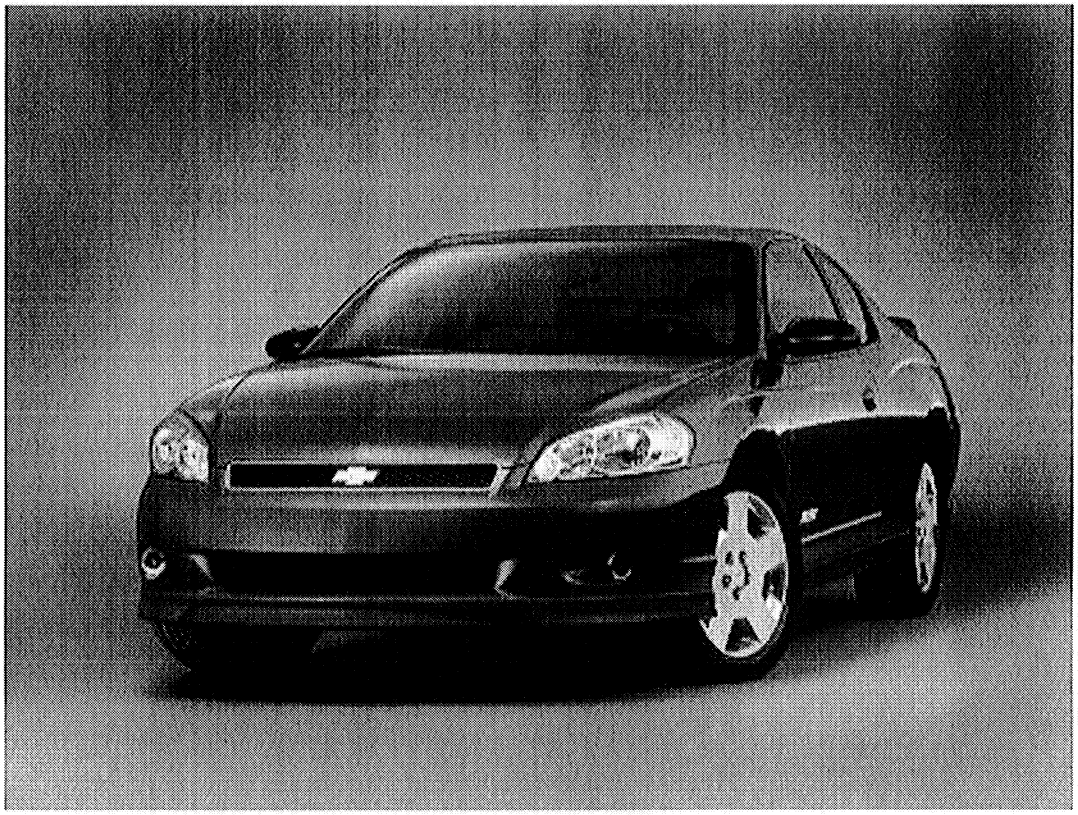
Chevrolet

Monte Carlo



2006

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Product Information

2006 Monte Carlo: A New Look For an On-Track Winner

The aggressively styled 2006 Chevy Monte Carlo heats up the sizzling mid-car segment with enhanced premium-quality features, racing-inspired styling, a new family of powerful engines, as well as thoughtful attention to detail. A new look for the front and rear fascias – including bold headlamps and taillamps – is complemented by revised suspension systems that deliver comfortable, quiet and more confident ride and handling characteristics. These new ingredients improve on an already popular recipe for driving satisfaction.

Monte Carlo draws on a rich NASCAR stock car racing legacy – the most successful nameplate in the sport's history – to offer one of the industry's only true midsize personal coupes. The vehicle has remained true to the roots of style and performance established at its introduction in 1970.

"For '06, Monte Carlo delivers more of the performance and style demanded by customers, but with an increased emphasis on comfort, roominess and driving manners," said Brent Dewar, General Motors North America vice president of marketing and advertising . "We fine-tuned the details to deliver a value-driven vehicle that delivers unexpected refinement."

