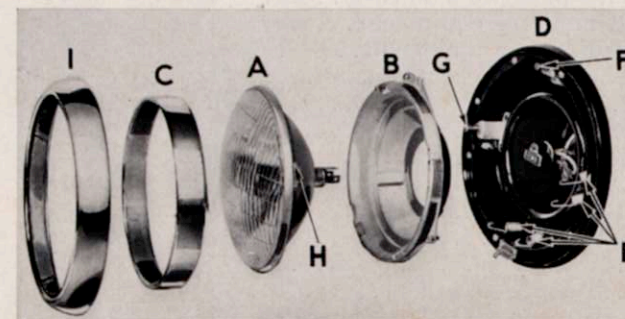


Fig. 27—Parts of the Headlamp Assembly

I—Lamp Rim
C—Retainer Ring
A—Reflector Unit

B—Sub-body
E—Springs

F—Vertical Adj. Screw
G—Horizontal Adj. Screw

Headlamp Aiming—For best road lighting results the aiming screen should be arranged as follows: Measure the height of lamp centers above floor level and stretch a ribbon or mark a line across the screen at the level of a point 3" below the headlamp centers. If your state requires a loading allowance draw this horizontal line "A-A", Fig. 30, below the above mentioned line, by the amount required by your particular state. Locate center of car on screen by sighting past left edge of rear window divider strip and left edge of windshield divider then past the right edges of each, the point midway between these two being the vertical center line which should be temporarily indicated on the screen. Measure the distance between the centers of the lamps then place vertical ribbon marks or draw vertical lines "B-B" and "C-C", Fig. 30, at half this distance on either side of the center line.

Place the car on a level stretch and set the previously arranged screen 25 feet ahead of the car. Pull lighting switch knob out to last notch and depress foot switch until the upper or country beam is lighted. When the upper beam is on, the lower filaments on both lamps are illuminated. Now cover the right lamp and turn the vertical adjusting screw "F" Fig. 28 of the left lamp until hot spot is centered on line "A-A" and screw "G" until centered on line "B-B." Now cover the left lamp and aim right lamp beam until it is similarly centered on lines "A-A" and "C-C." No further adjustment is needed for the traffic or lower beam.

Light Bulbs

Location	Candle-power	Mazda No.	Per Car
Front lamp.....	30-40 watts	GE	2
Front fender lamp.....	21-3	58	2
Instrument board panel light.....	1½	55	3
Glove compartment light.....	0.8	51	1
Instrument board reading light.....	1½	55	2
Rear reading light.....	6	81	1
Headlamp beam signal light.....	0.8	51	1
Stop and tail lamp (two filaments).....	21-3	1158	2
Stop lamp, trunk rack equipment.....	15	87	2
Tail lamp, trunk rack equipment.....	3	63	2
Instrument board radio control lamp.....	1½	55	1 or 3
Dome light.....	6	81	1 or 2
Rear quarter light.....	3.0	63	2
Heater indicator and defroster.....	0.8	51	2
Fog light.....	32	1321	1
License plate lamp.....	3	63	1
Backing light.....	15	87	1
Spot light.....	32	1323	1
Clock light.....	1½	55	1
Trunk compartment.....	1½	55	1
Rear compartment radio light.....	0.8	51	2
Speedometer pointer light.....	1½	55	1
Vanity cabinet light.....	3.0	63	2

Econo-Drive Controls

An extra winding and set of points in the Econo-Drive control relay prevents stopping of the engine in case of solenoid failure and the switch in the lock-out knob prevents engagement of Econo-Drive when reversing at speeds above the cut-in point. Circuits and wiring are shown on page 39.

The over-travel of the accelerator pedal is utilized to operate the Econo-Drive kick-down switch. When carburetor throttle is just wide open the end of switch plunger should just contact the tappet screw "T" in accelerator lever, shown in Fig. 29. Adjust screw if not to these specifications. Accelerator pedal must have enough over-travel to close switch before bottoming on floor boards.

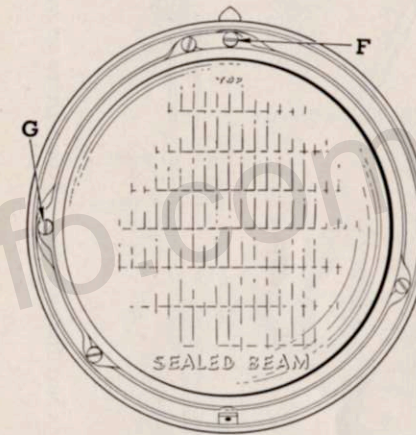


Fig. 28—Vertical and Horizontal Aiming of Headlamps is Controlled by Screws "F" and "G"

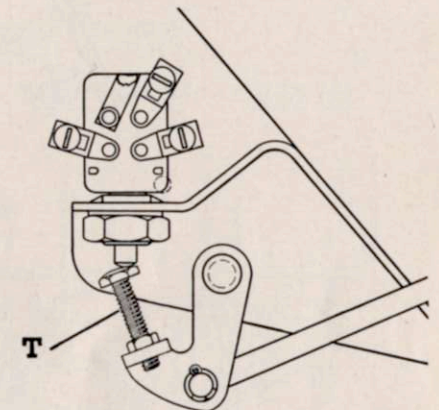


Fig. 29—Screw "T" Should Just Contact Switch Plunger When Throttle is Just Wide Open

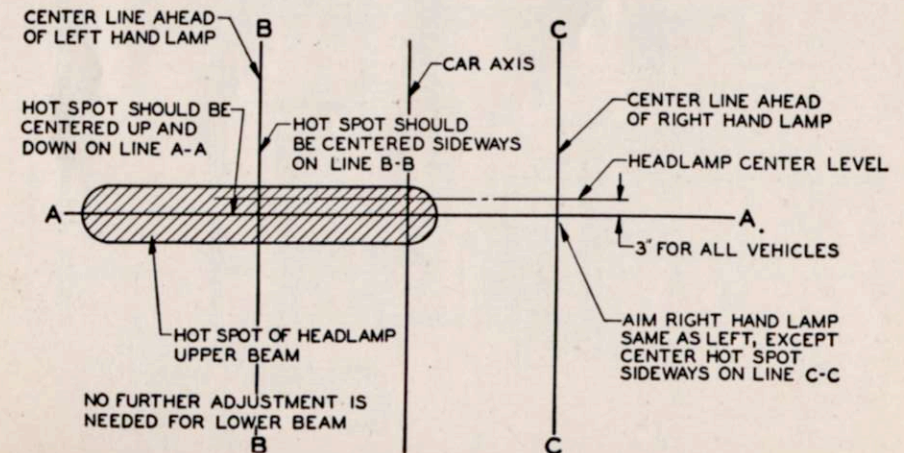


Fig. 30—Left Lamp is Correctly Aimed When Hot Spot is Centered on Lines "A-A" and "B-B" as Shown

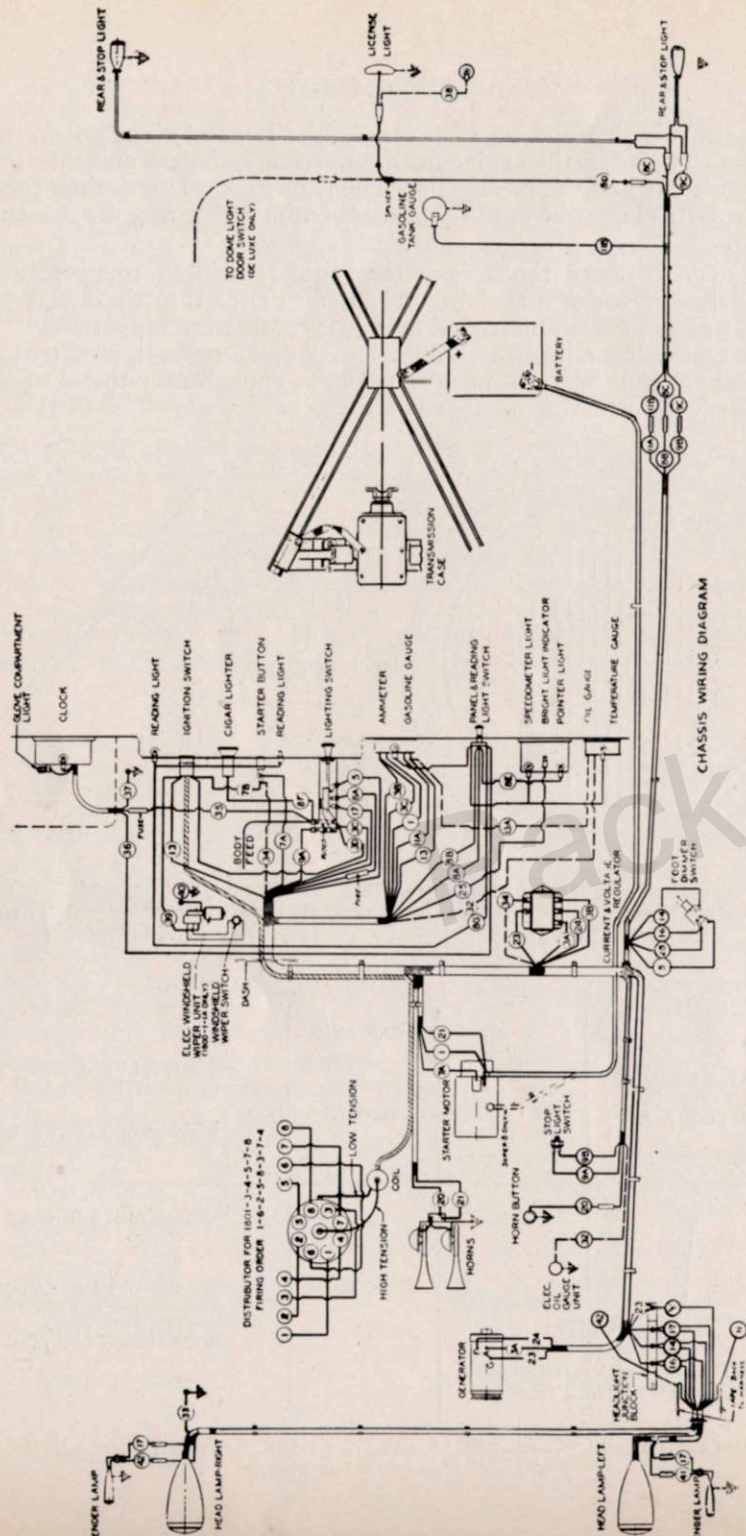


Fig. 31—Chassis Wiring Diagram. Does Not Include Body, Econo-Drive or Accessory Wiring

