►*TORSION LEVEL SUSPENSION CAR SERVICING CAUTION:* Do not jack car up in rear with jack placed under rear load arms or any part of torsion level suspension assembly. Rear load arm link may become disengaged from arm.

►*AIR CONDITIONED CAR SERVICE CAUTION: Before disconnecting any part of air conditioning equipment or lines, see "Air Conditioning Service Cautions in Miscellaneous Section.*

►*ELECTRICAL EQUIPMENT NOTE: Both Auto-Lite and Delco-Remy electrical equipment used.*

## MODEL IDENTIFICATION

| Model | Model Designation | Series |
|---|---|---|
| Clipper Deluxe | 5622 | 5640 |
| Clipper Super | 5642, 5647 | 5640 |
| Clipper Custom | 5662, 5667 | 5660 |
| Packard (290 HP) | 5682, 5687 | 5680 |
| Packard (310 HP) | 5697, 5699 | 5688 |
| Packard Executive | 5672A, 5677A | 5670 |

**SERIAL NUMBER:** Stamped on plate attached to left front hinge pillar post.

**ENGINE NUMBER:** Stamped on front end of engine block between cylinder banks, directly behind water pump.

►*DETONATION CORRECTION (First Cars in Low Octane Areas):* If detonation not eliminated by correcting other engine conditions (carbon deposits etc.), early Distributors can be converted to later type with different advance performance. *See Auto-Lite & Delco-Remy Distributors below.*

## TUNE-UP

**COMPRESSION PRESSURE:** 120 lbs. minimum at 150 RPM. Variation between cylinders should not exceed 10 lbs.

**VACUUM READING:** 18-21" at idling speed.

**VALVE TAPPET CLEARANCE:** None required in service (hydraulic).

**MANIFOLD HEAT CONTROL:** Thermostatic spring type mounted between right bank exhaust manifold and exhaust pipe. With heater valve in closed position, hook in end of coil should assume a position approximately 90° clockwise from coil anchor pin at normal room temperatures. Valve should operate freely.

►*NOTE:* When valve is closed, most exhaust gases are discharged through left exhaust pipe.

### IGNITION

**FIRING ORDER:** 1-8-4-3-6-5-7-2

**Cylinders**—RIGHT BANK 2-4-6-8. LEFT BANK 1-3-5-7.

**SPARK PLUG GAP:** .033-.037".

**Spark Plugs**—Champion N-18. 14mm. Torque to 26-30 ft. lbs.

### AUTO-LITE

**COIL: Auto-Lite CAD-4004.** *12 Volt.*

**Ignition Current**—2.2 amps. idling HOT.

**Resistor**—Auto-Lite PU-4001.

►*COIL RESISTOR NOTE:* Resistor is connected in series with primary circuit between battery and coil. Resistor is by-passed during cranking by lead from starter solenoid to coil.

**DISTRIBUTOR: Auto-Lite IBJ-4001-D (5640 Early), IBJ-4001C (5660 Early), IBJ-4001E (5640, 60, 70 Later).** *12 Volt. NOTE* - Delco-Remy Distributor 1110865 also used on later 5640, 60, 70.

►*DISTRIBUTOR CONVERSION TO CORRECT DETONATION (IBJ-4001C & IBJ-4001D):* Install all parts furnished in conversion kit for each distributor as listed below. Install new IBJ-4001E nameplate (furnished in kit) and check advance performance which should agree with IBJ-4001E data below.

**IBJ-4001C Conversion** – Install all parts furnished in Conversion Kit No. 6484609 as follows: Distributor Stop & Cam Plate, Governor Weight Springs (Weak & Heavy Spring), Vacuum Advance Unit Spring, and small parts.

**IBJ-4001D Conversion** – Install all parts furnished in Conversion Kit No. 6484607 as follows: Vacuum Advance Unit, Vacuum Spring, Governor Weight Springs (Weak & Heavy Spring), and small parts.

**Condenser** – Auto-Lite IBB-2015L. **Capacity** .25-.28 mfd.
**Contact Point Set** – Auto-Lite IGW-2038HS.
**Breaker Gap**—.017".
**Cam Angle**—31°±3°.
**Breaker Arm Spring Tension**—17-20 ozs.
**Rotation**—Counter-clockwise viewed from above.

**Automatic Advance—IBJ-4001C**

| Degrees Distr. | RPM | Degrees Eng. | RPM |
|---|---|---|---|
| Start | 300 | 0 | 600 |
| 1 | 350 | 2 | 700 |
| 10 | 850 | 20 | 1700 |
| 14 | 1765 | 28 | 3530 |
| 15 | 2000 | 30 | 4000 |

**Automatic Advance—IBJ-4001D**

| | | | |
|---|---|---|---|
| Start | 300 | 0 | 600 |
| 1 | 350 | 2 | 700 |
| 10 | 850 | 20 | 1700 |
| 13 | 1485 | 26 | 2970 |
| 14 | 1700 | 28 | 3400 |

