

TUNE-UP

ENGINE IDENTIFICATION

VEHICLE IDENTIFICATION NUMBER CODE

Fifth digit of Vehicle Identification Number, located on a plate affixed to top of instrument panel and visible through windshield, is the engine code letter.

VIN Engine Codes

Application	Code
267" 2-Bbl.	J
301" 4-Bbl. Turbo	T
305" 4-Bbl.	⓪H
350" 4-Bbl.	L
350" Diesel	N
350" 4-Bbl. (Corvette)	6
350" 4-Bbl. (Corvette)	8

⓪ — Used in Calif. Corvette

ENGINE IDENTIFICATION NUMBER CODE

Engine code letters are suffix of Engine Identification Number which is stamped on a pad on the front, right hand side of the cylinder block, in front of the cylinder head.

TUNE-UP NOTES

NOTE — In order to comply with emission standards, specifications shown on engine compartment emission control tune-up decal must be used in all instances.

CAUTION — Before making compression test or cranking engine with a remote starting switch, disconnect ignition switch "BATT" terminal lead at distributor.

CAUTION — Do not remove spark plug wires with engine running. H.E.I. secondary voltage is higher than standard ignition systems and may inflict harmful electrical shock.

CAUTION — Damage to the H.E.I. electronic module and/or ignition coil may result if "TACT" terminal, in distributor cap connector, is directly grounded.

CAUTION — Adjustment of injectors or internal adjustments of injector pump must be done in a properly equipped injector shop with clean environment.

ENGINE COMPRESSION

GASOLINE MODELS

Compression Ratio	
267" 2-Bbl.	8.5:1
301" 4-Bbl. Turbo	8.0:1
305" 4-Bbl.	8.5:1
350" 4-Bbl. VIN L & 8	8.5:1
350" 4-Bbl. VIN 6	9.0:1

Recommended Fuel	Unleaded (87 AKI Minimum)
Compression Pressure	120-160 psi
Max. Variation Between Cylinders	30%

Check compression pressure with engine at normal operating temperature, all spark plugs removed and throttle and choke valves wide open.

DIESEL MODELS

NOTE — Prior to checking compression, be sure batteries are fully charged to avoid run-down. When turning engine over during test, 6 "puffs" per cylinder should be used to obtain reading.

Compression Ratio	22.5:1
Compression Pressure	275 psi (min)
Max. Pressure Variation	⓪
Recommended Fuel	Diesel 2-D⓪

- ⓪ — Lowest cylinder must read within 70% of highest.
- ⓪ — Use 1-D for vehicle operation below 20°F.

1) Remove air cleaner. Install air crossover screened cover (J-26996-1).

2) Disconnect electrical wire from fuel solenoid terminal of injection pump.

3) Disconnect glow plug wires. Remove all glow plugs.

4) Use suitable compression tester (J-26999 or equivalent) to test individual cylinders.

NOTE — Compression should build evenly and rapidly to proper level while rotating engine past 6 compression strokes. If piston rings are worn or cracked, compression will read low on 1st stroke, will rise each stroke thereafter, but will not reach normal level.

VALVE TAPPET CLEARANCE

Hydraulic Lifters 1 Turn Down From Zero Lash

VALVE ARRANGEMENT

Diesel Engines
 I-E-I-E-E-I-E-I (Both Banks, Front to Rear)
 All Others
 E-I-I-E-E-I-I-E (Both Banks, Front to Rear)

SPARK PLUGS

Application	Gap	Torque
All Models	.045"	17-27 ft. lbs.

Spark Plug Type

Application	AC No.
All Models	R45TS

GLOW PLUGS

Glow plugs are small heaters. One is screwed into each cylinder to preheat cylinder and aid in cold starting. Glow plugs are activated when the ignition switch is turned to "RUN" position. Two types of glow plugs are used and cannot be interchanged. The 12 volt type utilizes a 1/4" spade connector, and the 6 volt type utilizes a 5/16" spade connector.

TUNE-UP (Cont.)

HIGH TENSION WIRE RESISTANCE

Carefully remove ends of wire from spark plug and distributor. Using an ohmmeter, check resistance while gently twisting wire. If resistance is not to specification, or fluctuates from infinity to any value, replace wire.

