

REPAIR and TUNE-UP MANUAL

Illustrated Service Procedure and Specifications for

PACKARD

- SERIES 21, 22 -

STANDARD EIGHT	120"
SUPER EIGHT	120"
CUSTOM EIGHT	127"



SPECIFICATIONS

STANDARD EIGHT: Eight cyl., "L" head. Bore, 3-1/2"; stroke, 3-3/4". Piston displacement, 288 cu/in. Compression ratio, 7.00:1. Horsepower - AMA., 39.2; Brake, 145 @ 3600 rpm.

SUPER EIGHT: Eight cyl., "L" head. Bore, 3-1/2"; stroke, 4-1/4". Piston displacement, 327 cu/in. Compression ratio, 7.00:1. Horsepower - AMA., 39.2; Brake, 145 @ 3600 rpm.

CUSTOM EIGHT: Eight cyl. "L" head. Bore, 3-1/2"; stroke, 4-5/8". Piston displacement, 356 cu/in. Compression ratio, 7.00:1. Horsepower, - AMA. 39.2; Brake, 160 @ 3600 rpm.

Photographs: Courtesy Packard Motor Car Company

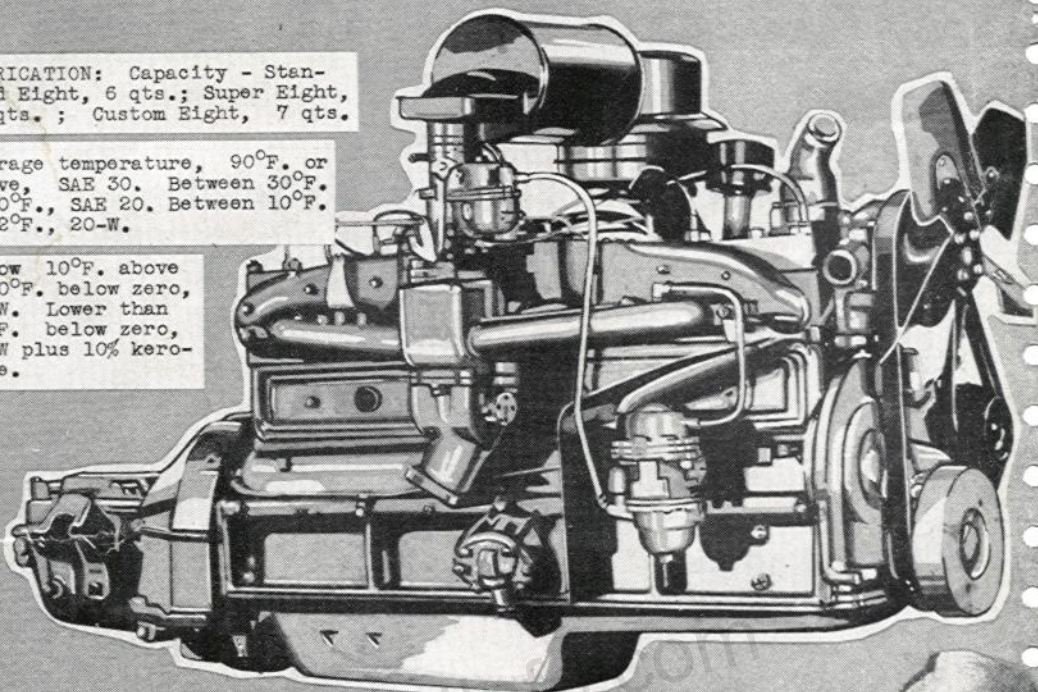
PACKARD

ENGINE

LUBRICATION: Capacity - Standard Eight, 6 qts.; Super Eight, 6 qts.; Custom Eight, 7 qts.