**Automatic Advance – IBJ-4001E**

| Degrees Distr. | RPM | Degrees Eng. | RPM |
|---|---|---|---|
| Start | 300 | 0 | 600 |
| 1 | 375 | 2 | 750 |
| 8 | 900 | 16 | 1800 |
| 13 | 2275 | 26 | 4550 |
| 14 | 2550 | 28 | 5100 |

**Vacuum Spark Control:** Integral type.

**Vacuum Advance—IBJ-4001C**

| Distr. Degrees | Eng. Degrees | Vacuum (" of HG) |
|---|---|---|
| Start | 0 | 7 |
| 1 | 2 | 7 1/2 |
| 5 | 10 | 9 5/8 |
| 9 | 18 | 12 1/8 |
| 10 | 20 | 13 |

**Vacuum Advance—IBJ-4001D**

| Distr. Degrees | Eng. Degrees | Vacuum (" of HG) |
|---|---|---|
| Start | 0 | 6 |
| 1 | 2 | 6 3/8 |
| 6 | 12 | 8 5/8 |
| 11 | 22 | 11 5/8 |
| 12 | 24 | 12 1/2 |

**Vacuum Advance – IBJ-4001E**

| Distr. Degrees | Eng. Degrees | Vacuum (" of HG) |
|---|---|---|
| Start | 0 | 8 |
| 1 | 2 | 8 5/8 |
| 5 | 10 | 11 1/4 |
| 9 | 18 | 14 3/4 |
| 10 | 20 | 16 |

**Distributor Removal & Installation:** *See "Ignition Notes" in Packard Special Data.*

### DELCO-REMY

**COIL: Delco-Remy 1115087.** *12 Volt.*

**Ignition Current**—1.25 amps. idling HOT.

**Resistor**—Delco-Remy 1927809.

►*COIL RESISTOR NOTE:* Resistor is connected in series with primary circuit between battery and coil. Resistor is by-passed during cranking by lead from starter solenoid to coil.

**DISTRIBUTOR: Delco-Remy 1110865 (5680 Early, 5640, 60, 70 Later), 1110873 (5688 Early), 1110880 (5680, 88 Later).** *12 Volt. NOTE* - Auto-Lite Distributors also used on 5640, 60, 70.

►*DISTRIBUTOR CONVERSION TO CORRECT DETONATION (Early Distributors):* Install all parts furnished in Conversion Kit No. 6484596.

**Condenser**—Delco-Remy 1869704. **Capacity** .18-.23 mfd.
**Contact Point Set**—Delco-Remy 1918148.
**Breaker Gap**—.016".
**Cam Angle**—26-33°.
**Breaker Arm Spring Tension**—19-23 ozs.
**Rotation**—Counter-clockwise viewed from above.

**Automatic Advance - 1110865**

| Degrees Distr. | RPM | Degrees Eng. | RPM |
|---|---|---|---|
| 1-3 | 450 | 2-6 | 900 |
| 7-9 | 900 | 14-18 | 1800 |
| 9.5-11.5 | 1600 | 19-23 | 3200 |
| 11-13 | 2000 | 22-26 | 4000 |

**Automatic Advance - 1110873**

| Degrees Distr. | RPM | Degrees Eng. | RPM |
|---|---|---|---|
| Start | 300 | 0 | 600 |
| 10 | 1300 | 20 | 2600 |

**Automatic Advance – 1110880**

| Degrees Distr. | RPM | Degrees Eng. | RPM |
|---|---|---|---|
| 0-2 | 625 | 0-4 | 1250 |
| 4-6 | 1100 | 8-12 | 2200 |
| 7-9 | 1800 | 14-18 | 3600 |

**Vacuum Spark Control:** Delco-Remy 1116101 (1110865 Distr.).

**Plunger Travel** - 11/64-3/16" (1116101).

**Vacuum Advance - 1110865**

| Distr. Degrees | Eng. Degrees | Vacuum (" of HG) |
|---|---|---|
| Start | 0 | 6-8 |
| 8.75 | 17.5 | 14.5-15.5 |

**Vacuum Advance - 1110873**

| Distr. Degrees | Eng. Degrees | Vacuum (" of HG) |
|---|---|---|
| 5 | 10 | 16 |

**Vacuum Advance – 1110880**

| Distr. Degrees | Eng. Degrees | Vacuum (" of HG) |
|---|---|---|
| Start | 0 | 6-8 |
| 9-11 | 18-22 | 12-13.75 |

**Distributor Removal & Installation:** *See "Ignition Notes" in Packard Special Data.*

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**Idle Speed** – 450 RPM with selector lever or pushbutton in "H" range.

**Synchronizing Carburetors:** 1) Loosen both jam nuts on throttle rod at front carburetor throttle valve lever and both jam nuts at forward end of transmission throttle rod (where it connects with accelerator pedal rod), several turns.

2) Back out front and rear carburetor idle speed adjusting screws until throttle valves are closed. While holding the front carburetor throttle valves tightly closed, adjust jam nuts on throttle rod at front carburetor throttle lever so that pin fits freely in lever, then tighten jam nuts.