Wire Length	Resistance (Ohms)	Resistance
0-24"	30,000 Max.
Over 24"	50,000 Max.

DISTRIBUTOR

All models are equipped with High Energy Ignition systems and no adjustments are required.

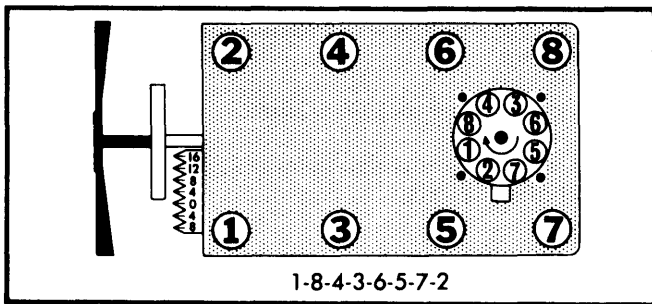


Fig. 1 Firing Order and Timing Marks (All V8 Engines)

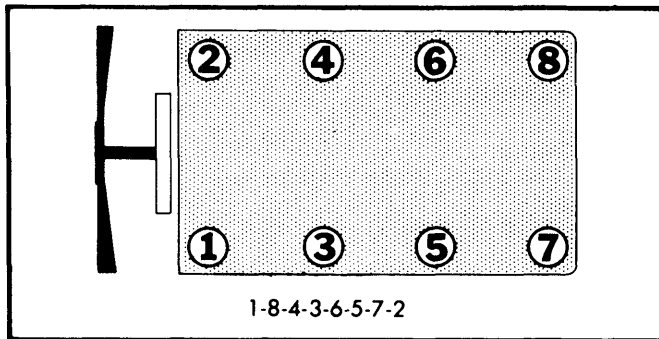


Fig. 2 Diesel Engine Firing Order

IGNITION TIMING

NOTE — Engines are equipped with a receptacle for a magnetic probe timing light, located 9.5° ATDC. Do not use this location for timing with a conventional light.

Check or adjust ignition timing with engine at normal operating temperature, choke fully open, air conditioning "OFF", distributor vacuum advance hose disconnected and plugged and engine running at specified RPM.

Ignition Timing Specifications (Degrees BTDC@RPM)

Application	Man. Trans.	Auto. Trans.
267" 2-Bbl. ....	.....	4@500
301" 4-Bbl. ....	.....	8@500
305" 4-Bbl.		
Federal	4@700	4@500
Calif. ....	.....	4@550
350" VIN L	6@700	6@500
350" VIN 6	12@900	12@700
350" VIN 8	6@700	6@500

INJECTOR TIMING (DIESEL ENGINES ONLY)

1) With engine off, use tool (J-26987 or equivalent) to loosen 3 pump retaining nuts.

2) Align mark on injection pump with mark on adapter and tighten nuts to 35 ft. lbs.

NOTE — In order to rotate pump to align marks, use a 3/4" wrench on boss at front of injector pump.

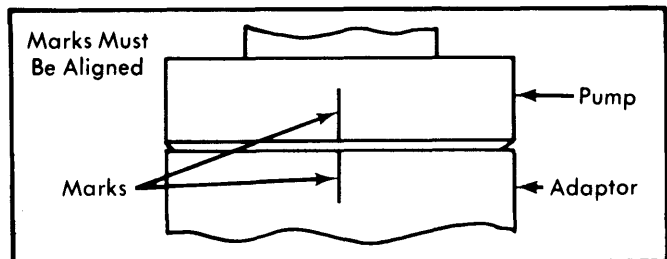


Fig. 3 Timing Marks on Injection Pump and Adapter

3) Adjust throttle rod with engine off. On cruise control equipped models, remove cruise control clip and remove rod from bellcrank.

HOT (SLOW) IDLE RPM

GASOLINE MODELS

NOTE — Idle adjustment procedures will vary with vehicle model and component application. Refer to Emission Control Tune-Up Decal in engine compartment for adjustment preparations, then proceed as follows:

Vehicles W/O Air Conditioning — With engine at normal operating temperature, turn idle speed screw to obtain specified "Curb Idle" RPM.

Vehicles W/Air Conditioning — 1) With engine at normal operating temperature and air conditioning "OFF", turn idle speed screw to obtain specified "Curb Idle" RPM.

