TUNE-UP

ENGINE IDENTIFICATION

VEHICLE IDENTIFICATION NUMBER CODE

Fifth digit of Vehicle Identification Number, located on plate attached to top left side of instrument panel, is the engine code letter.

VIN Code

Application	Code
260" 2-Bbl.	F
305" 4-Bbl.	H
307" 4-Bbl.	Y
350" 4-Bbl.	R
350" Diesel	N

ENGINE IDENTIFICATION NUMBER CODE

Engine identification numbers are found on engines at the following locations:

VIN Number	Location
VIN H	Code tape on right valve cover
VIN F, N, Y & R	Code tape on left valve cover

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 a compression test or cranking engine with a remote starting switch, disconnect ignition switch connector (pink wire) from H.E.I. system distributor.*

CAUTION — *Do not remove spark plug wires with engine running. High Energy Ignition secondary voltage is higher than standard ignition systems and may inflict harmful electrical shock.*

CAUTION — *Damage to H.E.I. electronic module and/or ignition coil may result if "TACH" 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	
260"	8.0:1
All Others	8.5:1
Recommended Fuel	Unleaded (87 AKI Minimum)
Compression Pressure	120-160 psi
Maximum Variation	30%

Test compression with engine warm, all spark plugs removed and throttle and choke valves wide open.

NOTE — *If using a remote starter switch, disconnect the ignition switch connector (pink wire) at H.E.I. distributor.*

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	①
Recommended Fuel	Diesel 2-D②

① — Lowest cylinder must read within 70% of highest.
② — Use 1-D for vehicle operation below 20° F (−7° C).

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 six 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	Zero Lash

VALVE ARRANGEMENT

All Engines
I-E-I-E-E-I-E-I (Front to rear, both banks).

SPARK PLUGS

Gap	
260", 307" & 350"	.080"
305"	.045"
Torque	
260", 307" & 350"	25 ft. lbs.
305"	22 ft. lbs.

Spark Plug Type

Application	AC No.
260", 307" & 350"	R46S
305"	R45TS

TUNE-UP (Cont.)

GLOW PLUGS

Glow plugs are small 12 volt heaters. One is screwed into each cylinder to aid in cold engine starting. Glow plugs are activated when 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.

HIGH TENSION WIRE RESISTANCE

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

Resistance (Ohms)

Wire Length	Resistance
Under 24"	30,000 Max.
Over 24"	50,000 Max.

DISTRIBUTOR

All models are equipped with High Energy Ignition System and no adjustment is required.

