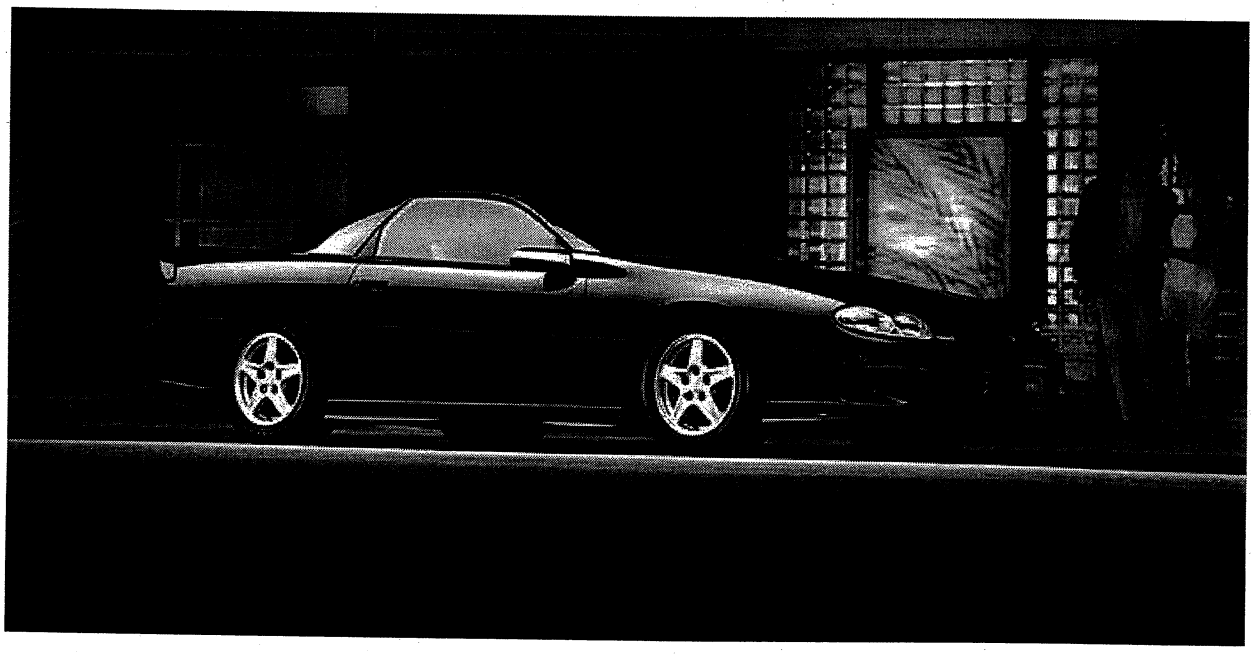
Chevrolet

Camaro



2000

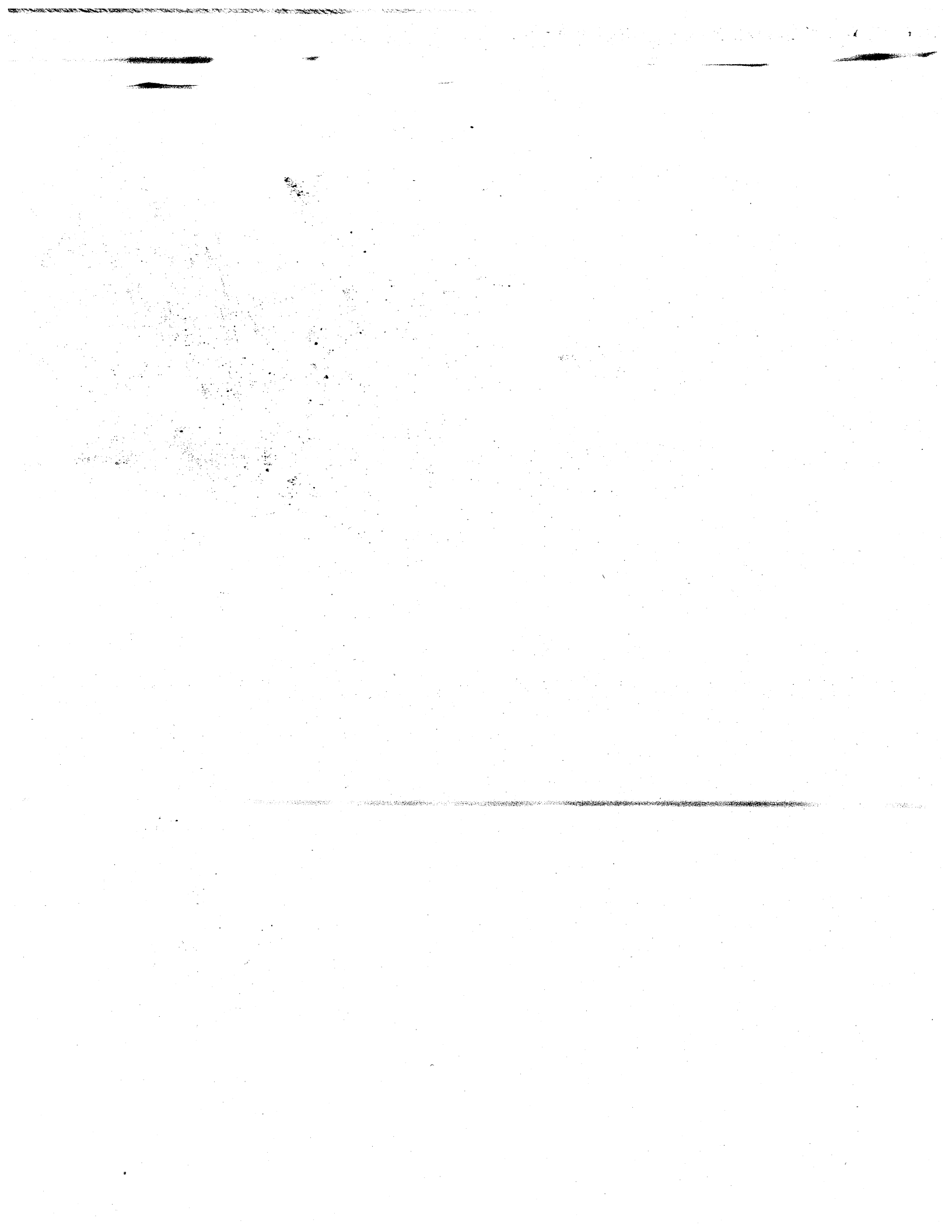


Table of Contents

Product Information

Camaro Adds Convenience, Audio And Appearance Features For 2000

DETROIT — For 2000, Camaro adds many convenience, audio and appearance features for those seeking high style in America's honest sports car.

A new convenience feature inside Camaro, the redundant radio control steering wheel eases the driver's need to divert their attention from the road to adjust common audio settings. For instance, volume, channel pre-set and AM/FM selections can all be reached within fingertip distance on the steering wheel. And for added convenience, the premium Monsoon® sound system with CD player is now compatible with the optional CD changer.

New interior fabrics on seats and door-trim panels give the interior a fresh, new look and are available in Medium Gray, Accent and Ebony.

"Camaro is a powerful sports car, and as the boldest kid on the block it naturally commands respect wherever it goes," said Jim Campbell, Camaro brand manager. "That attention is due in large part to its powertrains and its bold styling."

On the outside, the Z28 Coupe now receives standard body-color rearview mirrors that complement its overall appearance and new standard aluminum wheels. The new exterior color on Camaro for 2000 is Monterey Maroon Metallic.

The Performance Handling Package, available on Coupe and Convertible, also includes the new aluminum wheels for an aggressive appearance. Z28 models equipped with the SS Performance/Appearance Package also include new and unique aluminum wheels. Finally, all models, except Z28 with the SS Performance/Appearance Package, feature available aluminum wheels with a high polish finish.

Revisions made to the 3800 V6 and 5.7 Liter LS1 V8 engines helped bring both into compliance with government LEV regulations in California and states requiring California emissions.

Camaro is available in Coupe and Z28 Coupe models. Or for those who crave the thrill of open-air driving, there's the Camaro Convertible and Z28 Convertible. For those who can't decide between the Convertible and the Coupe, there's the T-Top, optional on Camaro Coupe and Z28 Coupe. The Ford Mustang doesn't offer this popular feature. And then, for the ultimate Camaro in terms of handling and performance, there's the Camaro SS.

Ever onward, ever upward — Camaro for 2000 continues to uphold its well-deserved reputation as "America's honest sports car."

What's New And Highlights

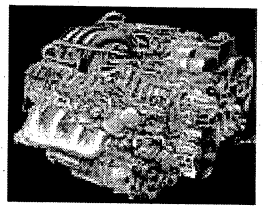
Interior

- Ebony interior color replaces Dark Gray for "true" black interior
- Medium gray interior cloth color replaces Arctic White (leather color)
- Accent interior cloth replaces Red Accent
- New cloth fabric on seats and door trim
- New redundant radio control steering wheel
- Monsoon radio with CD player (UNO) now compatible with 12-Disc CDchanger mounted in trunk.

Engines

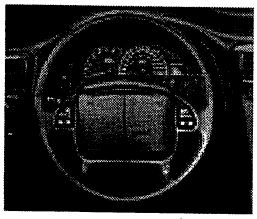
Revisions were made to both the V6 and V8 LS1 engines to meet Low Emission Vehicle regulations in California and states requiring California emissions, when properly equipped (see Engine Revisions in the Highlights section for more LEV information).

Engine Revisions



Properly equipped 3800 V6 and 5.7-liter LS1 engines have been revised in order to meet Low Emission Vehicle regulations in California and states requiring California emissions.

Redundant Radio Control - Steering Wheel



Instead of looking and reaching away to adjust radio settings, the redundant radio control steering wheel allows the driver convenient audio operation within fingertip reach on the steering wheel.

Exterior

- • Body color outside rearview mirrors on Z28 Coupe
- • Monterey Maroon Metallic exterior color
- • 16-inch aluminum wheel (painted or optional polished)
- • 17-inch aluminum wheel (Camaro SS only).

Model Summary

- Camaro Coupe
- Camaro Convertible
- Camaro Z28 Coupe
- Camaro Z28 Convertible.

Brand Identity

Marketplace

Camaro and Camaro Z28 provide both Coupe and Convertible model choices that cover a large segment of muscle car customers by offering rear-wheel-drive and V8 performance.

Camaro Competitors:

- Ford Mustang and Mustang GT
- Mercury Cougar
- Honda Prelude
- Mitsubishi Eclipse
- Toyota Celica GT
- Chrysler Sebring.

Camaro Z28 Competitors:

- Ford Mustang GT and Mustang Cobra
- Mitsubishi Eclipse GSX
- Mitsubishi 3000GT
- Toyota Celica GT.

1999 Awards

- The LS1 5.7 Liter V8 was voted one of the "10 Best Engines" by Ward's Auto World for 1997, '98 and '99
- Intellichoice 1999 "Best Value of the Year"
- Kiplinger's Personal Finance 1999 Consumer Guide "First for Safety" ($13,000-$18,000 range)

Demographics Target

	Overall Target	Convertible	Z28
Median Age	35 Years	40 Years	40 Years
Median Household Income	$55,000	$75,000	$75,000
College Graduate	36%	58%	43%
Principal Driver-Female	50%	50%	25%

Vehicle Overview

Interior Overview

Key Standard Features*

Camaro Coupe Model:

- **NEW** Cloth fabric on seats and door trim
- **NEW** Rear-seat child restraint anchor provisions
- Driver and front-passenger air bags†
- Air conditioning with CFC-free refrigerant
- Tilt-Wheel™ steering column
- Electronically-tuned AM/FM stereo with cassette player and extended range speakers
- Theatre lighting
- Center console with integral armrest and storage compartment
- Full-folding rear seatback
- Carpeted front floor mats
- "Change Oil Soon" indicator
- Gauge package with 125 mph speedometer, tachometer and digital odometer
- PASS-Key II theft-deterrent system
- Retained Accessory Power (RAP)
- Closeout panel for cargo area
- Solar-Ray Tinted Glass.

Camaro Convertible Model Adds The Following, In Addition To Or Replacing Camaro Coupe Features:

- **NEW** Leather-wrapped steering wheel with redundant radio control
- Leather-wrapped transmission shifter and parking brake handle
- Power windows with driver's Express-Down feature
- Power door locks
- Carpeted rear floor mats
- Monsoon ETR AM/FM stereo with seek-scan, digital clock, TheftLock, speed compensated volume, cassette and auto tone control.

Camaro Z28 Coupe Model Includes All The Following, In Addition To Or Replacing Camaro Coupe Features:

- Monsoon ETR AM/FM stereo with cassette player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- 155 mph speedometer.**

* See Feature Availability chart for additional features.
† Always use safety belts and proper child restraints even with air bags. Children are safer when properly secured in a rear seat. See the owner's manual for more safety information.
** Vehicle speed may be limited by speed rating of tires.

Camaro Z28 Convertible Model Includes All The Following, In Addition To Or Replacing Camaro Z28 Coupe Features:

- **NEW** Leather-wrapped steering wheel with redundant radio controls
- Power window with driver's Express-Down feature
- 6-way power driver seat
- Power door locks
- Carpeted rear floor mats
- Leather-wrapped transmission shifter and parking brake release handle.

Key Optional Features*

- Leather seating surfaces
- Monsoon ETRAM/FM stereo with compact disc player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control
- 12-disc remote CD changer mounted in trunk.

* See Feature Availability chart for additional features.

Exterior/Structural Overview

Key Standard Features*

Camaro Coupe Model:

- Daytime Running Lamps with Automatic Exterior Lamp Control
- Dual, body-color, outside rearview mirrors (LH remote, RH manual)
- 16" bolt-on wheel covers
- Extensive anti-corrosion measures includes the use of composites, two-sided galvanized steel and electrodeposition primer (ELPO). Camaro makes extensive use of dent-resistant, rust-proof body panels. Significant features include:
- The roof, doors, hatch and spoiler are made of sheet-molded compound (SMC), a material composed of finely ground glass in a polyester resin.
- Reaction Injection Molded (RIM) process (reinforced with mica) is used for front fenders and fascia.
- Rust-resistant, two-sided galvanized steel is used for the rear-quarter panels and hood.
- SS Performance/Appearance Package also features a fiberglass (SMC) hood.

Camaro Convertible Model Adds The Following, In Addition To Or Replacing Camaro Coupe Features:

- Power convertible top with a three-piece hard tonneau cover with storage bag
- Body-color, body-side moldings
- Foglamps
- Dual power outside rearview mirrors.

Camaro Z28 Coupe Model Includes All The Following, In Addition To Or Replacing Camaro Coupe Features:

- **NEW** 16" aluminum wheels
- Special black roof treatment
- Dual outlet exhaust.

Camaro Z28 Convertible Model Includes All The Following, In Addition To Or Replacing Camaro Z28 Coupe Features:

- Foglamps
- Dual, power, outside rearview mirrors
- Body-color body-side moldings
- Power convertible top with three-piece hard tonneau cover with storage bag.

Key Optional Features*

- **NEW** 16" polished aluminum wheels
- Sport Appearance Package.

Exterior Paint

Standard basecoat/clearcoat paint treatment on Camaro helps resist fading and provides a high gloss shine for long-lasting exterior beauty. The clearcoat system is formulated to assist in reducing the effects of acid rain and other environmental damage. Clearcoat finish is used with all colors.

Paint Colors

- **NEW** Monterey Maroon Metallic
- Onyx Black
- Navy Blue Metallic
- Arctic White
- Light Pewter Metallic
- Bright Rally Red
- Mystic Teal Metallic
- Sebring Silver Metallic.

Convertible Top Colors:

- Arctic White
- Black
- Neutral

* See Feature Availability chart for additional features.

Functional Overview

Key Standard Features*

Camaro Coupe Model:

- 3800 V6 engine with 200 horsepower
- Engine oil-life monitor
- Five-speed manual transmission
- Four-wheel disc brakes with antilock system (ABS)
- Power rack-and-pinion steering
- Stainless-steel exhaust
- Firm Ride and Handling Suspension
- P215/60R-16 touring tires.†

Camaro Convertible Model Adds The Following, In Addition To Or Replacing Camaro Coupe Features:

- Electric rear-window defogger
- Cruise control
- Remote trunk release
- Remote Keyless Entry with illuminated interior feature
- Theft-deterrent alarm system.

Camaro Z28 Coupe Model Includes All The Following, In Addition To Or Replacing Camaro Coupe Features:

- 5.7-liter Corvette inspired LS1 V8 engine with 305 horsepower
- Cruise control
- Remote trunk release
- Remote Keyless Entry system with illuminated interior feature.

Camaro Z28 Convertible Model Includes All The Following, In Addition To Or Replacing Camaro Z28 Coupe Model Features:

- Electric rear-window defogger
- Cruise control
- Remote trunk release
- Remote Keyless Entry system with illuminated interior feature
- Theft-deterrent alarm system.

Key Optional Features*

- Acceleration Slip Regulation(ASR)
- Removable roof panels (Coupe models only).

* See Feature Availability chart for additional features.
† Vehicle speed may be limited by speed rating of tires.

Optional Packages

Camaro Special Service Police Package

The (RPO B4C) Special Service Police Package includes:

Interior

- 155 mph speedometer.

Exterior

- **NEW** 16" aluminum wheels.

Functional

- 5.7-liter LS1 V8 engine with 305 horsepower
- Choice of six-speed manual or electronically controlled four-speed automatic overdrive transmission
- Performance Handling Suspension
- P245/50ZR-16 speed-rated all-season performance tires*
- 3.23:1 limited-slip rear axle ratio (automatic transmission)
- 3.42:1 limited-slip rear axle ratio (manual transmission)
- Power steering oil cooler.

* Vehicle speed may be limited by speed rating of tires.

Acceleration Slip Regulation (ASR)

The optional ASR system (better known as Traction Control) on Camaro gives the driver greater control in various road conditions. Traction Control features include:

ASR For Camaro Coupe And Convertible:

- Utilizes the electronic throttle control and powertrain control module (PCM) to reduce engine torque when wheel spin is detected. The PCM will reduce engine spark and the Electronic Throttle Control will reduce the engine throttle position until favorable traction is restored.
- Automatically engages when the vehicle is started.

ASR For Camaro Z28:

- Utilizes the Powertrain Control Module
- Automatically engages when the vehicle is started
- Calibrated to allow some wheel slip
- Features an individual rear brake control which makes it possible to use the available traction on a split coefficient. For example, traction would be optimized even though one rear wheel is on slick pavement and the other rear wheel is on dry pavement.

Sport Appearance Package

Available on all Camaro models except SS, contents include:

- **NEW** 16" 5-spoke aluminum wheels (Coupe and Convertible only)
- Front fascia extension
- Rocker moldings
- Rear spoiler extension.

SS Performance/Appearance Package

- **NEW** SS specific 17" aluminum wheels
- 5.7 Liter LS1 V8 engine with increased horsepower and torque
- Forced-air induction fiberglass hood
- Low restriction exhaust with dual 2 3/4-inch tailpipes
- SS badging
- Goodyear Eagle F1 high performance tires
- High Performance Ride and Handling Package
- Power steering cooler
- Unique rear spoiler.

Transparent Removable Roof Panels (T-Tops)

Available on Coupe and Z28 Coupe models only.

Safety And Security*

Crash Avoidance Features

- Daytime Running Lamps
- Automatic Exterior Lamp Control
- 4-wheel antilock brake system (ABS)
- Optional Acceleration Slip Regulation (Traction Control)
- Clutch/starter safety switch
- Brake/transmission shift interlock
- Second-gear-start feature (not available on V6 models equipped with Traction Control).

Occupant Protection Features

- Driver and front-passenger air bags†
- Three-point safety belt system
- Reinforced steel safety-cage construction
- Front and rear crush zones
- Rear-seat child-restraint anchor provisions
- Body reinforcements and energy-absorbing foam pads in the doors
- Energy-absorbing steering column.

* For additional safety information, see the Chevrolet section of this Guide.
† Always use safety belts and proper child restraints even with air bags. Children are safer when properly secured in a rear seat.See the owner's manual for more safety information.

Security

- PASS-Key II theft-deterrent system
- Remote hood release
- Laser-etched vehicle identification number
- Optional theft-deterrent alarm system.

Sound Systems

Camaro Coupe

Standard:

- Electronically tuned AM/FM stereo with cassette player, seek-scan, digital clock and extended-range speakers.

Optional:

- Monsoon 200 watt Premium Sound System with electronically tuned AM/FMstereo, cassette player, seek-scan, digital clock, TheftLock, speed-compensated volume, auto tone control, Dolby Noise Reduction, music search, eight speakers and 200-watt amplifier
- Monsoon 200 watt Premium Sound System with electronically tuned AM/FM stereo and compact disc player, seek-scan, digital clock, TheftLock®, speed-compensated volume, auto tone control, Dolby Noise Reduction, music search, eight speakers and 200-watt amplifier.
- **NEW** Remote compact disc changer with 12-disc magazine located in the left rear of the cargo area and with controls built into the radio for easy operation and convenience — optional on all models. Now available with (RPO UN0) Monsoon CD player.

Camaro Convertible, Z28 Coupe and Z28 Convertible

Standard:

- Monsoon 200 watt premium sound system with electronically tuned AM/FM stereo and cassette player (see above for system description).

Optional:

- Monsoon 200 watt premium sound system with electronically tuned AM/FM stereo and CD player (see above for system description)
- Remote compact disc changer with 12-disc magazine (see above for system description).

Monsoon Cassette and Compact Disc PlayerSystems

Key Features:

- Speed-compensated volume automatically regulates the volume of the audio to help overcome road noise, so the volume level adjusts to the vehicle's speed
- Automatic tone control allows the listener to choose preset bass and treble settings designed for classical, news, rock, pop, country/western and jazz stations.

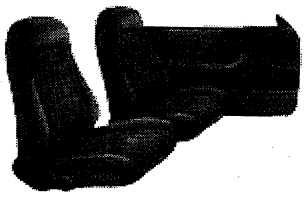
Redundant Radio Control Steering Wheel

Instead of looking and reaching away to adjust radio settings, the redundant radio control steering wheel allows the driver convenient audio operation within fingertip reach on the steering wheel.

This feature includes a leather-wrapped steering wheel. Controls include:

- Play
- Mute
- Volume
- Seek
- AM/FM.

Seats



Camaro Coupe, Convertible, Z28 Coupe and Z28 Convertible

Standard On All Models:

- Cloth front bucket, reclining seats
- Full-folding rear seats.

Optional On All Models:

- Bucket seats with leather seating surfaces (Camaro front bucket seats provide manual four-way seat adjusters)
- Six-way power driver-seat-adjuster (standard on Z28 Convertible).

Interior Colors

Cloth Colors:

- **NEW** Medium Gray
- **NEW** Ebony
- **NEW** Accent (in cloth door trim and seat inserts only).

Leather Seating Surface Colors:

- Ebony
- Neutral

Camaro Powertrains

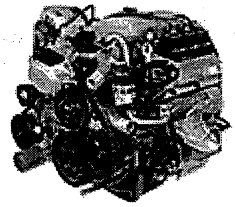
Engineering

Advanced technology features of the 5.7 liter, LS1 V8 engine include aluminum construction, a direct ignition system and an Overheated Engine Protection Operating system. Should an overheated engine condition exist and the LOWCOOLANTwarning lamp be displayed, an overheat protection mode which alternates firing groups of cylinders will help prevent engine damage. This operating mode allows the vehicle to be driven up to 50 miles to a safe place in an emergency.

All Camaro models are manufactured at the General Motors assembly plant in Ste. Therese, Quebec, Canada.

Engines

3800 V6 Engine (L36)



A 3800 V6 engine with sequential fuel injection (SFI) is standard on Camaro Coupe and Convertible models. Properly equipped, the 3800 V6 engine meets Low Emission Vehicle regulations in California and states requiring California emissions. The 3800 V6 is available with either a five-speed manual transmission or an optional four-speed electronically controlled automatic transmission.

Following are revisions made to the V6 engine:

- One-piece flex plate
- New air conditioning plumbing
- New converter catalyst loading
- New Borg Warner T2 air pump
- Multec II fuel injectors

Power Ratings For The 3800 V6 Engine Are:

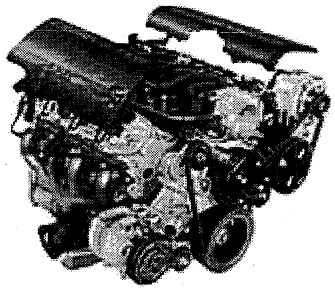
- 200 horsepower at 5200 rpm
- 225 lb.-ft. of torque at 4000 rpm

3800 V6 Engine Technical Features:

- Electronic throttle control
- "Change Oil Soon" indicator
- Proven overhead valve (OHV) design
- High performance pushrod valvetrain
- Composite intake manifold and air induction system
- Direct accessory mounting
- Tuned-for-performance throttle body
- Laminated oil pan
- Sequential Fuel Injection
- Returnless fuel system helps keep fuel fumes in the tank, not vented into the atmosphere, with the help of the Enhanced Evaporative Emissions system
- Low maintenance due to platinum-tip spark plugs which can go up to 100,000 miles before the first scheduled replacement* and extended-life engine coolant that lasts up to five years or 150,000 miles, whichever comes first.*

* Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

5.7 Liter V8 SFI Engine (LS1)



Camaro Z28 features the acclaimed technology of the Corvette inspired 5.7 liter LS1 V8 engine — named among the "Best Engines of 1999," three years in a row by Ward's Auto World. Standard on Camaro Z28 Coupe and Z28 Convertible, the LS1 takes Camaro to an exciting level of power and performance.

One of the major engineering goals in adapting the LS1 engine for use in Camaro was to keep many of the performance characteristics of the Corvette application. However, it was necessary to make some modifications to the engine in response to take advantage of the space under the Camaro hood.

For 2000, revisions were made to the LS1. These include:

- Revised engine block
- New close-coupled catalytic converters
- New progressive throttle cam replaces linear design
- New engine rear cover
- Water pump and one-piece pulley drive
- Cast iron exhaust manifolds
- Improved high flow air pump
- Revised EGR pipe
- New starter motor and heat shield.

Power Ratings For The LS1 V8 Engine Are:

- 305 horsepower at 5200 rpm and 335 lb.-ft. of torque at 4000 rpm (Z28 Coupe and Convertible)
- 320 horsepower at 5200 rpm and 345 lb.-ft. of torque at 4400 rpm (SS Coupe and Convertible).

LS1 V8 Engine Technical Features:

- Aluminum "deep-skirt" engine block
- Replicated cylinder head ports optimize airflow in the engine, contributing to overall performance
- Composite intake manifold
- Lightweight pistons and connecting rods
- In-line valves, rocker arms and pushrods
- Sequential Fuel Injection
- Individual ignition coils
- Air conditioning compressor is mounted on the lower right side of the engine
- Low, left side-mounted alternator
- Specific contour die-cast aluminum oil pan
- Oil-level sensor
- Powertrain Control Module
- Low maintenance due to platinum-tip spark plugs which can go up to 100,000 miles before the first scheduled replacement* and extended-life engine coolant that lasts up to five years or 150,000 miles, whichever comes first.*

* Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

Transmissions

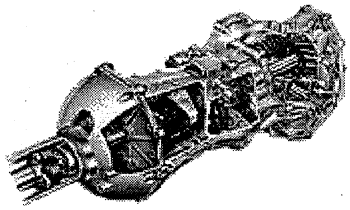
Five-Speed Manual Transmission

A five-speed manual transmission is standard on Camaro Coupe and Convertible equipped with the 3800 V6 engine. Features include:

- Wide range of gear ratios from 3.75:1 in first gear to 0.72:1 in fifth
- Heavy-duty hydraulic transmission mount, a two-piece driveshaft, a tuned tailshaft damper and a structural bellhousing with additional bracing
- Manual clutch system with concentric slave cylinder

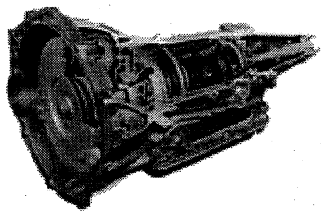
Six-Speed Manual Transmission

A six-speed manual transmission is optional at no cost on Camaro Z28 models equipped with the LS1 V8 engine. Features include:



- 2.66:1 ratio in first gear
- Two overdrive gears
- 3.42:1 rear-axle ratio
- Manual clutch system with concentric slave cylinder
- Computer-aided gear selection with skip shift telltale lamp
- Single-rail internal shift linkage
- Synchronized reverse gear
- Needle bearings on all mainshaft gears
- Three heavy-duty tapered rolling bearings
- Countershaft-mounted fifth-sixth gear synchronizers
- Internal oil passages.

4L60-E 4-Speed Electronic Automatic Transmission



The Hydra-matic 4L60-E four-speed electronically controlled automatic overdrive transmission is standard on Camaro Z28 Coupe and Convertible, and optional on Coupe and Convertible. The Powertrain Control Module (PCM) measures key vehicle factors including throttle position, vehicle speed, gear range, temperature and engine load to create a seamless interface between the engine and transmission. Shift timing is controlled by electronic signals sent to the valve body shift solenoids, which activate the shift valves for precise shift execution allowing the transmission to match the engine's performance. Features of this transmission include:

- Simple on-off solenoid
- 298mm torque converter
- Abuse torque management system protects the powertrain by reducing the amount of energy and heat generated by frequent severe shifts when a vehicle is stuck in the snow or mud and is "rocked"
- 3.06:1 first-gear ratio
- Overdrive 0.70:1 fourth gear
- Four solenoids communicate with the powertrain control module.
- Refined torque converter clutch controls
- Electronic controls provide the security of "fail-safe" operation; if the controls malfunction for any reason, the transmission will automatically default to operable gear ratios, giving the driver an opportunity to reach a safe location
- Second-gear-start feature provides an extra measure of control in slippery driving conditions. (Not available on V6 models equipped with Traction Control). By engaging the second gear start

button (on V6-equipped models only) the driver can reduce torque to the drive wheels, increasing control during initial acceleration on most slippery surfaces.
- Automatic transmission fluid will not need to be replaced for up to 50,000 miles* under normal operating conditions
- OBD II-compliant
- External seals
- Two-piece case design.

* Maintenance needs vary with different uses and driving conditions. See owner's manual for more information.

Suspension

Short/Long Arm (SLA) Front Suspension

Camaro has a Short/Long Arm (SLA) front suspension which is designed to help provide a smooth, controlled ride. This system features:

- Upper control arms are mounted high in the body structure to reduce loads
- De Carbon gas charged monotube shock absorbers feature a structure that is designed to enhance heat dissipation and fade-resistance, and provide a large working area for a given outside diameter, compared to conventional shock absorbers. The result is a smooth ride at high performance levels
- Front and rear spring rates on Z28 models help provide smooth, stable performance. They are stiffer than the springs in Coupe and Convertible models
- 28mm hollow front stabilizer bar (Z28 uses a 30mm front stabilizer bar. The 1LE Suspension Package uses a 32mm front stabilizer bar)
- 15mm solid rear stabilizer bar (Z28 uses a 19mm rear stabilizer bar)
- Lightweight stamped-steel lower control arms
- Salisbury rear axle design.

Performance Handling Package (RPO Y87)

Optional on Camaro Coupe and Convertible.

Key Features:

- **NEW** 16" aluminum wheels (required with RPO Y87)
- Optional 16" polished aluminum wheels
- Zexel® Torsen® limited slip differential uses a 3.42:1 rear axle ratio with optional automatic transmission, and a 3.23:1 ratio with the five-speed manual transmission
- Dual exhaust outlets
- Sport-steering gear ratio (14.4:1)
- P235/55R-16 tires* (required with RPO Y87)

Performance Suspension Package (RPO 1LE)

This optional Z28 Coupe package offers the serious performance enthusiast the suspension components often needed for autocross or other sanctioned competitive-speed performances, the 1LE option includes the following components:

- Koni manually double adjustable shock absorbers
- Larger diameter (32mm) front stabilizer bar
- Higher-rate front upper and lower control arm bushings
- Stiffer transmission mount
- Stiffer Panhard bar bushings
- Higher-rate front springs

- Stiffer variable-rate rear springs
- Requires 3.23 axle ratio with automatic transmission
- Not available with RPO CC1 Removable Roof Panels.