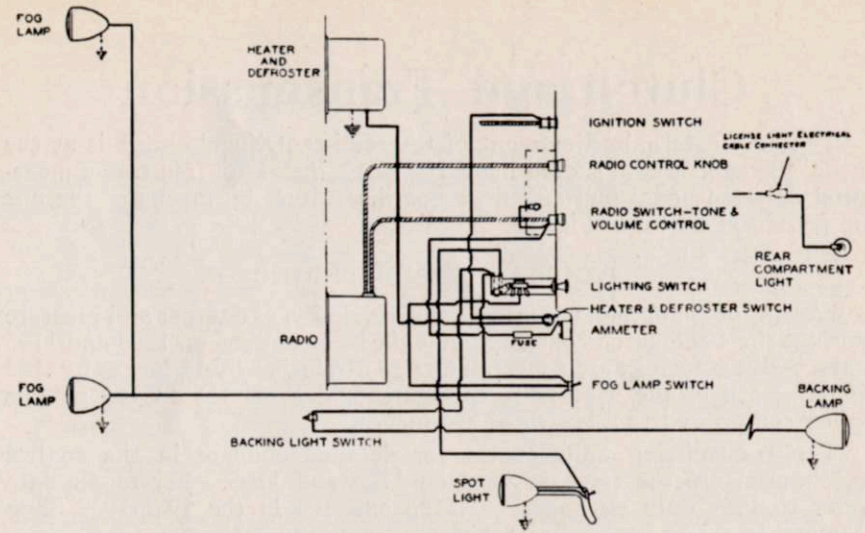


Fig. 32—Accessory Wiring Diagram

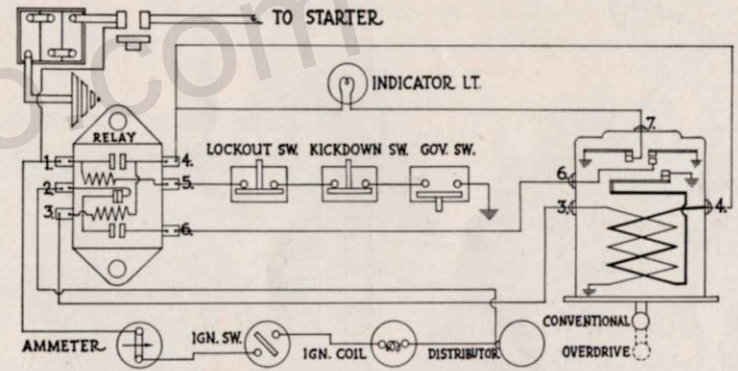


Fig. 33—Circuits of Econo-Drive Control Schematic

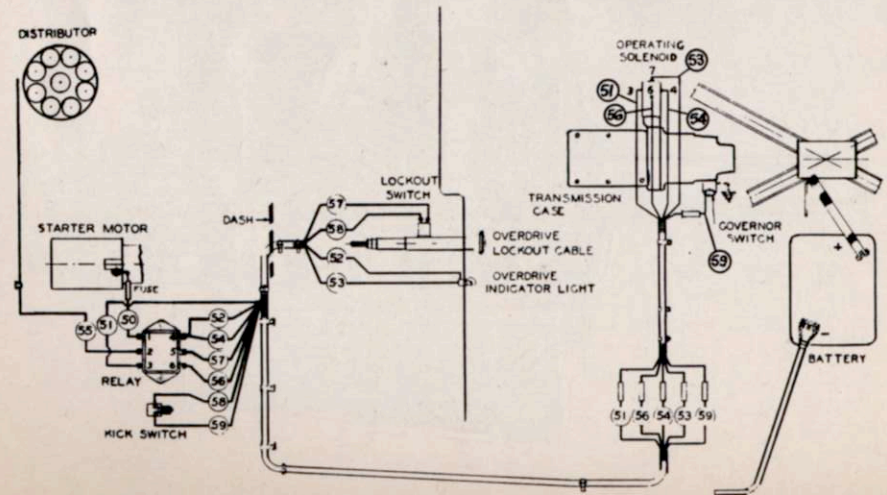


Fig. 34—Econo-Drive Wiring Diagram

Clutch and Transmission

The only external adjustment of the semi-centrifugal clutch is at the pedal linkage. Pedal should have $1\frac{1}{2}$ to $1\frac{3}{4}$ inches of free travel measured between pedal pad and floor board. Adjust by means of the nut on pedal rod shown in Fig. 35.

Notes for the Mechanic

Except for changes in the make of lining, design of damper and pressure springs the 1940 clutch construction is the same as used on 1703 and 1705 cars. Clutch facings are Amco make size $6\frac{1}{2}$ inches by 11 inches by .125 inch. Each of the 9 pressure springs should show 155 to 165 pounds when compressed to a length of $1\frac{43}{64}$ inches.

The transmission units except for detailed changes in the control mechanism are the same as used on 1703 and 1705. For repair data refer to 1939 data on pages 102, 103 and 104 in the 1938-1939 Shop Manual.

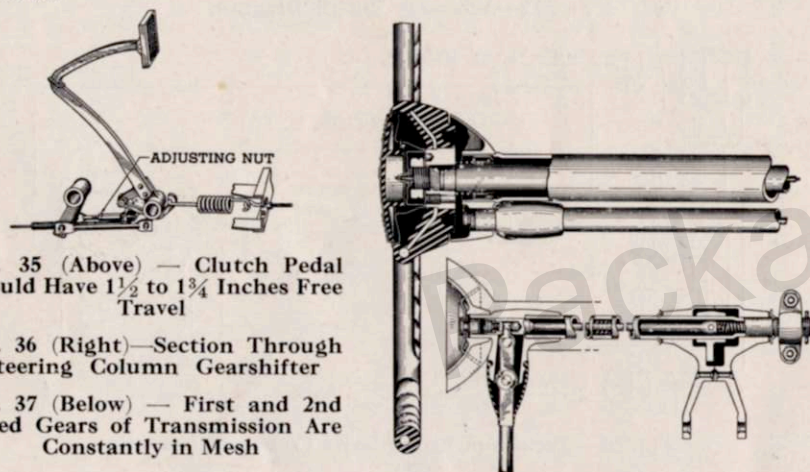


Fig. 35 (Above) — Clutch Pedal Should Have $1\frac{1}{2}$ to $1\frac{3}{4}$ Inches Free Travel

Fig. 36 (Right)—Section Through Steering Column Gearshifter

Fig. 37 (Below) — First and 2nd Speed Gears of Transmission Are Constantly in Mesh

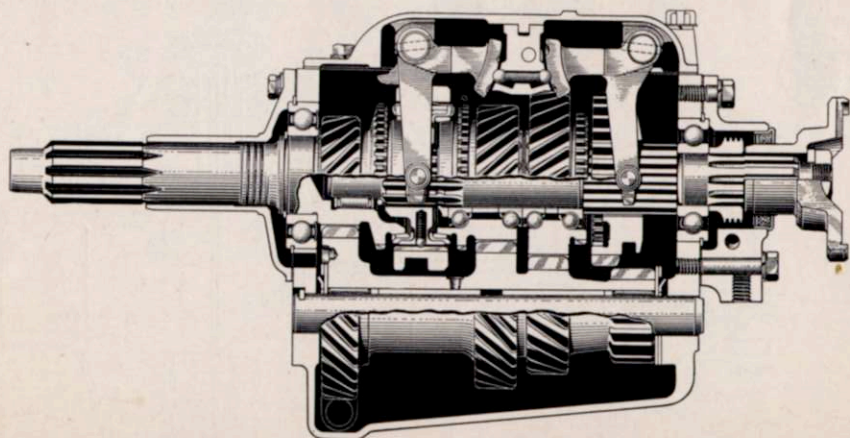


Fig. 38 Left—Rear View of Econo-Drive. The Centrifugal Switch Which Controls Cut-in Speed Is Not Adjustable Except by Changing the Governor Weight Springs

Fig. 39 Right—Movement of the Pawl Into and Out of the Balk Ring Controls Engagement and Disengagement of the Econo-Drive

The new solenoid operates in exactly the opposite direction to the old one, so that when the new solenoid is energized it pushes the pawl in, instead of pulling it out, as did the last year's type.

When the car is stationary and at all speeds up to that for which the governor is set, the pawl is in the out position, being held there by a spring. When the car reaches the road speed for which the external governor is set, the governor energizes the solenoid, causing it to push the pawl in towards the slots of the sun gear head where it is caught and held by the balk ring. When the foot is momentarily raised from the accelerator the slowing down of the engine causes the sun gear to rotate in the opposite direction bringing the opening in the balk ring under the pawl and allowing it to engage the slots in the sun gear, thus holding the sun gear stationary, and picking up the Econo-Drive train. The

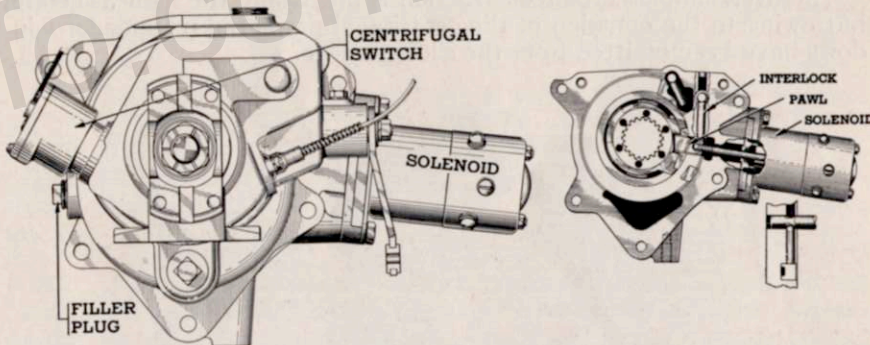
Econo-Drive Unit

The Econo-Drive unit steps up the propeller shaft speed 38.5 per cent with respect to the engine speed which is the equivalent of reducing the engine speed 27.8 per cent. To find final ratio in Econo-Drive multiply the axle ratio by .722.

The 1940 edition of the Econo-Drive used on Packard 160 and 180 cars is improved and internally simplified as compared to the unit used on the 1703 and 1705. The differences between the 1939 and 1940 units are described hereafter.

The fundamental difference is that the centrifugal clutch, with its pawls, springs, etc., which formerly picked up the overdrive gear train, is omitted.