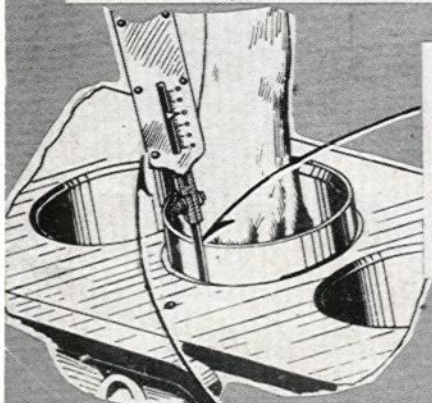
Average temperature, 90°F. or above, SAE 30. Between 30°F. & 90°F., SAE 20. Between 10°F. & 32°F., 20-W.

Below 10°F. above & 10°F. below zero, 10-W. Lower than 10°F. below zero, 10-W plus 10% kerosene.



PISTONS: All - Aluminum alloy, strut type, cam ground. Piston & connecting rod assemblies removed from top of block.

PISTON CLEARANCE: All - Skirt clearance .0005" - .001".



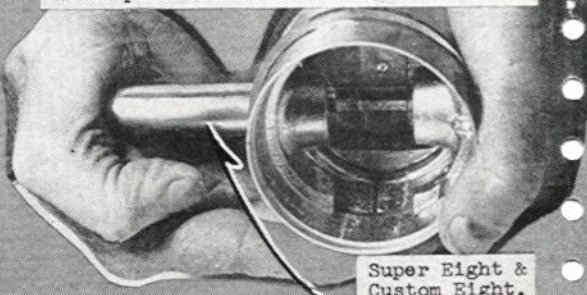
Check with .0015" X 1/2" feeler gage inserted between thrust side of piston & cylinder wall.

Feeler, piston & cylinder wall must be clean & dry when testing piston clearance.

Clearance correct when 12 - 18 lbs. pull required to withdraw feeler gage.

Install piston & connecting rod assembly with slot in piston facing camshaft side of engine.

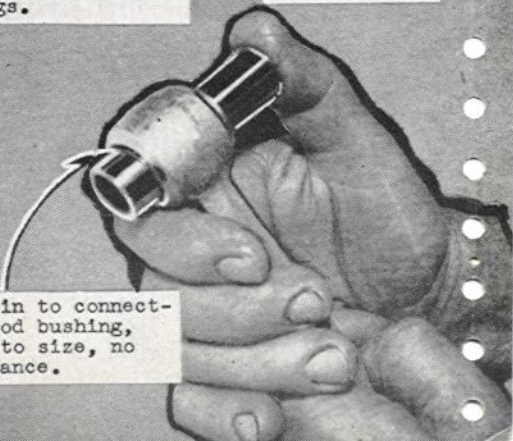
Pin Fit To Piston - Standard Eight, thumb push fit at room temperature.



PISTON PIN: All - Floating type, secured in piston bosses by snap rings.

Super Eight & Custom Eight, palm push fit with piston heated in hot water at 160°.

Fit pin to connecting rod bushing, size to size, no clearance.



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ENGINE

COOLING SYSTEM : Capacity - Standard Eight, 4-1/2 gals. Super & Custom, 5 gals.