* Vehicle speed may be limited by speed rating of tires.

Steering

Power rack-and-pinion steering provides a feeling of precise control under demanding driving conditions. The steering ratio and hydraulic valve settings are individually tailored to standard Camaro and Z28 models.

- 16.9:1 steering ratio on Camaro Coupe and Convertible
- 14.4:1 steering ratio on Z28 models and Camaro models equipped with the Y87 Performance Handling Package
- Power-steering cooler (RPO V12) optional on Z28, standard with SS Performance/Appearance Package
- Intermediate steering shaft on Z28 models only.

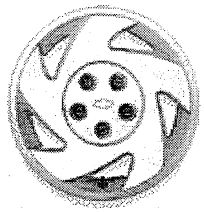
Brakes

The standard ventilated four-wheel disc antilock brakes on Camaro dissipate heat more effectively than disc/drum systems to help fight brake fade. Other brake features:

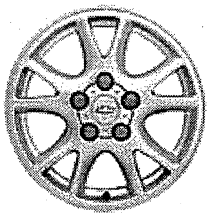
- Non-asbestos organic brake linings
- Drum-in-hat parking brake system
- ABS module and calibration employ an electric brake force distribution in place of a hydraulic proportioning valve, allowing for full utilization of the rear brakes and shorter stopping distances
- Plated brake calipers and corrosion-protected rotors enhance performance and appearance.

Wheels And Tires

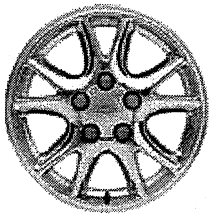
Wheels



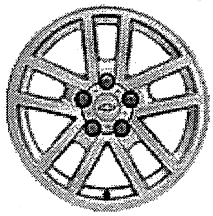
16" steel wheel with bolt-on wheel covers and P215/60R-16 touring tires are both standard equipment on Coupe and Convertible.



NEW (RPO N96) 16" aluminum wheel with painted surface and P235/55R-16 touring tires† are standard on Camaro Z28 models (and included with available Sport Appearance Package on V6 models), available on Camaro Coupe and Convertible. P245/50R-16 performance tires† are also optional on Camaro Z28 Coupe and Convertible.



NEW (RPO PW7) 16" aluminum wheel with polished surface, optional on all models.* P235/55R-16 touring tires† are standard on Z28 and P245/50ZR-16 tires are optional.



(RPO WU8) SS 17" aluminum wheel with painted surface and P275/40ZR-17 Goodyear Eagle F1 performance tires (included with optional SS Performance/Appearance Package on Z28 models).

* Not available with (WU8) SS Performance/Appearance Package. †Vehicle speed may be limited by speed rating of tires.

Feature Availability

	Coupe	Convertible Z28	Coupe Z28	Convertible
Interior				
Air bags [1] - driver and front-passenger	S	S	S	S
Air conditioning - with CFC-free refrigerant	S	S	S	S
Center console - consists of front storage compartments, two front and rear cup holders, cassette/CD storage and an auxiliary power outlet	S	S	S	S
Door locks - power	O	S	O	S
Defogger - electric rear-window	O	S	O	S
Engine oil life monitor	S	S	S	S
Redundant radio control steering wheel with leather-wrapped steering wheel	O	S	O	S
Remote Keyless Entry	O	S	O	S
Retained Accessory Power	S	S	S	S
Seats cloth front bucket, reclining	S	S	S	S
- full-folding rear	S	S	S	S
- leather seating surfaces	O	O	O	O
- power driver seat (6-way)	O	O	O	S
Steering column - Tilt-Wheel™	S	S	S	S
Stereo - ETR AM/FM stereo with cassette player, seek-scan, digital clock and extended range speakers	S	NA	NA	NA
- Monsoon 200 watt ETR AM/FM Premium Sound System with cassette player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control	O	S	S	S
- Monsoon 200 watt ETR AM/FM Premium Sound System with compact disc player, seek-scan, digital clock, TheftLock, speed-compensated volume and auto tone control	O	O	O	O
- 12-disc remote CD changer	O	O	O	O
Windows - power with driver's Express-Down feature	O	S	O	S
Exterior				
Daytime Running Lamps with Automatic Exterior Lamp Control	S	S	S	S
Foglamps	O	S	O	S
Body color mirrors - outside, LH remote/RH manual	S	NA	S	NA
- outside, twin sport, remote electric	O	S	O	S
Sport Appearance Package	O	O	O[2]	O[2]
Tires P215/60R-16 touring[3]	S	S	NA	NA
- P235/55R-16 touring[3]	O	O	S	S
- P245/50ZR-16 performance[3]	NA	NA	O	O
- P245/50ZR-16 all-season performance	NA	NA	O	O
- Transparent removable roof panels (T-tops)	O	NA	O	NA
Wheels 16" steel w/bolt-on wheel covers	S	S	NA	NA

- 16" aluminum	O[4,5]	O[4,5]	S	S
- 16" polished aluminum	O	O	O	O
Functional				
Acceleration Slip Regulation (ASR)	O	O	O	O
Brakes power, front and rear disc with ABS	S	S	S	S
Engine 3800 V6 SFI	S	S	NA	NA
- 5.7L LS1 V8 SFI	NA	NA	S	S
Limited slip rear axle with Zexel® Torsen® differential	O[6]	O[6]	S	S
Performance Handling Package (Y87)	O	O	NA	NA
SS Performance/Appearance Package	NA	NA	O	O
Steering power rack-and-pinion	S	S	S	S
Suspension - Firm Ride and Handling	S	S	NA	NA
- Performance Handling Package	NA	NA	S	S
Theft-deterrent system PASS-Key II	S	S	S	S
Transmission - 5-Speed Manual	S	S	NA	NA
- 6-Speed Manual (no-cost option)	NA	NA	O	O
- 4-Speed electronically controlled automatic	O[7]	O[7]	S	S

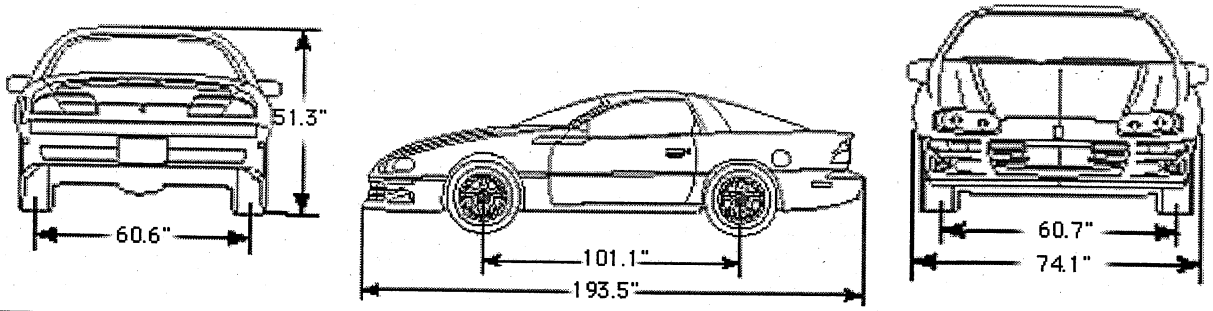
S — Standard.
O — Optional. (Some options may be available only as part of a Preferred Equipment Group.)
NA — Not available.

1. Always use safety belts and proper child restraints, even with air bags. Children are safer when properly secured in a rear seat. See the owner's manual for more safety information.
2. Not available with (WU8) SS Package.
3. Vehicle speed may be limited by speed rating of tires.
4. Requires (QCB) P235/55R-16 B/W tires.
5. Included with (Y3F) Sport Appearance Package.
6. Included with Y87 Performance Handling Package.
7. Includes second-gear-start switch without (NW9) Acceleration Slip Regulation.

Specifications

Model Availability	
Camaro Coupe, Camaro Convertible, Camaro Z28 Coupe and Camaro Z28 Convertibe	
EPA Vehicle Class	Subcompact
Assembly plant	Ste.Therese, Quebec, Canada

Dimensions



Dimensions & Capacities (inches/millimeters, unless otherwise noted)		
Exterior Dimensions	**Coupe**	**Convertible**
Wheelbase	101.1/2567.9	101.1/2567.9
Length (overall)	193.5/4914.9	193.5/4914.9
Width (overall)	74.1/1882.1	74.1/1882.1
Height (overall)	51.2/1300.5	51.8/1315.7
Tread — front	60.7/1541.8	60.7/1541.8
Tread — rear	60.6/1539.2	60.6/1539.2
Interior Front Dimensions		
Headroom	37.2/944.9	38.0/965.2
Legroom	43.0/1092.2	43.0/1092.2
Shoulder room	57.4/1458.0	57.4/1458.0
Hip room	53.5/1358.9	53.5/1358.9
Interior Rear Dimensions		
Headroom	35.3/896.6	39.0/990.6
Legroom	26.8/680.7	26.8/680.7
Shoulder room	55.8/1417.3	43.5/1104.9
Hip room	45.9/1165.8	43.7/1110.0
Capacities		
Passenger capacity	4	4
Passenger volume (cu. ft./liters)	81.9/2325.4	80.6/2288.5
Cargo volume (cu. ft./liters)	12.9/366.3	7.6/215.8
Fuel tank capacity (gal/liters.—approx.)	16.8/63.6	16.8/63.6
EPA interior index (cu. ft./liters)	94.8/2691.6	88.2/2504.2
Curb weight (lbs./kg, est.)	3306/1500(3439/1560 Z28)	3500/1588 (3574/1622 Z28)
Engine oil (quarts/liters)	4.0/3.8 (3800 V6)	6.0/5.7 (5.7 Liter LS1 V8)
Engine coolant (quarts/liters)	12.4/11.7 (3800 V6)	13.58/12.85 (5.7 Liter LS1 V8)

Steering		
Type	Power rack-and-pinion	
Ratio (overall)	16.9:1 (14.4:1 Z28 & Y87 Performance Handling Package on Camaro Coupe models)	
Turns stop-to-stop	2.67 (2.28 Z28 & Y87 Performance Handling Package on Camaro Coupe models)	
Turning diameter curb-to-curb (ft./m)	40.8/12.4 (40.1/12.2 Z28)	
Turning diameter wall-to-wall (ft./m)	42.6/13.0 (41.1/12.5 Z28)	
Brakes		
	Camaro and Camaro Z28	
Type	4-wheel ABS, power front/rear vented disc	
	U. S. STANDARD	METRIC
Gross lining, front/rear	37.8/17.2 sq. in.	243.9/111.2 sq. cm
Effective area, front/rear	40.7/17.2 sq. in.	262.4/111.2 sq. cm
Disc rotor outer working diameter,front/rear	11.8/11.85 in.	298.6/301.0mm
Disc rotor thickness, front/rear	1.27/1.02 in.	32.2/26.0mm
Total swept area, front/rear	238.6/169.0 sq. in.	1539.0/1094.0 sq. cm
Engines		
	L36	**LS1**
Type	3800 V6 SFI	5.7L V8 SFI
Block	Cast-iron	Cast-aluminum "Deep skirt"
Cylinder head	Cast-iron	Cast-aluminum
Hydraulic lifters	Yes/roller	Yes/roller
Bore & Stroke		
(in.)	3.80 x 3.40	3.90 x 3.62
(mm)	96.5 x 86.36	99.0 x 92.0
Cam drive	Chain	Chain
Redline (RPM)	6000	6000
Displacement (liters/CID)	3.8/231	5.7/346
Compression ratio	9.4:1	10.1:1
Fuel induction	SFI	SFI
Horsepower/kW @ engine RPM	200 @ 5200/149 kW @ 5200	305 @ 5200/228 kW @ 5200 320 @5200/239 kW @ 5200 (SS)
Torque/N-m (lb.-ft. @ engine RPM)	225 @ 4000/305 N-m @ 4000	335 @ 4000/454 N-m @ 4000 345 @ 4400/468 N-m @ 4400 (SS)
Exhaust system	Stainless-steel	Stainless-steel
Tailpipe(s)	Single (Dual w/Y87)	Dual/Dual 2 3/4" (SS)
Ignition system	Direct ignition	Coil near plug
Delcotron alternator rating (amps)	105	102
Battery (SAE capacity rating, cca)	690	525
Recommended fuel (unleaded)	87 octane	91 octane (87 acceptable)

Transmissions			
Models	Std. Camaro	Opt. Camaro Z28	Opt. Camaro and Std. Camaro Z28
Transmission	5-speed manual	6-speed manual	4-speed elect. automatic
Layout	RWD longitudinal	RWD longitudinal	RWD longitudinal
Gear ratios:			
1st	3.75	2.66	3.06
2nd	2.19	1.78	1.63
3rd	1.41	1.30	1.00
4th	1.00	1.00	0.70
5th	0.72	0.74	–
6th	–	0.50	–
Reverse	3.53	2.90	2.29
Final drive ratios	3.23	3.42	3.08 (2.73 Z28)*

* 3.42 with optional (Y87) Performance Handling Package for Camaro; 3.23 on Z28 with optional (GU5) Performance Axle.

Chassis	
Chassis	
Structure/frame	Unitized/full integral body frame
Body material	Steel and reinforced plastic
Suspension — front	
Type	Independent with coil spring, SLA (w/coil over shock absorber) monotube, gas-charged de Carbon shock absorbers (Koni shock absorbers with 1LE Performance Package)
Stabilizer bar design/diameter (mm)	Link/28 (30 with Z28, and 32 with 1LE Performance Package)
Suspension — rear	
Type	Salisbury axle with torque arm, trailing arm, track bar, coil springs, monotube, gas-charged de Carbon shock absorbers (Koni shock absorbers with 1LE Performance Package)
Stabilizer bar design/diameter (mm)	Link/15 (19 with Z28 and 1LE Performance Package)

Mileage/Performance*								
Powertrain	3800 V6 SFI w/5-Spd. Man.		3800 V6 SFI w/4-Spd. Elec. Auto.		5.7L V8 LS1 SFI w/6-Spd. Man.		5.7L V8 LS1 SFI w/4-Spd. Elec. Auto	
Mileage:	mpg	liters/ 100km	mpg	liters/ 100km	mpg	liters/ 100km	mpg	liters/ 100km
City	19	12.4	19	12.4	19	12.4	17	13.8
Highway	30	7.8	29	8.1	28	8.4	24	9.8
Est. cruising range	mi.	km	mi.	km	mi.	km	mi.	km
City	319	513	319	513	319	513	286	460

* Based on 1999 EPA estimates.

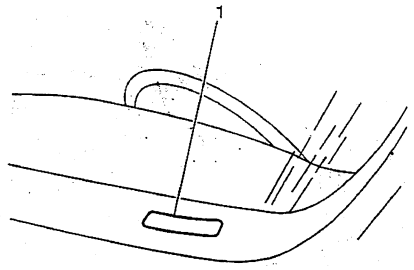
Trailering Information	
Trailer classification	Light
Gross trailer weight (lbs./kg, up to)	1000/454
Max tongue load (lbs./kg)	100/46

Wheels & Tires			
Model	Camaro	Camaro Z28	Camaro Z28 with SS Package
Wheel type/size	Steel 16" x 8"	Cast-aluminum 16" x 8"	Cast-aluminum 17" x 9"
Tire type	Steel-belted radial touring	Steel-belted radial touring	Steel-belted radial performance
Tire size	P215/60R-16	P235/55R-16	P275/40ZR-17
Spare size	16" Compact	16" Compact	16" Compact

All specifications are preliminary and subject to change. Chevrolet Motor Division, June 1999.

Vehicle Identification

Vehicle Identification Number (VIN)



The vehicle identification number (VIN) plate is the legal identifier of the vehicle. The VIN plate is located on the upper LH corner of the Instrument Panel and can be seen through the windshield from the outside of the vehicle:

Position	Definition	Character	Description
1	Country of Origin	2	Canada
2	Manufacturer	G	General Motors
3	Division	1	Chevrolet
		2	Pontiac
4-5	Carline/Series	FP	Camaro Sport Coupe
		FS	Firebird
		FV	Formula/Trans Am
6	Body Type	2	Two Door
		3	Two Door Convertible
7	Restraint System	2	Active (Manual) Belts with Driver and Passenger Inflatable Restraint System
8	Engine	G	RPO LS1, V8, 5.7L, MFI, United States Production, Mid/Lux Division
		K	RPO L36, V6, 3.8L, MFI, United States Production, Mid/Lux Division
9	Check Digit	0	--
10	Model Year	Y	2000
11	Assembly Plant	2	St Therese, Quebec
12-17	Plant Sequence Number	--	--

VIN Derivative

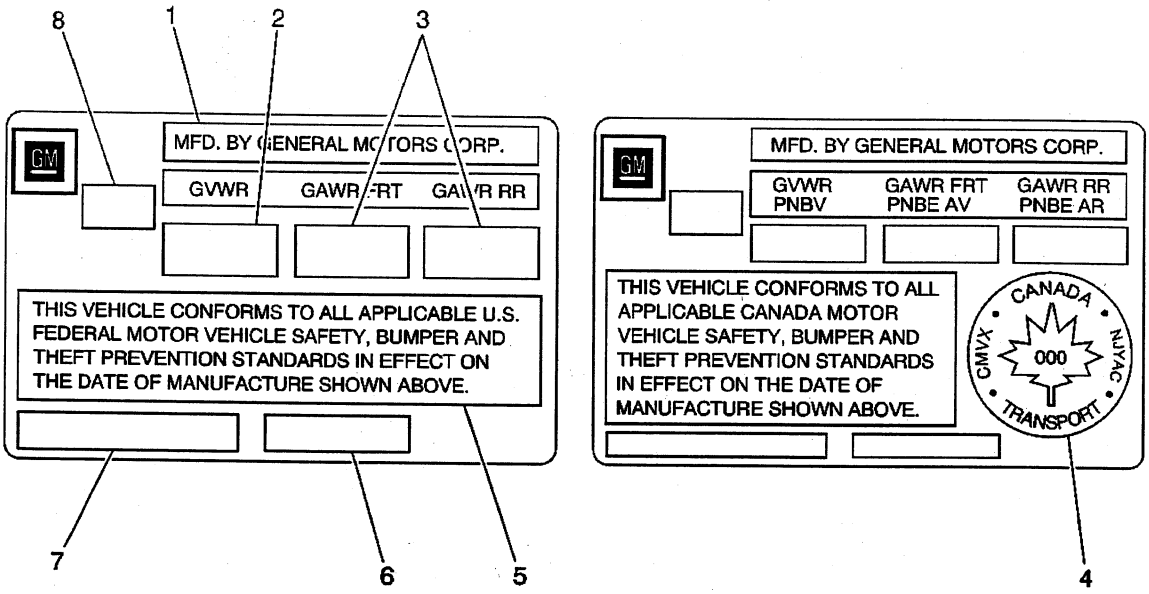
All engines and transmissions are stamped or laser etched with a partial vehicle identification number (VIN), which was derived from the complete VIN. A VIN derivative contains the following nine positions:

Position	Definition	Character	Description
1	GM Division Identifier	1	Chevrolet
		2	Pontiac
2	Model Year	Y	2000
3	Assembly Plant	2	St. Therese
4-9	Plant Sequence Number	--	--

A VIN derivative can be used to determine if a vehicle contains the original engine or transmission, by matching the VIN derivative positions to their accompanying positions in the complete VIN:

VIN Derivative Position	Equivalent VIN Position
1	3
2	10
3	11
4-5	12-17

Label - Vehicle Certification



The vehicle certification label displays the following assessments:

- The name of the manufacturer (1)
- The Gross Vehicle Weight Rating (GVWR) (2)
- The Gross Axle Weight Rating (GAWR) (3)
- The vehicle payload rating
- The vehicle class type Pass Car, etc. (6)
- The vehicle identification number (7)
- The date of manufacture (Mo/Yr) (8)
- The original equipment tire sizes and the recommended tire pressures

Gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. Include the following items when figuring the GVW:

- The base vehicle weight factory weight
- The weight of the vehicle accessories
- The weight of the driver and the passengers
- The weight of the cargo

The gross vehicle weight must not exceed the Gross Vehicle Weight Rating.

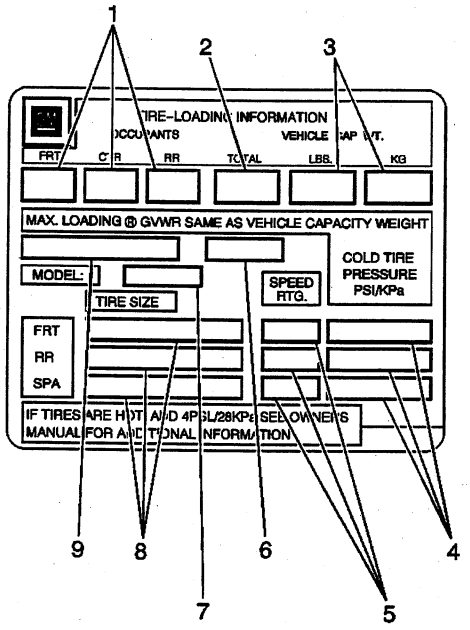
The front gross axle weight (GAW) is the weight exerted on the front axle. The rear gross axle weight (GAW) is the weight exerted on the rear axle. The front and rear gross axle weights must not exceed the front and rear gross axle weight ratings.

The payload rating defines the vehicle's maximum allowable cargo load. The cargo load includes the driver and the passengers. The payload rating is based on the vehicle's factory installed equipment. Deduct the weight of accessories added to the vehicle after the final date of manufacture from the payload rating.

The vehicle may have a Gross Combination Weight Rating (GCWR). The Gross Combination Weight Rating refers to the total maximum weight of the loaded tow vehicle including driver and passengers and a loaded trailer.

The vehicle tires must be the proper size and properly inflated for the load the vehicle is carrying. For more information on tires refer to Tire Placard.

Tire Placard

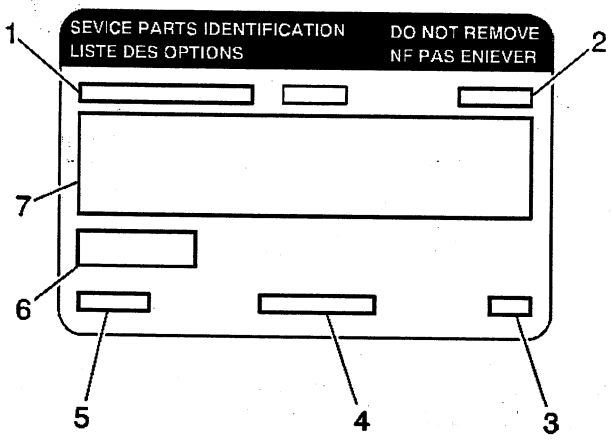


(1) Specified Occupant Seating Positions
(2) Total Occupant Seating
(3) Maximum Vehicle Capacity Weight
(4) Tire Pressures, Front, Rear, and Spare
(5) Tire Speed Rating, Front, Rear, and Spare
(6) Tire Label Code
(7) Engineering Model Minus First Character
(8) Tire Sizes, Front, Rear, and Spare
(9) Vehicle Identification Number

The Tire Placard is permanently located on the edge of the driver's door. Refer to the placard to obtain:

- The maximum vehicle capacity weight
- The cold tire inflation pressures
- The tire sizes (original equipment tires)
- The tire speed ratings (original equipment tires)

Service Parts Identification Label (SPID)

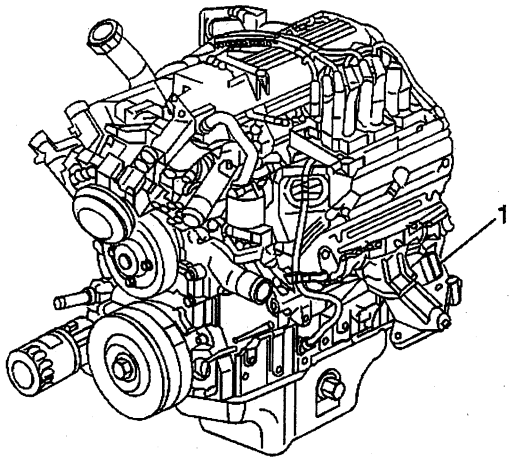


(1) Vehicle Identification Number
(2) Engineering Model Number (Vehicle Division, Vehicle Line and Body Style)
(3) Interior Trim and Decor Level
(4) Exterior (Paint Color) WA Number
(5) Paint Technology
(6) Special Order Paint Colors and Numbers
(7) Vehicle Option Content

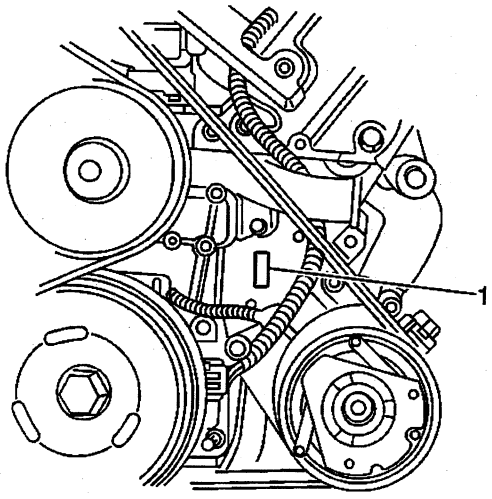
The Service Parts Identification Label aids the service personnel in identifying the parts and options originally installed on the vehicle.

Engine ID and VIN Derivative Location RPO L36

The eighth character in the Vehicle Identification Number (VIN) identifies the engine. Adhesive-backed labels attached to the engine, laser etching, or stampings on the engine block indicate the engine unit number/date code. All engines are stamped with a VIN derivative. For added information on VIN derivative, refer to VIN Derivative .



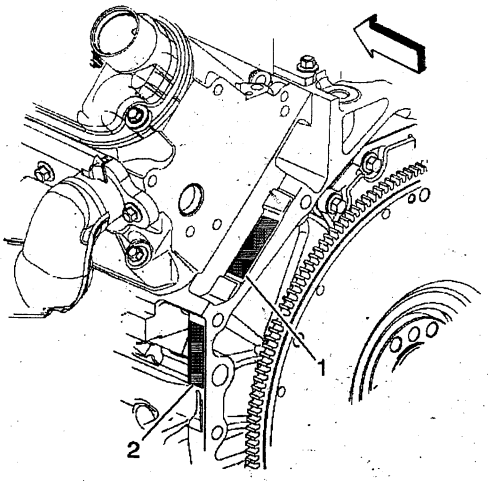
The primary location of the VIN derivative for the 3800 engine is above the starter motor on the engine block (1).



The secondary location of the VIN derivative for the 3.8 L engine is below the water pump on the engine block (1).

The location for the 3.8 Liter engine identification is in the center of the LH rocker arm or LH side of the engine in the oil pan rail area of the engine. (1)

Engine ID and VIN Derivative Location RPO LS1

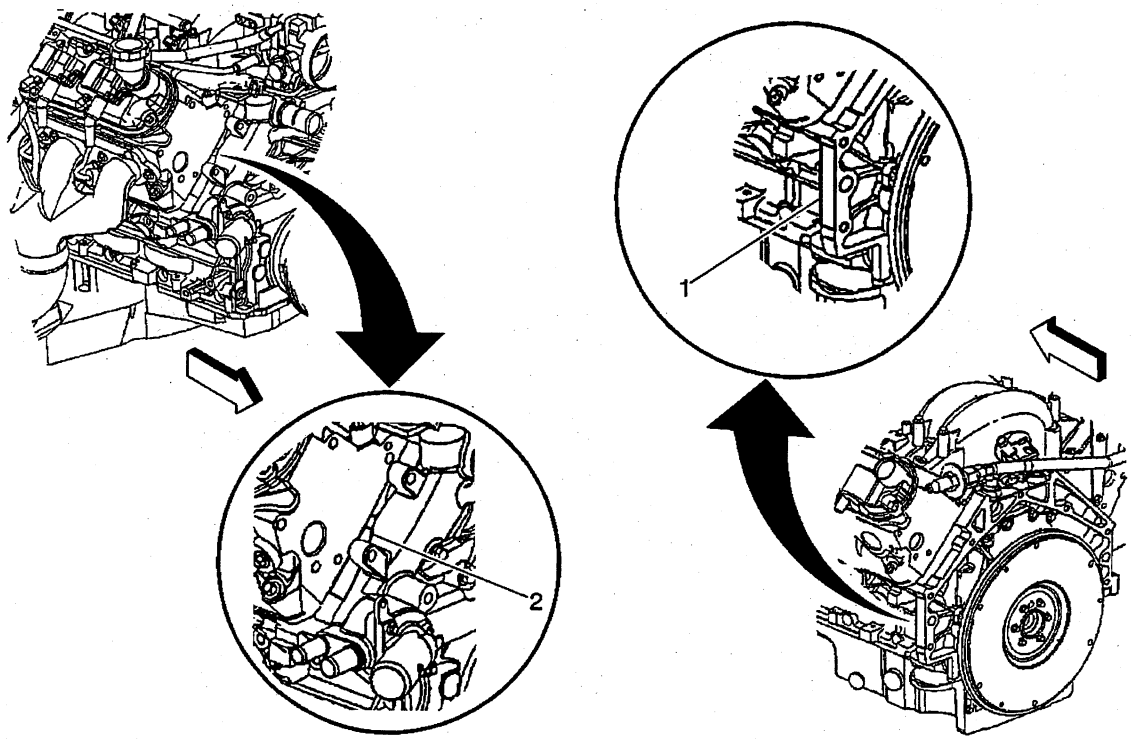


(1) Engine ID Number, Primary Location
(2) Engine ID Number, Secondary Location

The eighth digit of the vehicle identification number (VIN) is the engine code letter, which identifies the engine as a 5.7 L V8.

Stick-on labels attached to the engine, laser etching, or stampings on the engine block indicate the engine unit number/build date code.

The engine ID number will be located at either the primary or the secondary location on the rear of LH cylinder head or the front part of LH oil pan rail.

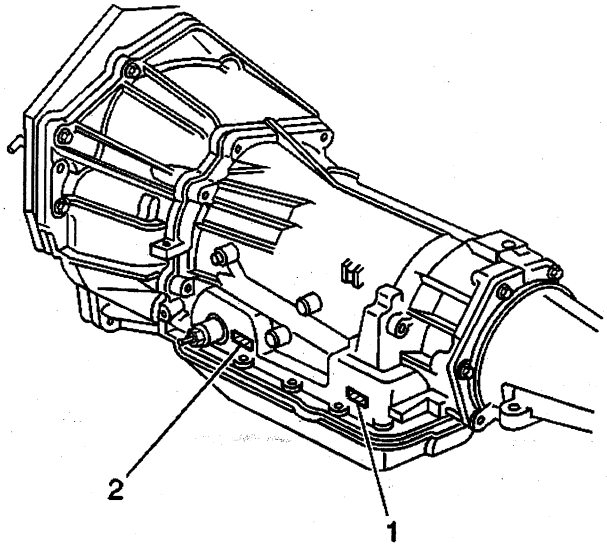


(1) VIN Derivative, Primary Location
(2) VIN Derivative, Secondary Location

The engine is also stamped with a VIN derivative which will be located at either the primary or secondary location, as shown.