The slotted hub, which carries the sun gear of the planetary train together with its sliding pawl and solenoid has now taken over the function of engaging and disengaging the Econo-Drive. The car speeds at which the sliding pawl engages and disengages are determined by a separate centrifugal governor switch, mounted externally at the rear of the Econo-Drive housing and driven from the speedometer drive gear. Refer to Figs. 38 and 39.



solenoid main coil is then automatically cut out leaving only a small holding coil energized, this being just strong enough to overcome the pressure of the spring on the solenoid stem, and to keep the pawl seated. The holding coil draws a very light current, but is on all of the time that the car is in Econo-Drive.

For forcing back out of Econo-Drive to direct, the throttle is pushed beyond the wide open position, just as in the previous design. This breaks the circuit of the small holding coil and cuts out the ignition for an instant which permits the spring on the stem of the solenoid to withdraw the pawl from its slot in the sun gear head, thus setting the sun gear free, and giving a direct drive.

When the lock-out knob on the dash is pulled the movement of the Econo-Drive shift rail pushes an interlock plunger over into a notch in the side of the pawl, thus preventing it from operating during the period while the car is driven in conventional gear.

The two steel wear plates which formerly formed guides for the pawl are omitted. The bearing mounting at the rear of the Econo-Drive main shaft now consists of one double-row unit "R" which is pre-loaded within itself, thus eliminating the former spacer and preloading washer.

The overrunning clutch construction is practically the same as before, but owing to the omission of the centrifugal pawls the rectangular windows have been omitted from the sliding sleeve.

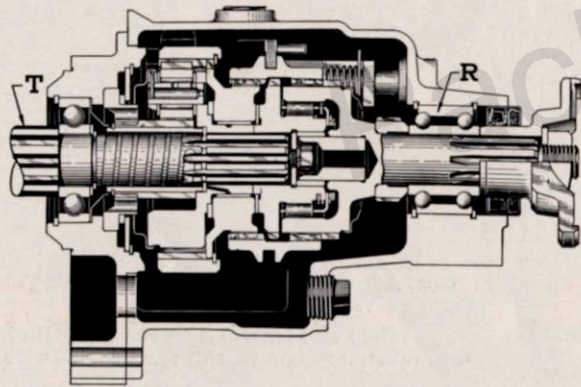


Fig. 40—Sectioned Econo-Drive Unit Which is Bolted to End of Transmission. "T" is a Continuation of the Transmission Mainshaft

Repair Notes—The external centrifugal governor is calibrated to cut in the Econo-Drive at 22 m.p.h. and cut out at 17 m.p.h. approximately. The governor is non-adjustable. Do not shim the governor cover and do not change the spring tension by stretching. If owner insists on higher cut-in speed secure special springs from the factory.

It should be remembered that the mainshaft rear bearing "R" requires no preloading and also that the external centrifugal clutch pawls have been omitted. The lock-out knob should clear the knob stop $\frac{1}{8}$ inch when pushed all the way in.

Rear Axle, Universals

The rear axle is a semi-floating unit with hypoid driving gears. The housing cover is welded in place. The driving pinion carries only a bearing adjustment, pinion mesh position being fixed and non-adjustable. Wheel bearings are semi-permanently lubricated.

Pinion, differential and wheel bearings are the same as 1703 and 1705.

Available axle ratios for cars with and without Econo-Drive are tabulated below:

Models	Std. Ratio	Std. Ratio With Econo-Drive	Opt. Ratio
1803, 1806	3.92	4.36	4.09
1804, 1807	4.09	4.36	4.36
1805, 1808	4.36	4.54	4.54
1803A	4.54	4.7	4.7

Notes for the Mechanic

Pinion Shaft Bearings—Bearings should be adjusted to the same preload drag of 25 to 30 inch-pounds as used on 1939 models by means of the self-locking, flange nut on the pinion shaft.

To adjust preload, draw up the nut until you feel the spacer start to buckle. Check scale pull required to rotate pinion shaft. If pull is less than 25 inch-pounds, tighten nut further until this amount of drag is secured. Refer to pages 35 and 36 of 1938-1939 Shop Manual.

Important—Readjust the preload, as just outlined, **every** time the universal flange nut is loosened or removed. Readjust with both wheels jacked off the floor or with carrier removed.

Differential side bearings should be preloaded to a .010" to .012" spread of the bearing support pedestals. To adjust spread, proceed as follows: Loosen each side bearing cap just slightly then back off the right hand (viewed from rear) bearing adjusting nut until ring gear mount is loose in bearings. Make sure that left hand adjusting nut is backed out far enough to provide some backlash between ring and pinion gear. Using a large outside caliper and a .010" feeler blade, caliper from one cap boss to

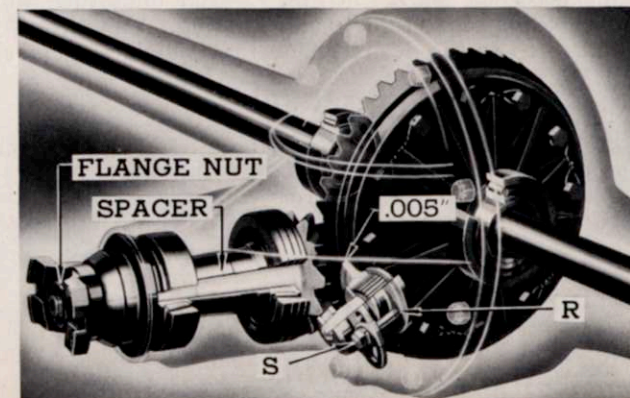


Fig. 41—Adjust Stud "S" to Secure .005 Inch Clearance Between Back Face of Ring Gear and Rim of Roller "R"

the other with the .010" feeler blade interposed between one of the machined bosses and the caliper as shown in Fig. 43. Lock the caliper at this setting. Now tighten the right hand bearing adjusting nut until the previously adjusted caliper (minus the .010" feeler) will just slide over both cap bosses. This gives the desired .010" spread.

Now check backlash between pinion and ring gear teeth. If lash is more than .005" back off the right hand adjusting nut and tighten the left hand nut exactly the same amount until lash is within the .003" to .005" limit. Tighten both caps securely and lock the adjusting nuts.

After backlash adjustment is completed adjust the support roller "R", Fig. 41, until it clears back of ring gear by .005 inch.

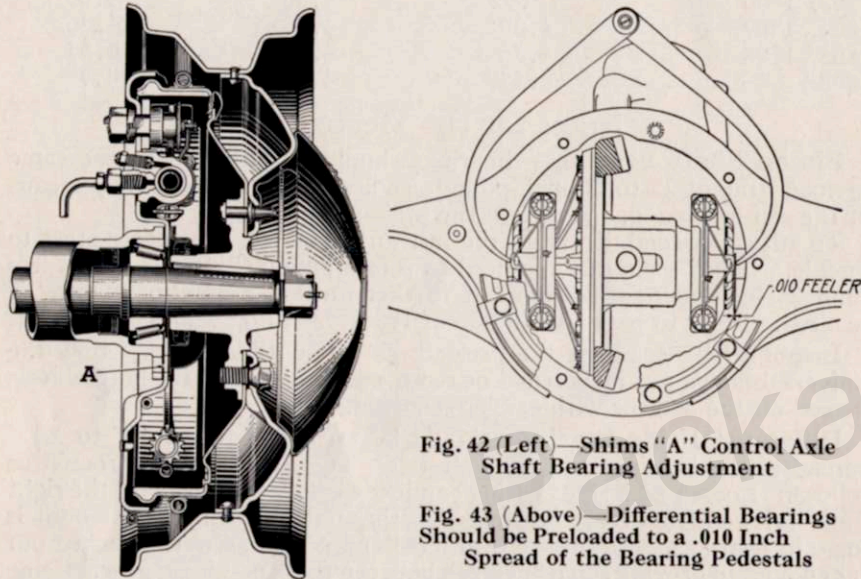


Fig. 42 (Left)—Shims "A" Control Axle Shaft Bearing Adjustment

Fig. 43 (Above)—Differential Bearings Should be Preloaded to a .010 Inch Spread of the Bearing Pedestals

Wheel Bearings—End play should be .004" to .007" total. Adjustment is by means of shims "A" in Fig. 42 after unbolting the backing plate and clips holding brake tube to axle housing. End play of less than .050" can be restored to the desired .006" by adjusting at one side only.

Universal Joints

Roller bearings should be disassembled and repacked every 30,000 miles. *Caution:* The rear universal flange must **never** be tightened indiscriminately, because it also controls the adjustment of the pinion shaft bearings. Refer to "Pinion Bearings" on preceding page.

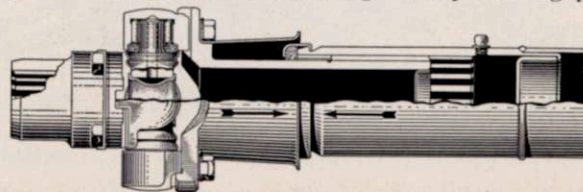


Fig. 44—Arrow on Universal Yoke Must Align With Arrow on Propeller Shaft

Steering System

Steering Gear

The gear should be checked for misalignment before proceeding to the actual adjustment. Loosen steering gear to frame bolts enough to permit gear to align itself to the angle determined by height setting of instrument board bracket then retighten the frame bolts securely. Next loosen gear bracket at instrument board so that gear will align itself to the angle determined by the frame bracket. Note this position and if it appears that tightening the instrument board bracket will strain the column, shim the bracket or elongate the mounting holes or both if necessary then retighten. The actual adjustments should be made in the order following:

A—Up and Down Play—Turn steering wheel to either stop then back up $\frac{1}{8}$ turn. Loosen the worm cover screws "A," Fig. 45, about $\frac{1}{8}$ inch. Remove one thin gasket, being careful not to mutilate the others.

Tighten the cover screws "A" and check to see if all play has been removed. When properly adjusted a pull of not less than $1\frac{1}{2}$ and not more than $2\frac{1}{4}$ lbs. (measured at rim end of wheel spoke) should be required to move the steering wheel. If drag is less than $1\frac{1}{2}$ pounds remove another thin gasket. When executing this test remember that an increase in drag will be encountered, momentarily, as wheel is turned through the "high spot" position. The pull of $1\frac{1}{2}$ to $2\frac{1}{4}$ lbs. applies only when gear is off the "high spot," with drag link disconnected.

B—Roller Shaft End Play—Turn steering wheel to either stop then back up $\frac{1}{8}$ turn. Grip hub of roller shaft lever, Fig. 45, and check end play by feel. Adjust to remove all end play by means of the roller shaft adjusting screw "C."

