SECTION A

ENGINE TUNE-UP
ALL SERIES

CONTENTS

Division	Paragraph	Subject	Page
I		SPECIFICATIONS AND ADJUSTMENTS:	
	69-1	General Specifications and Adjustments	69-2
	69-2	Engine Tune-up Chart	69-3
	69-3	Distributor Advance Chart	69-3
II		DESCRIPTION AND OPERATION:	
	69-4	Tune-up Purpose	69-3
III		SERVICE PROCEDURES:	
	69-5	Tune-up Procedure	69-4
IV		TROUBLE DIAGNOSIS:	

DIVISION I—SPECIFICATIONS AND ADJUSTMENTS

69-1 SPECIFICATIONS AND ADJUSTMENTS

Gasoline, Grade Required (With 1 & 2-Barrel Carb. Engines)	Regular
Gasoline, Grade Required (With 4-Barrel Carb. Engines)	Premium
Gasoline Tank Capacity (Approximately)	
Series 43-44000	20 Gal.
Series 45-46-48000	25 Gal.
Series 49000	21 Gal.
Gasoline Gauge, Make & Type	A.C., Electric
Fuel Pump, Make	A.C.
Fuel Pump, Type & Location	Mechanical, Left Front Engine
Fuel Pump Pressure—At Carb. Level	
250-350 Engines	3 Lbs. Min.
400-430 Engines	4-1/2 Lbs. Min.
Fuel Pump Volume	1 Pt. in 30 Seconds or Less
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-441
Fuel Filter, In Gas Tank	Woven Plastic
Carburetor, Make & Type	Rochester, Remote Choke Coil
Carburetor, Barrels & Compression Ratio	
1-Barrel Carb.	8.5 to 1 Comp. Ratio
2-Barrel	9 to 1 Comp. Ratio
4-Barrel	10.25 to 1 Comp. Ratio
Air Cleaner, Make & Material	A.C., Oiled Paper Element
Air Cleaner Element, Type - Standard Duty	
1 & 2-Barrel Carb. Engine	A169CW
4-Barrel Carb. Engine	A212CW
Air Cleaner Element, Type - Heavy Duty	
1 & 2-Barrel Carb. Engine	A227C
4-Barrel Carb. Engine	A279C

69-1 SPECIFICATIONS AND ADJUSTMENTS (Cont'd)

Positive Crankcase Ventilator Valve, Type
- L-6 Engine CV-723C
- V-8 Engine CV-679C

Intake Manifold Heat, Type . . . . . Exhaust Crossover
- Thermostat Wind-Up @ 70° F., Valve Closed . . . . . 1/2 Turn

Idle Speed
- V-8 Auto. Trans. Engine (In Drive, With Air Cond. Off) . . . . . 550 RPM
- L-6 Auto. Trans. Engine (In Drive, With Air Cond. Off) . . . . . 500 RPM
- Manual Trans. Engine (With Air Cond. Off) . . . . . 700 RPM

Fast Idle Speed (On Low Step of Cam) . . . . . Slow Idle Plus 20 RPM

69-2 ENGINE TUNE-UP CHART

Engine	Spark Plug	Plug Gap	Dwell Angle	Breaker Gap	Initial Timing	Choke Setting
250 Man. Trans.	46N	.030"	32° ± 2°	.019"	0° or T.D.C.	Rod Dia. Above Hole
250 Auto. Trans.	46N	.030"	32° ± 2°	.019"	4° B.T.D.C.	Rod Dia. Above Hole
350-2	45TS	.030"	30° ± 1°	.016"	0° or T.D.C.	Gaging Slot
350-4	45TS	.030"	30° ± 1°	.016"	0° or T.D.C.	Gaging Slot
400-4	44TS	.030"	30° ± 1°	.016"	0° or T.D.C.	Gaging Slot
430-4	44TS	.030"	30° ± 1°	.016"	0° or T.D.C.	Gaging Slot

69-3 DISTRIBUTOR ADVANCE CHART

Distributor Spark Advance (Crankshaft Degrees @ 2500 Engine RPM)

	Total Dist.Adv.	Cent.Adv.Only
250 Engine (Man. Trans.)	42° - 50°	22° - 26°
250 Engine (Auto. Trans.)	38° - 46°	18° - 22°
350 Engine	33° - 41°	19° - 23°
400-430 Engine	36° - 44°	22° - 26°

DIVISION II
DESCRIPTION AND OPERATION

69-4 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 is 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. While the items affecting compression and ignition may be handled according to personal preference, 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 references to these sections where detailed information is given.

DIVISION III SERVICE PROCEDURES

69-5 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. Remove all spark plugs.

2. Position throttle and choke valve in full open position.

3. Connect jumper wire between distributor terminal of coil and ground on engine to avoid high tension sparking while cranking engine.

4. Hook up starter remote control cable and turn ignition switch to "on" position.

CAUTION: The starter must not be energized when the ignition switch is in the LOCK position as the ground contact will be damaged in the ignition switch.

5. Firmly insert compression gage in spark plug port. Crank engine to obtain highest possible reading.

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% of the highest reading cylinder. See the following example and the "Compression Pressure Limit Chart".

EXAMPLE:

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

75% of 140 (highest) is 105. Thus, cylinder number 6 is less than 75% 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 and/or oil in cylinders could result from this defect.

NOTE: Low compression pressure in two adjacent cylinders indicates a possible head gasket leak between the two cylinders.

8. Clean, inspect and test spark plugs; if necessary, replace spark plugs. Gap to .030", and install spark plugs (par. 68-25).

9. Inspect battery and cables. (par. 120-3 and 8).

10. If battery is in good condition but cranking speed is low, test cranking motor circuit (par. 68-18).

11. Adjust generator belt (and power steering belt is so equipped). If difficulty is experienced in keeping battery charged, check generator regulator (par. 68-9).

12. Inspect entire ignition system and make indicated corrections. (par. 68-25).

13. Inspect and test fuel pump (par. 68-11).

14. Check gasoline filter (par. 64-5).

15. Check operation of choke valve and check setting of choke thermostat.

16. Check adjustment of fast idle cam and choke unloader.

17. Check throttle linkage and dash pot adjustment (par. 64-3).

18. Adjust carburetor idle speed and mixture (par. 64-2).

19. Inspect all water hose connections and tighten clamps, if necessary.

20. 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% of the highest reading number.

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 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	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

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 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.