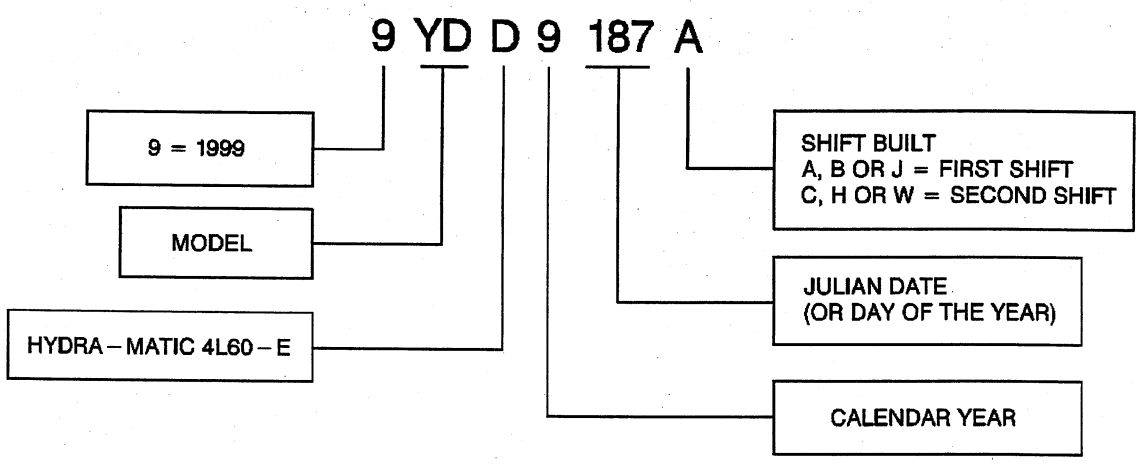
Transmission ID and VIN Derivative Location

Automatic Transmission



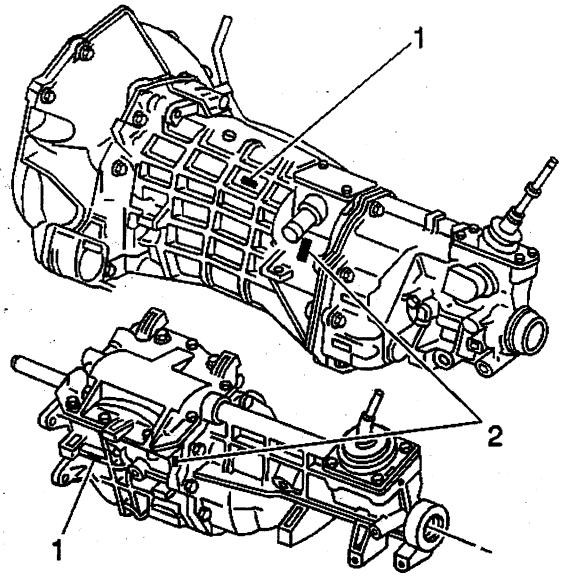
The transmission ID and the VIN derivative for the M30 transmission are located on the left side of the transmission just above the transmission pan.

VIN Derivative Breakdown



The transmission identification (ID) number indicates the transmission model year, type and when the unit was built.

Manual Transmission ID Location

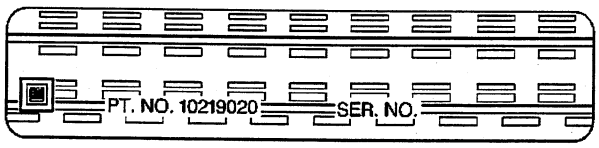


The transmission model identification is located on a label or tag on the transmission case. If this label is missing or unreadable, use the service parts identification label in order to identify the vehicle's transmission.

Transmission Usage

Body Type	Car Line (Division)	Engine Size	Fuel System	Engine RPO	Automatic Transmission Used	Manual Transmission Used
F	Camaro (Chevrolet)	5.7L V8	MFI	LS1	4L60-E (M30)	T56 (MM6)
F	Camaro (Chevrolet)	3.8L V6	MFI	L36	4L60-E (M30)	T-5 (M49)
F	Firebird (Pontiac)	5.7L V8	MFI	LS1	4L60-E (M30)	T56 (MM6)
F	Firebird (Pontiac)	3.8L V6	MFI	L36	4L60-E (M30)	T-5 (M49)

Labeling - Anti-Theft



Notice

The anti-theft label found on some major body panels MUST be covered before performing any painting, rustproofing or undercoating procedures. The mask must also be removed following those procedures. Failure to follow these precautionary steps may result in liability for violation of the Federal Vehicle Theft Prevention Standard, and subject the vehicle owner to possible suspicion that the part was stolen.

Federal law requires General Motors (GM) to affix a label to certain parts on selected vehicles with the Vehicle Identification Number (VIN). The purpose of this law is to reduce the number of motor vehicle thefts by helping in the tracing and recovery of parts from stolen vehicles. The certification label on the driver's door qualifies as a theft deterrent label.

The theft deterrent label will be permanently affixed to an interior surface of the part and will contain the complete VIN. The label on replacement parts will contain the letter R, the manufacturer's logo, and the acronym for the Department of Transportation (DOT). DO NOT deface, or remove these labels.

RPO Code List

The production/process codes provide the description of the Regular Production Options (RPOs) used on the vehicle. The RPO list is printed on the Service Parts Identification Label. The following is a list of the RPO abbreviations and the description of each:

RPO	Description
A26	Window Glazing, European
AG1	Driver Front Seat, Power Adjuster
AH3	Front Seat, Manual 4-Way Adjuster
AK5	Inflatable Restraint System, Driver and Passenger
AN4	Restraint Provisions, Child
AQ9	Front Seat, Driver and Passenger Recline
AR9	Front Bucket Seat, Deluxe European Style
AU0	Remote Entry Lock Control
AU3	Side Door Elec Lock Control
AX4	Restraint Conversion Seat, Manual European
A31	Window, Power Operated Side
A90	Lock Control, Rear Compt Lid Remote Elec Release
B35	Covering Rear Floor Mats
B4C	Sales Special Service Pkg (Police)
B84	Molding, B/S Exterior
CC1	Roof Hatch Removable Panels, Glass
C49	Rear Window Defogger, Electric
C60	HVAC System AC Man Controls
DD9	Mirror, O/S LH & RH Remote Control Electric Color
DE4	Sunshade, Removable Hatch Roof
DG7	Mirror, O/S LH & RH Remote Control Electric Color
D21	Sunshade, Windshield
D35	Mirror, O/S LH Remote Control, RH Manual Color
D82	Paint Special
FE2	Suspension System, Ride and Handling
FE4	Suspension System, Special Ride and Handling
FE7	Suspension System, Front and Rear Heavy Duty
FE9	Certification Emission-Federal
F41	Suspension System, Front and Rear Firm Ride and Handling
GU2	Axle Ratio 2.73
GU4	Axle Ratio 3.08
GU5	Axle Ratio 3.23
GU6	Axle Ratio 3.42
G80	Axle Positraction
IL2	Trim, Interior Leather (W/AQ9) Pontiac
IL4	Trim, Interior European Camaro
IL5	Trim, Interior (w/AQ9) Pontiac
IPB	Trim, Interior Cloth Camaro and Firebird
IPD	Trim, Interior (w/AR9) European Camaro
IP2	Trim, Interior Leather Camaro
IP3	Trim, Interior Leather Pontiac
JAF	Brake Provisions, European
J65	Brake System, PWR Front and Rear Disc
K05	Heater, Engine Block
K29	Module Powertrain Control, Export
K34	Cruise Control, Automatic

K68	Generator, 105 Amp
LS1	Engine, Gas V8 5.7L, MFI Aluminum
L36	Engine, Gas V6 3.8L, MFI HO
M49	Transmission, Manual 5 Speed OD
MM6	Transmission, Manual 6 Speed OD
M30	Transmission, Auto 4 Speed Electronic
NK3	Steering Wheel, Sport Soft Rim Simulated Leather
NM8	Leaded Fuel System Compatible, European
NP5	Steering Wheel, Leather Wrapped
NP7	Steering Column, EEC Approved
NW9	Traction Control, Electronic
N36	Steering Wheel, 4 Spoke Sport
N60	Wheel, Aluminum Painted
N66	Wheel, Styled Aluminum 17" 5 Spoke Polished
N73	Wheel, Custom Sport Var4 17" (Restricted to Camaro SS)
N92	Cover, Wheel Bolt-on
N96	Wheel, 16 X 8 Cast Aluminum
N98	Wheel, 16 X 8 Cast Aluminum Chrome
PA6	Wheel, Styled Painted 16"
P05	Wheel, Styled Chrome 16"
QA9	Wheel, 17 X 9 Aluminum Painted (Blue Tint)
QB3	Wheel, 16 X 7.5 Steel
QCB	Tire, All P235/55R16 BW
QEA	Tire, All P215/60R16 BW
QFK	Tire, All P275/40R17 BW
QFZ	Tire, All P245/50R16 BW
QLC	Tire, All P245/50R16 BW
TR7	Headlamps, Control Leveling System Automatic
T1G	Vehicle, Military Personnel
T37	Lamp, Fog Deluxe
T39	Lamp, Turn Signal Aux
T43	Spoiler, Rear
T62	Lighting, Daytime Running Delete
T65	Lighting, Daytime Running Export
T78	Headlamp Control, Delete
T79	Lamp, Fog Rear
T82	Headlamp Control, Automatic ON-OFF
T84	Headlamps, RH Rule of Road
T85	Headlamps, LH Rule of the Road
T89	Lamp, Tail & Stop Export
T96	Lamp, Fog
UA6	Theft Deterrent System
UB3	Cluster, Inst Oil Cool Temp Volts Trip Odom Tach
UC2	Speedometer, Inst Kilo Positive Bias
UK3	Electronic System Steering Wheel Acc Controls
UL0	Radio, AM/FM Stereo Auto Rev Music Srch Cass Clock ETR
UM6	Radio, AM/FM Stereo Auto Rev Cass Clock ETR
UN0	Radio, AM/FM Stereo Compact Disc Auto Tone Clock
UQ0	Speaker Sys, 4 Dual Frt Dr Mtd Dual STD RGE Qtr/Shelf
UW3	Radio, AM/FM Stereo Auto Rev Music Search Cass Data Sys
UZ7	Speaker System, 8 Quat Frt Dr Mtd Dual RR Hatch Amplifier
U1S	Player, Multiple Compact Disc
U62	Speaker System, 4 Dual Coax Frt Dual Coax PKG Shelf

U73	Antenna, Fixed Radio
U75	Antenna, Power Radio
VK3	License Plate, Front Mounting Pkg
VL4	License Plate, Rear Mounting Pkg
V12	Cooling System, Power Steering
V76	Hook, Tow
WS6	Performance Package Special
WS9	Model Conversion, Formula
WU6	Sales Package, Firehawk Upfitter
WU8	Sales Package, Z28 SS
W52	Entertainment System Option B
W53	Entertainment System Option C
W54	Entertainment System Option D
W55	Entertainment System Option E (MONSOON)
W59	Entertainment System Option I
W66	Merchandised Pkg, Formula
W68	Sales Package, Firebird Upfitter
W73	Entertainment System Option J
X10	Entertainment System, Option I
X20	Entertainment System, Option J
Y3F	Sales Package, RS Camaro
Y81	Merchandised Pkg, Firebird
Y82	Merchandised Pkg, Trans Am
Y84	Merchandised Pkg, Trans Am GTA
Y87	Merchandised Pkg, Performance Enhancement
Z5X	Mirror Provisions, Arabic Language
01U	Primary Color, Exterior Special
1LE	Performance Package, Component Special
1OI	Interior Trim, Arctic White
10Q	Molding Color, Arctic White
10T	Top Color, Arctic White
10U	Primary Color, Exterior Arctic White
11Q	Molding Color, Pewter Metallic
11U	Exterior Color, Pewter Metallic
102	Trim Combination, Leather Arctic White Camaro and Firebird
103	Trim Combination, Leather Arctic White Pontiac
105	Trim Combination, Leather Arctic White Pontiac
14B	Trim Combination, Cloth Dark Gray
14D	Trim Combination, Cloth Dark Gray
14I	Interior Trim, Very Dark Gray
142	Trim Combination, Leather Very Dark Gray Camaro and Firebird
143	Trim Combination, Leather Very Dark Gray Firebird
144	Trim Combination, Leather Very Dark Gray Camaro
20Q	Molding Color, Blue Metallic
20U	Exterior Color, Blue Metallic
28Q	Molding Color, Navy Blue Met
28U	Primary Color, Exterior Navy Blue Metallic
31Q	Molding Color, Bright Green
31U	Primary Color, Exterior Bright Green
36Q	Molding Color, Fern Green
36U	Exterior Color, Fern Green
41Q	Molding Color, Black
41T	Top Color, Black

41U	Primary Color, Exterior Black
52B	Trim Combination, Cloth Light Neutral
52D	Trim Combination, Cloth Light Neutral
52I	Interior Trim, Medium Neutral
522	Trim Combination, Leather Light Neutral
523	Trim Combination, Leather Medium Neutral II
524	Trim Combination, Leather Medium Neutral
56T	Top Color, Medium Dark Neutral
63Q	Molding Color, Sport Gold
63U	Exterior Color, Sport Gold
73B	Trim Combination, Cloth Flame Red
73I	Interior Trim, Flame Red
79Q	Molding Color, Mystic Teal
79U	Primary Color, Exterior Mystic Teal
81Q	Molding Color, Bright Red
81U	Primary Color, Exterior Bright Red
88Q	Molding Color, Bright Purple
88U	Primary Color, Exterior Bright Purple
92B	Trim Combination, Cloth Medium Pewter
92I	Interior Trim, Pewter
96Q	Molding Color, Cayenne Red
96U	Primary Color, Exterior Cayenne Red Metallic
99Q	Molding Color, Hugger Orange
99U	Exterior Color, Hugger Orange

Technical Information

Capacities - Approximate Fluid

Description	Specification	
	Metric	English
Engine Cooling System		
• 3.8 L With Manual Transmission	11.0 liters	11.6 quarts
• 3.8 L With Automatic Transmission	10.8 liters	11.4 quarts
• 5.7 L With Manual Transmission	11.3 liters	11.9 quarts
• 5.7 L With Automatic Transmission	11.2 liters	11.8 quarts
Engine Crankcase		
• 3.8 L With Filter	4.2 liters	4.5 quarts
• 5.7 L With Filter	5.2 liters	5.5 quarts
Transmission		
• 4L60-E	4.7 liters	5.0 quarts
• After Complete Overhaul (L36)	8.3 liters	8.8 quarts
• After Complete Overhaul (LS1)	10.2 liters	10.8 quarts
• M49 5-Speed Manual Transmission	3.2 liters	3.4 quarts
• MM6 6-Speed Manaual Transmission	3.8 liters	4.0 quarts
Approximate Fuel Capacities (All Vehicles)	**63.6 liters**	**16.8 quarts**

Maintenance Items

Usage	Type
Air Cleaner/Filter	
• 3.8 L and 5.7 L	AC Type A917C
Engine Oil Filter	
• 3.8 L (L36)	AC Type PF-47
• 5.7 L (LS1)	AC Type PF-44
Fuel Filter	
• 3.8 L (L36)	AC Type G627
• 5.7 L (LS1)	AC Type GF-578
PCV Valve	
• 3.8 L (L36)	AC Type CV892C
• 5.7 L (LS1)	AC Type CV948C
Radiator Cap	
• 3.8 L (L36) and 5.7 L (LS1)	AC Type RC-24
Spark Plugs and Gaps	
• 3.8 L (L36)	AC Type 41-921 (GAP 1.52 mm, 0.060 in)
• 5.7 L (LS1)	AC Type 41-952 (GAP 1.52 mm, 0.060 in)

Fluid and Lubricant Recommendations

Component	Fluid or Lubricant Recommended
Automatic Transmission	DEXRON®-III Automatic Transmission Fluid.
Chassis Lubrication	Chassis lubricant (GM P/N 12377985 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category GC or GC-LB.
Rear Axle (Locking Differential)	SAE 75W-90 Synthetic Axle Lubricant, GM P/N 12378261 (in Canada use PN 10953455) or equivalent meeting GM Specification 9986115. With complete drain and refill, add 4 ounces (118 ml) of Locking Differentail Axle Lubricant Additive, GM P/N 1052358 (in Canada use Part No. 992694) or equivalent.
Rear Axle (Standard)	SAE 75W-90 Synthetic Axle Lubricant, GM P/N 12378261 (in Canada use P/N 10953455) or equivalent meeting GM Specification 9986115.
Engine Coolant	50/50 mixture of clean water (preferably distilled) and GM Goodwrench® DEX-COOL® or Havoline® DEX-COOL® coolant (only).
Engine Oil	Engine oil with the American Petroleum Institute Certified For Gasoline Engines "Starburst" symbol of the proper viscosity. To determine the preferred viscosity for your vehicle's engine, refer to the Explanation of Scheduled Services.
Hinges, Hood and Door	Multi-Purpose lubricant, Superlube® (GM P/N 12346241 or equivalent).
Hood Latch • Pivots and Spring Anchor • Release Pawl	Lubriplate lubricant aerosol (GM P/N 12346293 or equivalent) or lubricant meeting requirements of NLGI Grade 2, Category LB or GC-LB.
Hydraulic Brake System	Delco Supreme 11® Brake Fluid (GM P/N 12377967 or equivalent DOT-3 brake fluid).
Hydraulic Clutch System	Hydraulic Clutch Fluid (GM P/N 12345347 7 or equivalent DOT-3 brake fluid).
Lock Cylinders	Multi-Purpose Lubricant, Superlube® (GM P/N 12346241 or equivalent).
Manual Transmission	DEXRON®-III Automatic Transmission Fluid.
Parking Brake Cable Guides	Chassis lubricant (GM P/N 12377985 or equivalent) meeting requirements of NLGI Grade 2, Category GC or GC-LB.
Power Steering System	GM Hydraulic Power Steering Fluid (GM P/N 1052884 (pt), 1050017 (qt), or equivalent).
Weatherstrip Conditioning	Dielectric Silicone Grease (GM P/N 12345579 or equivalent).
Windshield Washer Solvent	GM Optikleen® Washer Solvent (GM P/N 1051515) or equivalent.

Tire Inflation Pressure Specifications Tire Inflation Specifications

Application	Specification	
	Metric	English
Compact spare tire	420 kPa	60 psi
Tires under normal driving conditions	210 kPa	30 psi
Tires under sustained high speed driving of 160 km/h (100 mph) or higher	265 kPa	38 psi

Descriptions and Operations

Power Steering System Description and Operation

Fluid Specifications

Application	Type of Material	GM Part Number
Warm Climate	Power Steering Fluid	1050017 or 1052884 or equivalent meeting GM Specification 9985010
Cold Climate (see note)	Power Steering Fluid	12345867 or 12345866

Important: Drain and refill the system prior to using this fluid.

Power Steering Pump Description

A constant displacement vane-type pump provides hydraulic pressure and flow for the power steering system. The pump is located on the engine and is belt driven by the serpentine belt through the power steering pulley. The power steering reservoir is integrally mounted on the LS1 V8 system (engine mounted) and is remote-mounted (radiator support mounted) on L36 V6 systems.

The power steering pump contains the following major components:

- The drive shaft
- The pump housing
- The pump fitting
- The flow control valve
- The flow control spring
- The thrust plates
- The pressure plates
- The pump ring
- The pump rotor
- The pump vanes

The power steering system has a remote reservoir. The reservoir cap has an attached fluid level indicator which shows the fluid level in the reservoir.

The bore at the front of the housing contains the flow control fitting. The flow control fitting works with the flow control valve and spring in order to limit the maximum flow of the pump. The pressure relief valve is located inside of the flow control valve. The pressure relief valve limits the maximum pump pressure.

The casting boss that runs across the housing holds the following components:

- The flow control valve
- The flow control spring
- The pump fitting

Power Steering Gear Description

The power steering gear includes the following major internal components:

- The power steering gear pinion and valve shaft
- The steering gear rack and piston
- The inner tie rods
- The outer tie rods

The steering gear rack and piston is supported at the ends in the steering gear housing. The steering gear rack and piston is sealed in order to prevent leakage across the piston. The pinion and valve intersects with the rack and piston and meshes directly with the teeth of the rack and piston.

Manual steering is always available during the following situations:

- When the engine is not running
- In the event of power steering pump failure
- In the event of serpentine belt failure

Steering effort is increased when the above conditions exists.

The power steering pump provides hydraulic pressure and fluid flow in order to move the gear components. This action occurs when the vehicle is parked or moving. The valve directs pressurized fluid during a steering maneuver. The fluid travels through the external steel cylinder lines in order to act on the rack and piston. When the vehicle is turned right, the steering valve opens and routes pressurized fluid to the left side of the piston. At the same time, the valve allows fluid to escape from the right side of the piston and return to the valve area. The fluid pressure is converted into a mechanical force which is applied to the piston. This difference in force across the piston causes the rack to move to the right. The opposite action occurs when the gear is turned to the left.

The effort to steer the vehicle is created by the pressure difference at the piston when the following conditions exist:

- The power steering pump (3) provides pressurized fluid to the gear.
- The valve is operating correctly.

Steering Wheel and Column - Standard Description and Operation

The steering wheel and column has 4 primary functions:

- Vehicle steering
- Vehicle security
- Driver convenience
- Driver safety

Vehicle Steering

The steering wheel is the first link between the driver and the vehicle. The steering wheel is fastened to a steering shaft within the column. At the lower end of the column, the intermediate shaft connects the column to the steering gear.

Vehicle Security

Theft deterrent components are mounted and designed into the steering column. The following components allow the column to be locked in order to minimize theft:

- The ignition switch
- The steering column lock
- The ignition cylinder

Driver Convenience

The steering wheel and column may also have driver controls attached for convenience and comfort. The following controls may be mounted on or near the steering wheel or column.

- The turn signal switch
- The hazard switch
- The headlamp dimmer switch
- The wiper/washer switch
- The horn pad/cruise control switch
- The redundant radio/entertainment system controls
- The tilt or tilt/telescoping functions
- The HVAC controls

Driver Safety

The energy-absorbing steering column compresses in the event of a front-end collision, which reduces the chance of injury to the driver. The mounting capsules break away from the mounting bracket in the event of an accident.

Suspension Description and Operation

Front Suspension

The short/long arm front suspension design allows each wheel to compensate for changes in the road surface level without appreciably affecting the opposite wheel. Each wheel independently connects to the frame by the following:

- A steering knuckle
- A wheel hub
- A shock absorber and spring
- Upper and lower ball studs
- Upper and lower control arms

The steering knuckle and the hubs move in a prescribed three-dimensional arc. The front wheels are held in proper relationship to each other by the two front tie rods. The front tie rods connect to the steering arms on the knuckles and connect to the steering gear.

Springs mount to the lower control arms. Direct-acting shock absorbers provide ride control. The upper portion of the shock absorber connects to the front upper shock absorber mount. The upper mount extends through the upper control arm support and through the center wheelhouse. The upper mount attaches with two bolts/screws and two nuts.

The stabilizer shaft controls idle roll of the front suspension. The stabilizer shaft mounts to the stabilizer shaft insulators. These insulators attach to the frame side rails by the stabilizer shaft brackets. The ends of the stabilizer shaft connect to the lower control arms by the stabilizer shaft links. These ends are isolated by bushings.

The inner ends of the lower control arm have pressed-in bushings. Bolts pass through the bushings and attach the lower control arm to the crossmember.

The upper ball stud is riveted to the upper control arm. This stud attaches to the steering knuckle with a nut and a cotter pin. The control arm bolts to the shock absorber through an upper control arm support which attaches to the body.

The lower ball stud is press fit into the lower control arm. This ball stud attaches to the steering knuckle with a nut and a cotter pin.

Rubber seals are provided at the ball sockets in order to keep dirt and moisture from entering the stud and damaging the bearing surfaces.

Rear Suspension

- The rear axle attaches to the vehicle with a link suspension system.
- The rear axle housing connects to the floor panel by two lower control arms and a track bar.
- A single torque arm is used in place of an upper control arm.
- The torque arm rigidly mounts to the rear axle housing at the rear.
- The torque arm mounts through a torque arm bushing at the front.
- On some vehicles, the torque arm also mounts to the two piece propeller shaft center support bearing with two bolts.
- The rear springs support the weight of the vehicle.
- The rear shock absorbers mount to the rear of the axle housing and provide ride control.
- A rear stabilizer shaft is also part of the suspension system. The rear shock absorbers mount at the bottom with a nut to brackets welded to the rear of the rear axle housing and also mount at the top of the floor panel with a nut.
- The only service that the rear shock absorbers require is replacement for the following conditions:
  - Loss of resistance
  - Damage or leaking fluid

Wheels and Tires

Specifications

Application	Specification	
	Metric	English
Maximum Radial Runout		
• Aluminum Wheels	0.76	0.030
• Steel Wheels	1.01	0.040
Maximum Lateral Runout		
• Aluminum Wheels	0.76	0.030
• Steel Wheels	1.14	0.045
Tire Pressures		
• Compact Spare	420	60
• Front/Rear	210	30

General Description

The factory installed tires are designed to operate satisfactorily with loads up to and including the full rated load capacity when these tires are inflated to the recommended pressures.

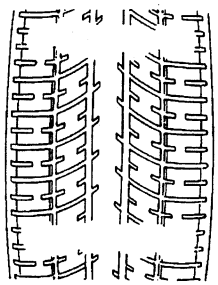
The following factors have an important influence on tire life:

- Correct tire pressures
- Correct wheel alignment
- Proper driving techniques
- Tire rotation

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

Tread Wear Indicators Description



The original equipment tires have tread wear indicators that show when you should replace the tires.

The location of these indicators are at 72 degree intervals around the outer diameter of the tire. The indicators appear as a 6 mm (0.25 in) wide band when the tire tread depth becomes 1.6 mm (2/32 in).

Metric Wheel Nuts and Bolts Description

Metric wheel/nuts and bolts are identified in the following way:

- The wheel/nut has the word Metric stamped on the face.
- The letter M is stamped on the end of the wheel bolt.

The thread sizes of metric wheel/nuts and the bolts are indicated by the following example: M12 x 1.5.

- M = Metric
- 12 = Diameter in millimeters
- 1.5 = Millimeters gap per thread

Tire Inflation Description

When you inflate the tires to the recommended inflation pressures, the factory-installed wheels and tires are designed in order to handle loads to the tire's rated load capacity. Incorrect tire pressures, or under-inflated tires, can cause the following conditions:

- Vehicle handling concerns
- Poor fuel economy
- Shortened tire life
- Tire overloading

Inspect the tire pressure when the following conditions apply:

- The vehicle has been sitting at least 3 hours.
- The vehicle has not been driven for more than 1.6 km (1 mi).
- The tires are cool.

Inspect the tires monthly or before any extended trip. Adjust the tire pressure to the specifications on the tire label. Install the valve caps or the extensions on the valves. The caps or the extensions keep out dust and water.

The kilopascal (kPa) is the metric term for pressure. The tire pressure may be printed in both kilopascal (kPa) and psi. One psi equals 6.9 kPa.

Inflation Pressure Conversion (Kilopascals to PSI)

kPa	psi	kPa	psi
140	20	215	31
145	21	220	32
155	22	230	33
160	23	235	34
165	24	240	35
170	25	250	36
180	26	275	40
185	27	310	45
190	28	345	50
200	29	380	55
205	30	415	60
Conversion: 6.9 kPa = 1 psi			

Tires with a higher than recommended pressure can cause the following conditions:

- A hard ride
- Tire bruising
- Rapid tread wear at the center of the tire

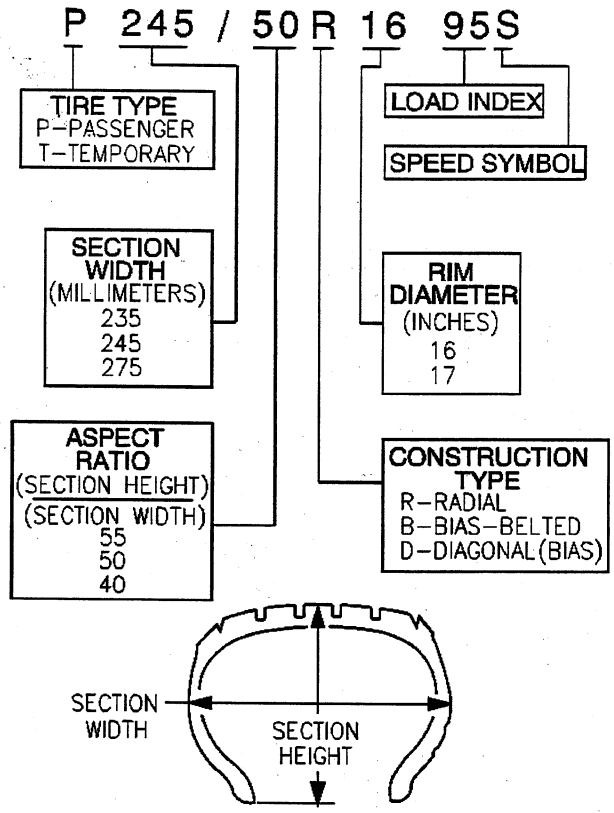
Tires with a lower than recommended pressure can cause the following conditions:

- A tire squeal on turns
- Hard steering
- Rapid wear and uneven wear on the edge of the tread
- Tire rim bruises and tire rim rupture
- Tire cord breakage
- High tire temperatures
- Reduced vehicle handling
- High fuel consumption
- Soft riding

Unequal pressure on the same axle can cause the following conditions:

- Uneven braking
- Steering lead
- Reduced vehicle handling

P-Metric Sized Tires Description



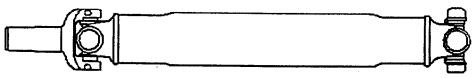
Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria (TPC) specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle. Consult a tire dealer if you must replace the P-metric tire with other sizes. Tire companies can best recommend the closest match of alphanumeric to P-metric sizes within their own tire lines.

Driveline System Description and Operation

Driveline/Axle – Propeller Shaft

Propeller Shaft Description and Operation

One Piece Shaft



Important

When undercoating a vehicle, keep the propeller shaft free from undercoating material. Undercoating or any other foreign material will upset the propeller shaft balance and may produce serious vibrations.

The propeller shaft is a hollow shaft or tube that connects the transmission to the differential. The propeller shaft connects to the transmission with a splined slip yoke and connects to the rear axle with a universal joint.

Propeller shafts have universal joints at each end in order to accommodate angle variations between the transmission and rear axle, and the rear axle position caused by suspension motion. All propeller shafts are the balanced tubular type.

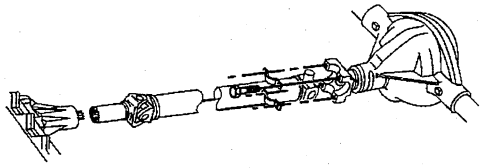
Vehicles with the 5.7L (VIN G) engine and both the 6-speed (MM6) and the automatic transmission (M30) are equipped with a one-piece propeller shaft of either stamped steel design or a lightweight aluminum.

Two Piece Shaft

Vehicles equipped with the 3800 (VIN K) engine and the 5-speed manual transmission (M49) are equipped with a two-piece propeller shaft assembly. The two-piece shaft assembly consists of a front propeller shaft, a rear propeller shaft, and a center support bearing. The center support bearing prevents angular movement (or "whipping") of the propeller shaft. The support bearing is a ball bearing type. The support bearing mounts in a rubber cushion. The rubber cushion mounts to the torque arm.

The bearing is prelubricated and sealed by the manufacturer.

The spline coupling has internal splines which accept the rear propeller shaft.



A propeller shaft joint (sometimes referred to as constant velocity joint) is located on the front of the rear propeller shaft. The propeller shaft joint fits into the spline coupling of the front propeller shaft. The propeller shaft joint (or constant velocity joint) allows adjustment of the propeller shaft angle without interrupting the power flow. The up and down movement of the vehicle requires the above action.

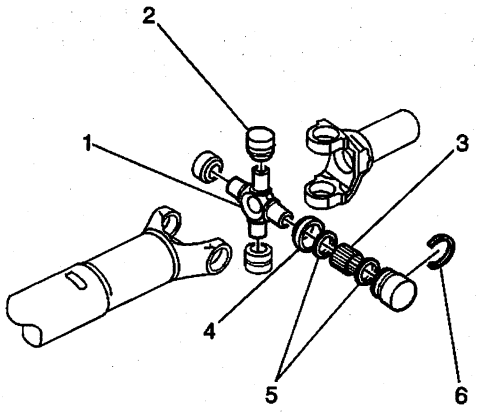
Vehicles with two or more propeller shafts use a center bearing. The center bearing is usually near the rear of the front propeller shaft. The slip joint is at the forward end of the rear propeller shaft.