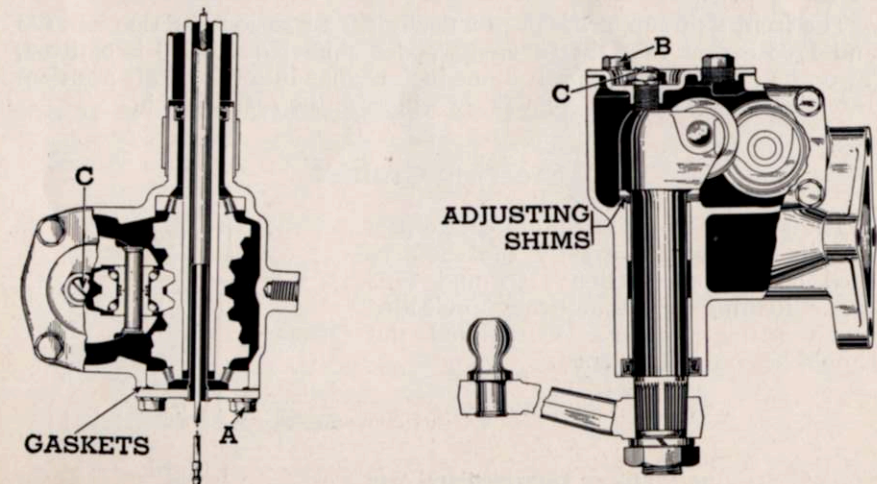


Fig. 45—Steering Gear is of the Integral Housing Type. Wormshaft Bearings and Roller Mesh Should be Adjusted to a Slight Drag as Outlined in Text

C—Roller Mesh—Turn steering wheel to “high spot” or mid position. Move roller shaft lever back and forth in direction of normal rotation to determine amount of backlash. If any backlash exists at this time, it will be necessary to remove the roller shaft assembly from the gear housing.

With roller shaft removed, mesh adjustment procedure is as follows:

Remove one of the thin roller shaft adjusting shims and temporarily reinstall roller shaft and cover plate. After tightening the cover screws adjust roller shaft to zero end play by means of the slotted head roller shaft adjusting screw “C.”

Check mesh adjustment by rotating steering wheel through the “high spot” or mid position with drag link disconnected. Adjustment is correct when the pull required to move steering wheel through the “high spot” is not less than 3 and not more than $4\frac{1}{2}$ lbs. If amount of drag at “high spot” is greater than $4\frac{1}{2}$ lbs., install a thin shim; if less than 3 lbs., remove a thin shim.

NOTE: Make sure that the thick thrust washer mounted with the adjusting shims on the roller shaft is installed with the bevel facing away from the splined end of shaft.

Important: Since the roller shaft must be removed in this adjustment, it is important to protect the roller shaft oil seal. Protection may be secured by installing a metallic protecting thimble, Packard S. T.-5032, over the splines prior to removal of roller shaft. If this tool is not available, a layer of friction tape must be carefully wound over the splines.

Column Angle and Head Room

The steering wheel cannot be raised although it can be lowered about $\frac{5}{8}$ of an inch by installing the steering column instrument bracket used on the model 1800 cars.

The front seat support is of practically the same construction as 1703 and 1705 except that the tapered wooden shim No. 337373 is omitted. Two sets of bolt holes permit a one-inch change in fore and aft position. Inserting tapered wedge No. 337373 will raise the seat $\frac{5}{8}$ inch.

Steering Crank

The steering crank or intermediate arm and its bearing are exactly the same as used on late production 1703 and 1705 cars. Bearing is automatically preloaded by a spring washer. Castellated nut should be snugly tightened.

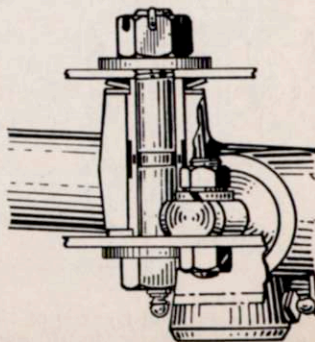


Fig. 46—Steering Crank or Intermediate Arm Bearing. A Special Spring Washer Automatically Imparts the Desired Amount of Friction Drag to the Bearing

Steering Rods

The steering connecting rod or drag link is the same as used on 1703 and 1705. Adjusting plug at steering gear end of drag link should be bottomed then backed off one full turn and the one at opposite end should be backed off two full turns.

It is advisable to coat the drag link ball studs and seats with hypoid lubricant wherever a seat, plug or stud is renewed. This precaution reduces the chances of surface scoring during the wear-in period of the new part.

Steering cross tubes or tie-rods are of the self-adjusting type but differ from 1703 and 1705 in details of coil springs and ball stud seats in the self-adjusting joints. The tie rod ends are serviced as complete assemblies as they cannot be successfully repaired in the field.

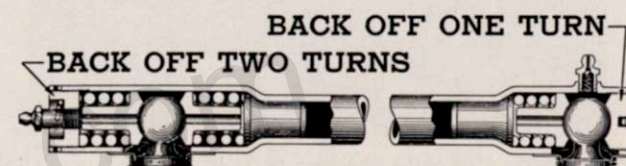


Fig. 47—Adjusting Plug at Steering Gear End of Drag Link (Steering Connecting Rod) Should be Bottomed then Backed Off One Full Turn

King Pin Bushings

These are steel backed bronze of the split type exactly the same as used on 1703 and 1705. They should be brought to size and finish with either a reamer or an .866 inch diameter burnisher bar such as S.T.-5046. King pins .005 inch oversize for correction of worn holes in the pin support are available.

King pin thrust bearings should be preloaded to give a drag of $3\frac{1}{2}$ pounds to 5 pounds pull when scale is attached to end of spindle. Adjust by means of shims which are available in thickness steps of .001 inch.

Toe-in

Recommended toe-in is $\frac{1}{32}$ to $\frac{1}{16}$ inch measured at or as near hub height as possible.

1. Inflate all tires to recommended pressure. Adjust front wheel bearings. Center the steering worm on “high spot” and front wheels straight ahead before measuring.

2. To adjust toe-in, loosen clamps on both cross tubes then turn both tubes an equal amount. If one cross tube (tie-rod) is longer than the other by more than $\frac{1}{8}$ inch when road wheels are in “straight ahead” position a bent knuckle arm is indicated.

Camber

Desired and minimum camber angle is $\frac{1}{2}^\circ$ but a maximum of $1\frac{1}{4}$ degrees is permissible.

Camber is adjusted by installing the proper offset thimbles in shock absorber arms as shown in Fig. 48. Pilots of zero, $\frac{1}{16}$, $\frac{1}{8}$ and $\frac{3}{16}$ " offset are available. A change of $\frac{1}{16}$ " in amount of offset changes the camber angle $\frac{1}{3}$ of a degree.



Fig. 48—It is Important to Note Position of Thimbles Because Their Reversal Will Change the Camber Angle

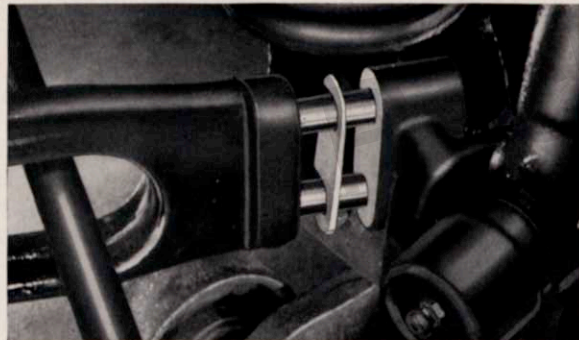


Fig. 49—Showing Installation of Caster Shim

Caster

Desired caster angle on all except the 1803A is one degree negative but a minimum of $1\frac{1}{2}$ degrees and a maximum of $\frac{1}{2}$ degree negative or reverse caster is permissible. Desired caster angle on the 1803A is $2\frac{1}{2}$ degrees but a minimum of 2 and a maximum of 3 degrees positive caster is permissible.

Caster is changed by installing the proper Packard tapered shim between forward end of torque arm and the front support arm, Fig. 49. Shims of one-half and one degree are available.

Caution: If more than one degree of shims is required to bring caster within limits look for bent parts.

Chassis Suspension

Friction Lag

Friction lag in suspension system should not exceed $\frac{5}{8}$ inch measured as outlined in section 281, page 118 of the 1938-1939 Shop Manual.

Riding Height

On complaints of unsatisfactory riding or improper road handling, check the riding height front and rear as follows:

Measure front riding height "A" from floor to **top** of frame at center line of front wheel and rear riding height "B" from bottom of frame to top of axle housing as shown in Fig. 50 with body loaded with passengers or ballast as indicated below:

Body Type	Loadings	
	Front	Rear
Sedans 5-Pass.	300 lbs.	375 lbs.
Sedans 7-Pass.	300 lbs.	675 lbs.
1803A-Hearse	300 lbs.	*800 lbs.
Coupes	300 lbs.	225 lbs.

*Weight of 800 pounds spread over hydraulic table.

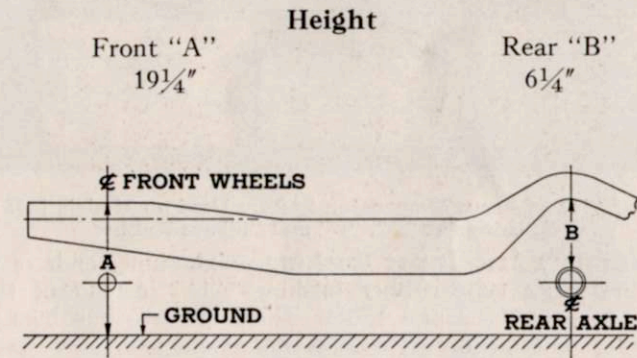


Fig. 50—Front Riding Height Dimension "A" is Measured from Floor or Ground to Top of Chassis Frame at Center Line of Front Wheels

If front riding height is less than $18\frac{3}{4}$ inches or more than $19\frac{3}{4}$ inches, front springs should be renewed or a spacer and insulator installed. Spacers which are available under part 326836 are $\frac{1}{4}$ inch thick and in combination with insulator 326706 will increase the riding height $\frac{3}{8}$ inch. Spacer should be installed between top of spring and frame, and the insulator between spacer and spring and between spacers when more than one spacer is used. Never use more than two spacers.

If rear riding height is less than $5\frac{3}{4}$ inches or more than $6\frac{3}{4}$ inches, reset or renew the rear springs.

Suspension Bearings

Front Support Arm Outer Bearings—These caged type roller bearings "E" differ from those used on models 1703 and 1705 mainly in that one of the two bearings in each assembly **must** be renewed whenever the arm pin or either bearing is removed for any reason. The thrust bearing should be preloaded one to six pounds by means of shims "S", Figs. 51 and 53.

