
GROUP 69

ENGINE TUNE-UP

Section	Title
A	Engine Tune-Up - All Series .

SECTION A

ENGINE TUNE-UP ALL SERIES

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DIVISION II

DESCRIPTION AND OPERATION

69-1 TUNE-UP PURPOSE

The purpose of an engine tune-up is to restore power and performance that has been lost through wear, corrosion or deterioration of one or more parts or units. In the normal operation of an engine, these changes take place gradually at a number of points so that it is seldom advisable to attempt an improvement in performance by correction of one or two items only. Time will be saved and more lasting results will be obtained by following a definite and thorough procedure of analysis and correction of all items affecting power and performance.

Because of federal laws limiting exhaust emissions, it is even more important that the engine tune-up be done accurately, using the specifications listed on the tune-up sticker found in each engine compartment.

Economical, trouble-free operation can better be assured if a complete tune-up is performed each 12,000 miles.

The parts or units which affect power and performance may be divided into three groups:

- (1) Units affecting compression
- (2) Units affecting ignition
- (3) Units affecting carburetion

The tune-up procedure should cover these groups in the order given. Correction of items in the carburetion group should not be attempted until all items affecting compression and ignition have been satisfactorily corrected.

Most of the service procedures for performing a complete engine tune-up are covered in Groups 64 and 68; therefore, this paragraph provides an outline only with reference to these sections where detailed information is given.

DIVISION III

ADJUSTMENTS AND MINOR SERVICE

69-2 TUNE-UP PROCEDURES

NOTE: To make sure hydrocarbon and carbon monoxide emissions will be within limits, it is very important that the adjustments be followed exactly as listed on the sticker found in each engine compartment.

The suggested procedure for engine tune-up is as follows:

1. Run engine until warm.
2. Remove all spark plugs.
3. Position throttle and choke valve in full open position.
4. Connect jumper wire between distributor terminal of coil and ground on engine to avoid high tension sparking while cranking engine.
5. Firmly insert compression gage in spark plug port.
6. Check compression of each cylinder. *Repeat* compression check and record highest reading obtained on each cylinder during the two pressure checks.

The recorded compression pressures are to be considered normal if the lowest reading cylinder is more than 75 percent of the highest reading cylinder. See Figure 69-1.

Cylinder No.	Pressure (PSI)
1	129
2	135
3	140
4	121
5	120
6	100
7	130
8	126

69-1

Figure 69-1 - Compression Test Example

EXAMPLE: 75 percent of 140 (highest) is 105. Thus, cylinder number 6 is less than 75 percent of number 3. This condition accompanied by low speed missing, indicates an improperly seated valve or worn or broken piston ring.

7. If one or more cylinders read low, inject about a tablespoon of engine oil on top of pistons in low reading cylinders through spark plug port. Repeat compression check on these cylinders.
 - a. If compression improves considerably, rings are worn.
 - b. If compression does not improve, valves are sticking or seating poorly.
 - c. If two adjacent cylinders indicate low compression and injecting oil does not increase compression, the cause may be a head gasket leak between the cylinders. Engine coolant in cylinders could result from this defect.

8. Clean, inspect and test spark plugs; if necessary, replace spark plugs. Gap to .030" (.035" - L-6), and install spark plugs (par. 68-19).
9. Inspect and test battery and cables (par. 120-7 and 120-1).
10. If battery is in good condition but cranking speed is low, test cranking motor circuit (par. 68-2).
11. Adjust generator and power steering belts (also air conditioner belt if so equipped). If difficulty is experienced in keeping battery charged, check generator and regulator (Group 68, Section C or D).
12. Inspect and test entire ignition system and make indicated corrections (par. 68-19).
13. Inspect and test fuel pump (par. 64-9).
14. Inspect gasoline filter (par. 64-7).
15. Check operation of choke valve and fast idle cam.
16. Check operation of choke unloader.