Propeller Shaft Phasing Description

The propeller shaft is designed and built with the yoke lugs (ears) in line with each other which produces the smoothest running shaft possible. A propeller shaft designed with built in yoke lugs in line is known as in-phase.

An out of phase propeller shaft often causes vibration. The propeller shaft generates vibration from speeding up and slowing down each time the universal joint goes around. The vibration is the same as a person snapping a rope and watching the wave reaction flow to the end. An in phase propeller shaft is similar to two persons snapping a rope at the same time and watching the waves meet and cancel each other out. A total cancellation of vibration produces a smooth flow of power in the drive line. Since phasing of a propeller shaft is between the front and center universal joints, you must reference mark the front and rear propeller shafts before removal in order to ensure proper phasing upon reinstallation. Some splined shaft slip yokes are keyed in order to ensure proper phasing.

Universal Joint Description



Universal joints are designed to handle the effects of various loadings and rear axle windup during acceleration and braking. Within the designed angle variations, the universal joint operates efficiently and safely. When the design angle changes or is exceeded, the operational life of the joint may decrease.

The trunnion bearings (3) used in universal joints are the needle roller type. Round bearing cups (2) hold the needle rollers in place on the trunnions. Either snap rings (6) or injected plastic hold the bearing cups in the yokes.

The Original Equipment Manufacturer (OEM) universal joints are lubricated for life and cannot be lubricated on the vehicle. A service kit which consists of a spider (1) with bearing assemblies,snap rings and derlin washers (4 and 5) may be installed if a universal joint becomes worn or noisy. If it is necessary to repair a universal joint, you must remove the propeller shaft from the vehicle. Avoid jamming, bending, or over-angulating any parts of the propeller shaft assembly. Avoid damaging the propeller weld yokes and slip yoke ears upon installation or removal of U-joints.

Center Bearing Description

Center bearings support the driveline when using two or more propeller shafts. The center bearing is a ball bearing assembly mounted in a rubber cushion that attaches to the rear axle torque arm in the Camaro and Firebird models. The manufacturer prelubricates and seals the bearing. The cushion allows vertical motion at the driveline and helps isolate the vehicle from driveline vibrations. Since the center bearing is a sealed assembly, it must be replaced as an assembly as it can not be overhauled.

Rear Drive Axle Description and Operation

Rear Axle Specifications

Application	Specification	
	Metric	English
Rear Axle Type	Semi-Floating Hypoid	
Drive and Torque	Through 4 Arms	
Ring and Drive Pinion Gear Set Type	Hypoid	
Rear Axle Lubricant Capacity	1.65 L	3.5 pt.
• Rear Axle Lubricant		
Standard and Limited Slip Differential	Synthetic 75W-90 Gear Lubricant (GM P/N 12378261) meeting GM spec. 9986115, or equivalent	
Limited Slip Differential Additive (GM P/N 1052358), or equivalent	118 ml	4 fl. oz.

Rear Axle Usage

Engine (RPO)	Transmission	Rear Axle Ratio	Rear Axle RPO	Ring Gear Diameter	Rear Brake	Teeth Ring Gear: Pinion
3800-V6 (L36)	5-SPD Manual (M49)	3.23	GU5	194 mm (7 5/8")	Disc	42:13
3800-V6 (L36) Y87 Package	5-SPD Manual (M49)	3.23	GU5	194 mm (7 5/8")	Disc	42:13
3800-V6 (L36)	4-SPD Automatic (M30)	3.08	GU4	194 mm (7 5/8")	Disc	40:13
3800-V6 (L36) Y87 Package	4-SPD Automatic (M30)	3.42	GU6	194 mm (7 5/8")	Disc	41:12
5.7L-V8 (LS1)	6-SPD Manual (MM6)	3.42	GU6	194 mm (7 5/8")	Disc	41:12
5.7L-V8 (LS1) WS6 Package	6-SPD Manual (MM6)	3.42	GU6	194 mm (7 5/8")	Disc	41:12
5.7L-V8 (LS1)	4-SPD Automatic (M30)	2.73	GU2	194 mm (7 5/8")	Disc	41:15
5.7L-V8 (LS1) WS6 Package	4-SPD Automatic (M30)	3.23	GU5	194 mm (7 5/8")	Disc	42:13

Rear Axle Description

The solid rear axle found in the Camaro and Firebird is a semi-floating hypoid rear axle, which is designed for use with the following components:

- An open driveline (with or without a torque arm)
- Coil springs
- One-piece or two-piece propeller shafts

The rear axle has a hypoid type differential ring gear. The centerline of the differential drive pinion gear is located below the centerline of the hypoid type differential ring gear. The rear axle housing encloses all of the components that are necessary for transmitting power from the propeller shaft to the rear wheels and tires. Bolts attach the rear axle housing cover to the back of the rear axle housing. The rear axle housing cover is removable in order to permit service of the differential case without removing the entire axle from the vehicle.

A universal joint connects the rear end of the propeller shaft to the drive pinion gear yoke. The drive pinion gear yoke has a splined end that fits over the drive pinion gear. The splined end of the drive pinion gear yoke also drives the pinion gear. Two preloaded tapered drive pinion gear bearings support the drive

pinion gear in the rear axle housing. The races of the following components are press fit into the rear axle housing:

- The inner drive pinion gear bearing press fits onto the drive pinion gear.
- The outer drive pinion gear bearing combines a light press fit to a close sliding fit on the yoke end of the drive pinion gear.

The races of the inner drive pinion gear bearing and the outer pinion gear bearing press against shoulders which are recessed in the rear axle housing.

Tightening the drive pinion gear nut compresses a collapsible drive pinion gear spacer. This bears against the following components:

- The outer drive pinion gear bearing
- A shoulder on the drive pinion gear

The drive pinion gear spacer performs the following actions:

- Enables automatic bearing preload adjustment.
- Maintains a preload on the inner drive pinion gear bearing.
- Maintains a preload on the outer drive pinion gear bearing.

Enable the adjustment of the fore-and-aft position of the drive pinion gear by placing selective drive pinion gear shims between the following components:

- The head of the drive pinion gear
- The inner drive pinion gear bearing

The differential case is one piece. Two differential side bearings support the differential case in the rear axle housing. The differential side bearings are preloaded by the insertion of differential bearing shims between the following components:

- The differential side bearings
- The rear axle housing

Vary the shim thickness from side to side. This positions the differential case for proper backlash between the differential ring gear and the differential drive pinion gear.

Bolts attach the differential ring gear to the differential case. The following components have splined bores used for driving the axle shaft:

- The left differential pinion gear
- The right differential pinion gear

The position of these pinion gears permits the gears to turn in counterbored cavities of the differential case. The following components have smooth bores:

- The upper differential pinion gear
- The lower differential pinion gear

The differential pinion gear shaft holds these pinion gears in position. The differential pinion gear shaft mounts and locks in the differential case. All four of the gears mesh with each other.

The following components turn freely on the pinion gear shaft:

- The upper differential pinion gear
- The lower differential pinion gear

These pinion gears act as idler gears when the rear wheels turn at different speeds.

The following components back the differential pinion gears:

- Differential pinion thrust washers
- Differential side gear thrust washers

Vehicles that are equipped with the standard rear axle and the Antilock Brake System (ABS) only, have a single rear wheel speed sensor mounted on the differential carrier behind the ring gear. A wheel speed sensor is bolted to the top of the rear axle housing opposite the reluctor wheel. This sensor provides wheel speed information to the electronic brake control module (EBCM)

Vehicles that are equipped with the limited slip rear axle, ABS, and a Traction Control System (TCS) have rear wheel speed sensors mounted on the axle shafts just behind the axle flange. The axle mounted reluctor wheels are an integral part of the rear axle shaft and cannot be replaced separately. If the wheel needs to be replaced, you must replace the entire axle.

Operation

When the vehicle turns a corner, the differential allows the outer rear tire and wheel assembly to turn faster than the inner tire and wheel assembly.

The inner tire and wheel assembly moves more slowly than the outer tire and wheel assembly. The inner tire and wheel assembly slows its (side) differential pinion gear. The side differential pinion gear is slowed because the axle shaft is splined to the side gear.

The differential pinion gears roll around the slowed (side) differential pinion gear. This action causes the other differential pinion gear and the tire and wheel assembly to move faster.

Limited Slip Rear Axle

Limited slip rear axles have several definite operating characteristics. An understanding of these characteristics is necessary in order to aid diagnostics. The rear axle limited slip differential found in Camaro and Firebird vehicles is the Zexel Torsen® rear axle. This axle differs from the previous Auburn® limited slip units. The Torsen® axle does not utilize clutches or cone clutches as in other limited slip units. The Zexel Torsen® axle is a unique design which utilizes parallel axis helical gearing to develop side gear separating force in an axial direction and planetary gear separating force in a radial direction.

There are not any major servicing differences between the Torsen® and Auburn® differentials except for a thrust block is used in the Torsen® differential for retention of the C-clip as compared to a pin used in the Auburn® differential.

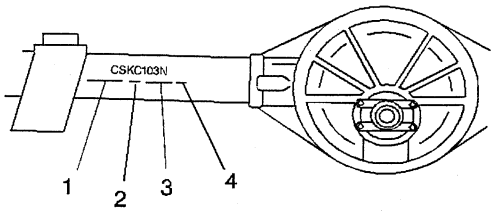
All the following rear axle components are interchangeable (except for the differentials):

- Vehicles with the limited slip rear axle
- Vehicles with the standard rear axle

The Zexel Torsen® limited slip differential is non-serviceable. Diagnosis is limited to the inspection of the unit for excessive wear to the helical gears or the differential case. The differential should not be disassembled nor should the helical gears be removed. The differential cases of the 2 vehicles are not interchangeable. The following procedures are the same for both the Torsen® limited slip differential case and the standard rear axle differential case:

- Removal of the differential
- Replacement of the differential
- Service of the side bearings
- Service of the ring and pinion gear set
- All backlash and tooth contact pattern procedures

Rear Axle Identification



You must know the rear axle identification code (1) and the manufacturer's code (2) before adjusting or repairing the repair axle shafts or the differential.

The following information is stamped onto the forward side of the right axle tube or on a metal tag on the housing cover:

- The rear axle ratio
- The differential type
- The manufacturer's code (2)
- The build date (3)

RPO codes for the rear axle are also printed on the service parts identification label.

Braking System Description and Operation

Hydraulic Brake System Description and Operation

System Component Description

The hydraulic brake system consists of the following:

Hydraulic Brake Master Cylinder Fluid Reservoir

Contains supply of brake fluid for the hydraulic brake system.

Hydraulic Brake Master Cylinder

Converts mechanical input force into hydraulic output pressure.

Hydraulic output pressure is distributed from the master cylinder through two hydraulic circuits, supplying diagonally-opposed wheel apply circuits.

Hydraulic Brake Pressure Balance Control System

Regulates brake fluid pressure delivered to hydraulic brake wheel circuits, in order to control the distribution of braking force.

Pressure balance control is achieved through dynamic rear proportioning (DRP), which is a function of the ABS modulator.

Hydraulic Brake Pipes and Flexible Brake Hoses

Carries brake fluid to and from hydraulic brake system components.

Hydraulic Brake Wheel Apply Components

Converts hydraulic input pressure into mechanical output force.

System Operation

Mechanical force is converted into hydraulic pressure by the master cylinder, regulated to meet braking system demands by the pressure balance control system, and delivered to the hydraulic brake wheel circuits by the pipes and flexible hoses. The wheel apply components then convert the hydraulic pressure back into mechanical force which presses linings against rotating brake system components.

Brake Assist System Description and Operation

System Component Description

The brake assist system consists of the following:

Brake Pedal

Receives, multiplies and transfers brake system input force from driver.

Brake Pedal Pushrod

Transfers multiplied input force received from brake pedal to brake booster.

Vacuum Brake Booster

Uses source vacuum to decrease effort required by driver when applying brake system input force.

When brake system input force is applied, air at atmospheric pressure is admitted to the rear of both vacuum diaphragms, providing a decrease in brake pedal effort required. When input force is removed, vacuum replaces atmospheric pressure within the booster.

Vacuum Source

Supplies force used by vacuum brake booster to decrease brake pedal effort.

Vacuum Source Delivery System

Enables delivery and retention of source vacuum for vacuum brake booster.

System Operation

Brake system input force is multiplied by the brake pedal and transferred by the pedal pushrod to the hydraulic brake master cylinder. Effort required to apply the brake system is reduced by the vacuum brake booster.

Disc Brake System Description and Operation

System Component Description

The disc brake system consists of the following components:

Disc Brake Pads

Applies mechanical output force from the hydraulic brake calipers to friction surfaces of brake rotors.

Disc Brake Rotors

Uses mechanical output force applied to friction surfaces from the disc brake pads to slow speed of tire and wheel assembly rotation.

Disc Brake Pad Hardware

Secures disc brake pads firmly in proper relationship to the hydraulic brake calipers. Enables a sliding motion of brake pads when mechanical output force is applied.

Disc Brake Caliper Hardware

Provides mounting for hydraulic brake caliper and secures the caliper firmly in proper relationship to caliper bracket. Enables a sliding motion of the brake caliper to the brake pads when mechanical output force is applied.

System Operation

Mechanical output force is applied from the hydraulic brake caliper pistons to the inner brake pads. As the pistons press the inner brake pads outward, the caliper housings draw the outer brake pads inward. This allows the output force to be equally distributed. The brake pads apply the output force to the friction surfaces on both sides of the brake rotors, which slows the rotation of the tire and wheel assemblies. The correct function of both the brake pad and brake caliper hardware is essential for even distribution of braking force.

Drum Brake System Description and Operation

System Component Description

The drum brake system consists of the following:

Drum Brake Shoes

Applies mechanical output force (from hydraulic brake wheel cylinders) to friction surface of brake drums.

Brake Drums

Uses mechanical output force applied to friction surface from drum brake shoes to slow speed of tire and wheel assembly rotation.

Drum Brake Hardware

Secures drum brake shoes firmly in proper relationship to hydraulic brake wheel cylinders. Enables sliding motion of brake shoes needed to expand toward friction surface of drums when mechanical output force is applied; provides return of brake shoes when mechanical output force is relieved.

Drum Brake Adjusting Hardware

Provides automatic adjustment of brake shoes to brake drum friction surface whenever brake apply occurs during rearward motion of the vehicle.

System Operation

Mechanical output force is applied from the hydraulic brake wheel cylinder pistons to the top of the drum brake shoes. The output force is then distributed between the primary and secondary brake shoes as the shoes expand toward the friction surface of the brake drums. The brake shoes apply the output force to the friction surface of the brake drums, which slows the rotation of the tire and wheel assemblies. The proper function of both the drum brake hardware and adjusting hardware is essential to the proper distribution of braking force.

Park Brake System Description and Operation

System Component Description

Park Brake System

The park brake system for this vehicle has been changed and now contains the "drum in hat" parking brake system instead of the previous system which relied on the disc brake caliper for parking brake system operation. The park brake system allows a mechanical application of the rear parking brake shoes to the inner rotor surface by pulling the park brake lever. When the park brake system is applied, the effort with which the brake lever is moved is transmitted by the cables to the brake levers which force the rear brake shoes outward against the inner rotor surface. As the brake shoe lining wears the park brake system must be manually adjusted to prevent excessive hand lever travel.

Park Brake Lever

This vehicle is equipped with a self-adjusting park brake lever. This mechanism automatically takes up any slack in the cables and provides the correct amount of tension in the cables when the system is released. The park brake cables cannot be manually adjusted. When operating correctly, the rear park brake actuator applies force to the rear brake shoe and forces it against the inner rotor surface. When the parking brake lever is released, the parking brakes will fully return to their mechanical stops eliminating any drag on the brake rotor.

Park Brake Cables

The park brake system uses the following three separate cables:

- The front cable
- The left rear cable
- The right rear cable

The left and right rear cables are joined to the front cable at the park brake cable equalizer. This vehicle is equipped with coated park brake cables. The cable is coated with a plastic material which slides over the plastic seals inside the conduit end fittings. The plastic material coating is for corrosion protection, and reduced park brake effort.

BRAKE Warning Lamp

- The red BRAKE warning lamp illuminates when the ignition switch is in the START position and the park brake lever is applied or is not fully released.
- The park brake warning switch is located on the park brake lever.
- The park brake lever will ground the BRAKE warning lamp circuit and cause the BRAKE warning lamp to illuminate.

ABS Description and Operation

General System Description

The purpose of the Bosch 5.3 Antilock Brake System (ABS) is to minimize wheel slip during heavy braking. The Bosch 5.3 performs this function by monitoring the speed of each wheel and controlling the brake fluid pressure to each wheel independently during a braking event. This allows the driver to retain directional stability and better steering capability.

The Traction Control System (TCS) also monitors rear wheel speed and compares the speed to the speed of the front wheel. If excessive rear wheel speed is detected in either rear wheels the TCS will be activated.

ABS Description

Brake Pressure Modulator Valve (BPMV)

The Brake Pressure Modulator Valve (BPMV) mounted on the left side of the engine compartment, provides brake fluid modulation for each of the individual wheel circuits as required during Antilock braking. During the Antilock mode, the BPMV can maintain or reduce brake fluid pressure independent of the pressure generated in the master cylinder. The BPMV does not provide more pressure than is applied by the master cylinder during braking.

The BPMV supplies Electronic Brakeforce Distribution (EBD). This function takes the place of the proportioning valve(s).

With the exception of the EBCM/EBTCM, the Brake Pressure Modulator Valve (BPMV) is an integral, non-serviceable component. The BPMV should never be disassembled.

If the vehicle is not equipped with traction control the BPMV uses a three circuit configuration with a front-rear split. Individual circuits are provided for the left front and right front wheels, and the rear wheels use one circuit.

If the vehicle is equipped with traction control the BPMV uses a four circuit configuration with a front-rear split. Individual circuits are provided for the left front and right front wheels, and left rear and right rear wheels.

The BPMV consists of several other components which are described as follows:

Pump Motor

The BPMV contains a motor driven recirculation pump. The pump serves two purposes: 1) During ABS Reduce Pressure events, it transfers fluid from the brake calipers back to the master cylinder; and 2) During traction control, it transfers fluid from the master cylinder reservoir to the rear brake calipers. The pump and motor are located within the BPMV and are not serviced separately.

ABS Valves

The ABS valves decrease or maintain brake fluid pressure at the individual wheel circuits. If the vehicle is not equipped with traction control there are three Inlet, and three Outlet solenoid valves. If the vehicle is equipped with traction control there are four Inlet, and four Outlet solenoid valves. The solenoid valves maintain, increase, or decrease brake fluid pressure to the individual wheel circuits. The EBCM/EBTCM commands the valves to their correct position during an antilock or traction event. During antilock mode, the pressure in each hydraulic circuit can be held or released by activating the appropriate valves. The normal state of the inlet valves is open, while the normal state of the Outlet valves is closed. This allows direct master cylinder pressure to the brakes during normal braking. The ABS valves are located within the BPMV and are not serviced separately.

TCS Master Cylinder Isolation Valves

If the vehicle is equipped with Traction Control there is one TCS Master Cylinder Isolation Valve within the BPMV. This valves isolates the master cylinder so the pump motor can build brake fluid pressure for the rear brakes during a traction event.

TCS Prime Valves

If the vehicle is equipped with Traction Control there is one TCS prime valve within the BPMV. This valves allow the pump to draw fluid from the master cylinder reservoir, through the compensating ports in the master cylinder bore.

Electronic Brake And Traction Control Module

The EBCM/EBTCM performs the following primary functions:

- Detects wheel slip tendencies
- Detects wheel speed differences
- Controls the brake system while in the antilock or traction control mode
- Controls the Electronic Brakeforce Distribution (EBD)
- Monitors the system for proper electrical operation

The EBCM/EBTCM also controls the display of the ABS and traction control DTCs while in diagnostic mode. The EBCM/EBTCM continuously checks the speed of each wheel in order to determine if any wheel is beginning to slip. If a wheel slip tendency is detected, the EBCM/EBTCM commands the appropriate valve positions to modulate the brake fluid pressure in some or all of the hydraulic circuits. This action prevents wheel slip and provides optimum braking. The EBCM/EBTCM continues to control pressure in the individual hydraulic circuits until a slipping tendency is no longer present. The EBCM/EBTCM continuously monitors the ABS/TCS for proper operation. If an error is detected, the EBCM/EBTCM can disable the ABS/TCS and turn on the ABS or TCS OFF Indicators in the IPC.

Wheel Speed Sensors

A wheel speed sensor is located at each front wheel bearing assembly. If the vehicle is equipped with traction control a wheel speed sensor is located at each rear wheel bearing assembly. If the vehicle is not equipped with traction control then a single rear wheel speed sensor is located in the differential housing. The sensors use AC voltage in order to transmit wheel speed information to the EBCM/EBTCM. Passing a toothed sensor ring past a stationary sensor causes the magnetic induction that generates the voltage.

A pair of wires carries the signal to the EBCM/EBTCM. The wheel speed sensors are located in their respective assemblies and are not adjustable.

Traction Control System ON/OFF Switch

The Traction Control On/Off Switch is a momentary on switch that allows the driver to shut off the TCS for personal or diagnostic reasons. Turning the switch to off places the TCS in the passive mode while maintaining ABS functions. With the TCS system on, pressing the switch disables the TCS and the TRACTION OFF indicator turns on.

Stoplamp Switch

The stoplamp switch is an input to the EBCM/EBTCM. The EBCM/EBTCM uses the stoplamp switch in order to tell when the brake pedal is being applied.

Engine Description and Operation

3.8L V-6 Engine

Engine Mechanical Specifications

Application	Specification	
	Metric	English
General Data		
• Engine Type	90° V-6	
• Displacement	231 cu in	
• Liter (VIN)	3.8L (K)	
• RPO	L36	
• Bore	96.52 mm	3.8 in
• Stroke	86.36 mm	3.4 in
• Compression Ratio	9.4:1	
• Firing Order	1-6-5-4-3-2	
Lubrication System		
• Oil Capacity with Oil Filter Change	4.25 L	4.5 qt
• Oil Capacity without Oil Filter Change	3.75 L	4 qt
• Oil Pressure @ Operating Temperature (1850 RPM) Using 10W-30 Oil	414 kPa	60 psi min
• Oil Filter Type	Throw Away Element and Can	
• Gear Pocket Depth	11.71-11.75 mm	0.461-0.4625 in
• Gear Pocket Diameter	89.10-89.20 mm	3.508-3.512 in
• Inner Gear Tip Clearance	0.152 mm	0.006 in
• Outer Gear Diameter Clearance	0.203-0.381 mm	0.008-0.015 in
• End Clearance	0.025-0.089 mm	0.001-0.0035 in
• Valve-to-Bore Clearance	0.038-0.076 mm	0.0015-0.003 in
Type of Lubrication		
• Main Bearings	Pressure	
• Connecting Rods	Pressure	
• Piston Pins	Splash	
• Balance Shaft Bearing - Front	Splash	
• Balance Shaft Bushing - Rear	Pressure	
• Camshaft Bearings	Pressure	
• Timing Chain	Splash	
• Cylinder Walls	Splash	
• Oil Pump Type	Gerotor	
• Oil Pressure Sending Unit	Electrical	
• Oil Intake	Stationary	
• Oil Filter System	Full Flow	
Cylinder Bore		
• Diameter	96.5 mm	3.8 in
• Out-Of-Round Maximum	0.0254 mm	0.001 in
• Taper	0.0254 mm	0.001 in

Piston		
• Used Piston Clearance (41 mm from Top of Piston)	0.050-0.091 mm	0.0020-0.0036 in
• New Piston Clearance (41 mm from Top of Piston)	0.010-0.051 mm	0.0004-0.0020 in
Piston Ring Groove Depth		
• Top Compression	4.019-4.146 mm	0.158-0.163 in
• 2nd Compression	4.214-4.341 mm	0.0166-0.171 in
• Oil Control	3.814-3.941 mm	0.150-0.155 in
Piston Ring End Gap		
• Top Compression	0.25-0.46 mm	0.010-0.018 in
• 2nd Compression	0.58-0.84 mm	0.023-0.033 in
• Oil Control	0.254-0.762 mm	0.010-0.030 in
Piston Ring Side Clearance		
• Top Compression	0.033-0.079 mm	0.0013-0.0031 in
• 2nd Compression	0.033-0.079 mm	0.0013-0.0031 in
• Oil Control	0.023-0.201 mm	0.0009-0.0079 in
Piston Ring Width		
• Top Compression	1.176-1.197 mm	0.0463-0.0471
• 2nd Compression	1.476-1.497 mm	0.0581-0.0589
• Oil Control	1.854-2.007 mm	0.073-0.079
Piston Pin		
• Diameter	21.9950-22.0000 mm	0.8659-0.8661 in
• Clearance in Piston	0.0020-0.0130 mm	0.00008-0.00051 in
• Fit-In-Rod (Clearance)	0.0066-0.0217 mm	0.0003-0.0009 in
Crankshaft		
• Main Journal Diameter-All	63.470-63.495 mm	2.4988-2.4998 in
• Rod Journal Diameter-All	57.1170-57.1475 mm	2.2487-2.2499 in
• Main Journal Taper-Maximum	0.00889 mm	0.00035 in
• Rod Journal Taper-Maximum	0.00889 mm	0.00035 in
• Main Journal Out-of-Round-Maximum	0.00635 mm	0.00025 in
• Rod Journal Out-of-Round-Maximum	0.00508 mm	0.00020 in
• Main Bearing To Journal Clearance 1	0.0178-0.0406 mm	0.0007-0.0016 in
• Main Bearing To Journal Clearance 2, 3, and 4	0.0229-0.0457 mm	0.0009-0.0018 in
• Rod Bearing Clearance	0.0127-0.0660 mm	0.0005-0.0026 in
• Crankshaft End Play	0.076-0.276 mm	0.003-0.011 in
Connecting Rod		
• Rod Side Clearance	0.102-0.508 mm	0.004-0.0200 in
• Connecting Rod Large End Bore ID	60.295-60.312 mm	2.37378-2.3745 in
Camshaft		
• Journal Diameter	47.655-46.858 mm	1.8462-1.8448 in
• Bearing Inside Diameter 1 and 4	46.970-46.934 mm	1.8428-1.8492 in
• Bearing Inside Diameter 2 and 3	46.977-46.942 mm	1.8481-1.8495 in
• Bearing-to-Journal Clearance	0.041-0.119 mm	0.0016-0.0047 in
• Intake Maximum Lobe Lift	6.55 mm	0.258 in
• Exhaust Maximum Lobe Lift	6.48 mm	0.255 in

Balance Shaft		
• End Play	0.0-0.171 mm	0.0-0.0067 in
• Rear Journal Diameter	38.085-38.105 mm	1.4994-1.5002 in
• Radial Play-Front, Bearing Clearance	0.0-0.026 mm	0.0-0.0010 in
• Rear Bearing To Journal Clearance	0.0127-0.109 mm	0.0005-0.0043 in
• Drive Gear Lash	0.050-0.125 mm	0.002-0.0049 in
• Bearing Bore Diameter-Front	51.973-51.999 mm	2.0462-2.0472 in
• Bearing Bore Diameter-Rear, In Block	47.584-47.612 mm	1.8735-1.8745 in
• Bearing Inside Diameter-Rear	38.118-38.194 mm	1.5007-1.5037 in
Valve System		
• Lifter	Hydraulic	
• Rocker Arm Ratio	1.6:1	
• Face Angle	45°	
• Seat Angle	45°	
• Minimum Margin	0.635 mm	0.025 in
• Seat Runout-Maximum	0.050 mm	0.002 in
• Seat Width-Intake	1.53-2.03 mm	0.060-0.080 in
• Seat Width-Exhaust	2.29-2.79 mm	0.090-0.110 in
• Stem Height-All	49.15-50.17 mm	1.935-1.975 in
• Stem Clearance-All	0.038-0.089 mm	0.0015-0.0032 in
Valve Spring		
• Free Length	49.78 mm	1.960 in
• Load-Closed	334 N @ 43.69 mm	75 lb @ 1.72 in
• Load-Open	1014 N @ 32.4 mm	228 lb @ 1.277 in
• Installed Height	42.93-44.45 mm	1.690-1.720 in
• Approximate Number of Active Coils	4.48	
• Approximate Number of Total Coils	6.60	
Flywheel		
• Runout-Maximum	0.38 mm	0.015 in

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
Accelerator Control Cable Bracket Bolt	10 N·m	89 lb in
Balance Shaft Gear Bolt	22 + 70° N·m	16 + 70° lb ft
Balance Shaft Retainer Bolt	30 N·m	22 lb ft
Camshaft Position Sensor Bolt	10 N·m	89 lb in
Camshaft Sprocket Bolt	100 + 90° N·m	74 + 90° lb ft
Camshaft Thrust Plate Bolt	15 N·m	11 lb ft
Connecting Rod Cap Bolt	27 + 50° N·m	20 + 50° lb ft
Crankshaft Balancer Bolt	150 + 114° N·m	111 + 114° lb ft
Crankshaft Main Bearing Cap Bolt	40 + 110° N·m	30 + 110° lb ft
Crankshaft Main Bearing Cap Bolt (Side)	15 + 45° N·m	11 + 45° lb ft
Crankshaft Position Sensor Stud	30 N·m	22 lb ft
Crankshaft Rear Oil Seal Housing Bolt	15 + 50° N·m	11 + 50° lb ft
Cylinder Head Bolt	50 + 120° N·m	37 + 120° lb ft
Drive Belt Tensioner Bracket Bolt	50 N·m	37 lb ft
EGR Valve Adapter Nut	50 N·m	37 lb ft

EGR Valve Nut	29 N·m	21 lb ft
EGR Valve Outlet Pipe Bolt/Nut (Except Upper Intake Manifold)	29 N·m	21 lb ft
EGR Valve Wiring Harness Heat Shield Bolt/Nut	10 N·m	89 lb in
Engine Block Coolant Drain Plug	18 N·m	13 lb ft
Engine Coolant Temperature Sensor	25 N·m	18 lb ft
Engine Flywheel Bolt (New)	15 + 50° N·m	11 + 50° lb ft
Engine Front Cover Bolt/Stud	20 + 40° N·m	15 + 40° lb ft
Engine Lift Bracket Bolt/Nut/Stud	30 N·m	22 lb ft
Engine Mount Bracket Bolt	102 N·m	75 lb ft
Engine Mount Nut, Lower	43 N·m	32 lb ft
Engine Mount Nut, Upper	47 N·m	35 lb ft
Engine Mount Strut Bolt	48 N·m	35 lb ft
Engine Mount Strut Bracket Bolt at Engine, Left	50 N·m	37 lb ft
Engine Mount Strut Bracket Bolt at Engine, Right	50 N·m	37 lb ft
Engine Mount Strut Bracket Bolt at Upper Radiator Support	28 N·m	21 lb ft
Engine Mount Strut Nut	48 N·m	35 lb ft
Engine Oil Gallery Plug	30 N·m	22 lb ft
Exhaust Manifold Nut	23 N·m	17 lb ft
Exhaust Manifold Bolt/Stud	23 N·m	17 lb ft
Fuel Injector Rail Assembly Nut	9 N·m	80 lb in
Fuel Injector Rail Stud	25 N·m	18 lb ft
Fuel Injector Sight Shield Bracket Nut	30 N·m	22 lb ft
Generator Brace Bracket Bolt	50 N·m	37 lb ft
Heated Oxygen Sensor	42 N·m	31 lb ft
ICM Bracket Stud	30 N·m	22 lb ft
ICM Assembly Bolt/Nut	50 N·m	37 lb ft
Lower Intake Manifold Bolt	15 N·m	11 lb ft
MAP Sensor Bracket Bolt	30 N·m	22 lb ft
MAP Sensor Bolt	3 N·m	27 lb in
Oil Cooler Adapter Connector	50 N·m	37 lb ft
Oil Filter Adapter Bolt	15 N·m + 50°	11 lb ft + 50°
Oil Level Indicator Tube Nut	19 N·m	14 lb ft
Oil Pan Bolt	14 N·m	125 lb in
Oil Pan Drain Plug	30 N·m	22 lb ft
Oil Pump Cover Screw	11 N·m	98 lb in
Oil Pump Screen Bolt	15 N·m	11 lb ft
Power Brake Booster Heat Shield Nut	20 N·m	15 lb ft
Side Main Cap Bolt	15 + 45° N·m	11 + 45° lb ft
Starter Motor Heat Shield Bolt	30 N·m	22 lb ft
Throttle Body Bolt/Nut	10 N·m	89 lb in
Throttle Body Support Bolt	10 N·m	89 lb in
Timing Chain Dampener Bolt	22 N·m	16 lb ft
Upper Intake Manifold Bolt	Refer to Procedure	
Valve Lifter Guide Retainer Bolt	30 N·m	22 lb ft
Valve Rocker Arm Bolt	15 + 90° N·m	11 + 90° lb ft
Valve Rocker Arm Cover Bolt	10 N·m	89 lb in
Water Outlet Bolt	27 N·m	20 lb ft
Water Pump Bolt	15 + 80° N·m	11 + 80° lb ft
Water Pump Pulley Bolt	13 N·m	116 lb in

Engine Component Description

Engine Construction

Starting at the front of the engine, the cylinders of the left bank are numbered 1-3-5 and the cylinders of the right bank are numbered 2-4-6. The crankshaft is supported in the engine block by four bearings. The crankshaft is counterbalanced by the flywheel, the crankshaft balancer, and the weights cast into the crankshaft. Additional counterbalancing is obtained from the balance shaft which rides in the engine block above the camshaft and is driven by the camshaft. All 3800 engines are even-firing, the cylinders fire at equal 120 degree intervals of crankshaft rotation. The location of the crankshaft journals has been offset by 30 degrees to fire the cylinders at 120 degree intervals of crankshaft rotation. The camshaft lobes and timing also reflect the 120 degree intervals. The even firing crankshaft provides an equal interval of 120 degrees between ignition of each of the cylinders throughout the firing order. The firing order is 1-6-5-4-3-2. The aluminum alloy pistons have slipper skirts and are cam turned. Four drilled holes or casted slots in the oil ring grooves permit drain back of the oil collected by the oil ring. The camshaft is supported by four bearings in the engine block and is driven by the crankshaft through sprockets and a timing chain. The cylinder heads are cast iron and incorporate integral valve stem guides. Right and left cylinder heads are identical and are interchangeable, but it is good practice to reinstall the cylinder heads on the side from which they are removed. The intake manifold is bolted to the inner faces of both cylinder heads so it connects with all inlet ports.