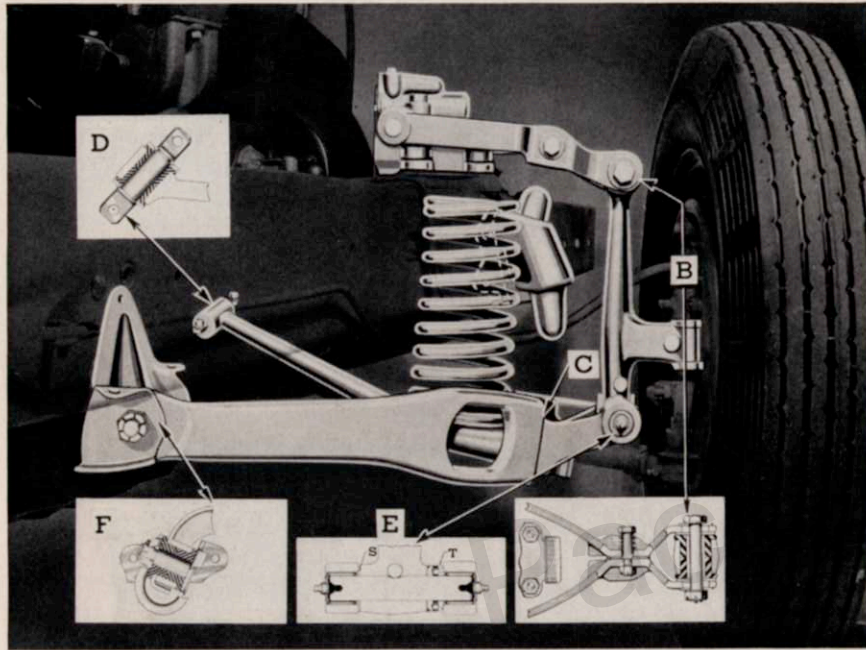


Fig. 51—Rear View of Front Suspension System Used on Models 1803 and 1806. Bushings at "B", "D" and "F" are Rubber

Front Support Arm Inner Bushings—The inner ends of arms are mounted in Harris type rubber bushings "D" instead of the metal cased type used on 1703 and 1705. There are two bushings per arm, the two being held in place by a snap ring at one end.

Although the bushings may be renewed without using an arbor press they must be installed in the correct neutral angular position as outlined in section 83 on page 41 of the 1938-1939 Shop Manual except that a new aligner gauge will be required.

Vertical Wheel Support Bushings—The rubber bushings in upper eye of vertical wheel support are of the Harris type the same as used on 1703 and 1705.

Torque Arm Rear Mountings—New Harris type rubber bushings "F" are used on the 1803 and 1806. The bushing bolt nut should be drawn up until frame stamping bottoms against shoulder on bolt.

On models 1804, 1805, 1807 and 1808 the mountings, "F", Fig. 54, are the same as used on 1703 and 1705. Dip hollow rubber balls in soap water when assembling.

Roll Control Bar

The roll control or sway bar on models 1803 and 1806 is now mounted at the front. It is rubber bushed at the frame ends. Nuts at torque arm anchorages should be kept tight and rubber bushings should be renewed when worn.

Models 1804, 1805, 1807 and 1808 are equipped at front and rear with roll control bars of the same general design as used on the 1803 and 1806.

Rear Lateral Stabilizer

The rear lateral stabilizer and fifth shock absorber are serviced in the same manner as the 1703 and 1705 of 1939.

Adjust needle valve in center of shock absorber until not less than 18 seconds and not more than 24 seconds are required for shock arm to travel from top to bottom of stroke when a 50 pound weight is hung on arm as shown in Fig. 52.

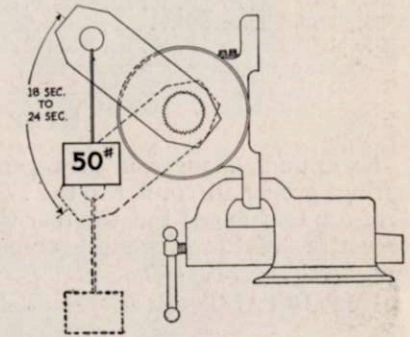


Fig. 52—Checking Resistance of Lateral Stabilizer Shock Absorber

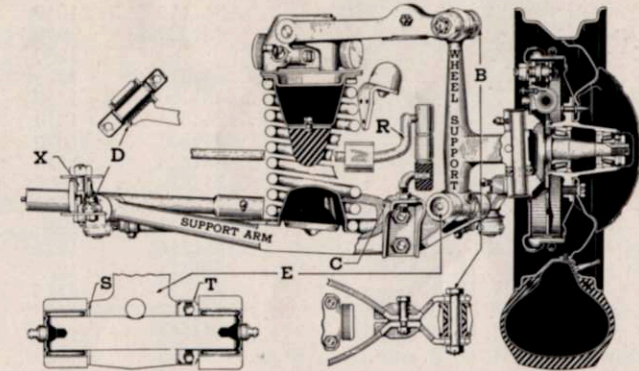


Fig. 53—Front Suspension Details for Models 1804, 1805, 1807 and 1808

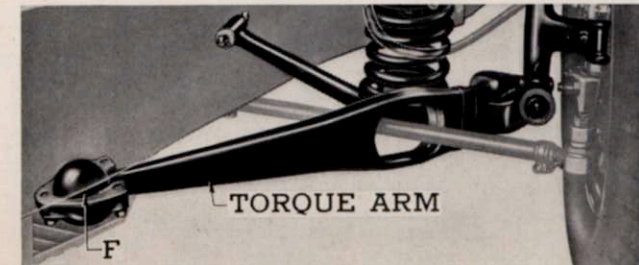


Fig. 54—Hollow Spherical Rubber Mountings are Used at Rear of Torque Arm on Models 1804, 1805, 1807 and 1808

Front Springs

	Part No.	Load	Rate	Color
1803, 1806 Domestic Std.	335692	1750	77	Red and Silver
1803, 1806 Domestic *F. W. E.	338166	1900	90	Yellow and Silver
1804, 1807 Domestic Std.	326880	1965	95	White and Blue
1804, 1807 Domestic *F. W. E.	351256	2075	100	Purple and Silver
1805, 1808 Domestic Std.	338156	2125	110	Orange and Purple
1805, 1808 Domestic *F. W. E.	335990	2250	120	Orange and Blue
1803A Commercial Chassis except Bus.	326925	2200	130	White and Green
1803, 1806 Export Std.	338269	1750	110	Blue and Silver
1803, 1806 Export *F. W. E.	351708	1900	110	Silver and White
1804, 1807 Export Std.	333736	1965	110	Brown and Blue
1804, 1807 Export *F. W. E.	333575	2075	110	Brown and Silver
1805, 1808 Export Std.	Same as Domestic 1805, 1808 Std.			
1805, 1808 Export *F. W. E.	Same as Domestic 1805, 1808 *F. W. E.			

*Cars equipped with fender wells

Rear Springs

Except for changes in arrangement of the inter-leaf inserts the rear springs proper are similar to the 1703 and 1705 equipment. Front mountings are unchanged but the rear shackles on the 1803 and 1806 only are now attached to spring-steel goosenecks riveted to the frame as shown in Fig. 57.

IMPORTANT—Rear springs should not be lubricated.

	Part No.	Load	Rate
1803, 1806 Domestic sedans	347419	1040	115
1803, 1806 Domestic coupes	351220	920	110
1703-A Commercial chassis Std.		1800	170
1804, 1807 Domestic all.	351215	1225	115
1805, 1808 Domestic all.	351200	1350	127
1803, 1806 Export sedans L. H. D.	348863	1070	135
1803, 1806 Export sedans R. H. D. L. side	348863	1070	135
1803, 1806 Export sedans R. H. D. R. side	351228	1120	135
1803, 1806 Export coupes L. H. D.	348859	1000	125
1803, 1806 Export coupes R. H. D. L. side	348859	1000	125
1803, 1806 Export coupes R. H. D. R. side	351227	1050	125
1804, 1807 Export all L. H. D.	351216	1225	135
1804, 1807 Export all R. H. D. L. side	351216	1225	135
1804, 1807 Export all R. H. D. R. side	351217	1275	135
1805, 1808 Export all L. H. D.	333734	1400	155
1805, 1808 Export all R. H. D. L. side	333734	1400	155
1805, 1808 Export all R. H. D. R. side	333735	1450	155

Arrangement of inserts used in above springs from front to rear of spring is as follows:

Spring No.	Rubber Inserts	Silenite Inserts
347419	1, 2, 3, 12, 13, 14	4, 5, 6, 7, 8, 9, 10, 11
351220	Same as Spring No. 347419	
351215	Same as Spring No. 347419	
351200	1, 2, 3, 4, 15, 16, 17, 18	5, 6, 7, 8, 9, 10, 11, 12, 13, 14
348863	All Silenite inserts	
351228	All Silenite inserts	
348859	All Silenite inserts	
351227	All Silenite inserts	
351216	All Silenite inserts	
351217	All Silenite inserts	
333734	All Silenite inserts	
333735	All Silenite inserts	

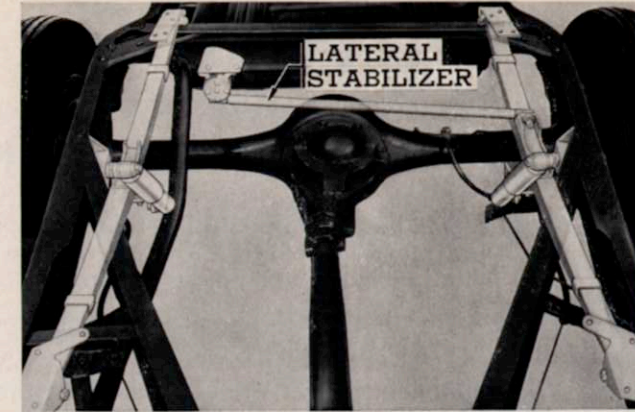


Fig. 55—Rear Suspension Used on Models 1801, 1803 and 1806. Refer to Fig. 67 for 138" and 148" Wheelbase Cars