2) Disconnect air conditioning compressor electrical lead at compressor. Turn air conditioning "ON" and place automatic transmission in Drive. Open throttle slightly to allow solenoid plunger to fully extend, then turn solenoid screw to obtain specified "Solenoid Energized" RPM. Reconnect compressor lead after adjustment is completed.

TUNE-UP (Cont.)

Application	Idle Speed (RPM)	
	Curb Idle	Solenoid Energized
267" 2-Bbl.	500	600
301" 4-Bbl.	600	650
305" 4-Bbl.		
Man. Trans.	700	.....
Auto. Trans.	500	600
350" VIN L		
Man. Trans.	700	.....
Auto. Trans.	500	600
350" VIN 8		
Man. Trans.	700	.....
Auto. Trans.	500	600
350" VIN 6		
Man. Trans.	900	.....
Auto. Trans.	700	800

DIESEL MODELS

NOTE — Use magnetic pick-up tachometer (J-26925 or equivalent) to check idle speed. Insert probe in timing indicator hole.

1) Block driving wheels and engage parking brake. Start engine.

2) Adjust slow idle screw on injection pump to obtain RPM indicated on emission control label. See Fig. 4 for idle adjustment locations.

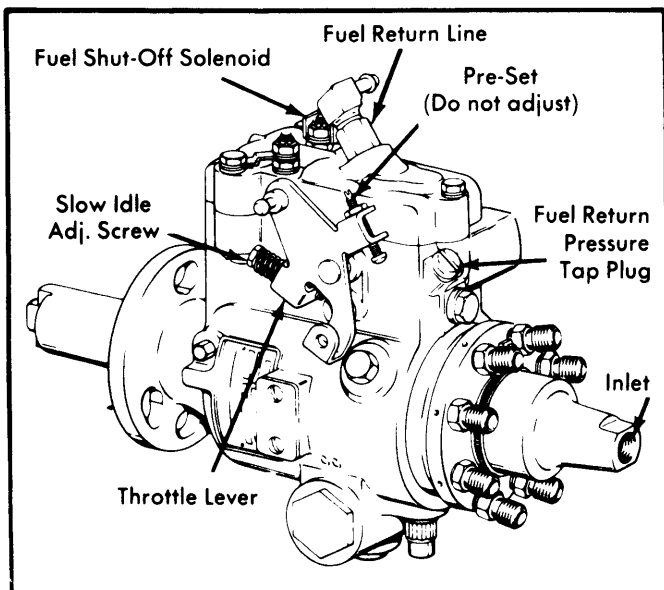


Fig. 4 Diesel Injection Pump Adjustment Locations

IDLE MIXTURE

NOTE — Idle mixture is not part of normal tune-up. Idle mixture should be adjusted only in case of major carburetor overhaul or high idle CO.

MIXTURE SCREW PLUG REMOVAL

1) Remove carburetor from engine, invert carburetor and drain fuel into a container. Place carburetor on a suitable holding fixture with manifold side up.

2) Place a punch between the 2 locator marks on throttle body beneath mixture screw plug (manifold side) and break out throttle body to gain access to plug.

3) Use punch to drive out mixture screw plug. If hardened steel plug shatters, remove loose pieces.

4) Repeat steps 2) and 3) to remove remaining plug (if equipped).

PROPANE ENRICHMENT PROCEDURE (FEDERAL MODELS ONLY)

1) With engine at normal operating temperature, choke fully open and air conditioning "OFF" (if equipped), set parking brake and block drive wheels. Disconnect and plug hoses as directed on Emission Control/Tune-Up Decal under the hood.

2) Connect tachometer to engine. Disconnect vacuum advance and set timing to specification on Emission Decal. Reconnect vacuum advance. Disconnect crankcase ventilation tube from air cleaner. Insert hose with rubber stopper tool J-26911 from propane valve into positive crankcase ventilation tube opening in air cleaner.

3) Propane cartridge must be in vertical position. Slowly open propane control valve until maximum engine speed is reached with automatic transmission in DRIVE and manual transmission in NEUTRAL.

NOTE — Too much propane will cause engine speed to drop.