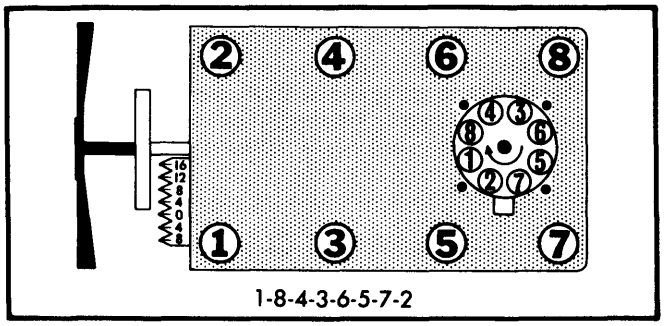

Fig. 1 305" Firing Order and Timing Marks

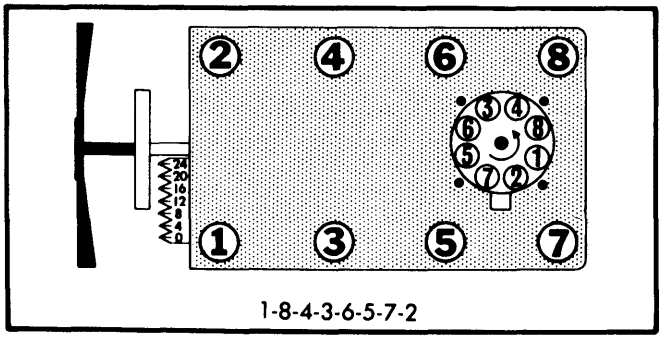

Fig. 2 260", 307" & 350" Firing Order and Timing Marks

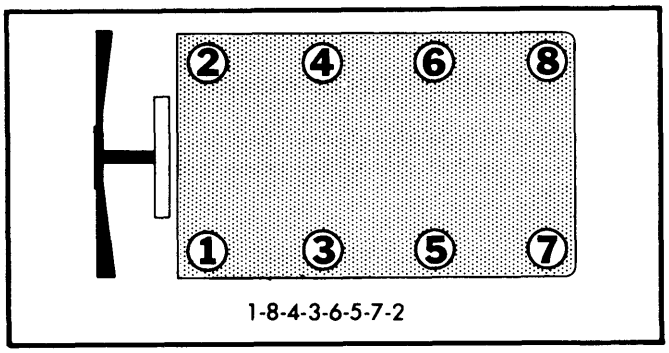

Fig. 3 350" Diesel Firing Order

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.*

Ignition Timing procedures will vary with vehicle model and component application. Refer to Emission Control Tune-Up decal in engine compartment for correct adjustment procedures.

Ignition Timing (Degrees BTDC@RPM)

Application	Man. Trans.	Auto. Trans
260" 2-Bbl.	.....	20@1100
305" 4-Bbl.	.....	4@550
307" 4-Bbl.	.....	20@1100
350" 4-Bbl.	.....	18@1100

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 the boss at front of injector pump.*

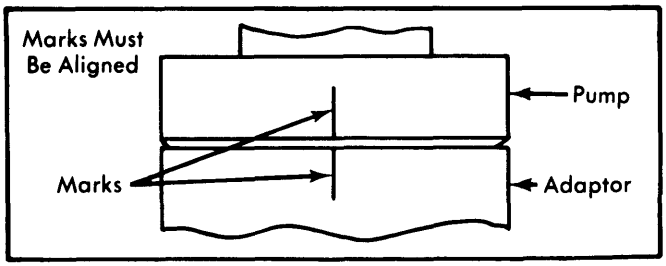

Fig. 4 Timing Marks on Injection Pump and Adapter

TUNE-UP (Cont.)

3) Adjust throttle rod with engine off. On cruise control equipped models, remove cruise control rod clip and remove rod from bellcrank. *See Linkage Adjustment in GM Diesel Fuel Injection article in FUEL SYSTEMS Section.*

HOT (SLOW) IDLE RPM

GASOLINE MODELS

Idle speed 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 Cond. & Idle Speed Solenoid – Place idle speed screw on low step of fast idle cam. Adjust idle speed screw to obtain specified RPM.

Vehicles W/O Air Cond; W/Idle Speed Solenoid – 1) With solenoid energized, open throttle slightly to allow solenoid plunger to fully extend. Adjust solenoid screw to obtain specified solenoid energized RPM.

2) Disconnect electrical connection at solenoid. With solenoid de-energized, adjust idle speed screw to obtain specified curb idle RPM.

Vehicles W/Air Cond. – 1) Adjust idle speed screw to obtain specified curb idle RPM. Disconnect A/C compressor clutch electrical lead at compressor.

2) Turn A/C "ON" to energize idle speed solenoid. Place automatic transmission in "D". Open throttle slightly to allow solenoid plunger to fully extend.

3) Adjust idle speed solenoid screw to obtain specified solenoid energized RPM. Reconnect A/C compressor clutch electrical lead.

Idle Speed (RPM) ①

Application	Curb Idle	Solenoid Energized
260" 2-Bbl.	500	625
305" 4-Bbl.		
Federal	500	600
Calif.	550	650
307" 4-Bbl.	500	600
350" 4-Bbl		
Federal	500	600
Calif.	550	650

① – With auto. trans. in drive.