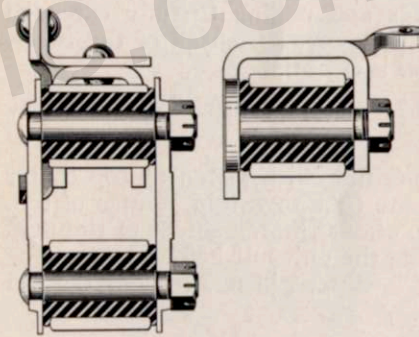


Fig. 56—Rear Springs on 138" and 148" Wheelbase Cars are Carried in Rubber Bushed Front and Rear Mountings as Shown Above

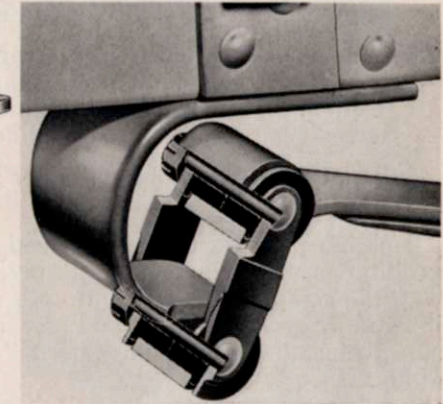


Fig. 57—Rubber Bushings and Flexible Gooseneck on Rear Springs of Models 1803 and 1806

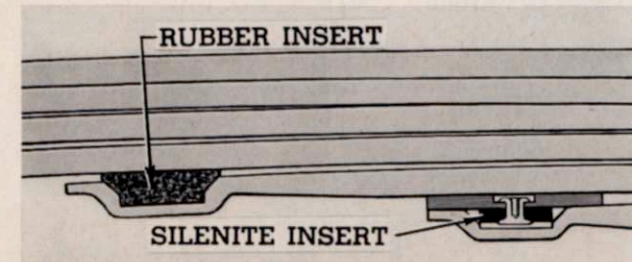


Fig. 58—Special Non-Metallic Inserts Control the Static and Dynamic Friction of the Rear Springs

Rear Shock Absorbers (Domestic)

Models 1803 and 1806

The Monroe rear shock absorbers on the above models are of the direct acting airplane type. Piston diameter is one inch. The Monroe parts number for right or left units is 11187 and the corresponding Packard number is 351194.

IMPORTANT—It should be kept in mind that these shock absorbers have no filler plugs and must be refilled with **exactly** the specified amount of approved fluid by removing and disassembling the units.

Refilling—Method of refilling is as follows: Clamp bottom eye of unit in vise and pull top eye out to fully extended position, Fig. 59.

1. Using the special rod guide spanner wrench S.T. 10047 through the openings in dust shield engage the slots in top guide "K" then unscrew and lift off the top unit which includes the dust shield and the cylinder pressure tube "M." Now remove lower half from vise and pour all of the fluid out of the reservoir tube "L." Tap the compression valve "O" out of the tube. Refer to Fig. 61.
2. Remove all the fluid from pressure tube by grasping top eye and end of pressure tube in opposite hands and pulling to fully extended position. Be sure all of the fluid is removed from all of the tubes. Remember that absolute cleanliness is essential.
3. Prepare in a suitable container $6\frac{3}{4}$ ounces or 199 c.c. of factory approved shock absorber fluid.

Holding pressure tube in vertical position with piston at top center position as shown in Fig. 59, fill pressure tube to within $\frac{1}{4}$ inch of top. Tap the compression valve into place. Pour the remainder of the fluid into the reservoir cylinder and assemble the unit but before doing so be sure to install a new guide gasket "P"—dipped in fluid, under the rod guide.

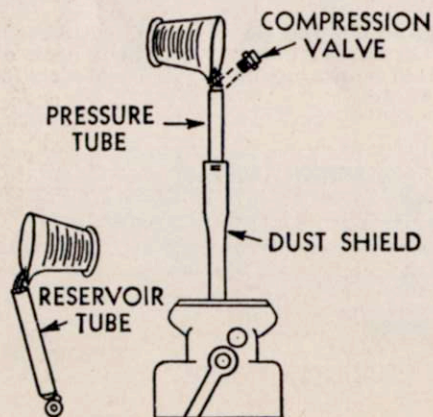


Fig. 59—Rear Units on the 1803 and 1806 Cars Must Be Removed From the Car and Disassembled for Refilling

With unit still mounted as for filling move the upper portion slowly up and down to the limit of travel several times to expel all air from pressure tube.

Changing Valves—The compression valve "O" in end of pressure tube is changed as an assembly by following the procedure used for refilling. Refer to table on page 60 for valving calibrations.

The rebound valve is on the shock absorber piston. To change the valve or any of its parts remove the compression valve as in refilling, then with piston at bottom of stroke remove the "staked on" piston nut "7" and the individual valve parts shown in Fig. 62.

Before removing the piston insure its reinstallation in exactly the same position by marking it in relation to the rod.

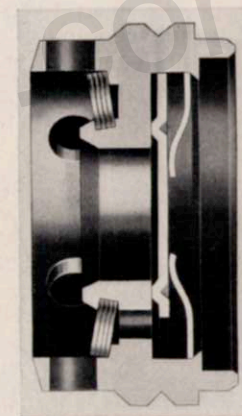


Fig. 60 (Above)—Compression Valve for Domestic 1803 and 1806 Rear Shock Absorbers

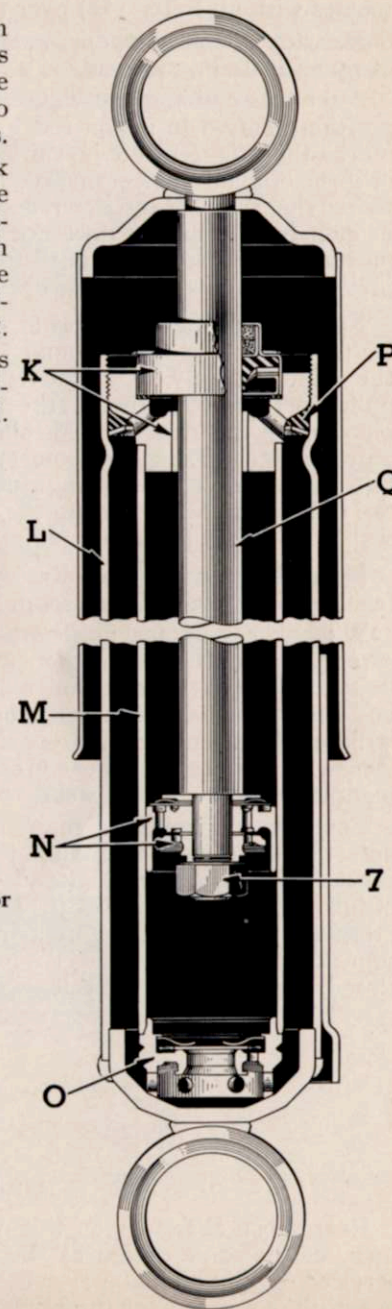


Fig. 61 (Right)—Sectioned One Inch Monroe Unit Used at the Rear on 1803 and 1806 Cars. Many Parts Are Interchangeable With the One Inch Delco

- K—Rod Guide and Seal Assembly
- L—Reservoir Tube
- M—Pressure Tube
- N—Piston and Rebound Valve
- O—Compression Valve
- P—Guide Gasket
- Q—Piston Rod
- 7—Piston Nut

If piston rod threads are not in perfect condition, recut with threading die S.T.-10052. Before inserting the piston rod through the seal protect the latter from injury by installing the protective thimble S.T.-10049 (comes with kit S.T.-5150) over the piston rod threads.

Measure piston with micrometer and if it is more than .003 inch out of round install a new one.

After reassembling the valve parts and piston turn piston to original position relative to piston rod by referring to previously made locating marks then tighten nut just firmly. If a new piston has been installed or if the original was not marked at disassembly, check for free movement by moving tube up and down and rotating to find out if piston is binding in cylinder. If piston does not move freely loosen nut and try a new position of piston on rod until freedom is obtained. Tighten piston nut just firmly then stake in place with S.T.-10051.

Renewal of Seal—Renewal of the piston rod seal is accomplished by first removing the rebound valve as previously outlined, then with the guide assembly "K" removed from tube, extract the seal with special puller S.T.-10048. Install the a piston rod seal gasket "P" using a piece of $1\frac{1}{16}$ inch round cold-rolled stock to seat the gasket in shoulder on rod guide. Using the same $1\frac{1}{16}$ inch rod, press down on the new seal until it rests on gasket, being careful not to press hard enough to distort top of seal. Before inserting the piston rod through the seal protect the seal by placing protecting thimble S.T.-10049 on rod.

Miscellaneous—Renewal of worn rubber eye grommets will be greatly facilitated by use of liquid soap.

When checking for noise make sure that all units and brackets are bolted tightly to the frame and axle, and that the shock absorber is not striking the frame or other parts. Renew any of the rubber eye grommets that show signs of wear.

Compression squeaks may be detected by slowly extending the shock absorber approximately $\frac{2}{3}$ of full length and then rapidly compressing it. To detect rebound squeaks compress shock slowly until closed, then quickly extend it.

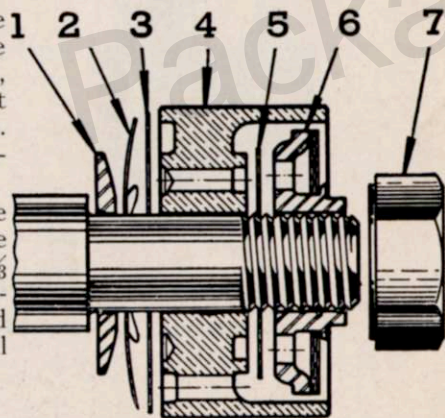


Fig. 62—The Rebound Valve Which is Serviced as an Assembly

- | | |
|--------------------------|--------------------|
| 1. Piston Support Washer | 4. Piston |
| 2. Star Spring | 5. Metering Washer |
| 3. Intake Valve | 6. Relief Valve |
| | 7. Nut |

Model 1803A

Rear shock absorbers on this model are Delco model 1001V, size one inch, of the same design as the Monroe units. The rebound valve is serviced by individual parts otherwise the maintenance procedure is exactly the same as for the Monroe equipment.

Rear Shock Absorbers (Export)

Models 1803 and 1806

Heavy duty Delco shock absorbers having $1\frac{3}{8}$ inch diameter piston and $2\frac{5}{8}$ inch outer tube are used as regular equipment on 1803 and 1806 export cars and are available on domestic vehicles as special equipment. Tool kit S.T. 5151 is required for servicing. Refer to Fig. 63.

Servicing—Refilling and repair procedure is the same as for the regular one-inch models except the following:

Install new cork and rubber guide gaskets before assembling the unit being sure to place the rubber one on top. When reassembling the pressure tube use thimble Delco No. 583 or the one in Packard S.T.-5151 kit, on piston rod to protect the seal assembly.