3) Turn in the idle speed screw on **front** carburetor until it makes contact and then turn it in **one additional turn.** Turn the four idle mixture screws (two each carburetor) all the way in and then **back them out one full turn.**

4) After engine is warmed up, adjust the **front carburetor** idle speed screw to obtain 450 RPM (selector lever in "D" or pushbutton in "H" position).

*NOTE–The rear carburetor idle speed screw is not used and should therefore remain in the "backed out" position.*

5) Adjust the idle mixture screws to obtain a smooth idle in the following recommended manner: Turn each idle mixture screw in until the lean "drop-off" point (as noticed by a drop in the tachometer and vacuum gauge readings), counting the turns while turning the needle out to its rich "drop-off" point, then returning the screw to a position midway between the two "drop-off" points. Repeat with each idle mixture screw in the following sequence: right rear, right front, left front, left rear. Adjust for the highest possible RPM and vacuum reading. Readjust front carburetor idle speed screw to 450 RPM if necessary.

6) Raise the **rear** carburetor fast idle cam so that the idle speed adjusting screw rests on the high step of the cam. Adiust fast idle screw to obtain 2300-2350 engine RPM and then drop cam away from the screw. Repeat this procedure with the **front** carburetor, adjusting the screw to obtain 1850 RPM, drop cam away from the screw. *NOTE–Because of the inaccessibility of the fast idle screws on both carburetors at low idle position, it will be necessary to shut the engine off and partially open the throttle to adjust the fast idle screws.*

**Throttle Linkage Adjustment (Ultramatic):** *See CARBURETOR above.*

► *OTHER DATA: See "Rochester 4GC" Carburetors in Carburetion Section.*

**Fuel Pump Pressure:** 3½-5 lbs. at 500 RPM.

## CARB. EQUIPMENT

**Fuel Pump:** Carter (Fuel only). Vacuum pump is part of engine oil pump assembly.

**Replacement Fuel Pump** - Carter No. M-2198S.

**Fuel Pump Pressure** - 3½-5 lbs. at 500 RPM

*See "Fuel Pumps" in Carburetion Section.*

**Gasoline Gauge:** King-Seeley Electric "CV" type (Constant Voltage) type with voltage regulator.

**Dash Unit** - K-S No. 49546 (5640, 60, 70), 49506 (5680, 88).

**Tank Unit** - K-S No. 44519.

*See "Fuel Gauges" in Carburetion Section.*

## BATTERY

**Auto-Lite 3EA-60 or Willard HDW-3KM-60.** *12 Volt,* 9 plate, 60 ampere hour capacity (20 hr. rate).

**Battery Ground** - Negative.

► *CAUTION: This is reversed from previous models.*

**Engine Ground** - Cylinder head to dash panel.

## STARTER

### AUTO–LITE

**Auto-Lite MDF-6008.** *12 Volt.* **Armature** MDF-2122.

**Drive** - Solenoid pinion shift (over-running clutch).

**Rotation** - Counter-clockwise at commutator end.

**Brush Spring Tension** - 42-53 ozs.

**Performance Data**

| Torque | RPM | Volts | Amperes |
|---|---|---|---|
| 0 ft. lbs. | 3200 min. | 10.0 | 60 max. |
| 6.5 ft. lbs. min. | Lock | 4.0 | 240 max. |

**Starting Switch:** Auto-Lite SAD-4101. Solenoid switch, with key starting. *See "Starter Controls" in Electrical Section.*

**Ultramatic Neutral Safety & Back-up Light Switch:** *See "Delco-Remy Starter" data below.*

### DELCO–REMY

**Delco-Remy 1107656.** *12 Volt.* **Armature** 1926626.

**Drive** - Overrunning clutch (solenoid pinion shift).

**Rotation** - Counter-clockwise at commutator end.

**Brush Spring Tension** - 35 ozs. min.

**Performance Data**

| Torque | RPM | Volts | Amperes |
|---|---|---|---|
| 0 ft. lbs. | 3240 | 10.6 | 91 |
| | Lock | 3.5 | 395 |

**Starting Switch:** Delco-Remy 1119760 solenoid switch, mounted on starter and controlled by Ignition & Starter Switch. Turn key full RIGHT to start. *See "Starter Controls" in Electrical Section.*

**Ultramatic Neutral Safety & Back-up Light Switch:** Delco-Remy 1998118. Located on lower end of steering column. Connected in starter control circuit so that starter operative in "N" or "P" only.

## GENERATOR

### AUTO–LITE

**Auto-Lite GJC-6001A (Early), GJC-7002F(Later).** *12 Volt.*

**Armature** - Auto-Lite GJC-2006F (GJC-6001A Gen.), GJC-2030F (GJC-7002F Gen.).

**Maximum Charging Rate** - *See Voltage Regulator.*

**Performance Data**

| Amperes | Volts | RPM |
|---|---|---|
| 20 Ⓒ | 15.0 | 1750 max. |
| 30 Ⓒ | 15.0 | 2050-2250 |

Ⓒ - Do not operate at high output without ventilating fan for any length of time. To do so may result in burned armature and fields.

