

APPENDIX: TUNE-N-TEST

TUNE-N-TEST PROCEDURE

The services outlined below will assure peak performance in most cases. In isolated cases other factors may cause trouble. For this reason, it is important that performance be checked after the tune-up by making a road test. If this test shows subnormal performance, appropriate steps under Diagnosis should be followed to find and correct the difficulty. Tune-N-Test operations should be performed in accordance with the detailed procedures supplied with special testing equipment, providing none of the operations on this chart are omitted.

Basic information is given for each step. The appropriate sections of the shop manual should be referred to for detailed procedures.

CLEAN TOP OF BATTERY, TIGHTEN TERMINALS AND HOLD DOWN CLAMP

Clean and neutralize the top of the battery with a solution of baking soda and water. The top of the battery must be clean to prevent current leakage between the terminals and from the positive terminal to the hold down clamp. This is especially important with the 12-volt battery due to the increased voltage, increased rate of corrosion build-up, and the short distance between the positive terminal and the hold down clamp.

In addition to current leakage, prolonged accumulation of acid and dirt on top of the 12-volt battery may cause blistering of the material covering the connector straps and corrosion of the straps. After tightening terminals, coat them with petrolatum to protect them from corrosion. Hold down clamp should be tightened to 22-27 lb. in. torque. **NOTE:** Excessive tightening of the hold down clamp can crack the battery case.

TEST SPECIFIC GRAVITY OF BATTERY

Battery should be in good condition and have a specific gravity of at least 1.215 (corrected to 80°F.) before proceeding with tune-up. If battery is low, it should be charged. Cause should be found and corrected.

TEST BATTERY VOLTAGE WHILE CRANKING ENGINE

CAUTION: Disconnect distributor to coil primary wire on V-8 models during this test to prevent engine from firing.

Terminal voltage while cranking must not be less than 9.0 volts on a 12-volt battery or 4.5 volts on a 6-volt battery. Engine cranking speed should also be observed during this check to see that it is satisfactory. If cranking speed is low, check starting circuit to locate cause of low speed. If battery voltage is low while cranking, further tests of battery and/or starting motor circuit should be made to locate trouble.

REMOVE AND RECONDITION SPARK PLUGS

Check to see that correct spark plugs are being used. Spark plug upper insulators should be thoroughly cleaned to prevent possible flash-over. Thoroughly clean lower insulator and cavity by sand blasting. File both electrodes flat (rounded surfaces increase voltage required to fire plugs) and set gap (.035" on V-8, .025" on all other models). Leave plugs out for compression check. When plugs are installed, use new gaskets and tighten plugs to 25 lb. ft. torque.

TEST COMPRESSION PRESSURE OF EACH CYLINDER

Unless checking for worn rings or for the cause of low speed miss, compression check should not be necessary.

Test compression with engine warm, all spark plugs removed and throttle and choke wide open. No cylinder should be less than 80% of the highest cylinder (see examples). Excessive variation between cylinders, accompanied by low speed missing of the cylinder or cylinders which are low, usually indicates a burned valve. Low pressures, even though uniform, may indicate worn rings. This will usually be accompanied by excessive oil consumption.

Example 1

Cyl.	1	2	3	4	5	6	7	8
Press.	136	138	135	144	102	137	140	141

80% of 144 (highest) is 115. Thus cylinder No. 5 is less than 80% of No. 4. This condition, accompanied by low speed missing, indicates a burned valve or broken piston ring.

Example 2

Cyl.	1	2	3	4	5	6	7	8
Press.	85	91	90	87	96	93	87	89

80% of 96 is 77. While all cylinders are well above 77, they are all excessively low. This indicates all poor valves or, if accompanied by oil consumption, worn rings. If compression is subnormal, the tune-up will probably not be satisfactory.

CLEAN CARBURETOR AIR CLEANER AND CRANKCASE VENTILATOR AIR CLEANERS

Remove filter element from carburetor air cleaner. Wash dirt from filter element, and from crankcase ventilator inlets and outlet when so equipped, by plunging up and down several times in suitable solvent. Drain dry and re-oil standard carburetor air cleaner filter element and crankcase ventilator inlets and outlet. Do not oil filter element of oil bath air cleaner. Thoroughly clean oil reservoir of oil bath air cleaner and re-fill to indicated level with S.A.E. 50 oil for temperatures above 32°F., or S.A.E. 20W for temperatures below 32°F.