4) Observe flow meter to ensure cartridge is full. With propane flowing, adjust idle speed screw to the "enriched RPM" (see specifications). Readjust propane flow to be certain of maximum engine speed and adjust idle speed if necessary.

5) Turn off propane. Place transmission in NEUTRAL and run at 2000 RPM for 30 seconds. Put transmission in DRIVE (manual transmission in NEUTRAL). Check idle speed. If idle speed agrees with idle speed shown on Emission Decal, idle mixture is correct. Proceed to step 8).

6) If idle speed is too low, use a 3/16" deep socket to back screws out 1/8 turn at a time until correct speed is reached. If speed is too high, turn mixture screws in 1/8 turn at a time until correct speed is reached.

NOTE — It may be necessary to remove air cleaner to reach idle mixture screws. Reinstall air cleaner to check idle speed.

7) Turn propane on again to check maximum engine idle speed. If speed is different from specification, readjust idle speed screw to "enriched RPM" with propane flowing. Turn off propane, place transmission in NEUTRAL and accelerate engine to 2000 RPM for 30 seconds. Recheck idle speed. Idle speed should agree with specifications. If not, repeat procedure starting with step 6).

TUNE-UP (Cont.)

8) If idle is unusually rough, turn mixture screws in until lightly seated. Back screws out equally to previous position and rerun propane idle test starting with step 2). If idle is correct, turn engine off and remove propane tool. Connect PCV system and reconnect all other hoses.

Propane Enrichment RPM

Application	Enriched RPM	
	Man. Trans.	Auto. Trans.
267" 2-Bbl.		520-540
301" 4-Bbl.		540-550
305" & 350" VIN L & 8	800	550
350" VIN 6	1000	750

NOTE — The C-4 system is sensitive to any changes in mixture control. Because of this, "Propane Enrichment" cannot be used to set mixture. The following procedure should only be used in the event of emissions failure or major carburetor work.

MIXTURE CONTROL ADJUSTMENT — C-4 (CALIFORNIA ONLY)

1) Before adjusting idle air bleed valve, mixture control solenoid adjustment must be checked and corrected as necessary. See Rochester E2ME & E4ME Carburetor article in FUEL SYSTEMS Section.

2) To adjust idle air bleed valve, set parking brake and block drive wheels. Disconnect and plug hoses as directed on Emissions Control Tune-Up decal in engine compartment. Check ignition timing and adjust if necessary.

3) Connect a dwell meter to lead wire from mixture control solenoid in carburetor, then set dwell meter on 6 cylinder scale. Start engine and run at idle until normal operating temperature is reached and a varying dwell is noted on dwell meter.

NOTE — It is absolutely essential that engine is operated for a sufficient length of time to ensure that engine coolant sensor and oxygen sensor in exhaust, are at full operational temperature.

4) Adjust curb idle speed, if necessary. With engine idling, observe dwell reading. If within, or varying between 10-50° range, no further adjustment is necessary. If dwell does not vary and/or falls outside the 10-50° range, perform the following:

5) With engine off, cover primary and secondary inlets with a shop towel. Align a number 3 drill on the rivet head holding the air bleed valve cover. Drill only enough to remove rivet head, use a small punch and drive remainder of rivet from air bleed tower. Remove idle bleed cover and discard.

6) Restart engine and allow to idle, using a screwdriver that fully fits in valve, slowly turn valve up or down until dwell reading varies and falls within the 25-35° range, attempting to be at or as close to 30° as possible.

CAUTION — Perform this step carefully. The idle air bleed valve is very sensitive in controlling air/fuel ratios and the valve should be turned only in 1/8 turn increments.

7) If after performing this adjustment the dwell reading does not vary and is not within the 25-35° range, it will be necessary to remove carburetor to gain access to plugs covering the idle mixture needles and adjust the idle mixture as follows:

8) With idle mixture needle plugs removed, use a 3/16" thin wall deep socket and turn each idle mixture inward until lightly seated. Then, back out each mixture needle 2 turns.

9) Reinstall carburetor (without air cleaner and gasket). Start engine, run until fully warm, and repeat idle air bleed adjustment until dwell reading is varying and within specified limits.

10) If unable to achieve varying dwell and specified range, turn each mixture needle out an additional 1/2 turn. Then, reset idle air bleed valve to obtain dwell limit specifications.