**Brush Spring Tension** - 35-53 ozs. (GJC-6001A), 18-36 ozs. (GJC-7002F), with new brushes.

**Field Current** - 1.2-1.3 amps. at 10.0 volts (70°F.).

**Motoring Current** - 3.4-3.9 amps. at 10.0 volts (70°F.).

**Rotation** - Counter-clockwise at commutator end.

**Belt Adjustment:** Loosen generator-to-mounting bracket bolts and adjusting arm screw. Place Fan Belt Adjusting Tool J-4672 over head of front mounting bolt and rotate tool until arm of tool contacts edge of generator end plate. Then using torque wrench, turn tool counter-clockwise until a 20-25 ft. lbs. torque is indicated on wrench scale. While holding wrench at proper torque, tighten adjusting arm screw securely. Remove tool and tighten the generator-to-mounting bracket bolts.

### DELCO–REMY

**Delco-Remy 1102003.** *12 Volt.* **Armature** 1923535.

**Maximum Charging Rate** - *See Voltage Regulator.*

**Performance Data–Cold**

| Amperes | Volts | RPM |
|---|---|---|
| 30 | 14.0 | 2150 |

**Rotation** - Counter-clockwise at commutator end.

**Brush Spring Tension** - 28 ozs.

**Field Current** - 1.48-1.62 amps. at 12.0 volts (80°F.).

**Belt Adjustment:** Same as for Auto-Lite above.

## REGULATOR

### AUTO–LITE

**Auto-Lite VRX-6009A.** *12 Volt.*

**Cutout Relay**

**Cuts In** - 13.0-13.7 volts.

**Cuts Out** - 8.2-9.3 volts.

**Contact Gap** - .015" minimum.

**Air Gap** - .031-.034".

**Voltage Regulator**

**Setting** - 14.2-14.8 volts at 80°F., *unit operating normally while charging at 10 amps. or with a .25 ohm resistor between regulator and battery.*

**Air Gap** - .048-.052" with contacts just opening (check at brass armature stop pin).

**Checking & Adjusting** - *See Electrical Section.*

**Current Regulator**

► *SETTING CAUTION: "Temperature Compensated" type, Set to following specifications at 70°F.*

| Test A | Operating Amperes | Test B |
|---|---|---|
| 36 amps. | | 30 (28-32) |

**Test A** - After 15 minutes operation charging at 10 amps.

**Test B** - After additional 15 minutes operation with current regulator operating (load applied to hold voltage down to 13.6-13.8 volts).

**Air Gap** - .048-.052" with contacts just opening (check at brass armature stop pin).

**Checking & Adjusting** - *See Electrical Section.*

### DELCO–REMY

**Delco-Remy 1119123.** *12 Volt. NOTE - Regulator is "1119000 Series". Specifications below are "Normal" settings.*

**Cutout Relay**

**Cuts In** - 11.8-13.5 volts (Hot).

**Contact Gap** - .020".

**Air Gap** - .020" (with contacts just closed).

**Voltage Regulator**

**Setting** - 13.8-14.8 volts (Hot).

**Air Gap** - .075" with armature pressed down to point where contacts just touching.

**Checking & Adjusting** - *See "1119000 Series" Regulator in Electrical Section.*

**Current Regulator**

**Setting** - 27-33 amps. (Hot).

**Air Gap** - .075" with armature pressed down to point where contacts just touching.

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**Checking & Adjusting** - *See "1119000 Series" Regulator in Electrical Section.*

## MISC. ELECTRICAL

**Headlamps:** Sealed Beam. *See Electrical Section.*
**Direction Signal:** *See Electrical Section.*
**Lighting Switch Removal:** Remove knob, then remove nut on instrument panel with special wrench. Remove switch.
**Stop Light Switch Location:** On brake master cylinder outlet tee.
**FUSES:** All fuses, except as noted are located on a fuse block under instrument panel.
**Stop Light** - AGW-7½ amps. (SFE-20 amps. fuse with Spring Suspension on Clipper Deluxe 4-Dr. Sedan).
**Body Wiring** - SFE-20 amps.
**Dome Light** - SFE-20 amps.
**Direction Signal** - SFE-9 amps.
**Courtesy Light** - SFE-20 amps.
**Clock** - AGA-2 amps.
**Overdrive** - AGC-15 amps., on relay on dash panel.
**Instruments** - AGW-7½ amps.
**Windshield Washer** - SFE-9 amps.
**Heater** - AGC-15 amps.
**Radio** - AGW-7½ amps.
**Antenna (Electric)** - SFE-20 amps.
**Torsion Level Motor** - AGC-30 amps., in container near starter.
**Torsion Level Control** - AGW-7½ amps., in container near starter.
**CIRCUIT BREAKERS: Lighting** - 20 ampere circuit breaker on headlight switch protects head, tail, and parking lights.
**HORNS: Sparton.** Dual horns with relay.
**Horn Relay:** Delco-Remy 1116781.