After inserting the 12 ounces or 359 c.c. of fluid into the pressure tube and reserve chamber make sure that the notch in rod guide and seal assembly matches the depression in the side of the reserve chamber.

Important—Before installing shock absorbers on car check and reset the ride adjustment as outlined in the next paragraph.

Ride Adjustment—Shock absorbers are set at "soft ride" position when they leave the factory but since disassembly may change the setting they should always be checked as follows before reinstalling on car:

With shock absorber in collapsed position rotate lower end of unit with arrow on it in the direction arrow points until the adjusting cam, Fig. 65, engages. Hold in this position and measure the distance from arrow to the edge of upper tube. Now rotate further until cam reengages and note whether distance has increased or decreased. The shock absorber is in the soft ride position when distance between arrow and end of tube is greatest. This rule should be followed rather than the positions indicated by the "F" and "S" marks on the tube because the marks do not indicate truly after the unit has been once disassembled. The change in collapsed length between these two positions is slightly more than $\frac{1}{16}$ inch.

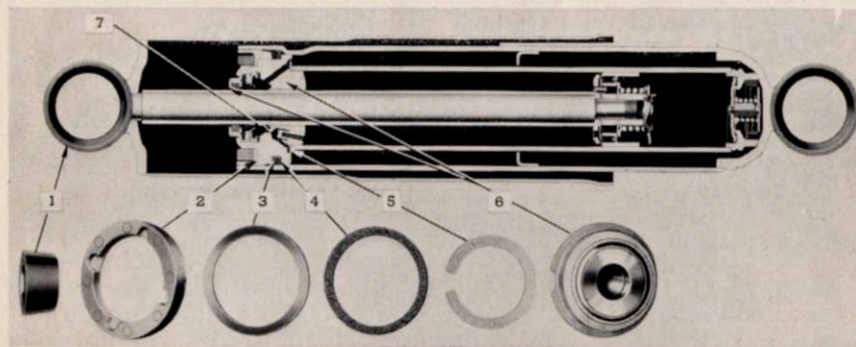


Fig. 63—The $1\frac{3}{8}$ Inch Delco Unit Used on 1803 and 1806 Export Cars

- | | | |
|-------------------|------------------|-----------------------|
| 1. Rubber Bushing | 3. Rubber Gasket | 6. Rod Guide and Seal |
| 2. Retainer Nut | 4. Cork Gasket | *7. Orifice Plug |
| | 5. Baffle Ring | |

Changing Valves—The compression valve is serviced as an assembly in the same manner as on the Monroe one inch units. To disassemble the valve it will be necessary to use the special holding tool of kit S.T. 5151 to hold the assembly, and the special wrench which fits over the valve stem to disassemble the unit.

The rebound valve on the piston rod is serviced as either an assembly or by individual parts. Disassembly procedure is the same as for the one inch models. Reassembly of the parts of this valve requires the special assembling sleeve of kit S.T. 5151 or Delco No. 581. This sleeve fits inside of piston between reinforcing washer and piston and is removed only after the piston nut has been tightened.

Parts which control the ride calibration on compression stroke are spring disk, relief valve spring Fig. 64, and the orifice plug "7" Fig. 63. Calibration parts of the rebound valve are valve spring, spring disk orifice plate and spider spring shown in Fig. 65.

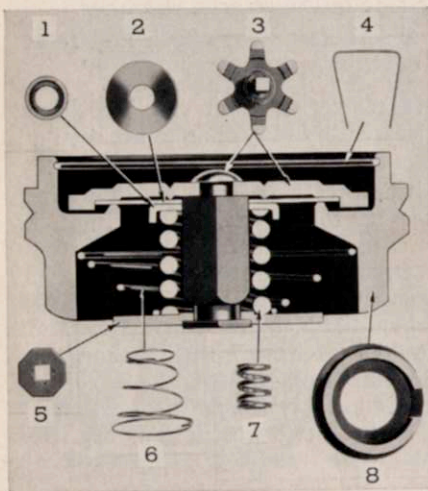


Fig. 64—Compression Valve 1 3/8 Inch Delco Rear Shock Absorber

1. Spring Cup
- *2. Spring Disk
3. Intake Valve and Stem
4. Retainer Clip
5. Valve Washer
6. Intake Valve Spring
- *7. Relief Valve Spring
8. Cylinder End

*Indicates a ride calibration item.

Renewal of Rod Guide Seal—The piston rod guide seal can be renewed only as an assembly because the sealing elements cannot be purchased separately. To renew the assembly proceed as in installing rebound valve. The baffle ring must be placed with the gap on the opposite side from the orifice plug. Be sure to install protecting thimble of kit S.T. 5151 or Delco No. 496 on piston rod when inserting the piston rod through the seal assembly and rod guide.

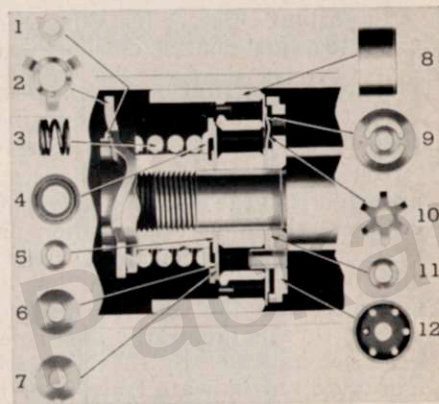


Fig. 65—Rebound Valve Assembly 1 3/8 Inch Delco Shock Absorber

1. Piston Nut
2. Valve Adjusting Cam
- *3. Valve Spring
4. Reinforcing Plate
5. Back Plate
- *6. Spring Disk
- *7. Orifice Plate
8. Piston
9. Intake Plate
- *10. Spider Spring
11. Collar
12. Washer and Pin

Rear Shock Absorbers

Models 1804, 1805, 1807 and 1808

The above cars, both domestic and export, are equipped with tandem cylinder end-to-end-discharge type shock absorbers Delco model 2007 with 1 3/4 inch diameter pistons.

Refilling—Units may be refilled while on the car by removing filler plug, disconnecting each arm from link and using fluid gun S.T.-5119 or Delco No. 315. The arm must be moved up and down slowly while adding fluid.

To Change Valves and Pistons—Except for size these absorbers are the same as the 1 1/2 inch models used on the 1700 and 1701 cars of 1939. For servicing instructions refer to section 88, page 44 of the 1938, 1939 Shop Manual.

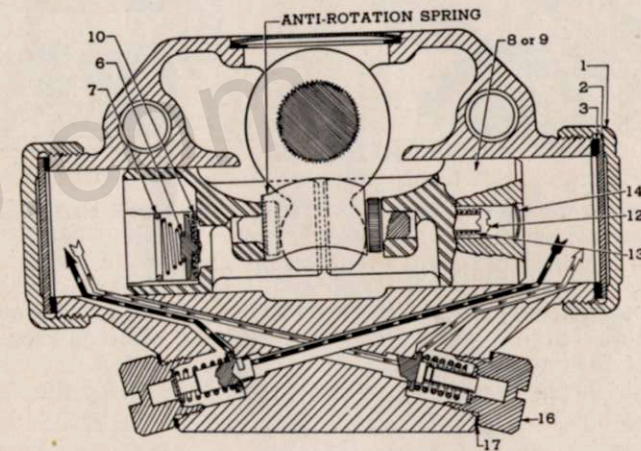


Fig. 66—This Type of Shock Absorber is Used at Front and Rear on Models 1804, 1805, 1807 and 1808

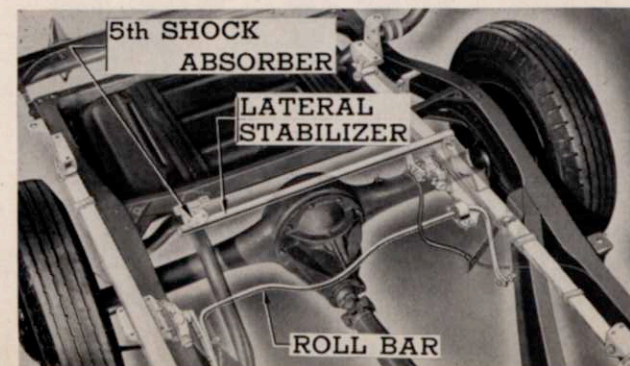


Fig. 67—Rear Suspension Models 1804, 1805, 1807 and 1808

Front Shock Absorbers

Models 1803 and 1806

Front shock absorbers shown in Fig. 68 are of the double action, parallel cylinder, end-to-end-discharge type, Delco model 2206.

Refilling and Valve Changes—Follow procedure outlined on preceding page.

Repairing—It is not practical to repair these units in the field so they will be serviced on a unit exchange basis.

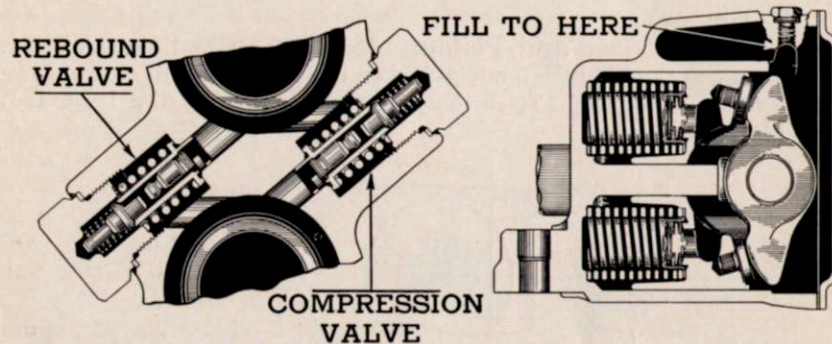


Fig. 68—Front Shock Absorbers on 1803 and 1806 are Delco Parallel Cylinder Type

Models 1804, 1805, 1807 and 1808

Front absorbers on these models are size $1\frac{1}{2}$ inch of the tandem piston, end-to-end-discharge type Delco model 1966 the same as used on 1703 and 1705 of 1939 as shown in Fig. 66.

For repair instructions refer to section 88, page 44 of the 1938-1939 Shop Manual.