Be sure rubber seal is in place between element and reservoir when re-assembling. Leave air cleaner off until ready to adjust idle mixture.

CAUTION: Do not wash or oil felt silencer on top of air cleaner.

CLEAN AND ADJUST DISTRIBUTOR POINTS

Clean the points with a few strokes of a clean contact point file. It is normal for points which have been in use for several thousand miles to have a rough or pitted surface. The roughness between points matches and there will still be a large contact area. The points will operate properly, providing alignment is not disturbed. (Do not attempt to remove all roughness.)

Adjust point gap on 1956 and earlier distributors using Dial Indicator J-3955 as outlined in the 1956 Shop Manual. Adjust dwell angle on 1957 distributor as outlined in the 1957 Shop Manual.

CLEAN AND INSPECT HIGH TENSION WIRES, DISTRIBUTOR CAP AND ROTOR

External surfaces of all parts of the secondary system must be cleaned to reduce the possibility of voltage loss. All high tension wires should be removed from the distributor cap and coil so that terminals can be inspected and cleaned. Burned or corroded terminals indicate that wires were not fully seated, causing arcing between the end of the wire and the terminal. When replacing wires in terminal, be sure they are fully seated before pushing rubber nipple down over tower.

LUBRICATE DISTRIBUTOR

1949-1956 Models

Wipe a small amount of Delco-Remy Cam and Ball Bearing Lubricant on cam lobes and apply 3 or 4 drops of light engine oil to the rotor wick. Put a drop

of oil on the breaker pivot and 4 or 5 drops of oil on the breaker plate felt through the oil hole in the plate. Wipe off any excess oil appearing on the plate. *Do not overlubricate.* Oil on the distributor points will cause them to burn.

1957 External Adjustment Distributor

Fill hinge cap oiler, and wipe a small amount of Delco-Remy Cam and Ball Bearing Lubricant on cam lobes.

FUEL FILTER

On 1957 and late 1956 models with glass bowl filters, remove and clean bowl. Replace filter element if it shows evidence of becoming plugged. (Early 1956 models with filter in tank only do not require service.) On 1955 models, remove drain plug from front side of filter and allow filter to drain completely, then replace plug. On 1954 and earlier models, clean fuel pump bowl.

SEE THAT CHOKE OPERATES FREELY AND IS CORRECTLY INDEXED

The specified choke setting provides ideal choke operation in all climates. No seasonal changes are necessary.

Settings are as follows:

Carter 4BBL WCFB	Set at index
55-56, AFB 57	
Carter WGD (HM) 55 2 BBL	Set 1 notch rich
Carter WGD (SM) 55 2 BBL	Set 1 notch lean
Carter WCD 49-54 8 cyl,	Set at index mark
53-54 6 cyl.	
Carter WA-1 49-50 6 cyl.	Set 3 notches rich
Rochester (all models)	Set at index mark

The choke should *just* close at 75°F. when set at index. In rare cases, it may be necessary to change slightly (never more than two notches) from the standard setting to properly calibrate the choke.

Choke linkage must operate freely. *Do not lubricate linkage since this will collect dust and cause sticking.*

LUBRICATE ACCELERATOR PUMP COUNTERSHAFT ON 1949-1956 CARTER CARBURETORS

Lubricate 1955 and 1956 countershaft by removing dust cover and putting two drops of light engine oil in the screw hole at the lever end of the shaft and center lubrication hole on 2 barrel, and in two oil holes under dust cover on 4 barrel. On models prior to 1955, put two drops of oil in each screw hole.

TIGHTEN INTAKE MANIFOLD AND CARBURETOR ATTACHING NUTS

Intake manifold attaching screws and nuts on V-8 engines should be tightened to 40 lb. ft. torque. Carburetor attaching nuts should be tightened securely. Leaks at these areas can cause rough idle, surging, deceleration popping, or deceleration whistle.

SEE THAT EXHAUST MANIFOLD HEAT VALVE OPERATES FREELY

Manifold heat valve must operate freely. If stuck open, it can cause sluggish operation of the engine, especially during warm-up. If stuck closed, engine performance when hot will be unsatisfactory, especially in hot weather. **NOTE:** If owner complains about a V-8 engine stalling during warm-up in cool, humid weather, remove carburetor and clean exhaust gas passages in throttle body.