## ENGINE

► *AIR CONDITIONED CAR SERVICE CAUTION: Before disconnecting any part of air conditioning equipment or lines for access to engine, see "Air Conditioning Service Cautions" in Miscellaneous Section.*

**ENGINE SPECIFICATIONS:** Own 90° V8 (All Models).

| Model | Bore | Stroke | Displmnt. |
|---|---|---|---|
| 5640, 60, 70 | 4" | 3½" | 352 cu. ins. |
| 5680, 5688 | 4 1/8" | 3½" | 374 cu. ins. |

| Model | Rated HP | Compr. Ratio | Developed HP |
|---|---|---|---|
| 5640 | 51.2 | 9.5-1 | 240 at 4600 RPM |
| 5660, 70 | 51.2 | 9.5-1 | 275 at 4600 RPM |
| 5680 | 54.45 | 10.0-1 | 290 at 4600 RPM |
| 5688 | 54.45 | 10.0-1 | 310 at 4600 RPM |

**Compression & Vacuum Reading**—*See TUNE-UP.*
**TIGHTENING TORQUES:** *See "Tightening Specifications" in Packard Special Data.*
**ENGINE REMOVAL:** *See "Engine" in Packard Special Data.*
**OIL PAN REMOVAL:** *See "Oiling System in Packard Special Data.*
**CYLINDER HEAD REMOVAL & INSTALLATION:** *See "Cylinder Head & Manifolds" in Packard Special Data.*

### PISTONS

Aluminum alloy, cam ground, Autothermic flat head, slipper skirt, tin plated.
**Weight** - 24.762 ozs. (5640, 60, 70), 26.067 ozs. (5680, 88).
**Removal** - Pistons and rods removed from above.
**Clearance** - .000-.0015" at bottom of skirt.
**Fitting New Pistons:** Using a .0015 x 1/2" feeler gauge placed against side of cylinder wall, insert piston without rings, in an inverted position in cylinder bore. Push piston down until bottom of skirt is slightly below top of cylinder block and piston pin bore is parallel to crankshaft. Pull to withdraw feeler should be 6-11 lbs.
**Installing Pistons:** Install with "F" cast in piston strut, and notch in piston head, toward front of engine. *See Rod Installation below.*
**Replacement Pistons:** Std. size, .010", .020", .030" oversize.

### PISTON PINS

Floating type retained by lock ring at each end. Split type bushing used at upper end of rod. Pin is offset .0625" toward thrust side.

► *PISTON PIN LOCK CAUTION:* 5640 60, 70 (4" bore) engines prior to Engine Plant Nos. A-1347 and B-1196 use piston pin locks, Part. No. 440847 (.080" wire size). All 5680 & 5688 engines and 5640, 60, 70 engines beginning at above Engine Plant Nos. use piston pin locks, Part No. 440995 (.063" wire size).

**Pin Fit in Piston—(Clearance)** .0000"-.0002". Hand push fit with piston heated to 160°F.
**Pin Fit in Connecting Rod—(Clearance)** .0000"-.0004". With pin held in a vise and connecting rod horizontal, rod should fall slowly of its own weight.
**Replacement Pins:** Std. size, .003", .006" oversize.
**Piston Pin Bushing (In Connecting Rod) Installation:** *See "Piston Pins" in Packard Special Data.*

### PISTON RINGS

| Ring | Width | End Gap | Side Clearance |
|---|---|---|---|
| Compr. (1 & 2) | .078" | Ⓒ | .0015-.005" |
| Oil | .186" | .015" | .0015-.005" |

Ⓒ -.019"(5640, 60, 70),.018" (5680, 5688).
**Replacement Rings:** Std. size, .010", .020", .030" oversize.
**Installing Rings:** Install upper compression ring and oil ring with gap toward camshaft side of engine. Install lower compression ring with gap toward opposite side from camshaft. All gaps should be midway between pin bosses. Grooves on inner diameter of compression rings should be toward top of engine.

### CONNECTING RODS

**Length**—6-25/32", (center-to-center). **Weight**—26.688 ozs.
**Crankpin Journal Diameter**—2.250".
**Lower Bearing**—Replaceable precision type.
**Clearance**—.0005-.0025". **Sideplay**—.003-.011".
**Replacement Bearings:** Std. size, .001", .002", .020" Undersize.
**Installing Rods:** Install odd numbered rods in left bank and even numbered rods in right bank, with numbers on rods facing down and away from block and milled oil groove in connecting rod cap upward and toward crankshaft.