11) If necessary, reset curb idle speed and fast idle speed to specifications. Disconnect dwell meter and tachometer. Unplug and reconnect vacuum hoses, reinstall air cleaner and gasket.

COLD (FAST) IDLE RPM

With engine at normal operating temperature, disconnect and plug vacuum hose at EGR valve. Position cam follower on cam step specified on Emission Control Tune-Up decal and turn fast idle screw to obtain specified fast idle speed.

Fast Idle Speed (RPM)

Application	Man. Trans.	Auto. Trans.
267" 2-Bbl.		1850
301" 4-Bbl.		2400
305" 4-Bbl.	1500	1850
350" VIN L	1500	1850
350" VIN 6 & 8	1300	1600

AUTOMATIC CHOKE

Automatic chokes are riveted and require no adjustment. A tab on the choke cover fits into a slot cut into the choke housing, preventing accidental turning.

FUEL PUMP

Disconnect or pinch off fuel return line (if equipped), connect pressure gauge to fuel line at carburetor.

Pressure	
301"	7.5-9.0 psi
All Others	8.0-8.5 psi
Volume	
All Models	One pint in 30 seconds

INJECTION PUMP FUEL PRESSURE (DIESEL ENGINES ONLY)

1) Remove air crossover. Install screened covers (J-26996-2). Remove fuel return pressure tap plug.

2) Screw pressure tap adapter (J-28526 or equivalent) into pump housing. Be sure to use seal from tap plug on tap adapter before installing. Connect a low pressure gauge to adapter.

GENERAL SERVICING (Cont.)

3) Connect magnetic pick-up tachometer (J-26925 or equivalent). Place shift lever in "PARK" position. Start engine.

Pressure 8-12 psi
Maximum Fluctuation 2 psi

4) Raise engine speed to 1000 RPM. Pressure should be as follows:

EXHAUST EMISSION SYSTEMS

See EXHAUST EMISSION SYSTEMS section.

GENERAL SERVICING

IGNITION

DISTRIBUTOR

Delco-Remy — High Energy Ignition

NOTE — Module must be replaced as a unit. A liberal coat of silicone grease must be applied to surface on which module will be mounted.

IGNITION COIL

Resistance

Primary (At 75°F)4-1.0 ohms
Secondary (At 75°F) 6000-30,000 ohms

Coil Output

At all engine speeds 25-35 KV Minimum[Ⓞ]

Ⓞ — Replace if below 25 KV.

CARBURETION

CARBURETORS

Application	Model
267" 2-Bbl.	Rochester M2ME
301" 4-Bbl.	Rochester M4ME
305" 4-Bbl.	
Federal	Rochester M4ME
Calif.	Rochester E4ME
350" 4-Bbl.	Rochester M4ME

Other Data & Specifications — See Tune-Up and Rochester Carburetors in FUEL SYSTEMS Section.

FUEL INJECTION (DIESEL ENGINES ONLY)

Application	Type
350" Diesel	Gear Driven Mechanical Fuel Injection Pump (High Pressure Rotary)

Other Data & Specifications — See Tune-Up and General Motors Diesel Fuel Injection in FUEL SYSTEMS Sections.

ELECTRICAL

BATTERY

12 Volt — Negative Ground.

Application	Cold Crank (Amps @0°F)	Reserve Capacity (Minutes)
267", 301" 305" & 350" ...	350	80
Corvette	430	100
Diesel	540	135

STARTER

Delco-Remy solenoid actuated with overrunning clutch.

Free Speed Voltage

267" & 301"	9@7000-11,900 RPM
305"	10.6@7500-11,400 RPM
350"	10.6@9500-10,500 RPM
350" Diesel	9@8000-13,000 RPM

Free Speed Amperage

267" & 301"	45-70@7000-11,900 RPM
305"	50-80@7500-11,400 RPM
350"	65-95@7500-10,500 RPM
350" Diesel	40-140@8000-13,000 RPM

ALTERNATOR

Application	Standard (Amps.)	Optional (Amps.)
267", 305" & 350"	37	55 & 63
Corvette	42	61
Diesel	70	

ALTERNATOR REGULATOR

Delco-Remy nonadjustable, integral with alternator.
Operating Voltage (at 85°F) 13.8-14.8

ENGINE

INTAKE MANIFOLD TIGHTENING

Tighten intake manifold bolts in sequence shown in illustration to 30 Ft. lbs.