INSPECT AND ADJUST FAN BELT

The engine fan belt tension should give $\frac{1}{4}$ " movement of the belt with approximately an 8 lb. (10 lb. prior to 1955) force applied midway between generator and fan pulley. On V-8 with air conditioning, proper tension should give $\frac{1}{4}$ " movement of belt with a 14 lb. (5 lb. prior to 1957) force applied halfway between the generator and fan pulley.

Power steering pump or air conditioning compressor belt tension should be adjusted by using a torque wrench and tool J-5574. (Use tool J-5452 on 1953 and early 1954 models with rotor type pump.) Tension should be set at 51-53 lb. ft. with a used belt or 58-65 lb. ft. when a new belt is installed. **NOTE:** 1953 and early 1954, with rotor type pump, should be set at 43-45 lb. ft. torque.

TEST DISTRIBUTOR RESISTANCE AND CAM ANGLE

Excessive resistance indicates defective points or poor connections in the primary circuit of the distributor. Cam angle should be within the limits given in the specifications below. Variation in cam angle between idle speed and 1750 R.P.M. should not exceed 3° . Excessive variation indicates improper breaker lever tension or worn parts in distributor. **NOTE:** Cam angle readings at speeds above 1750 engine R.P.M. may prove unreliable on some cam angle meters.

SET IGNITION TIMING AND ADJUST CARBURETOR IDLE MIXTURE AND SPEED

Timing, idle speed, and mixture are all inter-related and any change in one may affect the others. Adjust idle speed at the specified R.P.M. or below, then adjust timing. (Do not puncture spark plug wire nipple to connect timing light. Use adaptor or slip paper clip under nipple.) Re-adjust idle speed if necessary and then adjust mixture. Correct mixture will usually be obtained with the mixture adjusting screws backed out between 1 and 2 turns from lightly seated position. Smoothest idle is usually obtained with both screws backed out the same amount. (On early 1953 six cylinder carburetors with two screws, back off both screws $1\frac{1}{4}$ turns, then adjust *front screw only* to give proper idle.) Re-adjust idle speed after correct mixture is obtained. **CAUTION:** When adjusting timing of a V-8 engine, the distributor vacuum line must be disconnected to assure that there is no vacuum advance.

ROAD TEST

TEST PERFORMANCE OF CAR

Road test all cars as outlined under *Road Test*.

Observe performance of engine at low speed, during acceleration, and at constant speed. Check for missing, stalling, surging, poor acceleration or flat spots on acceleration. If any irregularity is found, tests listed under Diagnosis should be conducted to find and correct trouble.

TEST OPERATION OF:

BRAKES—Pedal should not go closer than 2" from floor mat (1" with power brakes).

PARKING BRAKE—Should hold the car without excessive movement of parking brake pedal or handle.

HYDRA-MATIC—Observe shift pattern at minimum and full throttle and test forced downshifts. Watch for any indications of slipping or unusual shift characteristics that may indicate need for adjustment.

STEERING GEAR—See that steering operates normally and that steering wheel does not have excessive play. Also observe for alignment of steering wheel, pull, wander, or other irregularity that might indicate need for front end alignment.

WINDSHIELD WIPER—Should operate with sufficient speed, and without slowing excessively during acceleration. Wiper operation should be tested with windshield wet in order to properly judge the action.

If vacuum windshield wipers stop or slow up excessively during acceleration, the wiper air cleaner may be dirty or the vacuum section of the fuel pump may be faulty. On V-8 models, hoses on top of pump may be collapsed due to twisting.

CLUTCH—See that clutch engages smoothly and that pedal has approximately 1" of free travel. "Hard" pedal or lack of pedal return may indicate need for overcenter spring adjustment.

LIGHTS AND HORNS — Test operation of headlights, tail lights, stop lights, parking lights, direction signals, and all other lights, as well as the horns.

INSTRUMENTS—Observe operation of all instruments. Observe especially for possible abnormal readings which may indicate trouble.

ACCESSORIES—Test operation of radio, heater, defroster, cigar lighter, other accessories.

DIAGNOSIS

REMOVE AND COMPLETELY TEST DISTRIBUTOR

Refer to the Pontiac Shop Manual for complete distributor specifications. Follow testing equipment manufacturer's instructions for making distributor tests.

TEST HIGH TENSION CABLE RESISTANCE AND INSULATION

Resistance type high tension cables are used on 1950-1957 models. Cable insulation should be checked visually or with a high voltage tester for cracks or pin holes which could provide a path for short circuit when damp. Resistance specifications are given on page 12-52. These specifications apply to all models.