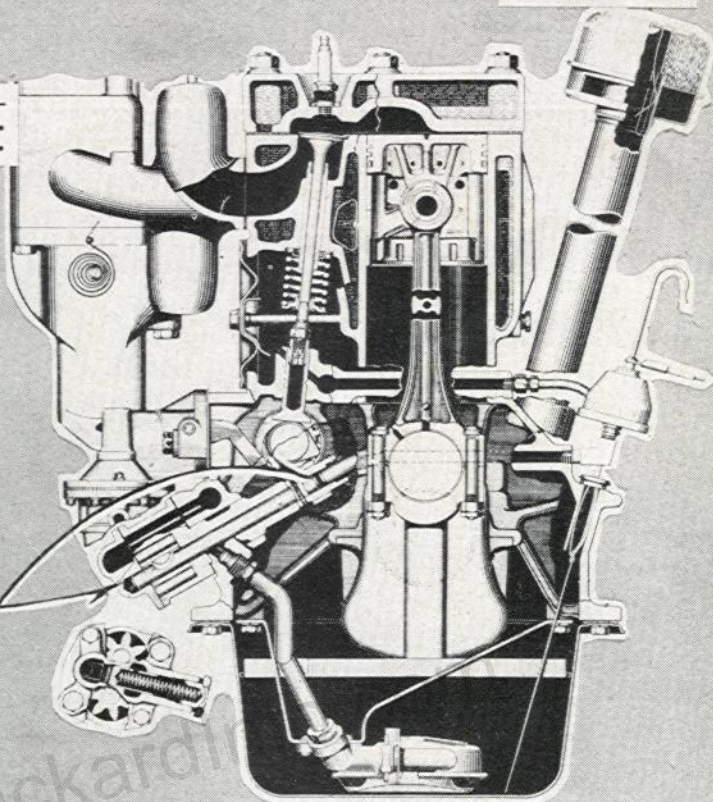
THERMOSTAT: All - Located in cylinder head outlet elbow.

Thermostat opens at 147-1/2°F.

OIL PUMP INSTALLATION: All - Turn engine until No.1 piston is at TDC of compression stroke.

Install pump with slot in driving gear parallel to center line of camshaft. Punch mark on driving gear should be on top.

Oil Pressure - With oil of proper viscosity & engine at normal operating temperature, oil pressure should be 50 lbs. at 45 mph.



TUNE-UP

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

SPARK PLUG GAP: All - Check with round feeler. Gap, .0255" - .0305".

Ignition timing, 6° BTDC.

Breaker point gap, .0125" - .0175".

Breaker arm spring tension, 19-23 oz.

Leave vacuum line disconnected until engine is correctly timed with synchroscope.

Vacuum advance starting point adjusted by changing spring pressure.

DISTRIBUTOR: Standard & Super Eight - Auto-Lite, IGP-4502-B.

Vacuum advance starts at 7" (of mercury). Full advance, 5-1/2° at 16" (of mercury).

Automatic advance starts at 250 rpm. (dist.). Full advance, 11.5° at 1800 rpm. (dist.).

Custom Eight - Auto-Lite IGT-4203.

Vacuum advance starts at 10" (of mercury). Full advance, 6° at 17" (of mercury).

Automatic advance starts at 325 rpm. (dist.). Full advance, 10.75° at 1550 rpm. (dist.).

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ENGINE

PISTON RINGS: All - Two compression rings & one oil ring, located above piston pin.

Gap Clearance - Compression rings, .007"-.017". Oil rings, .007"-.015".

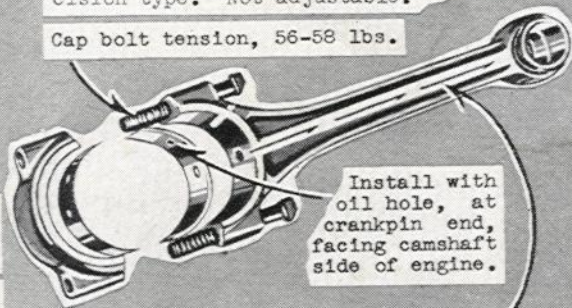
Radial clearance, .0005" - .0025".
Side clearance, .004" - .010".

CRANKSHAFT: All - Standard & Super Eight, 5 main bearing journals; Custom Eight, 9 main bearing journals.

