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 pro edure of analysis and correction of all c 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 s 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 70 percent of the highest reading cylinder. See Figure 69-1.

Cylinder No.	Pressure PSI
1	129
2	135
3	146
4	121
5	120
6	100
7	130
8	126

EXAMPLE: *70 percent of 146 (highest) is 102. Thus, cylinder number 6 is less than 70 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.

It should be pointed out, however, that continued slow-speed driving with leaded fuel can produce deposit build-up on exhaust valves and seats which can cause temporary valve leakage, engine miss and low compression readings.

Repeated hard accelerations or a few miles of freeway operation usually will remove these deposits, allowing normal engine operation and satisfactory cranking compression pressures, thereby eliminating unnecessary engine repair.

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 .040" 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 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 spark 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 70 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 127 psi. Since the lowest reading obtained was 145 psi, the car is within limits and the compression is considered satisfactory.*

Maximum Pressure Pounds Sq. Inch	Minimum Pressure Pounds Sq. Inch	Maximum Pressure Pounds Sq. Inch	Minimum Pressure Pounds Sq. Inch
134	94	186	130
136	95	188	132
138	97	190	133
140	98	192	134
142	99	194	136
144	101	196	137
146	102	198	139
148	104	200	140
150	105	202	141
152	106	204	143
154	108	206	144
156	109	208	146
158	111	210	147
160	112	212	148
162	113	214	150
164	115	216	151
166	116	218	153
168	118	220	154
170	119	222	155
172	120	224	159
174	122	226	158
176	123	228	160
178	125	230	161
180	126	232	162
182	127	234	164
184	129	236	165
		238	167

DIVISION VI

SPECIFICATIONS

69-3 SPECIFICATIONS AND ADJUSTMENTS

Gasoline Tank Capacity (Approximately)
- Series 4D-4F-4G-4H Series ..... 20 Gal.
- Series 4L-4N-4R-4P-4U-4V ..... 25 Gal.
- Series 4Y ..... 25 Gal.

Gasoline Gauge, Make and Type ..... A.C., Electric
Fuel Pump, Make ..... A.C.
Fuel Pump, Type and Location
- All ..... Mechanical, Left Front Engine

Fuel Pump Pressure - At Carb. Level
- 350 Engines ..... 3 Lbs. Min.
- 455 Engines ..... 4-1/2 Lbs. Min.

Fuel Pump Volume ..... 1 Pt. in 30 Seconds or Less
Carburetor, Make and Type ..... Rochester, Remote Choke Coil
Air Cleaner Element, Make and Material ..... A.C., Oiled Paper Element
Air Cleaner Element, Type - Standard Duty
- 350-455 Engines A329C
- All G.S. Engines A212CW

Air Cleaner Element, Type - Heavy Duty
- 350-455 Engines A368C
- All G.S. Engines A279C

Fuel Filter, In Carb. Inlet, Make, Material and Type

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	
V-8 Engine	CV-679C
Intake Manifold Heat, Type	Exhaust Crossover
Thermostat Wind-Up at 70 F., Valve Closed	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 Engines	650 RPM

69-4 ENGINE TUNE-UP CHART

Engine	Spark Plug	Plug Gap	Dwell Angle	Breaker Gap	Initial* Timing ± 1°	Curb Idle Speed**		
						IDLE STOP SOLENOID CONNECTED	IDLE STOP SOLENOID DISCONNECTED	FAST IDLE SPEED
350 Engine (Man. Trans.) 4D - 4F - 4G - 4H Series	R45TS	.040"	30° ± 2°	.016"	4° B.T.D.C.	800	600	820
350 Engine (Auto. Trans.) 4D - 4F - 4G - 4H Series W/2 BBL. Carburetor	R45TS	.040"	30° ± 2°	.016"	4° B.T.D.C.	650	500	700
350 Engine (Auto. Trans.) 4D - 4F - 4G - 4H Series W/4 BBL. Carb. and 4L - 4N Series W/2 & 4 BBL.	R45TS	.040"	30° ± 2°	.016"	4° B.T.D.C.	650	500	700
455 Engine (Man. Trans.)	R45TS	.040"	30° ± 2°	.016"	4° B.T.D.C.	900	600	920
455 Engine (Auto. Trans.)	R45TS	.040"	30° ± 2°	.016"	4° B.T.D.C.	650	500	700
455 State 1 (Man. Trans.)	R45TS	.040"	30° ± 2°	.016"	8° B.T.D.C.	900	600	920
455 Stage 1 (Auto. Trans.)	R45TS	.040"	30° ± 2°	.016"	10° B.T.D.C.	650	500	700

*With Hose Disconnected From Vacuum Advance and Plugged.

**With Automatic Transmission in Drive (Manual Transmission in Neutral) – First Set Idle Speed with Idle Stop Solenoid Connected, then with Solenoid Disconnected.

69-5 DISTRIBUTOR ADVANCE CHART

	Total Dist. Adv.	Cent. Adv. Only
350 Engine (Man. Trans.) 4D - 4F - 4G - 4H Series	32° – 40°	18° – 22°
350 Engine (Auto. Trans.) W/2 BBL. Carb. 4D - 4F - 4G - 4H Series	32° – 40°	18° – 22°
350 Engine (Auto. Trans.) W/4 BBL. & 4D - 4F - 4G - 4H Series – 4L - 4N Series W/2 & 4 BBL. Carb.	32° – 40°	18° – 22°
455 Engine (Manual Transmission)	34° – 44°	20° – 24°
455 Engine (Automatic Transmission)	34° – 44°	20° – 24°
455 Stage I Engine	35° – 43°	20° – 24°