TEST COIL AND IGNITION RESISTOR

Follow instructions furnished with coil testing equipment. The ignition resistor is used on V-8 models only. If the resistor is shorted or open, the engine will start (resistor is by-passed during starting), but will stop as soon as the key is released from the start position. Resistor should have 1.40-1.65 ohms resistance.

TEST COMBUSTION EFFICIENCY

Combustion efficiency will usually show up irregularities in the carburetor as well as air leaks into the induction system. Follow testing equipment instructions completely to check out combustion efficiency of idle, part throttle and accelerator pump circuits.

TEST FUEL PUMP PRESSURE AND CAPACITY

Excessive pressure from the fuel pump could result in decreased fuel economy or loading of the carburetor. Too little pressure or insufficient capacity could cause poor performance. A plugged fuel filter (part of the pump prior to 1955) could cause fuel starvation. If the filter on a 1955 engine is suspected, drain it and remove it for thorough cleaning. Clean by agitating in carburetor solvent, then blowing compressed air into the *outlet* side. (Blowing into inlet would imbed dirt deeper into filter disc.) Before installing, rinse in kerosene and again blow compressed air into *outlet* side.

TEST VOLTAGE REGULATOR SETTING

Excessive voltage may cause distributor points to burn in addition to other difficulties such as repeatedly burned out headlamps or radio tubes. Insufficient voltage, in addition to allowing the battery to run down, may give weak secondary voltage and poor performance at high speeds.

SPECIFICATIONS

	1949—1954				1955	1956	1957
	6 Cylinder		8 Cylinder		V-8		
Spark Plug Gap	.025 inch		.025 inch		.035 inch		
Distributor Point Gap	.022 inch*		.016 inch		.016 inch		
Breaker lever tension	17—21 oz.†		19—23 oz.		19—23 oz.		
Condenser Capacity	.18—.23 mfd.		.18—.23 mfd.		.18—.23 mfd.		
Cam Angle (Dwell)	27°—31° ^Δ		21°—30°		26°—33°		30° (28°—32°)
Ignition Timing	6° BUDC With Low Compression Head# 3° BUDC With High Compression Head				5° BUDC		6° BUDC
Fan Belt Adjustment	¼ inch Deflection With 10 lb. Force Applied Midway Between Generator and Fan				¼ inch Deflection With 8 lbs. (5 lbs. 1955-1956 With Air Conditioning) (14 lbs. 1957 With Air Conditioning)		
Battery Voltage While Cranking Engine	Not Less Than 4.5 Volts on a 6 volt Battery				Not Less Than 9.0 Volts on a 12 volt Battery		
Idle Adjustment (Neutral) Synchro-Mesh Hydra-Matic Air Conditioning (in "OFF" position)	450-475 RPM 365-385 RPM —		450-475 RPM 365-385 RPM 460-480 RPM		450-475 RPM 390-410 RPM 450-470 RPM	450-470 RPM 450-470 RPM 510-530 RPM	450-470 RPM 430-450 RPM 500-520 RPM } Drive Range
Compression Pressure at cranking Speed (approx. 200 R.P.M.) Specs. are for new broken-in engine	1949-51	1952-54	1949-51	1952-54	135-145 (Std. 8.0:1)	145-155 (Std. 8.9:1)	155-165 (H.M.10:1)
	118-135 (Std. 6.5:1)	123-141 (S.M. 6.8:1)	118-135 (Std. 6.5:1)	123-141 (S.M. 7.0:1)			
	135-153 (Opt. 7.5:1)	139-158 (H.M. 7.7:1)	135-153 (Opt. 7.5:1)	139-158 (H.M. 7.7:1)			
Ignition Resistor					1.40-1.65 Ohms		
Fuel Pump Pressure	4-5 PSI Constant Between 450-1000 RPM						
Power Steering Pump Belt Torque	58-65 lb. ft. with new belt**—51-53 lb. ft. with used belt **						

*1954 6 Cylinder Distributor Point Gap is .016 inch

^Δ1954 6 Cylinder Cam Angle is 38°-45°

**43-45 lb. ft. on 1953 and early 1954 with rotor type pump.

†19-23 oz. on 1954 Six Cylinder.

#1953 and 1954 6 Cylinder Ignition Timing 3° BUDC