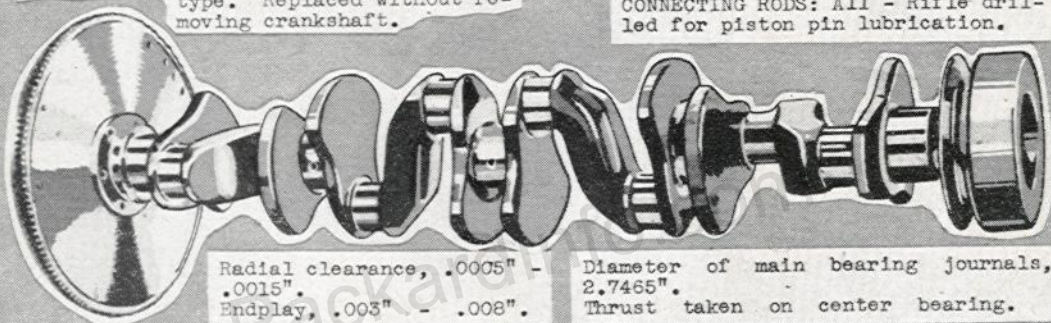
MAIN BEARINGS: All - Steel back, babbit lined, replaceable precision shell type. Replaced without removing crankshaft.

CONNECTING ROD BEARINGS: All - Steel back, babbit lined, replaceable precision type. Not adjustable.

Cap bolt tension, 56-58 lbs.



CONNECTING RODS: All - Rifle drilled for piston pin lubrication.



VALVES: All - Inlet valve head diameter, 1-43/64"; exhaust valve head diameter, 1-7/16".

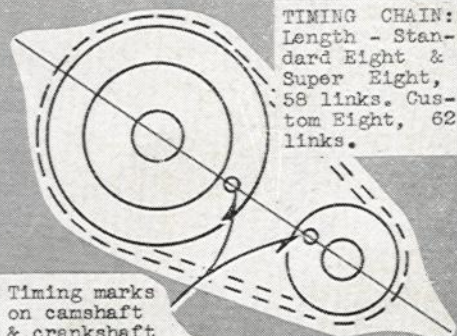
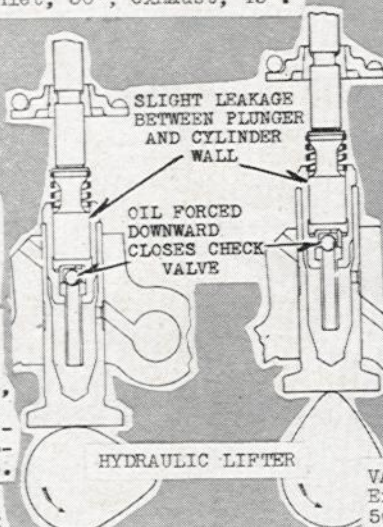
Seat angle - Inlet, 30°; exhaust, 45°.

CAMSHAFT BEARINGS: All - Steel back, babbit lined, not adjustable. Radial clearance, .001" - .003". Endplay, .0025" - .006".

VALVE TAPPET CLEARANCE FOR TIMING:
Inlet .0125";
exhaust .015".
Custom Eight, no manual setting.

VALVE TAPPET RUNNING CLEARANCE: Inlet .006"; exhaust, .008" (warm setting). Custom Eight, automatic take up.

VALVE SPRINGS: All - Spring pressure compressed to 1-3/4", closed valve position, 60-66 lbs. Pressure when compressed to 1-13/32", open valve position, 135 - 145 lbs.



Timing marks on camshaft & crankshaft sprockets should be together & fall under line drawn between sprocket centers.

Cylinder head nut torque tension, 60-62 ft. lbs.

VALVE TIMING: Standard Eight & Super Eight - Inlet opens 10° BTDC.; closes 50° ALDC. Exhaust opens, 50° BLDC.; closes 5° ATDC.

Custom Eight - Inlet opens, 4° BTDC.; closes, 51° ALDC. Exhaust opens, 49° BLDC.; closes 10° ATDC.

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CARBURETOR: Custom Eight - Carter No. WDO 531-S. Dual down-draft, climatic control.

