TUNE-UP ALL SERIES

CONTENTS

DESCRIPTION AND OPERATION

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, performance, and exhaust emission.

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 label found in each engine compartment.

Economical, trouble-free operation can better be assured if a complete tune-up is performed each 12,000 miles, when using non leaded fuels and each 6,000 miles when using leaded fuels.

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 tune-up are covered in the carburetor and electrical sections, therefore, the following provides an outline only.

MAINTENANCE AND ADJUSTMENTS

IDLE MIXTURE ADJUSTMENT MODELS MV, 2GV AND 4MV CARBURETORS

Idle mixture screws have been preset and capped at the Factory.

Before suspecting the carburetor as the cause of poor engine performance or rough idle, check the ignition system including the distributor, set ignition timing, check the PCV system and compression pressures. Also, check all vacuum hoses and connections for leaks.

At the 24,000 mile maintenance period, and in the case of high idle CO, major carburetor overhaul, throttle body replacement, or when poor idle quality exists after performing the checks in the previous paragraph, idle mixture may be adjusted. To properly set idle mixture to achieve the smoothest idle while maintaining emission levels within the standards one of the approved procedures must be followed. The CO meter method is preferred when a meter of sufficient accuracy is available, otherwise the lean drop procedure may be used.

CO METER METHOD (PREFERRED) EXCEPT MV CARBURETOR

1. Set parking brake and block drive wheels.

2. Disconnect evaporative emission hose from the air cleaner. Disconnect and plug the distributor vacuum hose at the vacuum advance unit. Disconnect and plug the EGR vacuum hose at the EGR valve.

> **NOTE:** *Adjust idle speed and mixture with engine at normal operating temperature (not hot), air conditioning off, air cleaner installed and transmission selector in drive.*

> **NOTE:** *CO meter must be capable of low level, accurate readings. Meters should be accurate within ± .1% CO in the setting range specified. The meter scale should have divisions of .2% CO or less.*

3. Connect CO meter to exhaust system tailpipe.

4. Set idle speed to specified RPM.

5. Turn each idle mixture cap in equal amounts until idle CO is at or below .3%. DO NOT REMOVE CAPS. Reset idle speed if necessary, with air cleaner in place.

6. Reconnect evaporative emission hose, EGR vacuum hose and distributor vacuum advance hose.

If idle CO level is still too high due to inadequate adjustment range with mixture caps installed, or if the carburetor has been disassembled or a major repair is necessary, the following procedure may be used. DO NOT USE THIS PROCEDURE IF IDLE CO IS AT OR BELOW.3%.

1. Cut off TAB on mixture caps. (Care must be taken to avoid damage to mixture screws).

2. Turn each idle mixture screw in equal amounts from rich stop until idle CO is at or below .3%. Reset idle speed if necessary, (with air cleaner in place).

3. Reconnect evaporative emission hose, EGR vacuum hose and distributor vacuum advance hose.

LEAN DROP PROCEDURE (ALTERNATE)

Models 2GV and 4MV

1. Set parking brake and block drive wheels.

2. Disconnect evaporative emission hose from the air cleaner. Disconnect and plug the distributor vacuum hose at the vacuum advance unit. Disconnect and plug the EGR vacuum hose at the EGR valve.

> **NOTE:** *Adjust idle speed and mixture with engine at normal operating temperature (not hot), air conditioning off, air cleaner installed and transmission selector in drive.*

3. Adjust idle RPM to specified speed.

4. Cut off TAB on mixture caps (care must be taken to avoid damage to mixture screws) equally richen (turn out) mixture screws until maximum idle speed is achieved. Reset speed if necessary with idle solenoid screw to obtain 70 RPM above specified idle speed for all 455 engines and 60 RPM above specified idle speed for all 350 engines.

5. Equally lean (turn in) mixture screws until specified idle speed is achieved (idle stop solenoid energized). Reset curb idle speed if necessary (with air cleaner in place, if previously removed).

6. Reconnect evaporative emission hose, EGR vacuum hose and distributor vacuum advance hose.

LEAN DROP PROCEDURE

Model MV (Preferred)

1. Refer to Specifications below for idle speed settings.

2. Set parking brake and block drive wheels.

3. Disconnect fuel tank vent hose from vapor canister. Disconnect and plug distributor vacuum hose at vacuum advance unit.