Each exhaust and intake valve has a valve spring to insure positive seating throughout the operating speed range. The valve rocker arms for each bank of the cylinders pivot on pedestals bolted to the cylinder head. Hydraulic roller valve lifters and tubular push rods are used to operate overhead rocker arms and valves of both banks of the cylinders from a single camshaft. This system requires no lash adjustment at the time of assembly or service.

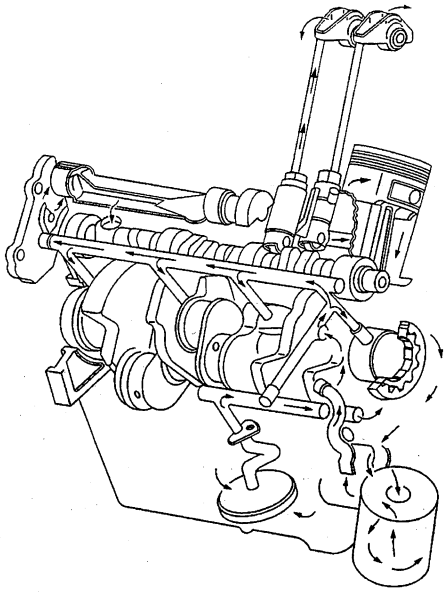
In addition to its normal function of a cam follower, each valve lifter also serves as an automatic adjuster which maintains zero lash in the valve train under all operating conditions. By eliminating all lash in the valve train and also providing a cushion of oil to absorb operating shocks, the valve lifter promotes quiet valve operation. It also eliminates the need for periodic valve adjustment to compensate for wear of parts. Oil is supplied to the valve lifter through a hole in the side of the valve lifter body which indexes with a groove and a hole in the valve lifter plunger. Oil is then metered past the oil metering valve in the valve lifter, through the push rods to the valve rocker arms. When the valve lifter begins to move up the camshaft lobe, the check ball is held against its seat in the plunger by the check ball spring which traps the oil in the base of the valve lifter body below the plunger.

The plunger and the valve lifter body then raise as a unit, pushing up the push rod to open the valve. The force of the valve spring which is exerted on the plunger through the valve rocker arm and push rod, causes a slight amount of leakage between the plunger and the valve lifter body. This leakage allows a slow escape of trapped oil in the base of the valve lifter body. As the valve lifter rolls down the other side of the camshaft lobe and reaches the base circle or valve closed position, the plunger spring quickly moves the plunger back (up) to its original position. This movement causes the check ball to open against the ball spring, and any oil inside the plunger is drawn into the base of the valve lifter. This restores the valve lifter to the zero lash.

Drive Belt System Description

See Drive Belt System Description in the next section.

Lubrication Description



The engine lubrication system is of the force-feed type. The oil is supplied under full pressure to the crankshaft, connecting rods, valve lifters, camshaft, and rear balance shaft bearing. A controlled volume of oil is supplied to the valve rocker arms and push rods. All other moving parts are lubricated by gravity flow or splash. The engine oil is stored in the lower crankcase (oil pan) which is filled through a filler opening in the valve rocker arm cover. A removable oil level indicator, on the left side of the engine block, is provided to check the oil level. The oil pump is located in the engine front cover and is driven by the crankshaft. It is a gerotor-style pump which is a combination of a gear and a rotor pump. It is connected by a passage in the cylinder block to an oil screen and pipe assembly. The screen is submerged in the oil supply and has ample volume for all operating conditions. If the screen becomes clogged, oil may be drawn into the system through the oil pressure relief valve in the oil filter adapter. Oil is drawn into the pump through the screen and pipe assembly, and a passage in the crankcase, connecting to the passages in the engine front cover. Oil is discharged from the oil pump to the oil filter adapter. The oil filter adapter consists of an oil filter bypass valve and a nipple for installation of an oil filter. The spring-loaded oil pressure relief valve, located in the engine front cover, limits the oil pressure. The oil filter bypass valve opens when the oil filter is restricted to approximately 68.95 kPa (10 psi) of pressure difference between the oil filter inlet and discharge. The oil will then bypass the oil filter and channel unfiltered oil directly to the main oil galleries of the engine. A full-flow oil filter is externally mounted to the oil filter adapter on the lower right front side of the engine. If the filter element becomes restricted, not allowing engine oil to pass through, a spring-loaded bypass valve opens. The main oil galleries run the full length of the engine block and cut into the valve lifter guide holes to supply oil at full pressure to the valve lifters. Holes, drilled from the crankshaft bearings to the main oil gallery, intersect the camshaft bearing bores to supply oil to the cam bearings.

Oil is transfered from the crankshaft bearings to the connecting rod bearings through holes drilled in the crankshaft. Pistons, piston pins, and cylinder walls are lubricated by oil splash from the crankshaft and connecting rods.

Each valve rocker arm and valve is supplied with oil through the tubular push rod. The oil comes from the inside of the valve lifter passing around the metering valve and through a hole in the push rod seat. Oil from the push rod passes through a hole in the push rod seat, and emerges on top of the push rod seat boss.

5.7L V-8 Engine

Engine Mechanical Specifications

Application	Specification	
	Metric	English
General Data		
• Engine Type	V8	
• Displacement	5.7L 5665 cc	346 CID
• Bore	99.0 mm	3.898 in
• Stroke	92.0 mm	3.622 in
• Compression Ratio	10.1:1	
• Firing Order	1-8-7-2-6-5-4-3	
• Spark Plug Gap	1.524 mm	0.06 in
Lubrication System		
• Oil Capacity (without Oil Filter Change)	4.7 Liters	5.0 Quarts
• Oil Capacity (with Oil Filter Change)	5.2 Liters	5.5 Quarts
• Oil Pressure (Minimum--Hot)	41 kPa at 1,000 engine RPM 124 kPa at 2,000 engine RPM 165 kPa at 4,000 engine RPM	6 psig at 1,000 engine RPM 18 psig at 2,000 engine RPM 24 psig at 4,000 engine RPM
• Oil Type	5W-30	
Camshaft		
• Camshaft End Play	0.025-0.305 mm	0.001-0.012 in
• Camshaft Journal Diameter	54.99-55.04 mm	2.164-2.166 in
• Camshaft Journal Diameter Out-of-Round	0.025 mm	0.001 in
• Camshaft Lobe Lift (Intake)	7.43 mm	0.292 in
• Camshaft Lobe Lift (Exhaust)	7.43 mm	0.292 in
• Camshaft Runout (Measured at the Intermediate Journals)	0.05 mm	0.002 in
Connecting Rod		
• Connecting Rod Bearing Bore Diameter	56.505-56.525 mm	2.224-2.225 in
• Connecting Rod Bearing Bore Out-of-Round (Production)	0.004 mm	0.00015 in
• Connecting Rod Bearing Bore Out-of-Round (Service Limit)	0.008 mm	0.0003 in
• Connecting Rod Bearing Clearance (Production)	0.015-0.063 mm	0.0006-0.00248 in
• Connecting Rod Bearing Clearance (Service Limit)	0.015-0.076 mm	0.0006-0.003 in
• Connecting Rod Side Clearance	0.11-0.51 mm	0.00433-0.02 in
Crankshaft		
• Crankshaft Bearing Clearance (Production)	0.018-0.054 mm	0.0007-0.00212 in
• Crankshaft Connecting Rod Journal Diameter (Production)	53.318-53.338 mm	2.0991-2.0999 in
• Crankshaft Connecting Rod Journal Diameter (Service Limit)	53.308 mm	2.0987 in
• Crankshaft Connecting Rod Journal Taper	0.005 mm (Maximum	0.0002 in (Maximum for

(Production)	for 1/2 of the Journal Length)	1/2 of the Journal Length)
• Crankshaft Connecting Rod Journal Taper (Service Limit)	0.02 mm (Maximum)	0.00078 in (Maximum)
• Crankshaft Connecting Rod Journal Out-of-Round (Production)	0.005 mm	0.002 in
• Crankshaft Connecting Rod Journal Out-of-Round (Service Limit)	0.01 mm	0.00039 in
• Crankshaft End Play	0.04-0.2 mm	0.0015-0.0078 in
• Crankshaft Main Journal Diameter (Production)	64.993-65.007 mm	2.558-2.559 in
• Crankshaft Main Journal Diameter (Service Limit)	64.993 mm (Minimum)	2.558 in (Minimum)
• Crankshaft Main Journal Out-of-Round (Production)	0.003 mm	0.000118 in
• Crankshaft Main Journal Out-of-Round (Service Limit)	0.008 mm	0.00031 in
• Crankshaft Main Journal Taper (Production)	0.01 mm	0.00039 in
• Crankshaft Main Journal Taper (Service Limit)	0.02 mm	0.00078 in
• Crankshaft Reluctor Ring Runout (Measured 1.0 mm (0.04 in) Below the Tooth Diameter)	0.25 mm	0.01 in
• Crankshaft Runout (at Rear Flange)	0.05 mm (Maximum)	0.002 in (Maximum)
• Crankshaft Thrust Wall Runout	0.025 mm	0.001 in
• Crankshaft Thrust Wall Width (Production)	26.14-26.22 mm	1.029-1.032 in
• Crankshaft Thrust Wall Width (Service)	26.2 mm (Maximum)	1.0315 in (Maximum)
Cylinder Bore		
• Cylinder Bore Diameter	99.0-99.018 mm	3.897-3.898 in
• Cylinder Bore Taper Thrust Side	0.018 mm (Maximum)	0.0007 in (Maximum)
Cylinder Head		
• Cylinder Head Engine Block Deck Flatness (Measured within a 152.4 mm (6.0 in) area)	0.08 mm	0.003 in
• Cylinder Head Engine Block Deck Flatness (Measuring the Overall Length of the Cylinder Head)	0.1 mm	0.004 in
• Cylinder Head Exhaust Manifold Deck Flatness	0.22 mm	0.008 in
• Cylinder Head Intake Manifold Deck Flatness	0.22 mm	0.008 in
• Cylinder Head Height (Measured from the Cylinder Head Deck to the Valve Rocker Arm Cover Seal Surface)	120.2 mm (Minimum)	4.732 in (Minimum)
Engine Block		
• Camshaft Bearing Bore 1 and 5 Diameter	59.08-59.13 mm	2.325-2.327 in
• Camshaft Bearing Bore 2 and 4 Diameter	58.83-58.88 mm	2.316-2.318 in
• Camshaft Bearing Bore 3 Diameter	58.58-58.63 mm	2.306-2.308 in
Engine Block Cylinder Head Deck Surface Flatness (Measured within a 152.4 mm (6.0 in) area)	0.08 mm	0.003 in
Engine Block Cylinder Head Deck Surface Flatness (Measuring the Overall Length of the Block Deck)	0.22 mm	0.008 in
Engine Block Cylinder Head Deck Height (Measuring from the Centerline of Crankshaft to the Deck Face)	234.57-234.82 mm	9.235-9.245 in
• Main Bearing Bore Diameter (Production)	69.871-69.889 mm	2.75-2.751 in
• Main Bearing Bore Out-of-Round	0.5 mm	0.02 in

• Valve Lifter Bore Diameter (Production)	21.417-21.443 mm	0.843-0.844 in
Intake Manifold		
• Intake Manifold Cylinder Head Deck Flatness (Measured at Gasket Sealing Surfaces)	0.5 mm	0.02 in
Oil Pan and Front/Rear Cover Alignment		
• Oil Pan to Rear of Engine Block Alignment (at Transmission Bellhousing Mounting Surface)	0.0-0.25 mm (Maximum)	0.0-0.01 in (Maximum)
• Front Cover Alignment (at Oil Pan Surface)	0.0-0.5 mm	0.0-0.02 in
• Rear Cover Alignment (at Oil Pan Surface)	0.0-0.5 mm	0.0-0.02 in
Piston		
• Piston - Piston Diameter - Measured Over Skirt Coating	98.984-99.027 mm	3.897-3.899 in
• Piston Out-of-Round (Service Limit)	0.018 mm	0.0007 in
• Piston - Piston to Bore Clearance Coated Skirt - Production	-0.027 to +0.029 mm	-0.001 to +0.0011 in
• Piston - Piston to Bore Clearance Coating Worn Off - Service Limit	0.074 mm	0.0029 in
Piston Pin		
• Piston Pin Clearance to Piston Bore (Production)	0.01-0.02 mm	0.0004-0.00078 in
• Piston Pin Clearance to Piston Bore (Service Limit)	0.01-0.02 mm (Maximum)	0.0004-0.00078 in (Maximum)
• Piston Pin Diameter	23.997-24.0 mm	0.9447-0.9448 in
• Piston Pin Fit in Connecting Rod	0.02-0.043 mm (Interference)	0.00078-0.00169 in (Interference)
Piston Rings		
• Piston Compression Ring End Gap (Production--Top) (Measured in Cylinder Bore)	0.23-0.38 mm	0.009-0.0149 in
• Piston Compression Ring End Gap (Production--2nd) (Measured in Cylinder Bore)	0.44-0.64 mm	0.0173-0.0251 in
• Piston Oil Ring End Gap (Production) (Measured in Cylinder Bore)	0.18-0.69 mm	0.007-0.0271 in
• Piston Compression Ring End Gap (Service--Top) (Measured in Cylinder Bore)	0.23-0.38 mm (Maximum)	0.009-0.0149 in (Maximum)
• Piston Compression Ring End Gap (Service--2nd) (Measured in Cylinder Bore)	0.44-0.64 mm (Maximum)	0.0173-0.0251 in (Maximum)
• Piston Oil Ring End Gap (Service Limit) (Measured in Cylinder Bore)	0.18-0.69 mm (Maximum)	0.007-0.0271 in (Maximum)
• Piston Compression Ring Groove Clearance (Production--Top)	0.04-0.085 mm	0.00157-0.003346 in
• Piston Compression Ring Groove Clearance (Production--2nd)	0.04-0.08 mm	0.00157-0.003149 in
• Piston Oil Ring Groove Clearance (Production)	0.01-0.22 mm	0.0004-0.00866 in
• Piston Compression Ring Groove Clearance (Service--Top)	0.04-0.085 mm (Maximum)	0.00157-0.003346 in (Maximum)
• Piston Compression Ring Groove Clearance (Service--2nd)	0.04-0.08 mm (Maximum)	0.00157-0.003149 in (Maximum)
• Piston Oil Ring Groove Clearance (Service Limit)	0.01-0.22 mm (Maximum)	0.0004-0.00866 in (Maximum)

Valve System		
• Valve Face Angle	45 degrees	
• Valve Guide Installed Height (Measured from the Cylinder Head Spring Seat Surface to the Top of the Valve Guide)	17.32 mm	0.682 in
• Valve Lash	Net Lash--No Adjustment	
• Valve Lift (Exhaust)	12.15 mm	0.479 in
• Valve Lift (Intake)	11.99 mm	0.472 in
• Valve Lifter	Hydraulic Roller	
• Valve Margin	1.25 mm (Minimum)	0.05 in (Minimum)
• Valve Rocker Arm Ratio	1.70:1	
• Valve Seat Angle	46 degrees	
• Valve Seat Runout	0.05 mm (Maximum)	0.002 in (Maximum)
• Valve Seat Width (Exhaust)	1.78 mm	0.07 in
• Valve Seat Width (Intake)	1.02 mm	0.04 in
• Valve Spring Free Length	52.9 mm	2.08 in
• Valve Spring Installed Height (Exhaust)	45.75 mm	1.8 in
• Valve Spring Installed Height (Intake)	45.75 mm	1.8 in
• Valve Spring Pressure (Closed)	340 N at 45.75 mm	76 lb at 1.8 in
• Valve Spring Pressure (Open)	980 N at 33.55 mm	220 lb at 1.32 in
• Valve Stem Clearance (Production--Exhaust)	0.025-0.066 mm	0.001-0.0026 in
• Valve Stem Clearance (Production--Intake)	0.025-0.066 mm	0.001-0.0026 in
• Valve Stem Clearance (Service--Exhaust)	0.093 mm (Maximum)	0.0037 in (Maximum)
• Valve Stem Clearance (Service--Intake)	0.093 mm (Maximum)	0.0037 in (Maximum)
• Valve Stem Diameter (Production)	7.955-7.976 mm	0.313-0.314 in
• Valve Stem Diameter (Service)	7.95 mm (Minimum)	0.313 in (Minimum)
• Valve Stem Oil Seal Installed Height (Measured from the Valve Spring Shim to Top Edge of Seal Body)	18.1-19.1 mm	0.712-0.752 in

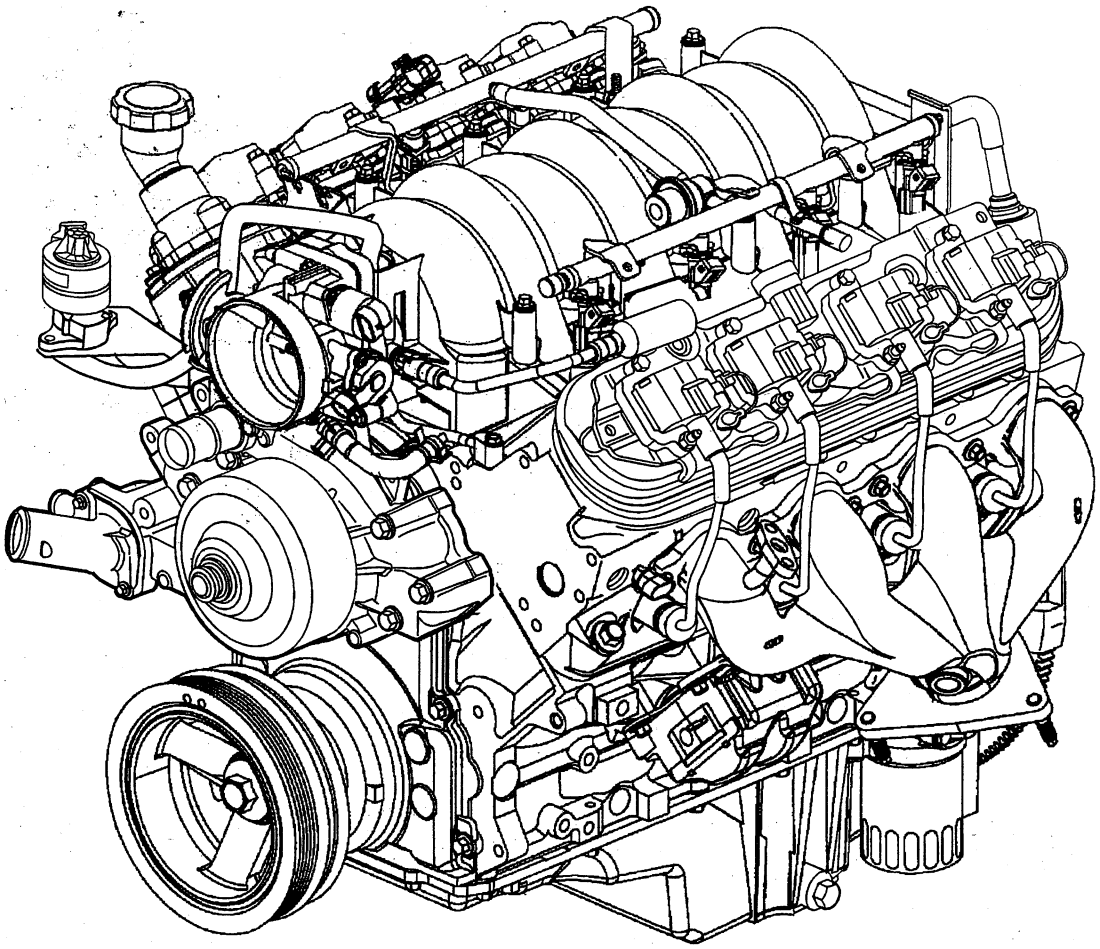
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Control Cable Bracket Bolts	10 N·m	89 lb in
Air Conditioning Compressor Bolts	50 N·m	37 lb ft
Air Conditioning Compressor Bracket Bolts	50 N·m	37 lb ft
Air Conditioning Idler Pulley Bolt	50 N·m	37 lb ft
Air Conditioning Tensioner Bolt	25 N·m	18 lb ft
Air Injection Reaction (AIR) Pipe-to-Exhaust Manifold Bolts	20 N·m	15 lb ft
Camshaft Retainer Bolts	25 N·m	18 lb ft
Camshaft Sensor Bolt	25 N·m	18 lb ft
Camshaft Sprocket Bolts	35 N·m	26 lb ft
Catalytic Converter Nut	25 N·m	18 lb ft
Connecting Rod Bolts - First Pass	20 N·m	15 lb ft
Connecting Rod Bolts - Final Pass	75 degrees	
Coolant Temperature Gauge Sensor	20 N·m	15 lb ft
Crankshaft Balancer Bolt (Installation Pass-to Ensure the Balancer is Completely Installed)	330 N·m	240 lb ft
Crankshaft Balancer Bolt (First Pass-Install a NEW Bolt After the Installation Pass and Tighten as Described in the First and Final Passes)	50 N·m	37 lb ft
Crankshaft Balancer Bolt (Final Pass)	140 degrees	
Crankshaft Bearing Cap Bolts (Inner Bolts-First Pass in Sequence)	20 N·m	15 lb ft

Crankshaft Bearing Cap Bolts (Inner Bolts-Final Pass in Sequence)	80 degrees	
Crankshaft Bearing Cap Side Bolts	25 N·m	18 lb ft
Crankshaft Bearing Cap Studs (Outer Studs-First Pass in Sequence)	20 N·m	15 lb ft
Crankshaft Bearing Cap Studs (Outer Studs-Final Pass in Sequence)	53 degrees	
Crankshaft Oil Deflector Nuts	25 N·m	18 lb ft
Crankshaft Position Sensor Bolt	25 N·m	18 lb ft
Cylinder Head Bolts (First Pass all M11 Bolts in Sequence)	30 N·m	22 lb ft
Cylinder Head Bolts (Second Pass all M11 Bolts in Sequence)	90 degrees	
Cylinder Head Bolts (Final Pass all M11 Bolts in Sequence-Excluding the Medium Length Bolts at the Front and Rear of Each Cylinder Head)	90 degrees	
Cylinder Head Bolts (Final Pass M11 Medium Length Bolts at the Front and Rear of Each Cylinder Head in Sequence)	50 degrees	
Cylinder Head Bolts (M8 Inner Bolts in Sequence)	30 N·m	22 lb ft
Cylinder Head Coolant Plug	20 N·m	15 lb ft
Cylinder Head Core Hole Plug	20 N·m	15 lb ft
Drive Belt Idler Pulley Bolt	50 N·m	37 lb ft
Drive Belt Tensioner Bolts	50 N·m	37 lb ft
Engine Block Coolant Drain Plugs	60 N·m	44 lb ft
Engine Block Heater	40 N·m	30 lb ft
Engine Block Oil Gallery Plugs	60 N·m	44 lb ft
Engine Coolant Air Bleed Pipe Bolts and Studs	12 N·m	106 lb in
Engine Crossmember Bolts (Large)	145 N·m	107 lb ft
Engine Crossmember Bolts (Small)	125 N·m	92 lb ft
Engine Flywheel Bolts (First Pass)	20 N·m	15 lb ft
Engine Flywheel Bolts (Second Pass)	50 N·m	37 lb ft
Engine Flywheel Bolts (Final Pass)	100 N·m	74 lb ft
Engine Flywheel-to-Torque Converter Bolts	60 N·m	44 lb ft
Engine Front Cover Bolts	25 N·m	18 lb ft
Engine Mount Heat Shield Nuts	10 N·m	89 lb in
Engine Mount Stud-to-Engine Block	50 N·m	37 lb ft
Engine Mount Through Bolts	95 N·m	70 lb ft
Engine Mount Through Bolt Nuts	80 N·m	59 lb ft
Engine Mount-to-Engine Block Bolts	50 N·m	37 lb ft
Engine Rear Cover Bolts	25 N·m	18 lb ft
Engine Service Lift Bracket M10 Bolts	50 N·m	37 lb ft
Engine Service Lift Bracket M8 Bolt	25 N·m	18 lb ft
Engine Valley Cover Bolts	25 N·m	18 lb ft
Engine Wire Harness Clip Bolt	50 N·m	37 lb ft
Engine Wire Harness Ground Strap Bolt	50 N·m	37 lb ft
Exhaust Gas Recirculation (EGR) Valve Bolts (First Pass)	10 N·m	89 lb in
EGR Valve Bolts (Final Pass)	30 N·m	22 lb ft
EGR Valve Pipe-to-Cylinder Head Bolts	50 N·m	37 lb ft
EGR Valve Pipe-to-Exhaust Manifold Bolts	30 N·m	22 lb ft
EGR Valve Pipe-to-Intake Manifold Bolt	10 N·m	89 lb in
Exhaust Manifold Bolts (First Pass)	15 N·m	11 lb ft
Exhaust Manifold Bolts (Final Pass)	25 N·m	18 lb ft
Exhaust Manifold Heat Shield Bolts	9 N·m	80 lb in
Exhaust Manifold Pipe Nuts	35 N·m	26 lb ft
Front Shock-to-Engine Crossmember Bolts	65 N·m	48 lb ft
Fuel Injection Fuel Rail Bolts	10 N·m	89 lb in
Generator Bracket Bolts	50 N·m	37 lb ft
Generator Rear Bracket-to-Engine Block Bolt	25 N·m	18 lb ft
Generator Rear Bracket-to-Generator Bolt	25 N·m	18 lb ft
Ground Strap Bolt (at Rear of Cylinder Head)	50 N·m	37 lb ft

Ignition Coil-to-Bracket Bolts	12 N·m	106 lb in
Ignition Coil Bracket-to-Valve Rocker Arm Cover Bolts	12 N·m	106 lb in
Intake Manifold Bolts (First Pass in Sequence)	5 N·m	44 lb in
Intake Manifold Bolts (Final Pass in Sequence)	10 N·m	89 lb in
Knock Sensors	20 N·m	15 lb ft
Oil Filter	30 N·m	22 lb ft
Oil Filter Fitting	55 N·m	40 lb ft
Oil Level Indicator Tube Bolt	25 N·m	18 lb ft
Oil Level Sensor	13 N·m	115 lb in
Oil Pan Baffle Bolts	12 N·m	106 lb in
Oil Pan Closeout Cover Bolt (Left Side)	12 N·m	106 lb in
Oil Pan Closeout Cover Bolt (Right Side)	12 N·m	106 lb in
Oil Pan Cover Bolts	12 N·m	106 lb in
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pan M8 Bolts (Oil Pan-to-Engine Block and Oil Pan-to-Front Cover)	25 N·m	18 lb ft
Oil Pan M6 Bolts (Oil Pan-to-Rear Cover)	12 N·m	106 lb in
Oil Pressure Sensor	20 N·m	15 lb ft
Oil Pump-to-Engine Block Bolts	25 N·m	18 lb ft
Oil Pump Cover Bolts	12 N·m	106 lb in
Oil Pump Relief Valve Plug	12 N·m	106 lb in
Oil Pump Screen Nuts	25 N·m	18 lb ft
Oil Pump Screen-to-Oil Pump Bolt	12 N·m	106 lb in
Oxygen Sensor	42 N·m	31 lb ft
Positive Crankcase Ventilation (PCV) System Strap Nut (at Right Front Vapor Vent Pipe Stud)	12 N·m	106 lb in
Power Steering Pump Bolts	25 N·m	18 lb ft
Power Steering Pump Bracket Bolts	25 N·m	18 lb ft
Spark Plugs (Cylinder Heads-New)	20 N·m	15 lb ft
Spark Plugs (all Subsequent Installations)	15 N·m	11 lb ft
Throttle Body Bolts	12 N·m	106 lb in
Transmission Housing Bolt	50 N·m	37 lb ft
Valve Lifter Guide Bolts	12 N·m	106 lb in
Valve Rocker Arm Bolts	30 N·m	22 lb ft
Valve Rocker Arm Cover Bolts	12 N·m	106 lb in
Water Inlet Housing Bolts	15 N·m	11 lb ft
Water Pump Bolts (First Pass)	15 N·m	11 lb ft
Water Pump Bolts (Final Pass)	30 N·m	22 lb ft
Water Pump Cover Bolts	15 N·m	11 lb ft

Engine Component Description



The 5.7 Liter V8 engine is identified as RPO LS1 and VIN G.

Camshaft and Drive System

A billet steel one piece camshaft is supported by five bearings pressed into the engine block. The camshaft has a machined camshaft sensor reluctor ring incorporated between the fourth and fifth bearing journals. The camshaft timing sprocket is mounted to the front of the camshaft and is driven by the crankshaft sprocket through the camshaft timing chain. The crankshaft sprocket is splined and drives the oil pump driven gear. A retaining plate mounted to the front of the engine block maintains camshaft location.

Crankshaft

The crankshaft is cast nodular iron. The crankshaft is supported by five crankshaft bearings. The bearings are retained by crankshaft bearing caps which are machined with the engine block for the proper alignment and clearance. The crankshaft journals are undercut and rolled. The center main journal is the

thrust journal. A crankshaft position reluctor ring is mounted at the rear of the crankshaft. The reluctor ring is not serviceable separately.

Cylinder Heads

The cylinder head assemblies are cast aluminum and have pressed in place powdered metal valve guides and valve seats. Passages for the Engine Coolant Air Bleed system are at the front and rear of each cylinder head. There are no exhaust gas passages within the cylinder head. The cylinder head design has changed. Valve rocker arm covers are now retained to the cylinder head by four center mounted rocker arm cover bolts.