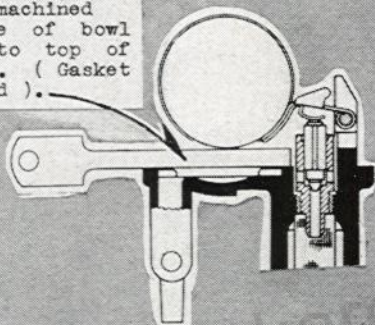


Initial idle mixture setting, 1 - 2 turns open.

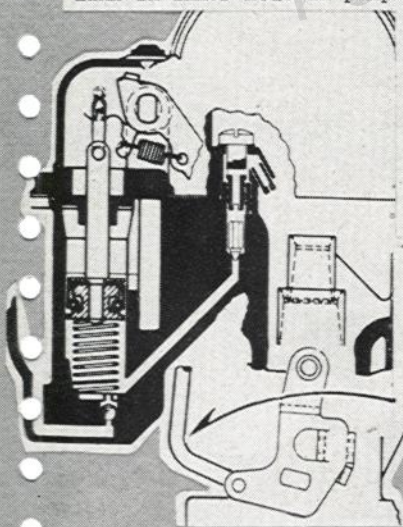
Turn screw out to richen mixture.

FLOAT LEVEL: Use Carter gage No. T-109-154 & gage both ends of float.

Float level $5/32$ " from machined surface of bowl cover to top of float. (Gasket removed).



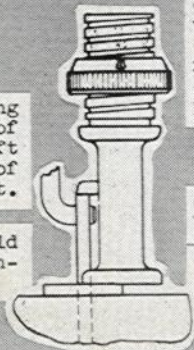
PUMP ADJUSTMENT: With pump connector link in inner hole in pump arm & throttle adjustment screw backed out, pump plunger should travel $26/64$ " from wide open to closed throttle position.



Adjust by bending throttle connector rod at lower angle with tool No. T-109-75.

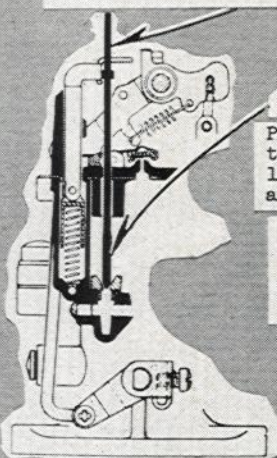
Measure pump stroke by placing gage No. T-109-117-S on rim of bowl cover around plunger shaft & measuring from top surface of connector link at pump shaft.

METERING ROD ADJUSTMENT: Should be made when leaner than standard rods are installed.



Note - Do not disturb pump adjustment.

Install metering rod gage (Carter tool No. T-109-113) in place of metering rods.



Be sure gage seats in jet. Install rod pin & vacuum piston link.

Press firmly on piston link until lip on link contacts lip on anti-percolator arm.

There should be less than $.005$ " clearance between metering rod pin & shoulder of notch on gage.

Adjust by bending lower tongue of anti-percolator arm.

ANTI-PERCOLATOR ADJUSTMENT: To be made after metering rod setting & installation of metering rods.

Pump & metering rod adjustments must not be disturbed.

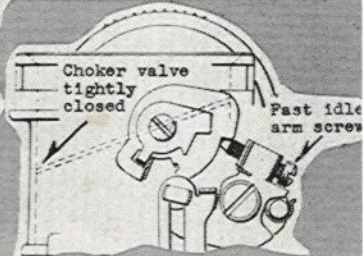
Back out throttle lever adjusting screw. With throttle valve tightly closed, insert $.015$ " feeler gage between anti-percolator stem & lip on anti-percolator arm.



Bend lips on anti-percolator arm to depress stem so indicator line is flush with top of anti-percolator plug.

Adjustment must be even on both anti-percolator lips.

FAST IDLE ADJUSTMENT: Hold choke valve tightly closed & adjust fast idle arm screw to give $.023$ " - $.028$ " opening between edge of throttle valve & bore of carburetor, side opposite port.