4. With engine at normal operating temperature (not hot), air conditioning off, and air cleaner installed, transmission selector in drive (automatic transmission) or neutral (manual transmission).

5. Cut off tab on mixture cap using side cutter pliers.

6. Adjust idle RPM to the higher of the two idle speeds specified, with idle stop solenoid energized and extended (Example 650/600).

7. Equally richen (turn out) mixture screws until maximum idle speed is achieved. Reset speed if necessary to the higher specified idle speed.

8. Equally lean (turn in) mixture screws until the lower specified idle speed is achieved (Example 650/600).

9. Connect fuel tank vent hose and distributor vacuum advance hose.

IDLE MIXTURE ADJUSTMENT SPECIFICATIONS

MODEL MV CARBURETOR

250 Cu. In. - Non-California

	Transmission	
	Automatic	Manual
Exhaust Emission Control System	CCS-EGR	AIR-EGR
Timing (°BTC @ RPM)	6° @ 600	8° @ 950
Solenoid Adj. (RPM)	600 (DR)	950 (N)
Lean Drop Idle Mixture (RPM)	650/600 (DR)	1100/950 (N)

250 Cu. In. - California

	Transmission	
	Automatic	Manual
AIR-EGR Exhaust Emission Control		
Timing (°BTC @ RPM)	6° @ 600	8° @ 950
Solenoid Adj. (RPM)	600 (DR)	950 (N)
Lean Drop Idle Mixture (RPM)	630/600 (DR)	1100/950 (N)

MAJOR REPAIR

ENGINE TUNE-UP

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:

PRELIMINARY CHECKS

1. Check engine oil level. Correct if necessary.

2. Check engine coolant level. Correct if necessary.

3. Check transmission fluid level. Correct if necessary.

4. Check all drive belt tensions and condition. Correct if necessary.

BATTERY

1. Check electrolyte level. Correct if necessary.

2. Clean battery terminals and cable ends.

3. Take hydrometer readings.

4. Perform high rate discharge test.

ELECTRICAL TEST

1. Check cranking volts at coil.

2. Check ignition resistor.

3. Check contact breaker resistance.

START ENGINE

1. Check dwell.

2. Check dwell variation.

3. Check timing.

4. Check firing voltage.

5. Check aviable voltage.

6. Check coil polarity. Correct if necessary.

COMPRESSION TEST (Dry)

1. Remove spark plugs. (Note; with compressed air blow around spark plugs before removal).

2. Perform compression test noting each cylinder reading.

3. Use compression pressure limit chart (at the end of procedure) to determine if a problem cylinder exists.

4. If a problem cylinder does exist use "wet" compression test to determine cause. Correct as necessary.

NORMAL OPERATION

Brown to grayish tan deposits and slight electrode wear indicate correct spark plug heat range and mixed periods of high and low speed driving.

SPARK PLUGS HAVING THIS APPEARANCE MAY BE CLEANED, REGAPPED AND REINSTALLED.

When reinstalling spark plugs that have been cleaned and regapped, be sure to use a new engine seat gasket in each case.

4B6G1

Figure 6G-1

CARBON FOULING

Dry, fluffy black carbon deposits may result from overrich carburetion, excessive hand choking, a faulty automatic choke, or a sticking manifold heat valve. A clogged air cleaner can restrict air flow to the carburetor causing rich mixtures. Poor ignition output (faulty breaker points, weak coil or condenser, worn ignition cables) can reduce voltage and cause misfiring. Fouled spark plugs are the result--not the cause--of this problem. **AFTER THE CAUSE HAS BEEN ELIMINATED, SPARK PLUGS HAVING THIS APPEARANCE CAN BE CLEANED, REGAPPED AND REINSTALLED.**

Excessive idling, slow speeds under light load also can keep spark plug temperatures so low that normal combustion deposits are not burned off. In such a case a hotter type spark plug will better resist carbon deposits. 4B6G2

Figure 6G-2

DEPOSIT FOULING—"A"