### CRANKSHAFT

**Journal Diameter**—2.4990". Five bearings.
**Bearings**—Precision type. The four front crankshaft bearings are interchangeable.
**Clearance** - .003-.0023".
**Replacement Bearings:** Std. size, .001", .002", .020" undersize.
**End Thrust:** Taken by No. 5 (rear) main bearing.
**Endplay**—.0035-.0085".
**Crankshaft Rear Main Bearing Oil Seal:** *See "Crankshaft & Main Bearings" in Packard Special Data.*
**Crankshaft Front Oil Seal:** *See "Engine Front Cover" in Packard Special Data.*
**Crankshaft Removal & Installation (With Engine in Car):** *See "Crankshaft & Main Bearings" in Packard Special Data.*
**Vibration Dampener:** *See "Vibration Dampener" in Packard Special Data.*

### CAMSHAFT

**Bearings**—Five, steel-backed babbitt lined precision bearings.
**Clearance**—.0005-.0045".
**End Thrust:** Taken by thrust plate behind camshaft sprocket. **Endplay** - .0035-.0065".
**Camshaft Removal & Installation:** *See "Camshaft & Bearings" in Packard Special Data.*
**Timing Chain:** Morse. **Width**—1". **Pitch**—.375". **Length**—64 links.
**Engine Front Cover Removal:** *See "Engine Front Cover" in Packard Special Data.*
**Engine Front Cover Oil Seal (Crankshaft Front Seal):** *See "Engine Front Cover" in Packard Special Data.*
**Camshaft Setting:** Both sprockets marked "O". Mesh chain with sprockets turned so that marks are adjacent and in line with straight edge across shaft centers.
**Timing Chain & Sprocket Removal:** *See "Timing Chain" in Packard Special Data.*

### VALVES

**Tappet Clearance:** Hydraulic lifters. Adjustment not required unless cylinder head removed or valve lifters replaced. *See "Valve Tappet Adjustment" in Packard Special Data.*

| Valve | Head Diam. | Stem Diam. | Length |
|---|---|---|---|
| Intake | 2" | .3725" | 5.712" |
| Exhaust | 1.687" | .3715" | 5.690" |

| Valve | Seat Angle | Lift | Stem Clearance |
|---|---|---|---|
| Intake | 30° | .398" | .001-.002" |
| Exhaust | 45° | .388" | .002-.003" |

**Valve Seat Width** - 3/64" (Intake), 5/64" (Exhaust).
**Valve Springs:** Single springs used. Install springs with the two closely wound coils against cylinder head.

**Valve Spring Specifications**

| Valve | Spring Pressure | Length |
|---|---|---|
| Closed | 87-97 lbs. | 1 3/4" |
| Open | 173-187 lbs. | 1 3/8" |

**Valve Guides:** Integral with cylinder head. Ream valve guide holes for oversize valves if valve stem clearance excessive. Valves are furnished with .003", .010", .020", .030" oversize stems.

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**Checking Valve Stem Clearance and Reaming Guides for Oversize Valve Stems:** *See "Valve System" in Packard Special Data.*

**Valve Lifters:** Hydraulic type.

**Hydraulic Lifter Removal, Overhaul & Testing**—*See "Valve System" in Packard Special Data.*

**Rocker Arm Assembly:** *See "Valve System" in Packard Special Data.*

## VALVE TIMING

*See "Camshaft Setting" under CAMSHAFT above.*

**Intake Valves -** Open 14° BTDC, Close 62° ALDC.

**Exhaust Valves -** Open 54° BLDC, Close 18° ATDC.

**Valve Timing Check -** Remove left bank rocker arm cover. Turn engine until No. 1 cylinder intake valve is open. Let engine stand for several minutes, until hydraulic lifter has leaked down completely. Then hold pressure against the top of the pushrod to keep lifter from refilling, and turn engine until valve closes. Insert tip of a screwdriver between end of valve stem and rocker arm to keep plunger in lifter bottomed, and turn engine until just before mark on timing gear reaches the 15° mark on the timing chain case cover as No. 6 cylinder comes up on compression stroke. Attach a dial indicator to the flange on cylinder head so that it will read any movement of the No. 1 intake valve rocker arm at the pushrod end of the arm. Turn engine very slowly until rocker arm just starts to move. At this point, mark on damper should be just 14° BTDC. *NOTE* - Maximum deflection of timing chain should be ½". If deflection is greater, it will cause a variation in the valve timing.

## OILING SYSTEM

**Crankcase Capacity:** 5 qts. (refill).

**Normal Oil Pressure:** 45 lbs. at 2800 RPM.

**Pressure Regulator Valve**—In pump body. Not adjustable.

**Pressure Relief Valve Spring**—3-19/64" (free length). Compressed to 1-3/8", pressure should be 9—9-1/2 lbs.

**Oil Pressure Indicator (Clipper Series)**—Red light on instrument panel. Lighted when oil pressure low.

**Oil Pressure Switch Engine Unit:** King-Seeley No. 47195.

**Oil Pressure Gauge (Packard Series):** King-Seeley "CV" (Constant Voltage) electric type with Gauge Voltage Regulator.

**Dash Unit -** K-S No. 49512.

**Engine Unit -** K-S No. 44000.

*See "Oil Pressure Gauges" in Miscellaneous Section.*

**Oil Pump:** Gear type. Located on rear main bearing cap and driven through distributor drive and camshaft gears. A vacuum pump is attached to oil pump cover plate and is driven by oil pump idler gear.