CHOKE: Climatic control type; offset butterfly valve.

Choke heat suction hole size, $.104$ " (No. 37 drill).

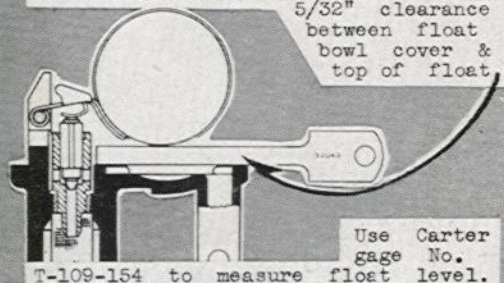
PACKARD

TUNE-UP

CARBURETOR: Standard Eight - Carter WDO-644-S.
Super Eight - Carter WDO - 643 - S.

IDLE ADJUSTMENT: Initial idle mixture setting - WDO-644-S, $5/8$ - $1-1/8$ turns open; WDO-643-S, $3/4$ - $1-1/4$ turns open.

FLOAT LEVEL: With float bowl cover inverted, gasket removed, set to obtain $5/32$ " clearance between float bowl cover & top of float.



Use Carter gage No. T-109-154 to measure float level.

PUMP ADJUSTMENT: Use Carter gage T-109-117-S - WDO-644-S, $14/64$ "; WDO-643-S, $28/64$ ".

Place pump gage No. T-109-117-S on rim of bowl cover around plunger shaft & measure to top of connector link where it extends through pump shaft.

Reading should be taken at closed & wide open throttle.

Difference in gage readings should be "14" on 643-S & "28" on 644-S.

Adjust by bending connector rod at bottom angle.

METERING ROD ADJUSTMENT: Made when assembling carburetor or when leaner than standard rods are installed.

Note - Do not disturb pump adjustment.

Back out throttle lever adjustment screw until throttle valves seat.

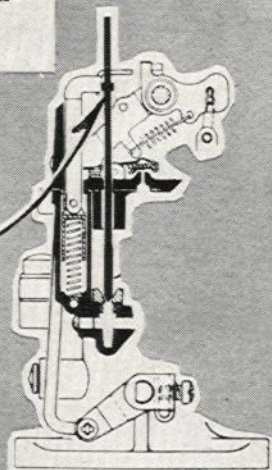
Insert one metering rod gage No. T-109-113 in place of metering rod so gage seats in jet. Install rod pin & pin spring in vacuum piston & link assembly.

Press down lightly on top of vacuum piston link until lip contacts tongue on anti-percolator arm.

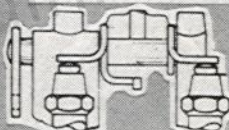
There should be less than .005" clearance between metering rod pin & shoulder in notch of gage with throttle valve seated.

Adjust by bending tongue on pump arm.

Vacuum piston & link must not bind or drag in any position.



ANTI-PERCOLATOR ADJUSTMENT: To be made after metering rod adjustment. Back out throttle lever adjustment screw so valves seat in bores of carburetor.



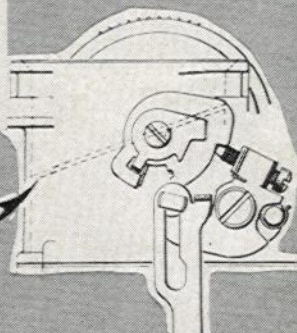
With .015" feeler blade inserted between anti-percolator stems & lips of anti-percolator arm, bend lips so center of indicator

lines are flush with top of anti-percolator plug.

FAST IDLE ADJUSTMENT: Hold choke valve tightly closed. Adjust fast idle arm screw until there is .026" clearance between edge of throttle valve & bore of carburetor, side opposite idle port on Model 643S or .020" clearance on Model 644S.

Set at index.

Choke valve closed.



CHOKE: Climatic Control type; offset butterfly. Choke heat suction hole, in body, size No.37 (.104") drill.