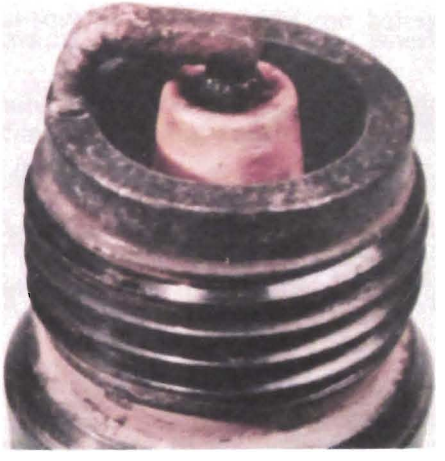
Red, brown, yellow and white colored coatings which accumulate on the insulator are by-products of combustion and come from the fuel and lubricating oil, both of which today generally contain additives. Most powdery deposits have no adverse effect on spark plug operation, however, they may cause intermittent missing under severe operating conditions, especially at high speeds and heavy load.

IF THE INSULATOR IS NOT TOO HEAVILY COATED, THE SPARK PLUGS MAY BE CLEANED, REGAPPED AND REINSTALLED.

Sometimes, even after cleaning, an invisible shunt path remains. The only remedy under such circumstances is to replace the plug.

4B6G3

Figure 6G-3



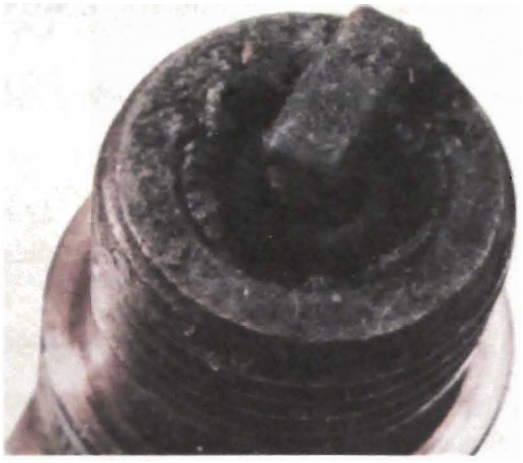
DEPOSIT FOULING—"B"

Most powdery deposits, as shown in "A", have no adverse effect on the operation of the spark plug as long as they remain in the powdery state. However, under certain conditions of operation, these deposits melt and form a shiny yellow glaze coating on the insulator which, when hot, acts as a good electrical conductor. This allows the current to follow the deposits instead of jumping the gap, thus shorting out the spark plug.

Glazed deposits can be avoided by not applying sudden load, such as wide open throttle acceleration, after sustained periods of low speed and idle operation. **IT IS ALMOST IMPOSSIBLE TO EFFECTIVELY REMOVE GLAZED DEPOSITS, SO WHEN THEY OCCUR THE PLUG SHOULD BE REPLACED.**

4B6G4

Figure 6G-4



OIL FOULING

Wet, oily deposits with very little electrode wear may be caused by oil pumping past worn rings. "Break-in" of a new or recently overhauled engine before rings are fully seated may also result in this condition. Other possibilities of introduction of oil into the combustion chamber are a porous vacuum booster pump diaphragm or excessive valve stem guide clearances and/or defective intake valve seals.

Usually, these spark plugs can be degreased, cleaned and reinstalled.

A HOTTER TYPE SPARK PLUG WILL REDUCE OIL DEPOSITS, but too hot a spark plug can cause preignition and, consequently, severe engine damage. An engine overhaul may be necessary in severe cases to obtain satisfactory service.

4B6G5

Figure 6G-5

HEAT SHOCK FAILURE

Heat shock is a common cause of broken and cracked insulator tips. Heat shock is the result of an excessively fast rise in tip temperature under severe operating conditions. It occurs due to engine detonation* caused by overadvanced ignition timing, or the use of too low octane fuel.

Chipped and broken insulator tips also result from improper gapping tools or procedures in which excessive or side pressures are exerted against the insulator tip.

ELIMINATE THE CAUSE AND INSTALL A NEW PLUG OF THE RECOMMENDED HEAT RANGE.

4B6G6

Figure 6G-6

EXCESSIVE OVERHEATING

Excessive overheating is evidenced by burned or blistered insulator tips and badly worn electrodes. It is brought on by preignition**, cooling system defects, lean fuel air ratios, low octane fuels, overadvanced ignition timing, improper installation procedures (see adjacent illustration), and stuck closed heat riser valves.