A new family of premium-feature V-6 engines is available in LS, LT and LTZ models, including a 211-horsepower (157 kw) 3500 3.5L V-6 and an available 3900 3.9L V-6 that uses variable valve timing and variable intake technology to help deliver 242 horsepower (180 kw) and 242 lb.-ft. (328 Nm) of torque.* The muscular Monte Carlo SS has a new 5.3L small-block V-8 that's good for 303 horsepower (226 kw) and 323 lb.-ft. (438 Nm) of torque. The 5.3L V-8 uses Displacement on Demand technology to regulate between eight-cylinder and four-cylinder operation, providing up to 8 percent improved fuel economy in certain driving conditions.

All engines are matched to the Hydra-Matic 4T65-E four-speed automatic transmission. This smooth shifting transmission is renowned for its durability and strength with high-torque engines. The version mated with the 5.3L V-8 is enhanced to match the engine's increased torque output.

Highlights for the 2006 Monte Carlo include:

- All-new family of 3.5L and 3.9L V-6 engines in LS, LT and LTZ models
- Standard 5.3L small-block V-8 with Displacement on Demand technology in SS model
- Hydra-Matic 4T65-E four-speed automatic transmission mated to all engines; enhanced version used with 5.3L V-8
- Modified exterior styling with bold headlamps and taillamps
- Retuned suspensions with wider front track
- New family of 16-, 17- and 18-inch wheels and tires
- Enhanced ABS and traction control
- Revised interior with high-quality attention to detail, including improved seat upholstery stitching, low-gloss IP components and jewel-like IP details
- High-quality Nuance Sandstone leather seating (available)
- New family of audio systems
- Standard dual-stage frontal air bags
- Available side seat-mounted air bags for front passengers (Monte Carlo)
- Factory-installed remote vehicle starter available
- Standard OnStar

Design details

Monte Carlo has a revised look, both inside and out. The exterior features large headlamps that have a premium, jeweled appearance with three independent lighting units. These details complement other high-quality attributes to provide an overall feeling of solidity. Also, new, flat-blade windshield wipers are used to provide consistent pressure on the glass, which helps eliminate streaking and wind noise. All models receive a sporty rear spoiler.

The Monte Carlo SS has a distinct front-end appearance, with a dual-split grille that has a black-diamond crosshatch pattern. The rear spoiler is unique, too, suggesting the purposefulness of NASCAR spoilers. Corvette-inspired bright exhaust outlets also are standard on the Monte Carlo SS.

Inside, the seats have a cleaner, simpler and more tailored appearance. Uplevel, available Nuance leather-covered seating features premium deck seams around their perimeter and French seams on the center cushions. The seats also have firmer cushions and increased lumbar support that provide more comfort, especially during long drives.

A revised cockpit-style instrument panel with a new instrument layout and control center stack is woven into '06 models, along with a sportier shifter with chrome accents. The Monte Carlo features premium materials throughout the interior and trunk area, including low-gloss trim and tight tolerances. Tight gaps and flush fitment throughout demonstrate quality and attention to detail.

Comfort and convenience are paramount to coupe buyers and Monte Carlo delivers with:

- Available dual-zone climate control system with up to 12 degrees F temperature setting difference between the two front zones
- Available factory-installed remote vehicle start system with a 197-foot (60-meter) range and automatic climate pre-conditioning to warm or cool the vehicle prior to entry
- Easier-to-read, more informative gauge cluster and driver information center – with more than 50 alerts, depending on the vehicle's equipment
- Standard easy-to-access, steering wheel-mounted cruise control buttons
- Steering wheel radio controls on uplevel models
- Available leather-trimmed, heated driver and front passenger seats

A new family of audio systems also debuts on the '06 Monte Carlo . The three systems feature new, simple-to-operate radios that are compatible with the enhanced OnStar system. The base CD-radio includes a six-speaker system. An uplevel MP3/CD-radio is configured for XM Satellite Radio, with a two-line, 32-character reconfigurable display and the capability to select between AM, FM and XM stations without having to reset the frequency. An uplevel ICDX radio adds an in-dash six-CD changer. Monte Carlo also offers a premium Bose audio system.