Engine Block

The engine block is a cam-in-block deep skirt 90 degree V configuration with five crankshaft bearing caps. The engine block is aluminum with cast in place iron cylinder bore liners. The five crankshaft bearing caps each have four vertical M10 and two horizontal M8 mounting bolts. The camshaft is supported by five camshaft bearings pressed into the block.

Exhaust Manifolds

The exhaust manifolds are one piece cast iron design. The exhaust manifolds direct exhaust gasses from the combustion chambers to the exhaust system. Each manifold has a single inlet for the Air Injection Reaction (AIR) system and the left exhaust manifold has a threaded opening for installation of an oxygen sensor. Exhaust system gasses are directed from the right exhaust manifold through the Exhaust Gas Recirculation (EGR) pipe assembly and valve to the intake manifold. The EGR pipe assembly is retained to the exhaust manifold by two bolts and sealed at the exhaust manifold flange with a gasket. Each manifold also has an externally mounted heat shield that is retained by bolts.

Intake Manifold

The IAFM or integrated air fuel module is a one piece composite design that incorporates brass threaded inserts for mounting the fuel rail, throttle cable bracket, throttle body, and EGR inlet pipe. The intake manifold is sealed to the cylinder heads by eight separate nonreusable silicone sealing gaskets which press into the grooves of the intake housing. The cable actuated throttle body assembly bolts to the front of the intake manifold. The throttle body is sealed to the intake manifold by a one piece push in place silicone gasket. The fuel rail assembly with eight separate fuel injectors is retained to the intake by four bolts. The injectors are seated in their individual manifold bores with O-ring seals to provide sealing. A fuel rail stop bracket is retained at the rear of the left fuel rail by the intake manifold mounting bolts. A snap fit Manifold Absolute Pressure (MAP) sensor housing is mounted at the rear of the manifold and sealed by an O-ring seal. The MAP sensor is installed and retained to the MAP sensor housing. An externally mounted Exhaust Gas Recirculation (EGR) pipe assembly installs into the top front of the intake manifold. The EGR pipe assembly is sealed to the intake manifold by an O-ring seal and is retained to the manifold by one bolt. There are no coolant passages within the intake manifold.

Oil Pan

The structural oil pan is cast aluminum. Incorporated into the design are the oil filter mounting boss, drain plug opening, oil level sensor mounting bore, and oil pan baffle. The oil pan cover and oil level sensor mount to the side of the oil pan. The alignment of the structural oil pan to the rear of the engine block and transmission bell housing is critical.

Piston and Connecting Rod Assemblies

The pistons are cast aluminum. The pistons use two compression rings and one oil control ring assembly. The piston is a low friction, lightweight design with a flat top and barrel shaped skirt. The piston pins are chromium steel. They have a floating fit in the piston and are retained by a press fit in the connecting rod. The connecting rods are powdered metal. The connecting rods are fractured at the connecting rod journal

and then machined for the proper clearance. The piston, pin, and connecting rod are to be serviced as an assembly.

Valve Rocker Arm Cover Assemblies

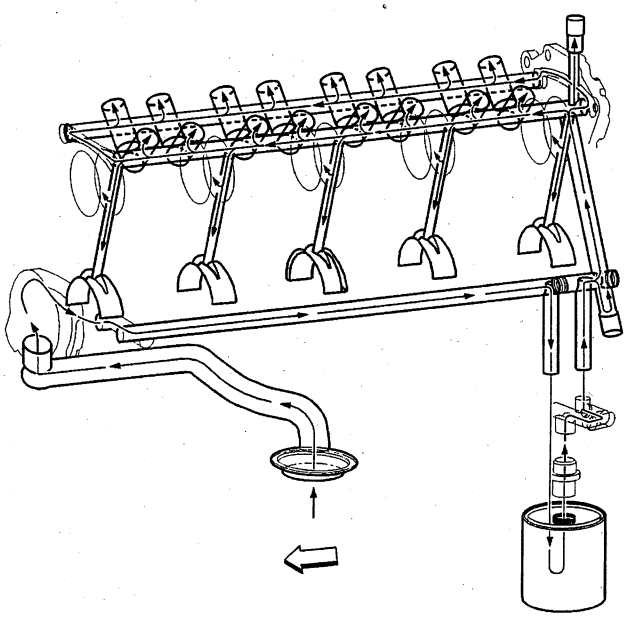
The valve rocker arm covers are cast aluminum and use a pre-molded silicone gasket for sealing. Mounted to each rocker cover is an ignition coil and bracket assembly. Incorporated into the covers are the oil fill tube, the Positive Crankcase Ventilation (PCV) system passages, and the engine fresh air passages. Rocker arm cover design has changed. The covers are now retained to the cylinder head by four center mounted rocker cover bolts.

Valve Train

Motion is transmitted from the camshaft through the hydraulic roller valve lifters and tubular pushrods to the roller type rocker arms. The valve lifter guides position and retain the valve lifters. The valve rocker arms for each bank of cylinders are mounted on pedestals (pivot supports). Each rocker arm is retained on the pivot support and cylinder head by a bolt. Valve lash is net build.

Lubrication

Lubrication Flow Schematic



Engine lubrication is supplied by a gerotor type oil pump assembly. The pump is mounted on the front of the engine block and driven directly by the crankshaft sprocket. The pump gears rotate and draw oil from the oil pan sump through a pick-up screen and pipe. The oil is pressurized as it passes through the pump and is sent through the engine block oil galleries. Contained within the oil pump assembly is a pressure relief valve that maintains oil pressure within a specified range. Pressurized oil is directed through the lower gallery to the full flow oil filter where harmful contaminants are removed. A bypass valve is incorporated into the oil pan which will permit oil flow in the event the filter becomes restricted. At the rear of the block, oil is then directed to the upper main oil galleries which are drilled just above the camshaft assembly. From there oil is then directed to the crankshaft and camshaft bearings. Oil that has entered the upper main oil galleries also pressurizes the valve lifter assemblies and is then pumped through the pushrods to lubricate the valve rocker arms and valve stems. Oil returning to the pan is directed by the crankshaft oil deflector. Oil temperature, pressure and crankcase level are each monitored by individual sensors.

Drive Belt System Description

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The drive belt idler pulley
- The crankshaft balancer pulley
- The accessory drive component mounting brackets
- The accessory drive components
  - The power steering pump, if belt driven
  - The generator
  - The A/C compressor, if equipped
  - The engine cooling fan, if belt driven
  - The water pump, if belt driven
  - The vacuum pump, if equipped
  - The air compressor, if equipped

The drive belt system may use one belt or two belts. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. There also may be a V-belt style belt used to drive certain accessory drive components. The drive belts are made of different types of rubbers (chloroprene or EPDM) and have different layers or plys containing either fiber cloth or cords for reinforcement.

Both sides of the drive belt may be used to drive the different accessory drive components. When the back side of the drive belt is used to drive a pulley, the pulley is smooth.

The drive belt is pulled by the crankshaft balancer pulley across the accessory drive component pulleys. The spring loaded drive belt tensioner keeps constant tension on the drive belt to prevent the drive belt from slipping. The drive belt tensioner arm will move when loads are applied to the drive belt by the accessory drive components and the crankshaft.

The drive belt system may have an idler pulley, which is used to add wrap to the adjacent pulleys. Some systems use an idler pulley in place of an accessory drive component when the vehicle is not equipped with the accessory.

Engine Cooling

Engine Cooling System Approximate Capacities

Application	Specification	
	Metric	English
3.8 L (VIN K)		
• Manual Transmission	11.8 liters	12.5 quarts
• Automatic Transmission	11.6 liters	12.3 quarts
5.7 L (VIN G)		
• Manual Transmission	14.5 liters	15.3 quarts
• Automatic Transmission	14.3 liters	15.1 quarts

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator and Cruise Control Servo Cable Adjuster Bolt	8 N·m	71 lb in
Air Cleaner Bolt	12 N·m	106 lb in
Air Conditioning Condenser Tube Nut	16 N·m	12 lb ft
Coolant Heater Bolt (3.8 L)	2 N·m	18 lb in
Coolant Heater (5.7 L)	40 N·m	30 lb ft
Coolant Recovery Reservoir Bolt	12 N·m	106 lb in
Cooling Fan Blade Nut	6 N·m	53 lb in
Cooling Fan Motor Bolt	6 N·m	53 lb in
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
EGR Valve Outlet Pipe Bolt	29 N·m	21 lb ft
EGR Valve Outlet Pipe Nut	29 N·m	21 lb ft
Engine Block Coolant Drain Hole Plug (5.7 L)	60 N·m	44 lb ft
Engine Coolant Temperature Sensor (3.8 L)	25 N·m	18 lb ft
Engine Coolant Temperature Sensor (5.7 L)	20 N·m	15 lb ft
Evaporator Tube Bolt	16 N·m	12 lb ft
Knock Sensor (3.8 L)	19 N·m	14 lb ft
Radiator Air Lower Deflector Screw	10 N·m	89 lb in
Radiator Drain Cock	2 N·m	18 lb in
Transmission Oil Cooler Line Fitting (radiator end)	27 N·m	20 lb ft
Vapor Vent Pipe Stud/Bolts (5.7 L)	12 N·m	106 lb in
Water Outlet Bolt (3.8 L)	27 N·m	20 lb ft
Water Outlet Bolt (5.7 L)	10 N·m	89 lb in
Water Pump Bolt (3.8 L)	15 N·m + 80 degrees	11 lb ft + 80 degrees
Water Pump Bolt (5.7 L)	30 N·m	22 lb ft
Water Pump Pulley Bolt (3.8 L)	13 N·m	115 lb in

Cooling System Description and Operation

The cooling system consists of the following major components:

- Radiator
- Coolant recovery reservoir
- Cooling fans
- Thermostat
- Water pump
- Engine coolant air bleed pipe
- Engine coolant temperature (ECT) sensor
- Transmission oil cooler
- All related hoses
- Fan shroud
- Fan motor/blade

The cooling systems functions is to maintain an efficient engine operating temperature during all speeds and under all operating conditions. Cooling systems are designed to remove about one-third (30 to 35 percent) of the heat produced in the combustion chambers by the burning of the air-fuel mixture. The engine is very inefficient while cold. Therefore the cooling system includes a devise (thermostat) that prevents normal cooling action during engine warm-up. The thermostat allows the engine parts to reach their normal operating temperature more quickly. This shortens the inefficient cold-operating time. When the engine reaches its normal operating temperature, the cooling system begins to function. The cooling system removes excess heat when the engine is hot, and slowly or not at all when the engine is cold or warming up.

The coolant absorbs heat as it passes through the engine. Then the hot coolant flows through a radiator in which the heat in the coolant is passed on to the air that is flowing through the radiator. The cooled coolant then flows back through the engine. This circulation of the coolant continually removes heat from the engine. The coolant is kept in circulation by the water pump.

Water jackets are designed to keep the cylinder block and cylinder heads cool. The water jackets are open spaces between the outside wall of the cylinder and the inside of the cylinder block and head. The coolant can circulate freely around the engine hot spots. These hot spots include the following:

- Valve guides
- Valve seats
- Upper parts of the cylinder walls

When the engine is running at the normal operating temperature, coolant flows into the block and through the water jackets surrounding the cylinders. Vapor is vented off through the engine coolant air bleed pipe. Then coolant is forced through the head gasket openings and into the cylinder head water jackets. In the heads, the coolant flows around the combustion chambers and valve seat, picking up additional heat. From the heads, the coolant flows through the upper hose into the radiator. There, the coolant temperature is lowered, and the coolant is drawn again into the engine by the water pump to provide passenger compartment heat and defrost. The coolant recovery reservoir provides a coolant fill point. The reservoir is translucent for coolant level viewing.

Coolant Recovery System Description

The cooling system has a separate plastic, translucent coolant recover reservoir. The reservoir, also caller a recovery tank or expansion tank, is partly filled with coolant and is connected to the overflow tube on the radiator fill neck to the reservoir by the overflow tube. The coolant in the engine expands as the engine heats up. Instead of dripping out the overflow tube onto the ground and being lost from the cooling system completely, the coolant flows into the reservoir.

When the engine cools, a vacuum is created in the cooling system. The vacuum siphons some of the coolant back into the radiator from the reservoir. In effect, a cooling system with a recovery reservoir is a closed system. Coolant can flow back and forth between the radiator and the reservoir. This occurs as the coolant expands and contracts from heating and cooling. Under normal conditions, no coolant is lost.

An advantage to the use of a coolant recovery reservoir is that it eliminates almost all air bubbles from the cooling system. Coolant without bubbles absorbs heat much better than coolant with bubbles in it. Although the coolant level in the recovery reservoir goes up and down, the radiator and cooling system are kept full. This results in maximum cooling efficiency.

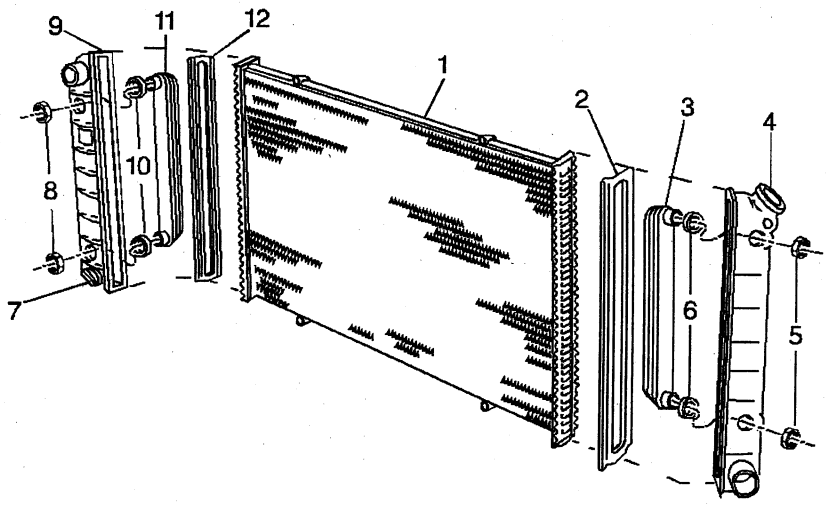
Throttle Body Coolant System Description

The fuel injection system has coolant passages in the throttle body, The heated coolant flow through these passages improves the cold weather driveability of the vehicle.

Coolant Heater Description

The engine coolant heater is used to heat the engine coolant prior to vehicle start up, making it easier to start the engine in very cold climates. It is installed into the engine block at a water jacket plug location. An engine coolant heater cord is routed inside the engine compartment. The heater is rated at 600 watts and uses a 110 volt ac power supply.

Radiator Assembly Description



The radiator is a heat exchanger that removes heat from the coolant passing through it. The radiator holds a large volume of coolant in close contact with a large volume of air so that heat will transfer from the coolant to the air. The radiator core is divided into two separate compartments coolant passes through one, and air passes through the other. The aluminum radiator core (1) is a crossflow tube and fin design. A tube and fin radiator consists of a series of tubes extending from side to side on the radiator core. The tubes run from the inlet tank (4) to the outlet tank (9). Fins are placed around the outside of the tubes to improve heat transfer. Air passes between the fins. As the air passes by, it absorbs heat from the fins which have, in turn, absorbed heat from the coolant.

In a typical radiator, there are five fins per inch. Radiators used in vehicles that have factory installed air conditioning have seven fins per inch. This provides the additional cooling surface required to handle the additional heat load imposed by air conditioning.

The inlet (4) and outlet (9) tanks are molded with high temperature nylon-reinforced plastic. A high temperature rubber gasket (2, 12) seals the tank flange edge. The tanks are clamped to the core with

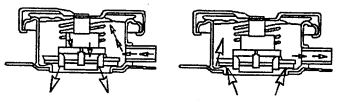
clinch tabs. The tabs are part of the aluminum header at each end of the core (1). A plastic serviceable drain cock (7) and rubber seal is used.

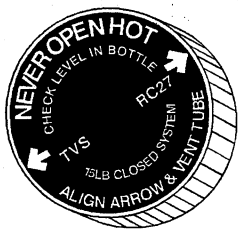
The integral transmission oil cooler (3) is housed inside the outlet (4) tank. The cooler provides the automatic transmission fluid cooling capacity. This maintains a fairly constant temperature under all operating conditions.

Pressure Cap Description

Caution

Under pressure, the temperature of the solution in the radiator can be considerably higher, without boiling. Removing the radiator cap while the engine is hot (pressure is high), will cause the solution to boil instantaneously, with explosive force. The solution will spew out over the engine, fenders, and the person removing the cap. Serious bodily injury may result. Flammable antifreeze, such as alcohol, is not recommended for use at any time. Flammable antifreeze could cause a serious fire.





The cooling system is sealed and pressurized by a radiator pressure cap. There are two advantages to sealing and pressurizing the cooling system.

- Increased pressure raises the boiling point of the coolant. This increases the efficiency of the cooling system.
- Sealing the cooling system reduces coolant losses from evaporation and permits the use of the recovery reservoir.

As the pressure goes up, the boiling point goes up. Therefore, the coolant can be safely run at a temperature higher than 212 degrees F (100 degrees C) without boiling. The higher the coolant temperature, the greater the difference between it and the outside air temperature. This difference in temperature is what causes the cooling system to work. The hotter the coolant, the faster the heat moves from the radiator to the cooler passing air. This means that the pressurized, sealed cooling system can take heat away from the engine faster. Therefore, the cooling system works more efficiently when the coolant is under higher pressure.

However, the cooling system can be pressurized too much. If the pressure in the system gets too high, it can damage the radiator and blow off the hoses. To prevent this the radiator cap has a pressure relief valve. When the pressure gets too high, it raises the valve so that the excess pressure can escape into the recovery reservoir.

The radiator pressure cap also has a vacuum vent valve. This valve protects the system from developing a vacuum that could collapse the radiator. When the engine is shut off and cools, the coolant volume is reduced. Cold coolant takes up less space than hot coolant. As the temperature of the coolant drops, a vacuum develops in the cooling system. To prevent excessive vacuum from developing, the vacuum valve opens to allow outside air or coolant from the recovery reservoir to flow into the cooling system. This relieves the vacuum that could otherwise cause outside air pressure to collapse the radiator.

Engine Cooling Fan Description - Electric

The cooling fans are located behind the radiator. The cooling fans are driven by an electric motor. The cooling fan motors both have five blades that are each 312 mm (12.3 in) in diameter. One cooling fan will start and run and then both cooling fans will run depending on the amount of cooling the radiator needs.

The advantage of the electric fan is less power drain on the engine and less fan noise. Also, there is no fan belt to inspect, adjust, or replace. This means less cooling system maintenance.

The engine cooling fan relays provide the current required for the motors based on a low current signal received from the powertrain control module (PCM).

Water Pump Description

The die-cast water pump is a centrifugal vane impeller type. The pump consists of a housing, with coolant inlet and outlet, and an impeller. The impeller is a flat plate mounted on the pump shaft with a series of flat or curved blades, or vanes. When the impeller rotates, the coolant between the blades is thrown outward by centrifugal force. Then the coolant is forced through the pump outlet and into the cylinder block. The pump inlet is connected by a hose to the bottom of the radiator. Coolant from the radiator is drawn into the pump to replace the coolant forced through the outlet.

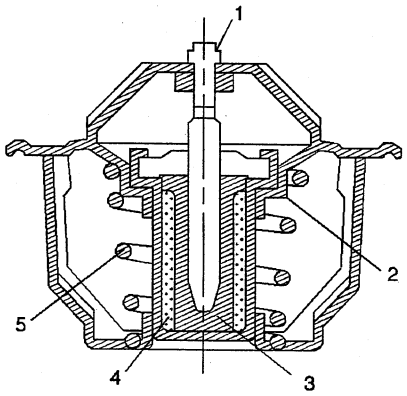
The impeller shaft is supported on one or more bearings. A seal prevents coolant from leaking out around the bearings. The water pump uses sealed bearings, which never need lubrication. With a sealed bearing, grease cannot leak out, and dirt and water cannot get in.

Thermostat Description

The thermostat is a coolant flow control components that utilizes a temperature sensitive wax-pellet element (4). Its purpose is to close off the coolant passage when the engine is cold. Now coolant circulation is restricted, causing the engine to reach normal operating temperature more quickly. Also , after warm-up, the thermostat keeps the engine running at a higher temperature than it would without a thermostat. The higher operating temperature improves engine efficiency and reduces exhaust emissions.

The thermostat performs the following functions:

- Controls the flow of coolant through the radiator
- Enables controlled engine warm up
- Assists in coolant temperature control



The wax pellet element (4) in the thermostat expands with increasing temperatures, and contracts with decreasing temperatures. The element connects through a piston (1) to a thermostat valve (2). When the element is heated, pressure is exerted against a rubber diaphragm (3) which forces the thermostat valve

to open. As the element is cooled, the contraction allows a spring (5) to close the thermostat valve. While the coolant is cold, the thermostat valve remains closed. This prevents circulation of coolant through the radiator. At this point, coolant is only allowed to circulate throughout the engine block and heater core in order to allow the engine to warm quickly. As the engine warms, the element expands and the thermostat valve opens. This permits coolant to flow through the radiator, where the heat dissipates to the atmosphere.

Engine Coolant Temperature Sensor Description

The engine coolant temperature (ECT) sensor is a variable resistance device. The ECT sensor resistance determines the position of the temperature gauge. As the temperature increases, the ECT sensor resistance decreases. This allows for more current to flow through the gauge, causing a higher temperature reading.

Air Baffles and Seals Description

A deflector redirects air flow. Deflectors are installed under the vehicle and redirects the air flow beneath the vehicle to flow through the cooling system. The deflectors perform the following functions:

- Reduce drag
- Prevent front end lift
- Increase radiator cooling

Air baffles are used to direct air into the radiator and A/C condenser. Air seals ensure that air passes through, and does not bypass, the radiator and the A/C condenser. A missing, damaged, or incorrectly installed baffle or seal may cause the engine to overheat.

Engine Electrical

Fastener Tightening Specifications

Application	Specification	
	Metric	English
ABS/SIR Electrical Ground Stud	14 N·m	10 lb ft
Accelerator and Cruise Control Servo Cable Adjuster Bolt (5.7 L)	7.5 N·m	66 lb in
Battery Hold Down Retainer Bolt	18 N·m	13 lb ft
Battery Side Terminal Adapters	15 N·m	11 lb ft
Coolant Recovery Reservoir Bolt	12 N·m	106 lb in
Engine Wiring Harness Ground Bolt to Engine Block (5.7 L)	25 N·m	18 lb ft
Forward Lamp Wiring Harness Grommet Bolt	2 N·m	71 lb in
Forward Lamp Harness Ground Stud	16 N·m	12 lb ft
Generator Brace Bracket Bolt (3.8 L)	50 N·m	37 lb ft
Generator Bracket Bolt (5.7 L)	50 N·m	37 lb ft
Generator Mounting Bolt (5.7 L)	50 N·m	37 lb ft
Generator Bolt (to drive belt tensioner lower) (3.8 L)	50 N·m	37 lb ft
Generator Bolt (to drive belt tensioner upper) (3.8 L)	30 N·m	22 lb ft
Generator Rear Brace Bolt (3.8 L)	25 N·m	20 lb ft
Generator Bolt (to rear brace) (3.8 L)	30 N·m	22 lb ft
Generator Mounting Bolt (5.7 L)	50 N·m	37 lb ft
Generator Mounting Bolt (rear to generator) (5.7 L)	25 N·m	18 lb ft
Ignition Coil Bolt (5.7 L)	12 N·m	106 lb in
Ignition Coil Bolt (3.8 L)	4 N·m	35 lb in
Ignition Control Module Bolt (3.8 L)	3 N·m	27 lb in
Ignition Control Module Nut	30 N·m	22 lb ft
Left Front Forward Lamp Wiring Ground Bolt	10 N·m	89 lb in
Lift Bracket to Ignition Control Module Bolt (3.8 L)	25 N·m	18 lb ft
Negative Battery Cable Bolt	15 N·m	11 lb ft
Negative Cable to Engine Block Stud Nut (3.8 L)	22 N·m	16 lb ft
Negative Cable to Engine Block Bolt (5.7 L)	32 N·m	24 lb ft
Negative Cable at Ground Terminal Nut	6 N·m	53 lb in
Positive Battery Cable Bolt	15 N·m	11 lb ft
Positive Cable RF Ground Nut (3.8 L)	25 N·m	18 lb ft
Positive Cable Nut to Generator Output Stud	22 N·m	16 lb ft
Positive Cable to Fuseblock Stud Nut	14 N·m	10 lb ft
Positive Cable to Starter Nut	10 N·m	89 lb in
Right Front Ground Bolt	10 N·m	89 lb in
Spark Plug (New Installation) (5.7 L)	20 N·m	15 lb ft
Spark Plug (Subsequent Installation) (5.7 L)	15 N·m	11 lb ft
Spark Plug (3.8 L)	27 N·m	20 lb ft
Starter Motor Bolt (3.8 L)	47 N·m	35 lb ft
Starter Motor Bolt (5.7 L)	50 N·m	37 lb ft
Starter Motor Stud (3.8 L)	45 N·m	33 lb ft
Starter Motor Shield Nut (3.8 L)	10 N·m	89 lb in
Starter Motor Shield Bolt (to transmission brace) (3.8 L)	10 N·m	89 lb in
Starter Motor Shield Bolt (to engine block) (3.8 L)	30 N·m	22 lb ft
Wiring Harness Ground Bolt	12 N·m	106 lb in
Wiring Harness Starter Lead Nut	2 N·m	18 lb in

Battery Usage

3.8L (L36)	
Application	Specification
GM Part Number	19001806
Cold Cranking Amperage (CCA)	525 A
Reserve Capacity	90 Minutes
Replacement Model Number	75-5YR
5.7L (LS1)	
Application	Specification
GM Part Number	19001808
Cold Cranking Amperage (CCA)	690 A
Reserve Capacity	90 Minutes
Replacement Model Number	75-7YR

Battery Temperature vs Minimum Voltage

Estimated Temperature °F	Estimated Temperature °C	Minimum Voltage
70 or above	21 or above	9.6
50	10	9.4
32	0	9.1
15	-10	8.8
0	-18	8.5
Below 0	Below -18	8.0

Starter Motor Usage Load Test @ 10 Volts Specs. PG-260

Application	Model
3.8L (L36)	PG-260 F2
5.7L (LS1)	PG-260M

Generator Usage

Application	Specification
Model	CS130D
Rated Output	105 A
Load Test	75 A

Spark Plug Usage

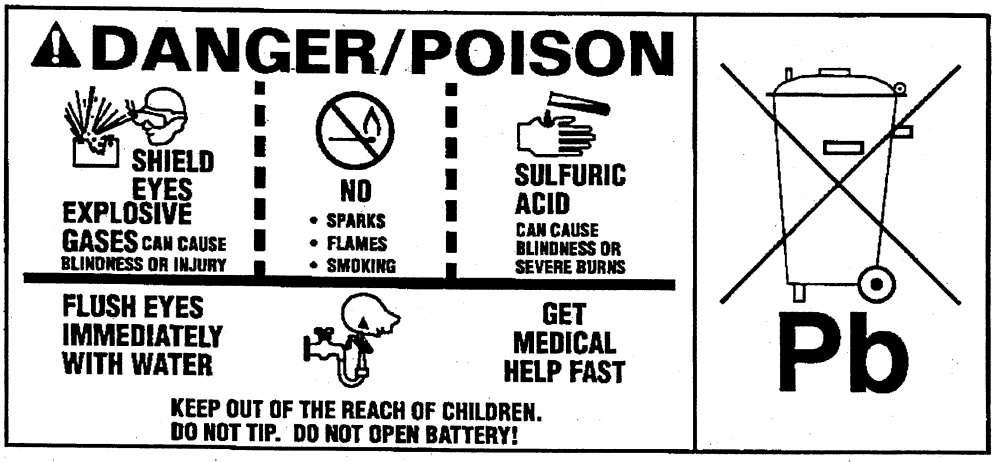
3.8L (L36)	
Application	Specification
Spark Plug	41-921
Spark Plug Gap	0.060 inch (1.524 mm)
5.7L (LS1)	
Application	Specification
Spark Plug	41-931
Spark Plug Gap	0.060 inch (1.524 mm)

Battery Description and Operation

Caution

Batteries produce explosive gases, contain corrosive acid, and supply levels of electrical current high enough to cause burns. Therefore, to reduce the risk of personal injury when working near a battery:

- Always shield your eyes and avoid leaning over the battery whenever possible.
- Do not expose the battery to open flames or sparks.
- Do not allow the battery electrolyte to contact the eyes or the skin. Flush immediately and thoroughly any contacted areas with water and get medical help.
- Follow each step of the jump starting procedure in order.
- Treat both the booster and the discharged batteries carefully when using the jumper cables.



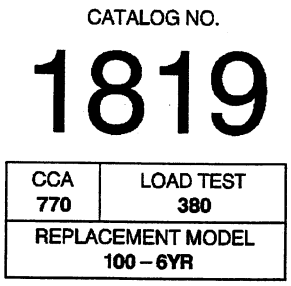
The maintenance free battery is standard. There are no vent plugs in the cover. The battery is completely sealed except for two small vent holes in the side. These vent holes allow the small amount of gas that is produced in the battery to escape.

The battery has three functions as a major source of energy:

- Engine cranking
- Voltage stabilizer
- Alternate source of energy with generator overload.

The battery specification label (example below) contains information about the following:

- The test ratings
- The original equipment catalog number
- The recommended replacement model number



A battery has 2 ratings:

- Reserve capacity
- Cold cranking amperage

When a battery is replaced use a battery with similar ratings. Refer to the battery specification label on the original battery or refer to Battery Usage .

Reserve Capacity

Reserve capacity is the amount of time in minutes it takes a fully charged battery, being discharged at a constant rate of 25 amperes and a constant temperature of 27°C (80°F) to reach a terminal voltage of 10.5 V. Refer to Battery Usage for the reserve capacity rating of the original equipment battery.

Cold Cranking Amperage

The cold cranking amperage is an indication of the ability of the battery to crank the engine at cold temperatures. The cold cranking amperage rating is the minimum amperage the battery must maintain for 30 seconds at -18°C (0°F) while maintaining at least 7.2 volts. Refer to Battery Usage for the cold cranking amperage rating for this vehicle.

Circuit Description

The battery positive terminal supplies Battery Positive voltage to the under hood fuse block and the rear fuse block. The under hood fuse block provides a cable connection for the generator and a cable connection for the starter.

The battery negative terminal is connected to chassis ground G305 and supplies ground for the AD converter in the DIM.

Starting System Description and Operation

When the ignition switch is turned to the START position, the battery voltage is applied to the starter motor solenoid, and both of the starter motor solenoid windings are energized. The pull-in windings work together magnetically in order to pull in and hold the plunger. The plunger then moves the shift lever. This action causes the starter drive to rotate as it engages with the flywheel on the engine. At the same time,

the plunger also closes the starter motor solenoid switch contacts. Full battery voltage is applied directly to the starter motor, which in turn cranks the engine.

As soon as the contacts close, the voltage is no longer applied through the pull-in windings, since the battery voltage is applied to both ends of the windings. The hold-in winding remains energized, and the magnetic field is strong enough to hold the plunger, the shift lever, and the starter drive contacts in place in order to continue cranking the engine.

When the ignition switch is moved from the START position, the battery voltage is removed from the starter motor solenoid and the junction of the windings. Voltage is applied from the contacts through both windings in order to ground at the end of the hold-in windings. However, the voltage applied to the pull-in winding is now opposing the voltage applied when the winding was first energized. The magnetic fields of the pull-in and hold-in windings now oppose each other. The return spring then causes the starter drive to disengage and the contacts to open simultaneously. As soon as the contacts open, the starter circuit is turned off.