DIESEL MODELS

NOTE – *Use magnetic pickup 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 600 RPM. Automatic transmission should be in "D" and A/C "OFF". *See Fig. 5.*

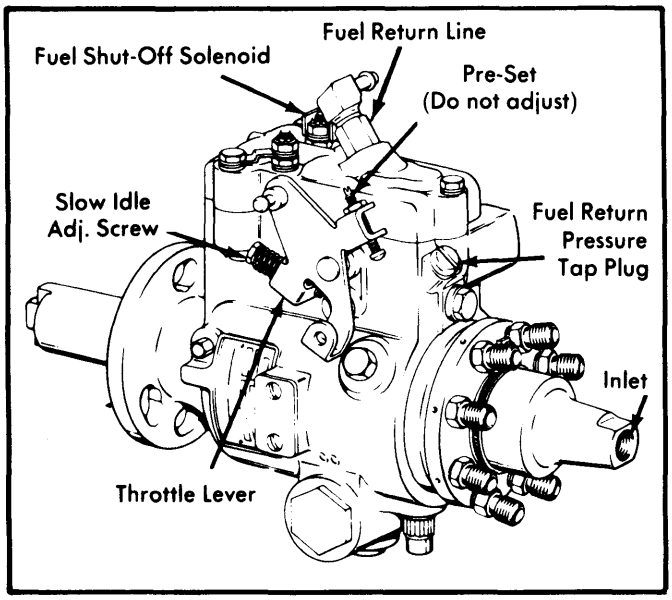

Fig. 5 Diesel Injection Pump Adjustment Locations

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 breakout throttle body to gain access to plug. Use a punch to drive out plug. If hardened steel plug shatters, remove loose pieces. Remove remaining plug (if equipped) in same manner.

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 the Emission Information Label under hood.

2) Connect a tachometer to engine. Disconnect vacuum advance and set timing to specification on Emission Label. 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.

NOTE – *Too much propane will cause engine speed to drop.*

3) Propane cartridge must be in a vertical position. Slowly open propane control valve until maximum engine speed is reached with transmission in drive (neutral for manual transmission).

TUNE-UP (Cont.)

4) Observe propane flow meter to ensure propane 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 2,000 RPM for 30 seconds. Put transmission in drive (neutral for manual transmission). Check idle speed. If it is as shown on Emission Label, idle mixture is correct, proceed to step 8.

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

6) If idle speed is too low, carefully remove cap(s) from mixture screw(s) and back screw(s) out 1/8 turn at a time until specified speed is reached. If speed is too high, turn mixture screw(s) in 1/8 turn at a time until specified speed is reached.

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 and accelerate engine to 2,000 RPM for 30 seconds and recheck idle speed. Idle speed should be to specification, if not repeat procedure starting with step 6.

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

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, E4MC or 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 25-35° 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, remove staking around plug covering idle air bleed valve and remove plug. Using a screwdriver that fully fits slot 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.*

6) 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 the plugs covering the idle mixture needles and adjust the idle mixture as follows:

7) With idle mixture needle plugs removed, use a 3/16" thin wall deep socket and turn each idle mixture needle inward until lightly seated. Then, back out each mixture needle 5 1/2 turns (VIN R) or 1 1/2 turns (VIN H).

8) 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.

9) 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.

10) 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.

Propane Enriched Idle Mixture RPM

Application	Propane Enriched
260" 2-Bbl.	530-550
305" 4-Bbl.	530-570
307" 4-Bbl.	530
350" 4-Bbl.	565-585

COLD (FAST) IDLE RPM

See Emission Control Decal for correct procedures for setting fast idle RPM.

Fast Idle RPM

Application	Man. Trans.	Auto. Trans.
260" 2-Bbl.		700
305" 4-Bbl.		
Federal		1850
Calif.		2200
307" 4-Bbl.		700
350" 4-Bbl.		700

TUNE-UP (Cont.)

FAST IDLE SOLENOID (DIESEL ENGINES ONLY)

1) Block driving wheels and engage parking brake. With ignition off, disconnect electrical connector (single green wire) from fast idle relay located on front of dash.

2) With engine running, adjust solenoid (with solenoid energized) to specifications listed on emission control lable.

AUTOMATIC CHOKE

Automatic choke needs no adjustment and has a riveted retainer.