INSTALL A NEW PLUG OF THE RECOMMENDED HEAT RANGE AFTER PROBLEM HAS BEEN CORRECTED.

Sustained high speed and/or heavy load service can produce high temperatures which will cause preignition and, in this instance, a colder spark plug should be used.

4B6G7

Figure 6G-7

IMPROPER INSTALLATION

Spark plug overheating caused by poor heat transfer is the result of failure to install the spark plug with sufficient torque to provide good contact between the spark plug and engine seat (also see adjacent illustration).

Dirty threads in the engine head which allow the plug to seize before it is actually seated will also cause this condition.

A NEW SPARK PLUG OF THE RECOMMENDED HEAT RANGE SHOULD BE INSTALLED IN ACCORDANCE WITH AC INSTALLATION INSTRUCTIONS.

4B6G8

Figure 6G-8

DISTRIBUTOR SERVICE

1. Replace points if burned or pitted.

a. When replacing points check point alignment and spring tension. Correct as necessary.

Spring Tension

L-6 19-23
V-8 21-25

2. Test condenser for specified capacity. Replace if necessary.

Microfarad capacity ..... .18 - .23

3. Check distributor cap and rotor for cracks, carbon tracking or other signs of deterioration. Replace if necessary.

4. Rotate distributor cam lubricator 180° every 12,000 miles and replace every 24,000 miles.

SPARK PLUGS

NOTE: *Spark plugs are usually the end result of another problem rather than the cause of a problem. Proper inspection and diagnosis of the spark plugs is essential for a lasting tune-up.*

1. Check condition of spark plugs. Replace if necessary. See Figures 6G-1 thru 6G-8.

2. Clean cylinder threads and seat.

3. Gap spark plugs to .040 install plugs and torque to 15 lb. ft.

4. Check spark plug and coil high tension wire(s) for cracks, hardness, or other signs of deterioration. Replace if necessary.

Spark plug and coil high tension wire(s)

Resistance..... 3,000 - 20,000 Ohms

CARBURETOR SERVICE

1. Inspect EGR passages and clean if deposits exists. See EGR System Maintenance in the EMISSIONS SECTION.

2. Torque carburetor bolts to 15 lb. ft.

3. Torque intake manifold bolts.

250 ..... 35 lb. ft.
350 ..... 45 lb. ft.
455 ..... 45 lb. ft.

4. Check automatic choke operation.

a. Check choke coil rod for free operation and proper adjustment. Correct if necessary.

b. Check primary and secondary vacuum breaks for free operation and proper adjustment. Correct if necessary.

c. Check choke unloader operation. Correct if necessary.

d. Check fast idle speed. Adjust if necessary.

5. Check secondary operation if equipped. Adjust if necessary.

6. Check accelerator pump operation. Correct if necessary.

7. Check float level, (if complaint of stall on turns was received). Correct if necessary.

8. If any of the above were out of adjustment be sure to adjust idle speed to specifications.

FILTERS

1. Replace air cleaner element if necessary.

2. Replace PCV filter in air cleaner if necessary.

3. Replace fuel filter in carburetor if necessary.

4. Replace carbon canister filter if necessary.

START ENGINE

1. Disconnect carbon canister hose to air cleaner.

2. Disconnect distributor vacuum and EGR vacuum hoses and plug.

3. Set dwell.

4. Set timing.

5. Set idle speed (throttle stop solenoid wire disconnected and plunger retracted).

6. Set idle speed (throttle stop solenoid wire connected and plunger extended).

7. Check idle mixture. Adjust if necessary as outlined under maintenance and adjustment in this section.

8. Recheck all idle speeds, dwell and timing. Correct if necessary.

FUEL PUMP

1. Test fuel pump pressure and volume.

2. Replace fuel pump if it does not meet specifications.

EXHAUST EMISSIONS SYSTEMS

1. Check operation of EGR system.
2. Check operation of A.I.R. system.
3. Check operation of CCS system.
4. Check operation of PCV system.
5. Check operation of TCS system.
6. Check operation of TVS system.
7. Check operation of vacuum spark delay system.
8. To check operation of the emission control systems. See Emission Controls Section of this manual.