17. Check throttle linkage and dash pot adjustment (par. 64-6).
18. Adjust carburetor idle speed and mixture (par. 64-5).
19. Inspect all water hose connections and tighten clamps, if necessary.
20. Check transmission controlled vacuum advance system (Paragraph 67-2).
21. Road test car for power and overall performance.

b. Compression Pressure Limit Chart

This chart may be used when checking cylinder compression pressures. It has been calculated so that lowest reading number is 75 percent of the highest reading number. See Figure 69-2.

EXAMPLE: After checking the compression pressures in all cylinders, it was found that the highest pressure obtained was 182 psi. The lowest pressure reading was 145 psi. By locating 182 in the maximum column, it is seen that the minimum allowable pressure is 136 psi. Since the

Maximum Pressure Pounds/ Sq. Inch	Minimum Pressure Pounds/ Sq. Inch	Maximum Pressure Pounds/ Sq. Inch	Minimum Pressure Pounds/ Sq. Inch
134	101	186	140
136	102	188	141
138	104	190	142
140	105	192	144
142	107	194	145
144	108	196	147
146	110	198	148
148	111	200	150
150	113	202	151
152	114	204	153
154	115	206	154
156	117	208	156
158	118	210	157
160	120	212	158
162	121	214	160
164	123	216	162
166	124	218	163
168	126	220	165
170	127	222	166
172	129	224	168
174	131	226	169
176	132	228	171
178	133	230	172
180	135	232	174
182	136	234	175
184	138	236	177
		238	178

Figure 69-2 - Compression Pressure Limit Chart

lowest reading obtained was 145 psi, the car is within limits and the compression is considered satisfactory.

c. Cylinder Head Torque and Valve Adjustment (L-6)

Retorquing the cylinder head bolts is not necessary unless a gasket has been replaced, or a leak is suspected. Valve lash must always be adjusted after the head has been torqued.

Before adjusting the valve lash, it is extremely important that the engine be thoroughly warmed up to normalize the expansion of all parts. This is very important because during the warm-up period, the valve clearances will change considerably.

1. After the engine has been normalized, remove rocker arm cover and gasket.

CAUTION: *Do not pry rocker arm cover loose. Gaskets adhering to cylinder head and rocker arm cover may be sheared by bumping end of rocker arm cover rearward with the palm of hand or a rubber mallet.*

2. With the engine running at idle, back off valve rocker arm nut until the valve rocker arm starts to clatter.

3. Turn rocker arm nut down slowly until the clatter just stops. This is the zero lash position.

4. Turn nut down 1/4 additional turn and pause 10 seconds until engine runs smoothly. Repeat additional 1/4 turns, pausing 10 seconds each time, until nut has been turned down 1 full turn from the zero lash position.

NOTE: *This 1 turn preload adjustment must be done slowly to allow the lifter to adjust itself to prevent the possibility of interference, between the inlet valve head and top of piston, which might result in internal damage and/or bent push rods. Noisy lifters should be replaced.*

5. Repeat Steps 2, 3 and 4 to adjust the rest of the valves.

6. Clean gasket surface on cylinder head and rocker arm cover with degreaser then install rocker arm cover, using new gasket and torque bolts to specifications.