FUEL PUMP

When testing pump, disconnect and plug fuel return line on models so equipped.

Pressure (At Idle)	
All Models	5.5-6.5 psi
Volume (At Idle)	
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. See *Fig. 5.*

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

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

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

Pressure	8-12 psi
Maximum Fluctuation	2 psi

5) If pressure does not read within specifications, replace fuel return line connector assembly.

6) Remove tachometer, gauge and adaptor. Install new pressure tap plug screw seal on plug. Install plug in housing. Remove screened covers. Install air crossover and torque (4) bolts to 22 ft. lbs.

INJECTION NOZZLES (DIESEL ENGINES ONLY)

If engine starts, but idles roughly, check injection nozzles as follows:

1) Start engine. Loosen injection line fitting at each nozzle, one at a time. Be sure to direct fuel away from ignition sources.

2) If, when a nozzle is removed, idle speed or quality does NOT change, replace that nozzle and repeat test.

3) Disconnect fuel return system from nozzles on one bank of engine at a time. Start engine. Observe fuel seepage at nozzles. Replace any nozzle that leaks excessively. Torque nozzle clamp bolt to 25 ft. lbs.

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 the surface on which module will be mounted.*

IGNITION COIL

Resistance

Primary (at 75°F)	0-1.0 ohms
Secondary (at 75°F)	6,000-30,000 ohms

Coil Output

At all engine speeds	25-35 KV Minimum①

① – Replace if below 25 KV.

CARBURETION

CARBURETORS

Application	Model
260" 2-Bbl.	Rochester M2MC
305" 4-Bbl.	
Federal	Rochester M4MC
Calif.	Rochester E4ME
307" 4-Bbl.	Rochester M4MC
350" 4-Bbl.	
Federal	Rochester M4MC
Calif.	Rochester E4MC

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

GENERAL SERVICING (Cont.)

FUEL INJECTION (DIESEL ENGINES ONLY)

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

Other Data & Specifications – *See Tune-Up and General Motors Diesel Fuel Injection in FUEL SYSTEMS Section.*

ELECTRICAL

BATTERY
12 Volt – Negative Ground.

Application	Cold Crank (Amps.@0°F)	Reserve Capacity (Minutes)
260", 305" & 350"		
Standard	350	80
Optional	430	100
Optional	500	125
Diesel		
Standard	500	125
Optional	540	135

STARTER

Delco-Remy solenoid actuated with overrunning clutch.

Free Speed Voltage	
260", 305" & 307"	9@7,000-11,000 RPM
350" Gasoline	9@6,800-10,300 RPM
350" Diesel	9@8,000-13,00 RPM
Free Speed Amperage	
260", 305" & 307"	45-75@7,000-11,900 RPM
350" Gasoline	65-96@6,800-10,300 RPM
350" Diesel	40-140@8,000-13,000 RPM

ALTERNATOR

Application	Standard (Amps.)	Optional (Amps.)
Cutlass, 88 & 98	42, 55 & 63	63 & 70
Toronado	63	70

ALTERNATOR REGULATOR

Delco-Remy nonadjustable, integral with alternator.

Operating Voltage (at 85°F).....13.8-14.8 V

ENGINE

INTAKE MANIFOLD TIGHTENING

305" – Tighten intake manifold attaching bolts, in sequence shown in *Fig. 6*. Specified torque is 35 ft. lbs.

All Others – Tighten intake manifold attaching bolts, in sequence shown in *Fig. 7*. Specified torque is 45 ft. lbs.