**Oil Pump Removal, Overhaul & Installation**—*See "Oiling System" in Packard Special Data.*

**Vacuum Pump:** Attached to engine oil pump. Serviced only as an assembly. Remove and install in same manner as oil pump. *See "Oiling System" in Packard Special Data.*

**Crankcase Ventilation:** Filter element in oil filler cap.

## COOLING

**Water Capacity:** 26 qts. Additional pint for each heater.

**Pressure Valve:** Radiator filler cap. 12 lbs. type.

**Thermostat:** Capsule type. Starts to open 167-173°F (Std.), 177-182°F (High Std.).

**Water Pump:** Packless type with sealed ball bearing. *See "Packard" in Water Pump Section.*

**Temperature Gauge:** King-Seeley "CV" (Constant Voltage) electric type with Gauge Voltage Regulator.

**Dash Unit -** K-S No. 49516 (5680, 88), 49550 (5640, 60, 70).

**Engine Unit -** K-S No. 44235.

*See "Temperature Gauges" in Miscellaneous Section.*

## CLUTCH

**Long 11CF, Assy. No. 268349 (5640, 60, 70 with Synchro-mesh Trans.).**

*See "Long" Clutches in Clutch Section.*

**Clutch Disc -** Long No. 284340 (11").

**Pedal Adjustment:** 1-1/4—1-1/2" free travel.

**Removal:** Remove transmission (see below). Remove flywheel lower housing, and clutch release bearing. Mark flywheel and clutch cover. Remove clutch cover to flywheel bolts evenly to relieve tension.

## SYNCHRO-MESH TRANSMISSION

**Own.** *See "Packard Synchro-mesh" in Transmission Section.*

**Transmission Controls:** *See "Transmission Controls" in Transmission Section.*

**Removal:** Disconnect speedometer cable, gear shift rods from levers on transmission case, and propeller shaft at rear universal joint. Remove propeller shaft completely by slipping front universal joint flange off the transmission main shaft. *(CAUTION*—Wire or tape the two bearings of the universal joint together to prevent them from falling off). Support rear of engine with a jack. Remove rear engine support mounting and support crossmember. Remove capscrews attaching transmission to flywheel housing. Using two pilots in bolt holes, slip transmission to rear so that clutch release bearing pull back spring may be unhooked. Remove transmission.

## OVERDRIVE

**Warner R11 Type.** Planetary gear type with solenoid operation and accelerator pedal controlled kickdown. Overdrive lockout switch not used.

*See "Warner R11" Overdrive in Transmission Section.*

**Overdrive Controls:** *See "Overdrive Controls" in Transmission Section.*

**Removal:** Same as for Synchro-mesh Transmission (above) after disconnecting overdrive control cable from lever on right side of overdrive case, electric leads at governor and solenoid. Remove governor, then remove solenoid.

## ULTRAMATIC DRIVE

**Own. "Twin Ultramatic",** Torque converter (with hydraulically operated direct speed clutch) and hydraulically operated planetary unit with manual control.

►*TESTING & TROUBLE SHOOTING: See "Twin Ultramatic Transmission" in Transmission Section.*

**Lubrication:** Check fluid level every 1000 miles, drain and refill every 25,000 miles.

**Checking Fluid Level**—*(CAUTION—Fluid level must be checked at normal operating temperatures and after engine has been idling at 800 RPM. for at least one minute to completely fill the transmission).* Run engine at low idle speed while fluid level is being checked, using the dipstick located in engine compartment. Add fluid through dipstick tube as required to bring level to "Full" mark on dipstick.

*NOTE*—If fluid level doubtful due to bent or distorted dipstick tube, check actual fluid level in transmission as follows: Place car on level floor and allow engine to run at idle speed for five minutes in "N" (neutral). Place a pan under rear of transmission and remove plug in rear of transmission case. If no oil runs out of opening, add oil until it begins to run out, install plug, then ADD ONE QT. If oil does run out when plug removed at rear of transmission, allow to drain to level of hole, then ADD ONE QT.

**Capacity**—Approximately 11 qts. Use only Packard Ultramatic Drive or any Type "A" Automatic Transmission Fluid which has an AQ-ATF number embossed on container.

►*OTHER TWIN ULTRAMATIC SERVICE DATA: See "Twin Ultramatic Transmission" in Transmission Section.*

## UNIVERSALS

**Spicer (Std. & Overdrive Cars), Universal Products (Ultramatic Drive Cars).**

►*CAUTION:* Rear universal joint flange nut controls rear axle pinion bearing preload which **must be adjusted** whenever nut is loosened. *See "Packard Hypoid" in Rear Axle Section.*

## REAR AXLE

**Spicer.** Semi-floating, hypoid gear, with Hotchkiss drive. *See "Spicer Hypoid" in Rear Axle Section.*

**Axle Ratios -** Optional ratios available as follows:

**Synchro-mesh -** 3.54-1, 4.09-1.

**Overdrive -** 3.54-1, 4.09-1.

**Ultramatic -** 2.87-1, 3.07-1, 3.31-1, 3.54-1, 4.09-1.

**Backlash -** .003-.006".

**Carrier Removal:** Remove axle shafts (see Axle Shaft Removal below). Disconnect rear universal (wire trunnions), wire or prop propeller shaft up against floor pan with a 2 x 4" inserted inside frame crossmember. Drain differential, replace drain plug. Clean off housing, take off carrier mounting nuts, lift carrier assembly out.