Starting System Circuit Description

When the ignition switch is moved to the START position, voltage is applied to the normally open contacts of the starter relay. Voltage is also applied through either the park neutral position switch (automatic transmission) when in park or neutral or the clutch pedal position switch (manual transmission) when the clutch pedal is depressed, to the starter relay coil. The body control module (BCM) energizes the starter relay by grounding one side of the relay coil only when the theft deterrent system has not been activated.

When the starter relay is energized, the normally open contacts close completing the circuit to the starter solenoid. When the starter solenoid circuit is completed, both the hold-in windings and the pull-in windings are energized. The circuit through the pull-in winding is completed through the starter motor. The windings work together magnetically to pull in and hold in the plunger. The plunger moves the shift lever. This action causes the drive assembly to rotate as it engages the flywheel ring gear on the engine. At the same time the plunger also closes the solenoid switch contacts in the starter solenoid. Full battery voltage is then applied directly to the starter motor and it cranks the engine.

As soon as the solenoid switch contacts close, voltage is no longer applied to the pull-in winding since battery voltage is applied to both ends of the winding. The hold-in winding remains energized and continues to hold the plunger, the shift lever, and the drive assembly solenoid switch contacts in place to continue cranking the engine.

When the ignition switch is released from the START position, battery voltage is removed from the two windings. Voltage is applied through the motor contacts and both windings to ground. However, the direction of current flow through the windings is reversed. The magnetic fields of the two windings now oppose one another. The return spring, aided by the opposing magnetic fields of the windings, disengages the drive assembly which opens the solenoid switch contacts. Once the contacts open, the starter circuit is turned off.

Charging System Description and Operation

Generator

The generator features the following major components:

- The delta stator
- The rectifier bridge
- The rotor with slip rings and brushes
- A conventional pulley
- Dual internal fans
- The regulator

The pulley and the fan cool the slip ring and the frame.

The generator features permanently lubricated bearings. Service should only include tightening of mount components. Otherwise, replace the generator as a complete unit.

Regulator

The voltage regulator controls the rotor field current in order to limit the system voltage. When the field current is on, the regulator switches the current on and off at a rate of 400 cycles per second in order to perform the following functions:

- Radio noise control
- Obtain the correct average current needed for proper system voltage control

At high speeds, the on-time may be 10 percent with the off-time at 90 percent. At low speeds, the on-time may be 90 percent and the off-time 10 percent.

Circuit Description

The generator provides voltage to operate the vehicle's electrical system and to charge its battery. A magnetic field is created when current flows through the rotor. This field rotates as the rotor is driven by the engine, creating an AC voltage in the stator windings. The AC voltage is converted to DC by the rectifier bridge and is supplied to the electrical system at the battery terminal.

When the engine is running, the generator turn-on signal is sent to the generator from the PCM, turning on the regulator. The generator's voltage regulator controls current to the rotor, thereby controlling the output voltage. The rotor current is proportional to the electrical pulse width supplied by the regulator. When the engine is started, the regulator senses generator rotation by detecting AC voltage at the stator through an internal wire. Once the engine is running, the regulator varies the field current by controlling the pulse width. This regulates the generator output voltage for proper battery charging and electrical system operation. The generator F terminal is connected internally to the voltage regulator and externally to the PCM. When the voltage regulator detects a charging system problem, it grounds this circuit to signal the PCM that a problem exists. The PCM monitors the generator field duty cycle signal circuit. The system voltage sense circuit receives battery positive voltage that is Hot At All Times through a fuse link that is connected to the starter motor. This voltage is used by the regulator as the reference for system voltage control.

Ignition System Description 3.8 L

The electronic ignition system controls fuel combustion by providing a spark to ignite the compressed air/fuel mixture at the correct time. To provide optimum engine performance, fuel economy, and control of exhaust emissions, the PCM controls the spark advance of the ignition system. The electronic ignition system does not use the conventional distributor and coil. The electronic ignition system has the following advantages over the conventional mechanical distributor system:

- No moving parts
- Less maintenance required
- Remove mounting capability
- No mechanical load on the engine
- More coil cool down time between firing
- Elimination of mechanical timing adjustments
- Increased available ignition coil saturation time

The electronic ignition system consists of three twin-tower ignition coils, an ignition control module, a dual Hall-effect crankshaft position sensor, an engine crankshaft balancer with interrupter rings attached to the rear, related connecting wires, and the Ignition Control (IC) and fuel metering portion of the PCM.

The three twin-tower ignition coils are individually mounted to the ignition control module. Each end of a coils secondary winding is attached to a spark plug. Each cylinder is paired with the cylinder that is

opposite it. These two spark plugs are on top dead center at the same time. When the ignition coil fires, both plugs fire at the same time to complete the circuit. The cylinder on compression is said to be the event cylinder and the one on exhaust is the waste cylinder. The cylinder on the exhaust stroke requires very little of the available energy to fire the plug. The remaining energy will be used as required by the cylinder on the compression stroke. The same process is repeated when the cylinders reverse roles. This method of ignition is called a waste spark ignition system.

The electronic ignition system consists of the following components:

- Crankshaft position sensor
- Crankshaft balancer interrupter rings
- Camshaft position sensor
- Ignition coils
- Ignition control module
- Powertrain control module (PCM)

Ignition System Description 5.7 L

The electronic ignition system controls fuel combustion by providing a spark to ignite the compressed air/fuel mixture at the correct time. To provide optimum engine performance, fuel economy, and control of exhaust emissions, the PCM controls the spark advance of the ignition system. The electronic ignition system does not use the conventional distributor and coil. The electronic ignition system has the following advantages over a conventional mechanical distributor system:

- No moving parts
- Less maintenance required
- Remove mounting capability
- No mechanical load on the engine
- More coil cool down time between firing
- Elimination of mechanical timing adjustments
- Increased available ignition coil saturation time

The ignition system on this vehicle feature a multiple coil ignition and is known as coil near plug. The secondary ignition wires are short compared with a distributor ignition system wire. Eight ignition coils/module are individually mounted above each cylinder on the rocker covers. The coil/modules are fired sequentially. There is an Ignition Control (IC) circuit for each ignition coil/module. The eight ignition control circuits are connected to the PCM. All timing decisions are made by the PCM, which triggers each coil/module individually.

The electronic ignition system consists of the following components:

- Crankshaft position sensor
- Crankshaft position sensor reluctor wheel
- Camshaft position sensor
- Ignition coils
- Powertrain control module (PCM)

Engine Controls

Fuel System Specifications

If you have the 3800 V6 engine (VIN Code K), use regular unleaded gasoline rated at 87 octane or higher.

If you have the 5.7L V8 engine (VIN Code G), use premium unleaded gasoline rated at 91 octane or higher for best performance. You may use middle grade or regular unleaded gasolines, but your vehicle may not accelerate as well.

It is recommended that the gasoline meet specification which have been developed by the American Automobile Manufactures Association (AAMA) and endorsed by the Canadian Motor Vehicle Manufacturers Association for better vehicle performance and engine protection. Gasolines meeting the AAMA specification could provide improved driveability and emission control system performance compared to other gasolines. For more information, write to : American Automobile Manufacturer's Association, 7430 Second Ave, Suite 300, Detroit MI 48202.

Be sure the posted octane for premium is at least 91 (at least 89 for middle grade and 87 for regular). If the octane is less than 87, you may get a heavy knocking noise when you drive. If it's bad enough, it can damage your engine.

If you're using fuel rated at the recommended octane or higher and you hear heavy knocking, your engine needs service. But don't worry if you hear a little pinging noise when you're accelerating or driving up a hill. That's normal, and you don't have to buy a higher octane fuel to get rid of pinging. It's the heavy, constant knock that means you have a problem.

Notice

Your vehicle was not designed for fuel that contains methanol. Do not use methanol fuel which can corrode metal parts in your fuel system and also damage plastic and rubber parts. This kind of damage would not be covered under your warranty.

If your vehicle is certified to meet to meet California Emission Standards (indicated on the under hood emission control label), it is designed to operate on fuels that meet California specifications. If such fuels are not available in states adopting California emissions standards, your vehicle will operate satisfactorily on fuels meeting federal specifications, but emission control system performance may be affected. The malfunction indicator lamp on your instrument panel may turn on and/or your vehicle may fail a smog-check test. If this occurs, return to your authorized dealer for diagnosis to determine the cause of failure. In the event it is determined that the cause of the condition is the type of fuels used, repairs may not be covered by your warranty.

Some gasolines that are not reformulated for low emissions may contain an octane-enhancing additive called methylcyclopentadienyl manganese tricarbonyl (MMT); ask your service station operator whether or not the fuel contains MMT.

Engine Controls – 3.8L

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Refrigerant Pressure Sensor	6 N·m	53 Lb In
Camshaft Position Sensor (CMP) Retaining Bolt	10 N·m	89 Lb In
Crankshaft Balancer Bolt	150 N·m + 114°	111 Lb Ft + 114°
Crankshaft Position Sensor (CKP) Bolts	20 N·m	15 Lb Ft
Engine Coolant Temperature Sensor (ECT)	25 N·m	18 Lb Ft
Engine Oil Level Switch	20 N·m	15 Lb Ft
Exhaust Gas Recirculation Valve (EGR) Bolts	25 N·m	18 Lb Ft
Fuel Filter Fitting	30 N·m	22 Lb Ft
Fuel Pipe Front Clip Bolt	4.5 N·m	40 Lb In
Fuel Pipe Rear Clip Bolt	5.5 N·m	49 Lb In
Fuel Pipe Shield Bolt	5 N·m	44 Lb In
Fuel Pipe Shield Nuts	5 N·m	44 Lb In
Fuel Pipe Shield Studs	5 N·m	44 Lb In
Fuel Rail Attaching Nuts or Bolts	10 N·m	89 Lb In
Fuel Sender Assembly Attaching Nuts	6.5 N·m	58 Lb In
Fuel Tank Retaining Strap Bolts	33 N·m	25 Lb Ft
Heated Oxygen Sensor	42 N·m	31 Lb Ft
Ignition Coil Retaining Bolts	4.5 N·m	40 Lb In
Ignition Control Module Retaining Bolts	30 N·m	22 Lb Ft
Knock Sensor	19 N·m	14 Lb Ft
Spark Plug	27 N·m	20 Lb Ft
Throttle Body Nuts or Bolts	10 N·m	89 Lb In

Engine Controls – 5.7L

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
AIR Check Valves	23 N·m	17 lb ft
AIR Pipe To Exhaust Manifold Bolts	20 N·m	15 lb ft
AIR Pump to Bracket	9 N·m	80 lb in
AIR Right Side Pipe Bracket-to-Cylinder Head Bolt	25 N·m	18 lb ft
AIR Shut Off Valve Bracket-to-Cylinder Head Bolt	20 N·m	14 lb ft
AIR Shut Off Valve Retaining Nut	12 N·m	8 lb ft
Camshaft Position (CMP) Sensor Bolt	25 N·m	18 lb ft
Crankshaft Position (CKP) Sensor Bolt	25 N·m	18 lb ft
EGR Valve to Mounting Flange, First Step	10 N·m	89 lb ft
EGR Valve to Mounting Flange, Second Step	25 N·m	18 lb ft
Engine Coolant Temperature (ECT) Sensor	17 N·m	13 lb ft
Fuel Fill Hose Clamps	2.5 N·m	22 lb in
Fuel Filter Fitting	30 N·m	22 lb ft
Fuel Pipe Front Clip Bolts	4.5 N·m	40 lb in
Fuel Pipe Rear Clip Bolt	5.5 N·m	49 lb in
Fuel Pipe Shield Bolt	5 N·m	44 lb in
Fuel Pipe Shield Nuts	5 N·m	44 lb in
Fuel Pipe Shield Studs	5 N·m	44 lb in
Fuel Rail Attaching Bolts	10 N·m	89 lb in
Fuel Tank Fill Pipe Shield Bolt	2.5 N·m	22 lb ft
Fuel Tank Fill Pipe Support Bracket Bolt	10 N·m	89 lb in
Fuel Tank Strap Bolts	33 N·m	24 lb ft
Heated Oxygen Sensor (HO2S)	41 N·m	30 lb ft
Idle Air Control (IAC) Valve Attaching Screws	3 N·m	27 lb ft
Knock Sensor (KS)	15 N·m	11 lb ft
Powertrain Control Module (PCM) Connector End Bolts	8 N·m	70 lb in
PCV Hose Assembly Mounting Cable Nut	12 N·m	106 lb in
Throttle Body Attaching Bolts	12 N·m	106 lb in
Throttle Position (TP) Sensor Attaching Screws	2 N·m	18 lb in

Exhaust System

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter Hanger Bolt	41 N·m	30 lb ft
Catalytic Converter Heat Shield Bolt	2.0 N·m	18 lb in
Catalytic Converter Nut	25 N·m	18 lb ft
End Link Nut	23 N·m	17 lb ft
Engine Mount Heat Shield Nut	10 N·m	89 lb in
Exhaust Heat Shield Bolt	2.0 N·m	18 lb in
Exhaust Manifold Pipe Bolt	30 N·m	22 lb ft
Exhaust Manifold Pipe Nut	35 N·m	26 lb ft
Exhaust Muffler Clamp Bolt	48 N·m	35 lb ft
Exhaust Muffler Hanger Bolt	10 N·m	89 lb in
Exhaust Muffler Heat Shield Bolt	2.0 N·m	18 lb in
Exhaust Pipe Hanger Nut	20 N·m	15 lb ft
Exhaust Pipe Hanger Bracket Bolt	9.5 N·m	84 lb in
Exhaust Pipe Heat Shield Bolt	2.0 N·m	18 lb in
Heated Oxygen Sensor	42 N·m	31 lb ft
Rear Axle Torque Arm Bracket Nut	45 N·m	33 lb ft
Rear Shock Nut	90 N·m	66 lb ft
Torque Arm Bolt	130 N·m	96 lb ft
Torque Arm Nut	132 N·m	97 lb ft
Wheel Nut	120 N·m	89 lb ft

Exhaust System Description

Important

Use of non-OEM parts may cause driveability concerns.

The exhaust system design varies according to the model designation and the intended use of the vehicle.

In order to secure the exhaust pipe to the exhaust manifold, the exhaust system utilizes a flange and seal joint coupling. A flange and gasket coupling secures the catalytic converter assembly to the muffler assembly.

Hangers suspend the exhaust system from the underbody, allowing some movement of the exhaust system and disallowing the transfer of noise and vibration into the vehicle.

Heat shields protect the vehicle from the high temperatures generated by the exhaust system.

Resonator

Some exhaust systems are equipped with a resonator. The resonator, located either before or after the muffler, allows the use of mufflers with less back pressure. Resonators are used when vehicle characteristics require specific exhaust tuning.

Catalytic Converter

The catalytic converter is an emission control device added to the engine exhaust system in order to reduce hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) pollutants from the exhaust gas.

The catalytic converter is comprised of a ceramic monolith substrate, supported in insulation and housed within a sheet metal shell. The substrate may be washcoated with 3 noble metals:

- Platium (Pt)
- Palladium (Pd)
- Rhodium (Rh)

The catalyst in the converter is not serviceable.

Muffler

The exhaust muffler reduces the noise levels of the engine exhaust by the use of tuning tubes. The tuning tubes create channels inside the exhaust muffler that lower the sound levels created by the combustion of the engine.

Transmission Description and Operation

Automatic Transmission – 4L60E

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accumulator Cover to Case Bolt	8.0-14.0 N·m	6-10 lb ft
Case Extension to Case Bolt	42.0-48.0 N·m	31-35 lb ft
Case Extension to Case Bolt (4WD Shipping)	11.2-22.6 N·m	8.3-16.7 lb ft
Converter Cover Bolt	10 N·m	89 lb in
Converter Housing to Case Screw	65.0-75.0 N·m	48-55 lb ft
Cooler Pipe Connector	35.0-41.0 N·m	26-30 lb ft
Detent Spring to Valve Body Bolt	20.0-27.0 N·m	15-20 lb ft
Floorshift Control Bolt	10 N·m	89 lb in
Flywheel to Torque Converter Bolt	63 N·m	46 lb ft
Forward Accumulator Cover to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Heat Shield to Transmission Bolt	17 N·m	13 lb ft
Line Pressure Plug	8.0-14.0 N·m	6-10 lb ft
Manual Shaft to Inside Detent Lever Nut	27.0-34.0 N·m	20-25 lb ft
Negative Battery Cable Bolt	15 N·m	11 lb ft
Oil Level Indicator Bolt	47 N·m	35 lb ft
Oil Pan to Transmission Case Bolt	11 N·m	97 lb in
Oil Passage Cover to Case Bolt	8-14.0 N·m	6-10 lb ft
Park Brake Bracket to Case Bolt	27.0-34.0 N·m	20-25 lb ft
Park/Neutral Position Switch Screw	3 N·m	27 lb in
Plate to Case Bolt (Shipping)	27.0-34.0 N·m	20-25 lb ft
Plate to Converter Bolt (Shipping)	27.0-34.0 N·m	20-25 lb ft
Plug Assembly, Automatic Transmission Oil Pan (C/K)	30-40 N·m	22.1-29.5 lb ft
Plug Assembly, Automatic Transmission Oil Pan (Y)	28-32 N·m	20.7-23.6 lb ft
Pressure Control Solenoid Bracket to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Pump Assembly to Case Bolt	26.0-32.0 N·m	19-24 lb ft
Pump Cover to Pump Body Bolt	20.0-27.0 N·m	15-20 lb ft
Shift Cable Grommet Screw	1.7 N·m	15 lb in
Shift Control Cable Attachment	20 N·m	15 lb ft
Speed Sensor Retainer Bolt	10.5-13.5 N·m	7.7-10 lb ft
Stud, Automatic Transmission Case Extension (Y-car)	18.0-22.0 N·m	13-16 lb ft
TCC Solenoid Assembly to Case Bolt	8.0-14.0 N·m	6-10 lb ft
Trans Mount to Transmission Bolt	25 N·m	18 lb ft
Transmission Fluid Pressure Manual Valve Position Switch to Valve Body Bolt	8.0-14.0 N·m	6-10 lb ft
Transmission Oil Cooler Pipe Fitting	35.0-41.0 N·m	26-30 lb ft
Transmission Oil Pan to Case Bolt	9.5-13.8 N·m	7-10 lb ft
Transmission to Engine Bolt	47 N·m	35 lb ft
Valve Body to Case Bolt	8.0-14.0 N·m	6-10 lb ft

Transmission General Specifications

Name	Hydra-matic 4L60-E
RPO Codes	M30
Production Location	Toledo, Ohio Romulus, MI Ramos Arizpe, Mexico
Vehicle Platform (Engine/Transmission) Usage	C/K, C/K 800, F, G, M/L, S/T, Y
Transmission Drive	Longitudinally-Mounted Rear Wheel Drive
1st Gear Ratio	3.059:1
2nd Gear Ratio	1.625:1
3rd Gear Ratio	1.000:1
4th Gear Ratio	0.696:1
Reverse	2.294:1
Torque Converter Size (Diameter of Torque Converter Turbine)	245 mm 258 mm 298 mm 300 mm
Pressure Taps	Line Pressure
Transmission Fluid Type	DEXRON® III
Transmission Fluid Capacity (Approximate)	245 mm Converter Dry: 8.3 l (8.8 qt) 258 mm Converter Dry: 8.8 l (9.3 qt) 298 mm Converter Dry: 11.25 l (11.9 qt) 300 mm Converter Dry: 11.50 l (12.1 qt)
Transmission Type: 4	Four Forward Gears
Transmission Type: L	Longitudinal Mount
Transmission Type: 60	Product Series
Transmission Type: E	Electronic Controls
Position Quadrant	P, R, N, Overdrive, D, 2, 1 P, R, N, Overdrive, 3, 2, 1
Case Material	Die Cast Aluminum
Transmission Weight Dry (Approximate)	245 mm Converter 65.4 kg (144.30 lb) 258 mm Converter 79.9 kg (176.6 lb) 298 mm Converter 70.5 kg (155.70 lb) 300 mm Converter 86.17 kg (190.5 lb)
Transmission Weight Wet (Approximate)	245 mm Converter 72.4 kg (159.55 lb) 258 mm Converter 89.2 kg (197.7 lb) 298 mm Converter 80.5 kg (176.16 lb) 300 mm Converter 98.4 kg (218.0 lb)
Maximum Trailer Towing Capacity	6 130 kg (13,500 lb)
Maximum Gross Vehicle Weight (GVW)	3 900 kg (8,600 lb)

Fluid Capacity Specifications

Application	Specification	
	Metric	English
Bottom Pan Removal	4.7 liters	5 quarts
Complete Overhaul	10.6 liters	11 quarts
(measurements are approximate)		

Range Reference

Range	Park	Reverse	Neutral	OD				D			2		1	
Gear				1st	2nd	3rd	4th	1st	2nd	3rd	1st**	2nd	1st	2nd***
1-2 Shift Solenoid	ON*	ON*	ON*	ON	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	ON	OFF
2-3 Shift Solenoid	ON*	ON*	ON*	ON	ON	OFF	OFF	ON	ON	OFF	ON	ON	ON	ON
2-4 Band	–	–	–	–	A	–	A	–	A	–	–	A	–	A
Reverse Input Clutch	–	A	–	–	–	–	–	–	–	–	–	–	–	–
Overrun Clutch	–	–	–	–	–	–	–	–	–	A	A	A	A	A
Forward Clutch	–	–	–	A	A	A	A	A	A	A	A	A	A	A
Forward Sprag Clutch Assembly	–	–	–	H	H	H	–	H	H	H	H	H	H	H
3-4 Clutch	–	–	–	–	–	A	A	–	–	A	–	–	–	–
Lo/Roller Clutch	–	–	–	H	–	–	–	H	–	–	H	–	H	–
Lo/Rev Clutch	A	A	–	–	–	–	–	–	–	–	–	–	A	–

- A = Applied
- H = Holding
- ON = The solenoid is energized.
- OFF = The solenoid is de-energized.
- *Shift Solenoid state is a function of vehicle speed and may change if the vehicle speed increases sufficiently in Park, Reverse or Neutral. However, this does not affect the operation of the transmission.
- **Manual Second-First gear is electronically prevented under normal operating conditions.
- ***Manual First-Second gear is only available above approximately 48-56 km/h (30-35 mph).

Shift Speed

		1-2 Shift @ +/- 250 RPM Output Shaft Speed			2-3 Shift @ +/- 200 RPM Output Shaft Speed			3-4 Shift @ +/- 150 RPM Output Shaft Speed			3-1 @ +/- 100 RPM Output Shaft Speed	3-2 @ +/- 100 RPM Output Shaft Speed	3-1 Wide Open Throttle Shift	2-3 Wide Open Throttle Shift	Min TCC Apply @ 12% Throttle (RPM)
% of TPS		12	25	50	12	25	50	12	25	50					
Trans Cal	Axle														
3.8L (L36)															
A	3.08	620	950	1239	1115	1735	2354	1982	2478	4584	N/A	785	1446	5500	1239*
B	3.42	590	953	1226	1090	1725	2315	1998	2633	5039	N/A	772	1453	5700	1226*
5.7L (LS1)															
A	2.73	475	657	1168	840	1205	2154	1205	1825	5475	N/A	657	1460	5900	1570
B	3.23	479	696	1218	870	1262	2219	1262	1871	5829	N/A	696	1523	5900	1566

* 3rd Gear Apply

Transmission Component and System Description

The 4L60E transmission consists primarily of the following components:

- Torque converter assembly
- Servo assembly and 2-4 band assembly
- Reverse input clutch and housing
- Overrun clutch
- Forward clutch
- 3-4 clutch
- Forward sprag clutch assembly
- Lo and reverse roller clutch assembly
- Lo and reverse clutch assembly
- Two planetary gear sets: Input and Reaction
- Oil pump assembly
- Control valve body assembly

The electrical components of the 4L60-E are as follows:

- 1-2 and 2-3 shift solenoid valves
- 3-2 shift solenoid valve assembly
- Transmission pressure control (PC) solenoid
- Torque converter clutch (TCC) solenoid valve
- TCC pulse width modulation (PWM) solenoid valve
- Automatic transmission fluid pressure (TFP) manual valve position switch
- Automatic transmission fluid temperature (TFT) sensor
- Vehicle speed sensor assembly

Adapt Function

Transmission Adapt Function

The 4L60-E transmission uses a line pressure control system, which has the ability to continuously adapt the system's line pressure. This compensates for normal wear of the following parts:

- The clutch fiber plates
- The seals
- The springs

The PCM maintains the Upshift Adapt parameters for the transmission The PCM monitors the AT ISS sensor and the AT OSS during commanded shifts in order to determine if a shift is occurring too fast or too slow. The PCM adjusts the signal from the transmission pressure control solenoid in order to maintain a set shift feel.

Transmission adapts must be reset whenever the transmission is overhauled or replaced.

Automatic Transmission Shift Lock Control Description

The automatic transmission shift lock control is a safety device that prevents an inadvertent shift out of PARK when the ignition is ON. The driver must press the brake pedal before moving the shift lever out of the PARK position. The system consist of the following components:

- The automatic transmission shift lock control solenoid.
- The automatic transmission shift lock control switch.
- The park/neutral position switch.

With the ignition in the ON position battery positive voltage is supplied to the park/neutral position switch. With the transmission in the PARK position the contacts in the park/neutral position switch are closed. This allows current to flow through the switch to the automatic transmission shift lock control switch. The circuit continues through the normally-closed switch to the automatic transmission shift lock control solenoid. The automatic transmssion shift lock control soleniod is permanently grounded. This energizes the automatic transmission shift lock control solenoid, locking the shift linkage in the PARK position. When the driver presses the brake pedal the contacts in the automatic transmission shift lock control switch open, causing the automatic transmission shift lock control solenoid to release. This allows the shift lever to move from the PARK position.

Manual Transmission - M49

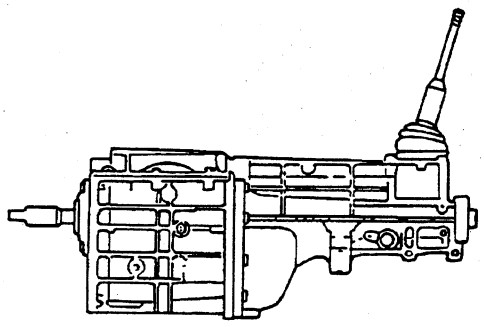
Fastener Tightening Specifications

Application	Specification	
	Metric	English
Backup Lamp Switch	38 N·m	28 lb ft
Clutch Actuator Cylinder Bolts	8 N·m	71 lb in
Flywheel Housing Bolts/Nuts	95 N·m	70 lb ft
Flywheel Housing Cover Bolts	9 N·m	80 lb in
Shift Control Closeout Boot Bolts	2 N·m	18 lb in
Shift Control Knob	3 N·m	27 lb in
Speed Sensor Bolt	10 N·m	89 lb in
Transmission Bolts	75 N·m	55 lb ft
Transmission Brace Bolts (left side to engine)	28 N·m	21 lb ft
Transmission Brace Bolts (left side to transmission)	50 N·m	37 lb ft
Transmission Brace Bolts (right side)	50 N·m	37 lb ft
Transmission Case Drain/Fill Plug	27 N·m	20 lb ft
Transmission Control Lever Bolts	17 N·m	13 lb ft
Transmission Mount Bolt	48 N·m	35 lb ft
Transmission Mount Nut	57 N·m	42 lb ft
Transmission Support Bolts	57 N·m	42 lb ft
Wiring Harness Clip Bolt	11 N·m	97 lb in

Lubrication Specifications

Application	Metric	English
DEXRON® III, IIE Manual Transmission Fluid	3.9 liters	4.1 quarts

Manual Transmission Description and Operation



The Borg Warner T5 model is a 5-speed 77 mm manual transmission assembly.

The Borg Warner T5 model is the only manual transmission assembly for the 3.8 L (RPO L36) engine.

Identify the manual transmission assembly as follows:

- Calculate the forward gears
- Measure the distance between the centerline of the output shaft and the counter gear

Notice

Use only DEXRON®-III Automatic Transmission Lubricant for this manual transmission assembly. Other lubricants or additives may damage the blocker ring friction material or the adhesives.

The Borg Warner model T5 5-speed manual transmission assembly has the following features:

- Fully synchronized
- Blocker ring synchronizers
- Sliding mesh reverse gear
- Three-piece synchronizer rings for first speed and second speed gears consisting of steel inner and outer cones and a tapered metal ring that is lined on both sides with friction material similar to automatic transmission friction plates
- Independent and separately replaced synchronizer cones
- 3RD speed and 4TH speed gear blocker rings that are conventional in appearance and are lined with friction material
- A brass 5TH speed gear blocker ring
- Tapered roller bearings that support the mainshaft and the countershaft (Must be shimmed for proper end play)
- Caged roller bearings for 1ST speed through 4TH speed gears
- A aluminum transmission case

The manual transmission control is mounted on top of the extension housing.

The manual transmission control cannot be adjusted.

The manual transmission control must be serviced independently of the manual transmission.

Manual Transmission – MM6

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Backup Lamp Switch	27 N·m	20 lb ft
Clutch Actuator Cylinder Bolt	8 N·m	71 lb in
Clutch Housing Bolt	50 N·m	37 lb ft
Control Lever Handle Bolt	25 N·m	18 lb ft
Gear Select/Skip Shift Solenoid	40 N·m	30 lb ft
Reverse Lockout Assembly Bolt	18 N·m	13 lb ft
Reverse Lockout Solenoid	40 N·m	30 lb ft
Shift Control Bolt	18 N·m	13 lb ft
Shift Control Closeout Boot Bolt	2 N·m	18 lb in
Shift Control Knob	3 N·m	27 lb ft
Transmission Bolt	50 N·m	37 lb ft
Transmission Drain/Fill Plug	27 N·m	20 lb ft
Transmission Mount Bolt	48 N·m	38 lb ft
Transmission Mount Nut	105 N·m	77 lb ft
Transmission Support Bolt	90 N·m	66 lb ft
Vehicle Speed Sensor Bolt	10 N·m	89 lb in

Lubrication Specifications

Application	Metric	English
DEXRON® III, IIE Manual Transmission Fluid	3.9 liters	4.1 quarts

Manual Transmission Description and Operation

Manual transmissions are identified by the number of forward gears and the measured distance between the centerline of the output shaft and the counter gear. The 6-speed, 85 mm manual transmission (PRO MM6), used in the Camaro/Firebird, incorporates the following features:

- An aluminum case.
- Fully synchronized gearing with an enhanced synchronizer cone arrangement:
  - Triple-cone: FIRST, SECOND
  - Double-cone: THIRD, FOURTH, FIFTH, SIXTH
  - Single-cone: REVERSE
- An internal shift rail mechanism.
- Tapered roller bearing supporting the mainshaft and countershaft.
- Caged roller bearings under all speed gears.
- Solenoid inhibit of SECOND and THIRD gears.
- Solenoid inhibit of REVERSE gear during predefined forward motion.

Gear Select (Skip Shift)

To ensure good fuel economy and compliance with federal economy standards, SECOND and THIRD gear are inhibited when shifting out of FIRST gear under the following conditions:

- Coolant temperature is above 50°C (122°F).
- Vehicle speed is between 20 and 29 km/h (12 and 19 mph).
- Throttle is opened 35 percent or less.

Reverse Lockout

A reverse lockout system (consisting of a reverse lockout solenoid which operates a reverse lockout mechanism) is utilized to prevent shifting into REVERSE gear when the vehicle is moving forward at a speed of 5 km/h (3 mph) or more.

Vehicle Speed Sensor

The vehicle speed sensor (VSS) is pulse type input that informs the PCM how fast the vehicle is traveling. The VSS system uses an inductive sensor mounted in the tail housing of the transmission and a toothed reluctor wheel on the tail shaft. The teeth of the reluctor wheel alternately interfere with the magnetic field of the sensor creating an induced voltage pulse as the reluctor rotates.