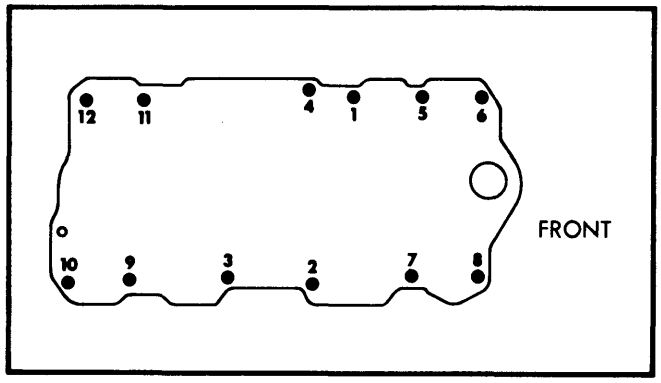

Fig. 6 305" Intake Manifold Tightening Sequence

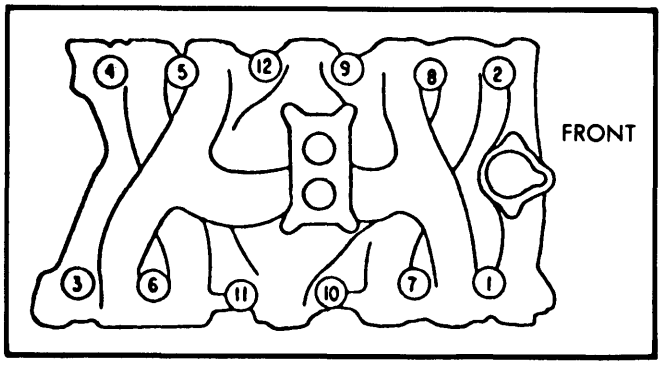

Fig. 7 Intake Manifold Tightening Sequence (Except 305" V8)

CAPACITIES

COOLING

Application	Standard (Qts.)	Optional (Qts.)
Cutlass		
260" 2-Bbl.	16.0	16.5
305" & 307" 4-Bbl.	15.25	16.0
350" 4-Bbl.	15.0	.....
350" Diesel	17.25	.....
88 & 98		
260" 2-Bbl.	19.0	19.75
307" 4-Bbl.	15.25	16.0
350" 4-Bbl.	14.5	15.5
350" Diesel	18.25	.....
Toronado		
307" 4-Bbl.	15.5	16.25
350" 4-Bbl.	14.75	15.5
350" Diesel	14.5	15.25

GENERAL SERVICING (Cont.)

CAPACITIES
(EXCEPT COOLING)

Application	Quantity
Crankcase	
Diesel Models	①7.0 qts.
260" 2-Bbl.	①4.0 qts.
All Others	②4.0 qts.
Auto. Trans.	
200C (Dexron II)	
Drain & Refill	3.5 qts.
350 & 350C (Dexron II)	
Drain & Refill	3.0 qts.
400 (Dexron II)	
Drain & Refill	3.0 qts.
Rear Axle (SAE-80W-90)	
7½" Ring Gear	3.5 pts.
8½" & 8¾" Ring Gear	4.25 pts.
Final Drive (SAE-80W-90)	3.25 pts.
Fuel Tank	
Gasoline	
Cutlass	18.0 gal.
Cutlass Cruiser	18.25 gal.
88 Sedan	20.75 gal.
Other 88 & 98 Models	25.0 gal.
Custom Cruiser	22.0 gal.
Toronado	21.0 gal.
Diesel	
Cutlass	19.75 gal.
Cutlass Cruiser	18.25 gal.
88 & 98	27.0 gal.
Custom Cruiser	22.0 gal.
Toronado	23.0 gal.

① — Includes oil filter.
② — Add 1 quart with oil filter change.

BELT ADJUSTMENTS

Tension (Lbs.) Using Strand Tension Gauge

Application	New Belt	Used Belt
5/16" Wide	80 Max.	50 Min.
3/8" Wide	140 Max.	70 Min.
15/32" Wide	165 Max.	90 Min
Cogged Belt	.....	60 Min

FILTERS & CLEANERS (GASOLINE MODELS)

Filter or Cleaner	Service Interval
Oil Filter	Replace every 2nd oil change
Fuel Filter	Replace every 15,000 mi.
PCV Valve	Replace every 30,000 mi.
PCV Filter	Replace every 30,000 mi.
Air Filter	Replace every 30,000 mi.
Canister Filter	Replace every 30,000 mi.

FILTERS & CLEANERS (DIESEL MODELS)

Service Item	Service Interval
Engine Oil①	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 the 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.