Shock Absorber Valving

Car Model	Front Absorbers		Rear Absorbers	
	Rebound Code	Compression Code	Rebound Code	Compression Code
1803, 1806 All Domestic	3-Dd-5	1½-Ad-3	42-B-4	A-3
1804, 1807 All Domestic	3½-D-4	A-3-2	.40-Ed-4	Ad-4-W
1805, 1808 All Domestic	1-D-4	2½-C-3	.10-E	A-1-W
1803A All Domestic	3-E-5	3-Ad-5	.12-G	.60-Ad-5
1803, 1806 All Export	.60-J-7	1-D-5	0-GR15-4	8-C-1
1804, 1807 All Export	.50-H-4	2-Cd-5	.05-H	Ad-0-2
1805, 1808 All Export	.90-J-4	1-E-3	.70-L	2-C-3

Above codes are stamped after unit model number on direct acting shock absorbers and on external valve nuts of double piston types.

Rebound Valve Location

Car Model	Front Absorbers	Rear Absorbers
1803 and 1806	Lower valve	On piston
1804, 1805, 1807, 1808	Nearest arm	Away from arm

Brakes

Service brakes are of the single eccentric-anchor self-energizing type, actuated hydraulically. The 1803 and 1806 models have only two shoe adjustments while other models of the 160 and 180 series have 3 shoe adjustments. The parking brake utilizes the rear wheel service shoes which are actuated mechanically by the hand lever through steel cables.

Service and Hand Major Adjustment

Models 1803 and 1806

This adjustment requires removal of the 4 wheels but not the hubs.

1. Jack up all 4 corners of car. Remove road wheels, also inspection covers from drums and backing plates.

Remove clevis pin "A" from each hand brake pull cable. Remove slack from hand lever to equalizer cable by turning the clevis at equalizer end of cable. Apply hand brake lever one notch. Tighten star wheel clearance adjuster "B" at both rear wheels until wheels can just be turned with both hands. Remove all slack from pull cables then reconnect cables to equalizer and place hand brake lever in released position.

Back off star wheel clearance adjusters "B" at rear wheels only until wheels turn freely.

2. Insert a screwdriver between drum and lining of secondary shoe (rear shoe) and force assembly over until primary shoe is seated solidly against opposite face of drum. Holding the shoes assembly in this position insert a .015 inch feeler blade between lining and drum at upper end of secondary shoe (rear shoe) and turn anchor "D" in direction of forward wheel rotation until feeler is just firmly gripped. Insert .015 inch feeler blade between lining and drum at the lower end of the rear (secondary) shoe and turn star wheel "B" until .015 inch feeler is just firmly gripped.

Recheck clearance at both ends of secondary shoe. If .015 inch clearance cannot be secured, readjust anchor and star wheel until both ends

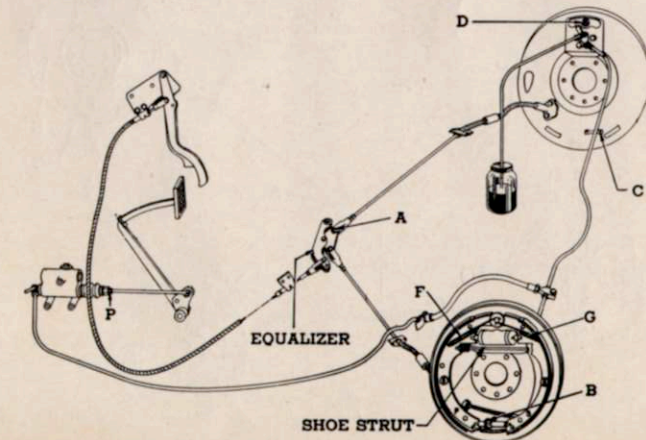


Fig. 69—Rear Portion of Brake System on Models 1803 and 1806. Note Absence of Shoe Eccentric Adjustment

show **same** clearance, then tighten lock nuts securely without moving anchors.

Do the same at other 3 wheels.

Models 1804, 1805, 1807 and 1808

1. Jack up all four corners of car. Remove wheels and inspection covers from drums and from backing plates. Remove clevis pin from each hand brake pull cable and apply hand brake lever one notch.

2. Execute "a" and "b" adjustments at each wheel.

(a) Insert a .010 inch feeler blade between lining and drum at **lower** end of secondary shoe (rear shoe) and turn eccentric "E" in direction of forward wheel rotation until .010 inch feeler is firmly gripped. Loosen lock nut on anchor "D" one turn, insert the .010 inch feeler at upper end of the rear shoe (secondary shoe) then turn anchor in direction of forward wheel rotation until feeler is firmly gripped. Refer to Fig. 70.

Recheck clearance at both ends of secondary shoe. If it is not .010 inch, readjust eccentric and anchor until both ends show .010 inch, then tighten lock nuts securely without moving anchor or eccentric.

(b) Turn star wheel clearance adjuster "B" through port "C" until each drum can just be turned with both hands.

3. Adjust length of both pull cables until all slack is removed, then reconnect cables and place hand lever in fully released position.

Back off star wheel adjuster at all four brakes until drums just turn freely. Approximately 22 notches back-off is sufficient.

Notes for the Mechanic

Brake pedal must have $\frac{1}{4}$ to $\frac{1}{2}$ inch free travel before engaging master cylinder piston. If pedal has less than $\frac{1}{4}$ inch free travel the master cylinder by-pass port will be obstructed by the piston cup and brakes will drag when fluid becomes slightly heated after several brake applications. Adjust at push rod nut "P," Fig. 70.

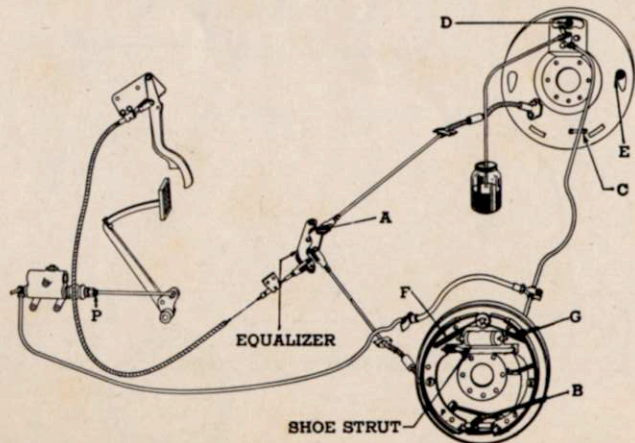


Fig. 70—Rear Portion of Brake System Models 1804-5-7-8. The Secondary Shoe Eccentric "E" is Not Used on the 1803 and 1806

Lining requirements are indicated below:

	1803-1806	1804-5-7-8	1803A
Primary, 4 pieces.....	2" x 11 $\frac{1}{2}$ "	2 $\frac{1}{4}$ " x 13"	2 $\frac{1}{2}$ " x 13"
Secondary, 4 pieces.....	2" x 13"	2 $\frac{1}{4}$ " x 13"	2 $\frac{1}{2}$ " x 13"
Lining thickness.....	$\frac{3}{16}$ "	$\frac{3}{16}$ "	$\frac{3}{16}$ "

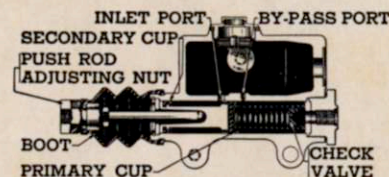


Fig. 71—If the Master Cylinder By-pass Port is Obstructed the Brakes Will Drag

Automatic Top

(Used on Convertible Coupes)

The power for raising or lowering the automatic top is supplied by the car engine vacuum, which is controlled by a valve on the left side of the instrument panel, and two power cylinders located behind the front seats.

The motor vacuum line is connected to the control valve on the instrument panel. On this valve there are also two pipe lines leading to the vacuum cylinders, one to the top of the cylinders and the other to the bottom of said cylinders.

Caution: The top should not be lowered or raised while the car is in motion. Best results will be obtained at engine idling speed, throttle closed. The required vacuum is about 17 inches.

If the top does not lower or raise with engine running at idling speed and valve control knob in proper position, the following parts should be inspected:

- Control valve on instrument panel.
- Pipe lines.
- Vacuum cylinders.
- Top folding arm assembly.

A. Control valve should operate freely without leaks. Check hose connections at valve for leaks. Check valve for proper assembly. When the valve has been disassembled, it should be reassembled with a little fibre grease between rotor or slide and the valve body, to provide a perfect vacuum seal.

B. Pipe lines should be free of kinks and leaks and may be checked with a vacuum gauge attached first to the engine to find the intake manifold vacuum, and then by attaching the gauge alternately to each of the tubes which enter the vacuum cylinder. As each tube is checked, the one on the opposite cylinder must be plugged to prevent leakage at that point.

- C. Vacuum cylinders should be checked to see that they are not dented or otherwise damaged. Check the piston rod seal at top of the cylinder for leaks. Piston leaks may be checked by disconnecting the piston rod from the top structure and moving it up with the valve knob pulled out, or down with the valve knob pushed in, with engine not running. Vacuum cylinders may be lubricated through the upper hose connection by detaching the hose from the tube and inserting it in 1 oz. container of shock absorber oil, or a half and half mixture of Neat's Foot Oil and kerosene. Operating the cylinder downward will draw in the lubricant.
- D. Top folding arm assembly should be checked for binding of top linkage, tight rivets and bolts. It is very important that no bind exist between the cylinder and the piston rods. Make sure that the piston rod and cylinder mounting are directly in line so that the piston can rock freely on its lower connection, otherwise a bind may develop which will ruin the piston rod seal and cause a leak.

Tires

Tires are balanced and marked with a red dot to indicate the proper location for the valve stem of the inner tube. The tube should always be installed with the valve stem aligned with the red dot on the tire casing.

To assure maximum tire life and minimum road reaction vibration, switch the location of wheel and tire assemblies at least every 10,000 miles and preferably every 5,000 miles. The recommended method is to move right front tire and wheel to left rear, left rear to right front, left front to right rear and right rear to left front.

For cars driven at high speeds and for all owners who desire minimum road reaction vibration, the tire and wheel assemblies should be checked for unbalance and rebalanced if necessary at least every 10,000 miles and preferably at 5,000 mile intervals on cars driven most of the time at road speeds above approximately 60 miles per hour.

A good plan to follow in any case is to check the tire and wheel balance every time the assemblies are switched for wear equalization. If a wheel and tire assembly has been rebalanced and a new tire is later installed, the new tire and wheel should be rebalanced.

Recommended tire inflation pressures are listed on page 3.

Trunk Shelf

To assure a neat fit of the detachable trunk compartment shelf proceed as follows whenever the spare wheel is removed for any reason: Place spare wheel on trunk floor and install shelf on wheel but do not install the wheel retaining clamp. Move wheel and shelf assembly to the right and forward or backward until edge of shelf conforms to contour of body. Now install wheel clamp and tighten clamp screw securely.