FINAL INSPECTION

1. Check engine vacuum hoses for disconnects, cracks, kinks, deterioration and proper routing. Correct if necessary.
2. Check condition of upper and lower radiator hoses. Replace if necessary.
3. Check condition of heater hoses. Replace if necessary.

Compression 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.

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

SPECIFICATIONS

SPECIFICATIONS AND ADJUSTMENTS

Gasoline Tank Capacity (Approximately)
- X Series ..... 20.7 Gal.
- A Series (Except Wagon) ..... 22 Gal.
- A and B Series Wagon ..... 22 Gal.
- B-C-E Series (Except Wagon) ..... 26 Gal.

Gasoline Gauge, Make and Type ..... A.C., Electric
Fuel Pump, Make ..... A.C.
Fuel Pump, Type and Location
- L6 ..... Mechanical Right Front Engine
- All V8's ..... Mechanical, Left Front Engine

Fuel Pump Pressure - At Carb. Level
- 250 Engines ..... 4-5 PSI
- 350 Engines ..... 3 PSI Min.
- 455 Engines ..... 4-1/2 PSI Min.

Fuel Pump Volume ..... 1 Pt. in 30 Seconds or Less
Carburetor, Make and Type ..... Rochester, Remove Choke Coil
Air Cleaner Element, Make and Material ..... A.C., Oiled Paper Element
Air Cleaner Element, Type - Standard Duty
250 Cu. in Engine A169CW
350-455 Engines in "A" Series Non G.S. A329C
All G.S. Engines A212CW
All 455 B-C-E Series A212CW
Air Cleaner Element, Type - Heavy Duty
350-455 Engines in "A" Series Non G.S. A368C
All G.S. Engines A279C
All 455 B-C-E Series A279C
Fuel Filter, In Carb. Inlet, Make, Material and Type
1-Barrel Carb. ..... AC 1 in. Paper, GF427
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
Positive Crankcase Ventilator Valve, Type
L-6 Engine CV781C
V-8 Engine CV-679C

1974 TUNE-UP SPECIFICATIONS

ENGINE	SPARK PLUG	SPARK PLUG GAP	DWELL ANGLE	BREAKER POINT GAP	INITIAL[1] TIMING ±2	CURB IDLE SPEED[2]		
						IDLE STOP SOLENOID DISCONNECTED	IDLE STOP SOLENOID CONNECTED	FAST IDLE SPEED
250 ENGINE MANUAL TRANS.	R46T	.035"	31°-34°	.019"	8°BTDC	450 IN NEUTRAL	950 IN NEUTRAL	1800 IN NEUTRAL AND ON HIGH STEP OF CAM
250 ENGINE AUTO. TRANS.	R46T	.035"	31°-34°	.019"	6° BTDC	450 IN DRIVE	600 IN DRIVE	1800 IN NEUTRAL AND ON HIGH STEP OF CAM
350 ENGINE W/2 AND 4 BBL CARB	R45TS	.040"	30°±2°	.016"	4°BTDC	500 IN DRIVE	650 IN DRIVE	700[3]
455 ENGINE W/2 AND 4 BBL CARB	R45TS	.040"	30°±2°	.016"	4°BTDC	500 IN DRIVE	650 IN DRIVE	700[3]
455 STAGE 1 ENGINE "A" SERIES	R45TS	.040"	30°±2°	.016"	10°BTDC	500 IN DRIVE	650 IN DRIVE	700[3]
455 STAGE 1 ENGINE B-C-E SERIES	R45TS	.040"	30°±2°	.016"	4°BTDC	500 IN DRIVE	650 IN DRIVE	700[3]

(1) SET TIMING WITH HOSE FROM DISTRIBUTOR VACUUM ADVANCE UNIT DISCONNECTED AND PLUGGED.

(2) ADJUST IDLE SPEED WITH IDLE STOP SOLENOID WIRE DISCONNECTED AND PLUNGER RETRACTED FIRST, THEN WITH IDLE STOP SOLENOID WIRE CONNECTED AND PLUNGER EXTENDED.

(3) SET ON LOW STEP OF CAM FOR 4 BBL CARBURETORS AND ON SECOND STEP OF CAM FOR 2 BBL CARBURETORS.

4B6G9

Figure 6G-9