**Axle Shaft Removal:** Remove wheel and brake drum (use screw type puller J-4153 (do not use knock-out type puller or thrust block may be damaged). Disconnect brake line at wheel cylinder. Remove nuts at oil seal guard and take off seal guard, gasket, retainer, oil seal, brake support plate, and bearing shims. Remove axle shaft and bearing using Puller J-2552 (do not drag shaft on inner seal). Use Tool J-943-B to remove

CONTINUED FROM PRECEDING PAGE

**Wheel Bearing Adjustment:** Endplay controlled by shims between flange end of housing and brake backing plate. Add or remove shims (furnished .005", .007", .020" thick) at one wheel if .050" or under; at both wheels if over .050" to secure .004-.007" endplay. Normally adjust by tightening nut to 20 ft. lbs. and back off one hex and lock.

**Endplay -** .004-.007".

## SHOCK ABSORBERS

**Delco or Monroe.** Direct acting hydraulic type. Serviced by replacement.

## FRONT SUSPENSION

**Independent.** Coil springs (5640), "Torsion Level Suspension" (others).

*See "Packard" & "Packard Torsion Level Suspension" in Suspensions & Wheel Alignment Section.*

**Kingpin Inclination–** 5° 50'.

**Caster–**Neg. 1° ± 1/2°.

**Camber–**0° (Pos. 3/4° to Neg. 1/4° range).

**Toe-In–**0" (plus 1/16", minus 0").

## STEERING

**Manual: Gemmer.** Worm and three tooth roller.

*See "Gemmer Worm & Roller" in Steering Section.*

**Power Steering:** Bendix or Monroe Linkage Types.

*NOTE* - Gemmer Worm & 2-Tooth Roller Steering Gear used with both types.

*See "Bendix Linkage Type" or "Monroe Linkage Type" Power Steering in Steering Section.*

**Steering Linkage:** *See "Steering Linkage" in Steering Section.*

**Steering Wheel & Horn Button Removal:** *See "Gemmer Worm & Roller" in Steering Section.*

**Steering Gear Removal:** *See "Gemmer Worm & Roller" in Steering Section.*

## BRAKES

**Bendix Hydraulic.** Single Anchor (without eccentric). Hand lever applies rear wheel service brakes.
rear wheel service brakes.
*See "Bendix Hydraulic" in Brake Section.*

**Drum Diameter -** 11"(5640, 60, 70),12" (5680, 5688).

| Lining Width | Front | Rear |
|---|---|---|
| 5640, 5660, 5670 | 2½" | 2" |
| 5680, 5688 | 2¼" | 2" |

**Lining Thickness -** 3/16" (All Series).

| Lining Length | ① Primary | ① Secondary |
|---|---|---|
| 5640, 5660, 5670 | 9 5/16" | 12" |
| 5680, 5688 | 11 1/2" | 13" |

① - Front & Rear wheels.

**Clearance -** Turn brake adjusting screw until wheel can just be turned by hand, then back off shoe until wheel turns free.

**Standard Master Cylinder:** On bracket on left side of frame near transmission support.

**Checking Fluid–**Access hole in front floor pan at left corner of drivers seat.

**Removal–**Remove brake lines from master cylinder. Disconnect pushrod at pedal. Remove gearshift selector linkage bellcrank from mounting bolt stud. Remove mounting bolts and master cylinder.

**Power Brakes: Bendix.** Combination power cylinder and hydraulic master cylinder.

*See "Bendix Power Unit" in Brake Section.*

**Checking Fluid–**Check level every 1000 miles. Add fluid to bring level to full mark.

**Removal of Power Unit–**Disconnect hose line and electrical wiring from power unit (raise hydraulic line above level of junction assembly to prevent fluid leakage). Disconnect and remove brake and accelerator pedal. Remove steering column grommet retainers, slide grommet out of way. Remove carpet retainers and fold carpet back. Remove cover plate screws, then remove power brake and cover as an assembly, take out mounting screws and remove power brake from cover.

## MISC. MECHANICAL

**Windshield Wipers:** Vacuum type, cable operated. *See "Windshield Wipers" in Miscellaneous Section.*

**Air Conditioning: Harrison.** *See "Frigidaire & Harrison" Air Conditioning in Miscellaneous Section.*

**Power Window Regulators:** Electric type with individual motors in each window. *See "Electric Window Regulators" in Miscellaneous Section.*

**Power Seat Controls:** Individual electric motors for horizontal and vertical seat adjustment. *See "Electric Seat Controls" in Miscellaneous Section.*

**Power Top Controls:** Hydro-Lectric type. *See "Hydro-Lectric Top Controls" in Miscellaneous Section.*