GENERAL SERVICING (Cont.)

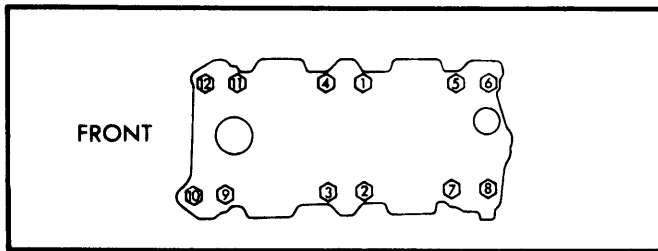


Fig. 5 267", 301", 305" & 350" Intake Manifold Tightening Sequence

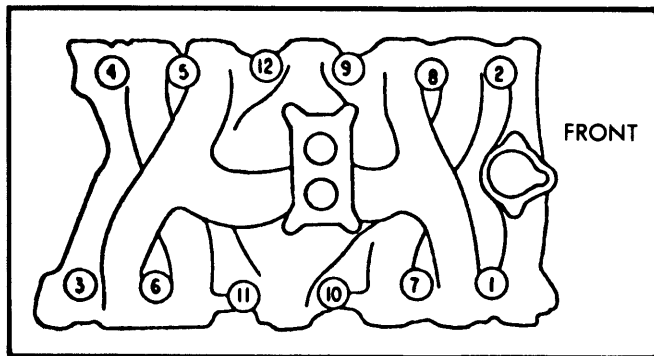


Fig. 6 350" Diesel Intake Manifold Tightening Sequence

BELT ADJUSTMENTS

Tension (Lbs.) Using Strand Tension Gauge

Application	New Belt	Used Belt
Fan & Power		
Steering.....	120-130	70-80
Air Conditioning.....	135-145	90-100
A.I.R. Pump.....	120-130	70-80

CAPACITIES (COOLING)

Application	(Qts.)
Caprice & Impala	
267"	
Sedan & Coupe	16.75
Station Wagon	15.5
301"	15.5
350"	16.25
El Camino, Malibu & Monte Carlo	
267", 305"	21.0
350"	19.0
Camaro	
267", 305"	15.0
350"	14.0
Corvette	21.0

FILTERS & CLEANERS (GASOLINE MODELS)

Filter or Cleaner	Service Interval (Miles)
Oil Filter	Replace every 2nd oil change
Air Filter	Replace every 30,000
Fuel Filter	Replace every 15,000
PCV Filter	Replace every 30,000
PCV Valve	Replace every 30,000
Vapor Canister Filter	Replace every 30,000

FILTERS & CLEANERS (DIESEL MODELS)

Service Item	Service Interval (Miles)
Engine Oil ^①	Change every 3000
Oil filter	Replace every 3000
Fuel Filter	Replace every 24,000
Air Cleaner	Replace every 30,000
PCV System	②

① — Use ONLY engine oils labeled with A.P.I. designations SE and CC. Be sure the can has both the SE and CC designations. DO NOT use an oil if the designation CD appears anywhere on the can.

② — Clean breather cap/valve assembly and ventilation filter assemblies (both valve covers) every 6000 miles. Replace breather cap/valve assembly and flow control valve every 30,000 miles.

CAPACITIES (EXCEPT COOLING)

Application	Quantity
Crankcase	
Diesel	① 7.0 qts.
All Others	① 5.0 qts.
Auto. Trans. (Dexron II)	
200 Drain & Refill	3.5 qts.
350 Drain & Refill	3.0 qts.
Man. Trans. (GL-5 80W-90)	3.5 pts.
Rear Axle (GL-5 80W-90)	
7.5"	3.5 pts.
8.5"	4.25 pts.
8.75"	5.4 pts.
Fuel Tank	
Caprice & Impala	
Coupe & Sedan	18.5 gals.
Station Wagon	22.0 gals.
Malibu & Monte Carlo	
Coupe & Sedan	18.1 gals.
Station Wagon	18.2 gals.
El Camino	17.5 gals.
Corvette	20.8 gals.

① — Includes oil filter.