Clutch

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Brake Pedal Pivot Nut	54 N·m	40 lb ft
Clutch Actuator Cylinder Bolt	8 N·m	71 lb in
Clutch Pressure Plate Bolt (5-Speed)	20 N·m + 45 degrees	15 lb ft + 45 degrees
Clutch Pressure Plate Bolt (6-Speed)	70 N·m	52 lb ft
Clutch Master Cylinder Nut	20 N·m	15 lb ft
Transmission Bolt (5-Speed)	75 N·m	55 lb in
Transmission Bolt (6-Speed)	50 N·m	37 lb ft

Sealers and Lubricants

Application	Description
Clutch Hydraulic Fluid	GM P/N 12345347
Clutch Pedal Bushing Lubricant	GM P/N 1052497

Principal Components

The following are the principal components of the clutch system:

- The driving members; attached to the engine and turning with the engine.
- The driven member; attached to the engine driveline and transmission and turning with the driveline and transmission.
- The operating members; including the spring, the clutch hydraulic system, and the clutch pedal linkage, required to apply and release the pressure, which hold the driving and driven members in contact with each other.

Clutch Driving Members

The clutch driving members consist of two, flat surfaced, iron plates, machined to a smooth finish. One of these surfaces is the rear face of the engine flywheel and the other is a comparatively heavy flat ring, with one side machined, known as the clutch pressure plate.

Clutch Driven Members

The driven member (friction or clutch disc) consists of a hub and a plate, with facings attached to the plate. The clutch disc has cushion springs and dampening springs. The cushion springs are slightly waved, or curled. The cushion springs are attached to the plat, and the clutch facings are attached to the springs. When the clutch is engaged, the cushion springs compress slightly to take up the shock of engagement. The dampening springs are heavy coil springs set in a circle around the hub. The hub is driven through these springs. They help to smooth out the torsional vibration so that the power flow to the transmission is smooth. There are grooves in both sides of the clutch disc facings. These grooves prevent the facings from sticking to the flywheel face and pressure plate when the clutch is disengaged. The grooves break any vacuum that might form and cause the facings to stick to the flywheel ore pressure plate.

Clutch Operating Members

The driving member and the driven member are held in contact by spring pressure. This pressure is exerted by a one-piece conical or diaphragm spring.

A diaphragm spring is a conical piece of spring steel that has been specially stamped to give it greater flexibility. The diaphragm is positioned between the cover and the pressure plate so that the diaphragm

spring is nearly flat when the clutch is in the engaged position. The action of this type of spring is similar to that of an ordinary oil can.

The pressure of the inner rim of the spring on the pressure plate decreases as the flat position is passed. The inner rim of the diaphragm bears on the pressure plate and is pivoted on a ring on the outer edge of the pressure plate. The application of a pulling load on the inner section of the pressure plate will cause the inner rim to move away from the flywheel and allow the pressure plate to move away from the clutch disc, thereby releasing or disengaging the clutch. When the pressure is released from the inner section, the OIL CAN action of the diaphragm causes the inner section to move in, and the movement of the inner rim forces the pressure plate against the clutch disc, thus engaging the clutch.

The clutch release bearing is moved by the actuator assembly to move the release levers which move the pressure plate to the rear, thus separating the clutch disc from the flywheel when the clutch pedal is depressed by the driver. A piston return spring in the actuator cylinder preloads the clutch linkage and assures a small load on the release bearing with the actuator assembly at all times. As the clutch disc wears, the diaphragm spring fingers move forward forcing the release bearing, actuator assembly, and pushrod to move. This movement forces the actuator cylinder piston to move forward in its bore, consuming hydraulic fluid from the master cylinder reservoir, thereby providing the SELF-ADJUSTING feature of the hydraulic clutch linkage system.

Hydraulic Clutch Description

Principal Components

The driving member and the driven member are held in contact by spring pressure. This pressure is exerted by a one-piece conical or diaphragm spring.

A diaphragm spring is a conical piece of spring steel that has been specially stamped to give it greater flexibility. The diaphragm is positioned between the cover and the pressure plate so that the diaphragm spring is nearly flat when the clutch is in the engaged position. The action of this type of spring is similar to that of an ordinary oil can.

The pressure of the inner rim of the spring on the pressure plate decreases as the flat position is passed. The inner rim of the diaphragm bears on the pressure plate and is pivoted on a ring on the outer edge of the pressure plate. The application of a pulling load on the inner section of the pressure plate will cause the inner rim to move away from the flywheel and allow the pressure plate to move away from the clutch disc, thereby releasing or disengaging the clutch. When the pressure is released from the inner section, the OIL CAN action of the diaphragm causes the inner section to move in, and the movement of the inner rim forces the pressure plate against the clutch disc, thus engaging the clutch.

The clutch release bearing is moved by the actuator assembly to move the release levers which move the pressure plate to the rear, thus separating the clutch disc from the flywheel when the clutch pedal is depressed by the driver. A piston return spring in the actuator cylinder preloads the clutch linkage and assures a small load on the release bearing with the actuator assembly at all times. As the clutch disc wears, the diaphragm spring fingers move forward forcing the release bearing, actuator assembly, and pushrod to move. This movement forces the actuator cylinder piston to move forward in its bore, consuming hydraulic fluid from the master cylinder reservoir, thereby providing the SELF-ADJUSTING feature of the hydraulic clutch linkage system.

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The pressure of the inner rim of the spring on the pressure plate decreases as the flat position is passed. The inner rim of the diaphragm bears on the pressure plate and is pivoted on a ring on the outer edge of the pressure plate. The application of a pulling load on the inner section of the pressure plate will cause the inner rim to move away from the flywheel and allow the pressure plate to move away from the clutch disc, thereby releasing or disengaging the clutch. When the pressure is released from the inner section, the OIL CAN action of the diaphragm causes the inner section to move in, and the movement of the inner rim forces the pressure plate against the clutch disc, thus engaging the clutch.

The clutch release bearing is moved by the actuator assembly to move the release levers which move the pressure plate to the rear, thus separating the clutch disc from the flywheel when the clutch pedal is depressed by the driver. A piston return spring in the actuator cylinder preloads the clutch linkage and assures a small load on the release bearing with the actuator assembly at all times. As the clutch disc wears, the diaphragm spring fingers move forward forcing the release bearing, actuator assembly, and pushrod to move. This movement forces the actuator cylinder piston to move forward in its bore, consuming hydraulic fluid from the master cylinder reservoir, thereby providing the SELF-ADJUSTING feature of the hydraulic clutch linkage system.

Hydraulic Clutch Description

The clutch hydraulic system consists of a master cylinder and an actuator cylinder. When pressure is applied to the clutch pedal (pedal depressed), the pushrod contacts the plunger and pushes it down the bore of the master cylinder. In the first 0.8 mm (0.031 in) of movement, the recuperation seal closes the port to the fluid reservoir tank, and as the plunger continues to move down the bore of the cylinder, the fluid is forced through the outlet line to the actuator cylinder. As fluid is pushed down the pipe from the master cylinder, this in turn forces the pistons in the actuator cylinder outward. As the actuator cylinder piston moves forward, it forces the release bearing to disengage the clutch pressure plate from the clutch disc. On the return stroke (pedal released), the plunger moves back as a result of the return pressure of the clutch. Fluid returns to the master cylinder and the final movement of the plunger opens the port to the fluid reservoir, allowing an unrestricted flow of fluid between system and reservoir.

Hydraulic Clutch Fluid Description

When adding, refilling or replacing hydraulic clutch fluid after service operations, use hydraulic clutch fluid GM P/N 12345347 or an equivalent fluid that meets DOT 3 specifications only (such as DOT 3 brake fluid).

Abbreviations and Meanings

Abbreviation	Meaning
A	
A	Ampere(s)
ABS	Antilock Brake System
A/C	Air Conditioning
AC	Alternating Current
ACC	Accessory, Automatic Climate Control
ACL	Air Cleaner
ACR4	Air Conditioning Refrigerant, Recovery, Recycling, Recharging
AD	Automatic Disconnect
A/D	Analog to Digital
ADL	Automatic Door Lock
A/F	Air/Fuel Ratio
AH	Active Handling
AIR	Secondary Air Injection
ALC	Automatic Level Control, Automatic Lamp Control
AM/FM	Amplitude Modulation/Frequency Modulation
Ant	Antenna
AP	Accelerator Pedal
APCM	Accessory Power Control Module
API	American Petroleum Institute
APP	Accelerator Pedal Position
APT	Adjustable Part Throttle
ASM	Assembly, Accelerator and Servo Control Module
ASR	Acceleration Slip Regulation
A/T	Automatic Transmission/Transaxle
ATC	Automatic Transfer Case, Automatic Temperature Control
ATDC	After Top Dead Center
ATSLC	Automatic Transmission Shift Lock Control
Auto	Automatic
avg	Average
A4WD	Automatic Four-Wheel Drive
AWG	American Wire Gage
B	
B+	Battery Positive Voltage
BARO	Barometric Pressure
BATT	Battery
BBV	Brake Booster Vacuum
BCA	Bias Control Assembly
BCM	Body Control Module

BHP	Brake Horsepower
BLK	Black
BLU	Blue
BP	Back Pressure
BPCM	Battery Pack Control Module
BPMV	Brake Pressure Modulator Valve
BPP	Brake Pedal Position
BRN	Brown
BTDC	Before Top Dead Center
BTM	Battery Thermal Module
BTSI	Brake Transmission Shift Interlock
Btu	British Thermal Units
C	
°C	Degrees Celsius
CAC	Charge Air Cooler
CAFE	Corporate Average Fuel Economy
Cal	Calibration
Cam	Camshaft
CARB	California Air Resources Board
CC	Coast Clutch
cm^3	Cubic Centimeters
CCM	Convenience Charge Module, Chassis Control Module
CCOT	Cycling Clutch Orifice Tube
CCP	Climate Control Panel
CD	Compact Disc
CE	Commutator End
CEAB	Cold Engine Air Bleed
CEMF	Counter Electromotive Force
CEX	Cabin Exchanger
cfm	Cubic Feet per Minute
cg	Center of Gravity
CID	Cubic Inch Displacement
CKP	Crankshaft Position
CKT	Circuit
C/Ltr	Cigar Lighter
CL	Closed Loop
CLS	Coolant Level Switch
CMC	Compressor Motor Controller
CMP	Camshaft Position
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO2	Carbon Dioxide

Coax	Coaxial
COMM	Communication
Conn	Connector
CPA	Connector Position Assurance
CPP	Clutch Pedal Position
CPS	Central Power Supply
CPU	Central Processing Unit
CRT	Cathode Ray Tube
CRTC	Cathode Ray Tube Controller
CS	Charging System
CSFI	Central Sequential Fuel Injection
CTP	Closed Throttle Position
cu ft	Cubic Foot/Feet
cu in	Cubic Inch/Inches
CV	Constant Velocity Joint
CVRSS	Continuously Variable Road Sensing Suspension
Cyl	Cylinder(s)
D	
DAB	Delayed Accessory Bus
dB	Decibels
dBA	Decibels on A-weighted Scale
DC	Direct Current, Duty Cycle
DCM	Door Control Module
DE	Drive End
DEC	Digital Electronic Controller
DERM	Diagnostic Energy Reserve Module
DI	Distributor Ignition
dia	Diameter
DIC	Driver Information Center
Diff	Differential
DIM	Dash Integration Module
DK	Dark
DLC	Data Link Connector
DMCM	Drive Motor Control Module
DMM	Digital Multimeter
DMSDS	Drive Motor Speed and Direction Sensor
DMU	Drive Motor Unit
DOHC	Dual Overhead Camshafts
DR, Drvr	Driver
DRL	Daytime Running Lamps
DTC	Diagnostic Trouble Code

E	
EBCM	Electronic Brake Control Module
EBTCM	Electronic Brake and Traction Control Module
EC	Electrical Center, Engine Control
ECC	Electronic Climate Control
ECI	Extended Compressor at Idle
ECL	Engine Coolant Level
ECM	Engine Control Module, Electronic Control Module
ECS	Emission Control System
ECT	Engine Coolant Temperature
EEPROM	Electrically Erasable Programmable Read Only Memory
EEVIR	Evaporator Equalized Values in Receiver
EFE	Early Fuel Evaporation
EGR	Exhaust Gas Recirculation
EGR TVV	Exhaust Gas Recirculation Thermal Vacuum Valve
EHPS	Electro-Hydraulic Power Steering
EI	Electronic Ignition
ELAP	Elapsed
ELC	Electronic Level Control
E/M	English/Metric
EMF	Electromotive Force
EMI	Electromagnetic Interference
Eng	Engine
EOP	Engine Oil Pressure
EOT	Engine Oil Temperature
EPA	Environmental Protection Agency
EPR	Exhaust Pressure Regulator
EPROM	Erasable Programmable Read Only Memory
ESB	Expansion Spring Brake
ESC	Electronic Suspension Control
ESD	Electrostatic Discharge
ESN	Electronic Serial Number
ETC	Electronic Throttle Control, Electronic Temperature Control, Electronic Timing Control
ETCC	Electronic Touch Climate Control
ETR	Electronically Tuned Receiver
ETS	Enhanced Traction System
EVAP	Evaporative Emission
EVO	Electronic Variable Orifice
Exh	Exhaust

F	
°F	Degrees Fahrenheit
FC	Fan Control
FDC	Fuel Data Center
FED	Federal All United States except California
FEDS	Fuel Enable Data Stream
FEX	Front Exchanger
FF	Flexible Fuel
FFH	Fuel-Fired Heater
FI	Fuel Injection
FMVSS	Federal U.S. Motor Vehicle Safety Standards
FP	Fuel Pump
ft	Foot/Feet
FT	Fuel Trim
F4WD	Full Time Four-Wheel Drive
4WAL	Four-Wheel Antilock
4WD	Four-Wheel Drive
FW	Flat Wire
FWD	Front Wheel Drive, Forward
G	
g	Grams, Gravitational Acceleration
GA	Gage, Gauge
gal	Gallon
gas	Gasoline
GCW	Gross Combination Weight
Gen	Generator
GL	Gear Lubricant
GM	General Motors
GM SPO	General Motors Service Parts Operations
gnd	Ground
gpm	Gallons per Minute
GRN	Green
GRY	Gray
GVWR	Gross Vehicle Weight Rating
H	
H	Hydrogen
H2O	Water
Harn	Harness
HC	Hydrocarbons
H/CMPR	High Compression

HD	Heavy Duty
HDC	Heavy Duty Cooling
hex	Hexagon, Hexadecimal
Hg	Mercury
Hi Alt	High Altitude
HO2S	Heated Oxygen Sensor
hp	Horsepower
HPL	High Pressure Liquid
HPS	High Performance System
HPV	High Pressure Vapor
HPVS	Heat Pump Ventilation System
Htd	Heated
HTR	Heater
HUD	Head-up Display
HVAC	Heater-Ventilation-Air Conditioning
HVACM	Heater-Vent-Air Conditioning Module
HVIL	High Voltage Interlock Loop
HVM	Heater Vent Module
Hz	Hertz
	I
IAC	Idle Air Control
IAT	Intake Air Temperature
IC	Integrated Circuit, Ignition Control
ICCS	Integrated Chassis Control System
ICM	Ignition Control Module
ID	Identification, Inside Diameter
IDI	Integrated Direct Ignition
IGBT	Insulated Gate Bi-Polar Transistor
ign	Ignition
ILC	Idle Load Compensator
in	Inch/Inches
INJ	Injection
inst	Instantaneous, Instant
IP	Instrument Panel
IPC	Instrument Panel Cluster
IPM	Instrument Panel Module
I/PEC	Instrument Panel Electrical Center
ISC	Idle Speed Control
ISO	International Standards Organization
ISS	Input Speed Shaft, Input Shaft Speed

K	
KAM	Keep Alive Memory
KDD	Keyboard Display Driver
kg	Kilogram
kHz	Kilohertz
km	Kilometer
km/h	Kilometers per Hour
km/l	Kilometers per Liter
kPa	Kilopascals
KS	Knock Sensor
kV	Kilovolts
L	
L	Liter
L4	Four Cylinder Engine, In-Line
L6	Six-Cylinder Engine, In-Line
lb	Pound
lb ft	Pound Feet Torque
lb in	Pound Inch Torque
LCD	Liquid Crystal Display
LDCL	Left Door Closed Locking
LDCM	Left Door Control Module
LDM	Lamp Driver Module
LED	Light Emitting Diode
LEV	Low Emissions Vehicle
LF	Left Front
lm	Lumens
LR	Left Rear
LT	Left
LT	Light
LT	Long Term
LTPI	Low Tire Pressure Indicator
LTPWS	Low Tire Pressure Warning System
M	
MAF	Mass Air Flow
Man	Manual
MAP	Manifold Absolute Pressure
MAT	Manifold Absolute Temperature
max	Maximum
M/C	Mixture Control
MDP	Manifold Differential Pressure

MFI	Multiport Fuel Injection
mi	Miles
MIL	Malfunction Indicator Lamp
min	Minimum
MIN	Mobile Identification Number
mL	Milliliter
mm	Millimeter
mpg	Miles per Gallon
mph	Miles per Hour
ms	Millisecond
MST	Manifold Surface Temperature
MSVA	Magnetic Steering Variable Assist, Magnasteer®
M/T	Manual Transmission/Transaxle
MV	Megavolt
mV	Millivolt
N	
NAES	North American Export Sales
NC	Normally Closed
NEG	Negative
Neu	Neutral
NI	Neutral Idle
NiMH	Nickel Metal Hydride
NLGI	National Lubricating Grease Institute
N·m	Newton-meter Torque
NO	Normally Open
NOx	Oxides of Nitrogen
NPTC	National Pipe Thread Coarse
NPTF	National Pipe Thread Fine
NOVRAM	Non-Volatile Random Access Memory
O	
O2	Oxygen
O2S	Oxygen Sensor
OBD	On-Board Diagnostics
OBD II	On-Board Diagnostics Second Generation
OC	Oxidation Converter Catalytic
OCS	Opportunity Charge Station
OD	Outside Diameter
ODM	Output Drive Module
ODO	Odometer
OE	Original Equipment
OEM	Original Equipment Manufacturer
OHC	Overhead Camshaft

ohms	Ohm
OL	Open Loop, Out of Limits
ORC	Oxidation Reduction Converter Catalytic
ORN	Orange
ORVR	On-Board Refueling Vapor Recovery
OSS	Output Shaft Speed
oz	Ounce(s)
	P
PAG	Polyalkylene Glycol
PAIR	Pulsed Secondary Air Injection
PASS, PSGR	Passenger
PASS-Key®	Personalized Automotive Security System
P/B	Power Brakes
PC	Pressure Control
PCB	Printed Circuit Board
PCM	Powertrain Control Module
PCS	Pressure Control Solenoid
PCV	Positive Crankcase Ventilation
PEB	Power Electronics Bay
PID	Parameter Identification
PIM	Power Inverter Module
PM	Permanent Magnet Generator
P/N	Part Number
PNK	Pink
PNP	Park/Neutral Position
PRNDL	Park, Reverse, Neutral, Drive, Low
POA	Pilot Operated Absolute Valve
POS	Positive, Position
POT	Potentiometer Variable Resistor
PPL	Purple
ppm	Parts per Million
PROM	Programmable Read Only Memory
P/S, PS	Power Steering
PSCM	Power Steering Control Module, Passenger Seat Control Module
PSD	Power Sliding Door
PSP	Power Steering Pressure
psi	Pounds per Square Inch
psia	Pounds per Square Inch Absolute
psig	Pounds per Square Inch Gauge
pt	Pint
PTC	Positive Temperature Coefficient
PWM	Pulse Width Modulated

Q	
QDM	Quad Driver Module
qt	Quart(s)
R	
R-12	Refrigerant-12
R-134a	Refrigerant-134a
RAM	Random Access Memory, Non-permanent memory device, memory contents are lost when power is removed.
RAP	Retained Accessory Power
RAV	Remote Activation Verification
RCDLR	Remote Control Door Lock Receiver
RDCM	Right Door Control Module
Ref	Reference
Rev	Reverse
REX	Rear Exchanger
RIM	Rear Integration Module
RF	Right Front, Radio Frequency
RFA	Remote Function Actuation
RFI	Radio Frequency Interference
RH	Right Hand
RKE	Remote Keyless Entry
Rly	Relay
ROM	Read Only Memory, Permanent memory device, memory contents are retained when power is removed.
RPM	Revolutions per Minute Engine Speed
RPO	Regular Production Option
RR	Right Rear
RSS	Road Sensing Suspension
RTD	Real Time Damping
RT	Right
RTV	Room Temperature Vulcanizing Sealer
RWAL	Rear Wheel Antilock
RWD	Rear Wheel Drive
S	
s	Second(s)
SAE	Society of Automotive Engineers
SC	Supercharger
SCB	Supercharger Bypass
SCM	Seat Control Module
SDM	Sensing and Diagnostic Module
SEO	Special Equipment Option
SFI	Sequential Multiport Fuel Injection

SI	System International Modern Version of Metric System
SIAB	Side Impact Air Bag
SIR	Supplemental Inflatable Restraint
SLA	Short/Long Arm Suspension
sol	Solenoid
SO2	Sulfur Dioxide
SP	Splice Pack
S/P	Series/Parallel
SPO	Service Parts Operations
SPS	Service Programming System, Speed Signal
sq ft, ft^2	Square Foot/Feet
sq in, in^2	Square Inch/Inches
SRC	Service Ride Control
SRI	Service Reminder Indicator
SRS	Supplemental Restraint System
SS	Shift Solenoid
ST	Scan Tool
STID	Station Identification Station ID
S4WD	Selectable Four-Wheel Drive
Sw	Switch
SWPS	Steering Wheel Position Sensor
syn	Synchronizer
	T
TAC	Throttle Actuator Control
Tach	Tachometer
TAP	Transmission Adaptive Pressure, Throttle Adaptive Pressure
TBI	Throttle Body Fuel Injection
TC	Turbocharger, Transmission Control
TCC	Torque Converter Clutch
TCS	Traction Control System
TDC	Top Dead Center
TEMP	Temperature
Term	Terminal
TFP	Transmission Fluid Pressure
TFT	Transmission Fluid Temperature
THM	Turbo Hydro-Matic
TIM	Tire Inflation Monitoring, Tire Inflation Module
TOC	Transmission Oil Cooler
TP	Throttle Position
TPA	Terminal Positive Assurance
TPM	Tire Pressure Monitoring, Tire Pressure Monitor
TR	Transmission Range

TRANS	Transmission/Transaxle
TT	Tell Tail Warning Lamp
TV	Throttle Valve
TVRS	Television and Radio Suppression
TVV	Thermal Vacuum Valve
TWC	Three Way Converter Catalytic
TWC+OC	Three Way + Oxidation Converter Catalytic
TXV	Thermal Expansion Valve
U	
UART	Universal Asynchronous Receiver Transmitter
U/H	Underhood
U/HEC	Underhood Electrical Center
U-joint	Universal Joint
UTD	Universal Theft Deterrent
UV	Ultraviolet
V	
V	Volt(s), Voltage
V6	Six-Cylinder Engine, V-Type
V8	Eight-Cylinder Engine, V-Type
Vac	Vacuum
VAC	Vehicle Access Code
VATS	Vehicle Anti-Theft System
VCIM	Vehicle Communication Interface Mode
VCM	Vehicle Control Module
V dif	Voltage Difference
VDOT	Variable Displacement Orifice Tube
VDV	Vacuum Delay Valve
vel	Velocity
VES	Variable Effort Steering
VF	Vacuum Fluorescent
VIO	Violet
VIN	Vehicle Identification Number
VLR	Voltage Loop Reserve
VMV	Vacuum Modulator Valve
VR	Voltage Regulator
V ref	Voltage Reference
VSES	Vehicle Stability Enhancement System
VSS	Vehicle Speed Sensor

W	
w/	With
W/B	Wheel Base
WHL	Wheel
WHT	White
w/o	Without
WOT	Wide Open Throttle
W/P	Water Pump
W/S	Windshield
WSS	Wheel Speed Sensor
WU-OC	Warm Up Oxidation Converter Catalytic
WU-TWC	Warm Up Three-Way Converter Catalytic
X	
X-valve	Expansion Valve
Y	
yd	Yard(s)
YEL	Yellow

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Conversion - English/Metric

English	Multiply/ Divide by	Metric
In order to calculate English measurement, divide by the number in the center column. In order to calculate metric measurement, multiply by the number in the center column.		
Length		
in	25.4	mm
ft	0.3048	m
yd	0.9144	
mi	1.609	km
Area		
sq in	645.2	sq mm
	6.45	sq cm
sq ft	0.0929	sq m
sq yd	0.8361	
Volume		
cu in	16,387.00	cu mm
	16.387	cu cm
	0.0164	L
qt	0.9464	
gal	3.7854	
cu yd	0.764	cu m
Mass		
lb	0.4536	kg
ton	907.18	
	0.907	tonne (t)
Force		
Kg F	9.807	newtons (N)
oz F	0.278	
lb F	4.448	
Acceleration		
ft/s²	0.3048	m/s²
In/s²	0.0254	
Torque		
Lb in	0.11298	N·m
lb ft	1.3558	
Power		
hp	0.745	kW

Pressure (Stress)		
inches of H2O	0.2488	kPa
lb/sq in	6.895	
Energy (Work)		
Btu	1055	J (J= one Ws)
lb ft	1.3558	
kW hour	3,600,000.00	
Light		
Foot Candle	10.764	lm/m²
Velocity		
mph	1.6093	km/h
Temperature		
(°F - 32) 5/9	=	°C
°F	=	(9/5 °C + 32)
Fuel Performance		
235.215/mpg	=	100 km/L

Equivalents - Decimal and Metric

Fraction (in)	Decimal (in)	Metric (mm)
1/64	0.015625	0.39688
1/32	0.03125	0.79375
3/64	0.046875	1.19062
1/16	0.0625	1.5875
5/64	0.078125	1.98437
3/32	0.09375	2.38125
7/64	0.109375	2.77812
1/8	0.125	3.175
9/64	0.140625	3.57187
5/32	0.15625	3.96875
11/64	0.171875	4.36562
3/16	0.1875	4.7625
13/64	0.203125	5.15937
7/32	0.21875	5.55625
15/64	0.234375	5.95312
1/4	0.25	6.35
17/64	0.265625	6.74687
9/32	0.28125	7.14375
19/64	0.296875	7.54062
5/16	0.3125	7.9375
21/64	0.328125	8.33437
11/32	0.34375	8.73125
23/64	0.359375	9.12812
3/8	0.375	9.525
25/64	0.390625	9.92187
13/32	0.40625	10.31875
27/64	0.421875	10.71562
7/16	0.4375	11.1125
29/64	0.453125	11.50937
15/32	0.46875	11.90625
31/64	0.484375	12.30312
1/2	0.5	12.7
33/64	0.515625	13.09687
17/32	0.53125	13.49375
35/64	0.546875	13.89062
9/16	0.5625	14.2875
37/64	0.578125	14.68437
19/32	0.59375	15.08125
39/64	0.609375	15.47812

Fraction (in)	Decimal (in)	Metric (mm)
5/8	0.625	15.875
41/64	0.640625	16.27187
21/32	0.65625	16.66875
43/64	0.671875	17.06562
11/16	0.6875	17.4625
45/64	0.703125	17.85937
23/32	0.71875	18.25625
47/64	0.734375	18.65312
3/4	0.75	19.05
49/64	0.765625	19.44687
25/32	0.78125	19.84375
51/64	0.796875	20.24062
13/16	0.8125	20.6375
53/64	0.828125	21.03437
27/32	0.84375	21.43125
55/64	0.859375	21.82812
7/8	0.875	22.225
57/64	0.890625	22.62187
29/32	0.90625	23.01875
59/64	0.921875	23.41562
15/16	0.9375	23.8125
61/64	0.953125	24.20937
31/32	0.96875	24.60625
63/64	0.984375	25.00312
1	1.0	25.4

Fasteners

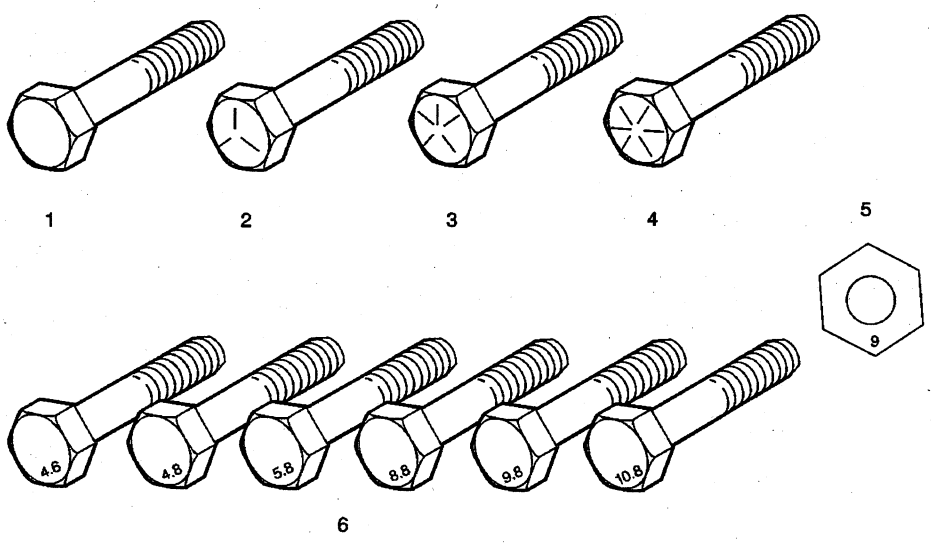
Metric Fasteners

This vehicle provides fastener dimensions using the metric system. Most metric fasteners are approximate in diameter to equivalent English fasteners. Make replacements using fasteners of the same nominal diameter, thread pitch, and strength.

A number marking identifies the OE metric fasteners except cross-recess head screws. The number also indicates the strength of the fastener material. A Posidrive® or Type 1A cross-recess identifies a metric cross-recess screw. For best results, use a Type 1A cross-recess screwdriver, or equivalent, in Posidrive® recess head screws.

GM Engineering Standards and North American Industries have adopted a portion of the ISO-defined standard metric fastener sizes. The purpose was to reduce the number of fastener sizes used while retaining the best thread qualities in each thread size. For example, the metric M6.0 X 1 screw, with nearly the same diameter and 25.4 threads per inch replaced the English 1/4-20 and 1/4-28 screws. The thread pitch is midway between the English coarse and fine thread pitches.

Fastener Strength Identification



1. English Bolt, Grade 2 (Strength Class)
2. English Bolt, Grade 5 (Strength Class)
3. English Bolt, Grade 7 (Strength Class)
4. English Bolt, Grade 8 (Strength Class)
5. Metric Nut, Strength Class 9
6. Metric Bolts, Strength Class Increases as Numbers Increase

The most commonly used metric fastener strength property classes are 9.8 and 10.9. The class identification is embossed on the head of each bolt. The English, inch strength classes range from grade 2 to grade 8. Radial lines are embossed on the head of each bolt in order to identify the strength class. The number of lines on the head of the bolt is 2 lines less than the actual grade. For example, a grade 8 bolt will have 6 radial lines on the bolt head. Some metric nuts are marked with a single digit strength identification number on the nut face.

English Prevailing Torque Fastener Minimum Torque Development

Application	Specification	
	Metric	English
All Metal Prevailing Torque Fasteners		
1/4 in	0.5 N·m	4.5 lb in
5/16 in	0.8 N·m	7.5 lb in
3/8 in	1.3 N·m	11.5 lb in
7/16 in	1.8 N·m	16 lb in
1/2 in	2.3 N·m	20 lb in
9/16 in	3.2 N·m	28 lb in
5/8 in	4 N·m	36 lb in
3/4 in	7 N·m	54 lb in
Nylon Interface Prevailing Torque Fasteners		
1/4 in	0.3 N·m	3 lb in
5/16 in	0.6 N·m	5 lb in
3/8 in	1 N·m	9 lb in
7/16 in	1.3 N·m	12 lb in
1/2 in	1.8 N·m	16 lb in
9/16 in	2.5 N·m	22 lb in
5/8 in	3.4 N·m	30 lb in
3/4 in	5 N·m	45 lb in