DIVISION VI SPECIFICATIONS

69-3 SPECIFICATIONS AND ADJUSTMENTS

Gasoline Tank Capacity (Approximately)	
Series 43-44000	20 Gal.
Series 45-46-48000	25 Gal.
Series 49000	25 Gal.
Gasoline Gauge, Make & Type	A.C., Electric
Fuel Pump, Make	A.C.
Fuel Pump, Type & Location	
All	Mechanical, Left Front Engine
Fuel Pump Pressure — At Carb, Level	
250-350 Engines	3 Lbs. Min.
455 Engines	4-1/2 Lbs. Min.
Fuel Pump Volume	1 Pt. in 30 Seconds or Less
Carburetor, Make & Type	Rochester, Remote Choke Coil
Air Cleaner Element, Make & Material	A.C., Oiled Paper Element
Air Cleaner Element, Type — Standard Duty	
250 Engine	A169CW
350-455 Engines	A329C
All G.S. Engines	A212CW
Air Cleaner Element, Type — Heavy Duty	
250 Engine	A227C
350-455 Engines	A368C
All G.S. Engines	A279C
Fuel Filter, In Carb. Inlet, Make, Material & Type	
1 & 2-Barrel Carb.	A.C., 1 In. Paper, GF-427
4-Barrel Carb.	A.C., 2 In. Paper, GF-4411
Fuel Filter, In Gas Tank.	Woven Plastic
Positive Crankcase Ventilator Valve, Type	
L-6 Engine	CV-723C
V-8 Engine	CV-679C
Intake Manifold Heat, Type	
Thermostat Wind-Up at 70 F., Valve Closed	Exhaust Crossover 1/2 Turn
Fast Idle Speed (On Low Step of Cam)	
Manual Transmission (In Neutral 350 Engine	820 RPM
455 Engine	720 RPM
Automatic Transmission (In Drive) 350 & 455 Engine	650 RPM
C. E. C. Valve Adjustment (250 L-6)	
Manual Transmission	850 RPM
Automatic Transmission	650 RPM
Throttle Control Solenoid Adjustment	
All 350 and 455 cu. in. Engines w/Man. Trans.	1100 RPM

69-4 ENGINE TUNE-UP CHART

Fast Idle Speed (On Low Step of Cam)

Manual
Automatic

*250 Eng. 850 650
350 Eng. 820 650
455 Eng. 720 650

*C.E.C. Valve Adjustment for 250 L-6

Engine	Spark Plug	Plug Gap	Dwell Angle	Breaker Gap	Initial Timing	Curb Idle Speed
250 Eng. (Man. Trans.)	R46T\$	.035"	32° ±2°	.019"	4° B.T.D.C.	550 in N
250 Eng. (Auto. Trans.)	R46T\$	.035"	32° ±2°	.019"	4° B.T.D.C.	500 in D
350 Eng. (Man. Trans.) 43-44-45000 Series	R45T\$	.030"	30° ±2°	.016"	6° B.T.D.C.	800 in N
350 Eng. (Auto. Trans.) 43-44000 W/2BBL. Carb.	R45T\$	.030"	30° ±2°	.016"	10° B.T.D.C.	600 in D
350 Eng. (Auto. Trans.) 43-44000 W/4BBL. Carb. and 45000 W/2 & 4BBL.	R45T\$	.030"	30° ±2°	.016"	4° B.T.D.C.	600 in D
455 Eng. (Man. Trans.)	R44T\$	.030"	30° ±2°	.016"	6° B.T.D.C.	700 in N
455 Eng. (Auto. Trans.)	R44T\$	.030"	30° ±2°	.016"	4° B.T.D.C.	600 in D
455 Stage I (Man. Trans.)	R44T\$	.030"	30° ±2°	.016"	10° B.T.D.C.	700 in N
455 Stage I (Auto. Trans.)	R44T\$	.030"	30° ±2°	.016"	10° B.T.D.C.	600 in D

69-5 DISTRIBUTOR ADVANCE CHART

	Total Dist. Adv.	Cent. Adv. Only
250 Eng.	41° — 55°	18° — 22°
350 Eng. (Man. Trans.) 43-44-45000 Series	30° — 38°	16° — 20°
350 Eng. (Auto. Trans.) 43-44000 W/2BBL. Carb.	24° — 33°	10° — 14°
350 Eng. (Auto. Trans.) 43-44000 W/4BBL & 45000 W/2 & 4BBL. Carb.	28° — 37°	14° — 18°
455 Eng. (Man. Trans.)	35° — 43°	20° — 24°
455 Eng. (Auto. Trans.)	32° — 40°	16° — 20°
455 Stage I Eng.	35° — 43°	20° — 24°