All radios include a standard auxiliary input for external devices, such as an iPod or MP3 player, to be played through the vehicle's audio system. The input is located in the lower right corner of each radio.

Chassis and suspension

A more robust front-end structure provides a firmer foundation to help reduce noise vibration and harshness (NVH). It also provides improved steering and handling performance. Fully boxed upper frame rail assemblies have a wider, deeper and structurally stronger upper front tie bar, with slight machining differences between V-6 and V-8 models to provide room for the 5.3L small-block V-8 engine. Stronger ties between the upper and lower rails stiffen the front structure for improved ride and handling and a large, lower front-of-dash panel has been strengthened. It is constructed from Quiet Steel laminated steel, which consists of sound deadening material bonded between sheets of steel and reduces resonant sound from a "clanging" to a muted "thud."

A stiffer, extruded aluminum engine cradle is used, too, and contributes to a smoother ride with less vibration. The cradle's lateral stiffness (at the steering joint) is increased with a new, one-piece machined rear cross member and new aluminum, load-bearing rear body mounts, which improve handling control. Models equipped with a V-6 engine have a two-point engine-mounting system, while V-8 models have a three-point mounting system.

A power rack-and-pinion steering system is standard on all models, with the base LS model now sharing the same, responsive 13.3:1 steering ratio of uplevel models. All models also receive a quieter, improved performance power steering pump and fluid reservoirs. The new system optimizes internal flow of the hydraulic steering fluid within both the pump and the reservoirs.

At the front suspension, a MacPherson strut coil-over-spring independent front suspension with gas-charged four-valve struts and a stabilizer bar are used. Taller jounce bumpers in the front suspension help enhance stability and control. The rear suspension uses a trailing arm, tri-link setup with gas-

charged, four-valve struts and coil springs. A rear stabilizer bar is standard on all models. From these basic suspension designs, three separate suspension settings are available, each tuned to match the power and expected performance level of its respective model:

FE2 (16-inch wheels): Standard on the base LS with the 3.5L V-6. It provides improved control over previous base models without compromising ride quality. Stiff, constant-rate front springs and variable-rate rear springs are used to provide higher roll rates. Up front, a stiffer torque strut design reduces NVH and helps provide a smoother, quieter ride. The package includes 16-inch wheels and P225/60R16 ALS (all-season) Goodyear Integrity radials, specifically developed to provide a quieter ride and increased fuel economy. A 10-mm (0.4-inch) wider track also is achieved, as the 16-inch wheels each are moved 5 mm outboard.

FE2 (17-inch wheels): The FE2 suspension also is available with 17-inch wheels and tires for better high-speed control. This combination is standard with vehicles equipped with the 3.9L V-6. The 3.9L engine also receives more powertrain damping to help optimize ride quietness, smoothness and handling. P225/55R17 AL2 (touring) Goodyear Eagle LS2 radials are partnered with the 17-inch aluminum wheels, providing greater handling capability and more stability during tighter turns.

FE4 (SS model): Monte Carlo SS comes with the FE4 suspension, which is tuned to provide a sporty ride that complements the 5.3L small-block V-8's performance. It offers increased stiffness and ride control, with reduced body lean and greater high-speed stability. The 34-mm hollow front stabilizer bar and 18-mm solid rear stabilizer bar are larger in diameter than the bars of the two FE2 suspension settings, providing increased roll control. Eighteen-inch alloy wheels with W-rated P235/50R18 AL3 Goodyear Eagle RS-A performance tires are included with the FE4 suspension.

Safety and crash avoidance

The Monte Carlo has standard dual-stage frontal air bags and offers new optional side-impact (seat-mounted) air bags, which help optimize head and torso protection for the driver and front passenger. The list of other standard and available safety features includes:

- Use of high-strength steel in the engine compartment, torque box and rocker panels reinforces the structure to protect against front and side impacts
- An improved four-wheel-disc brake system with all-new front brakes, improved rear brakes and increased brake boost. The system provides more stopping power and reduced stopping distances, compared to previous models, as well as smoother and quieter performance, longer pad life, and more resistance to brake pulsation.
- A new ABS system is standard on all trim levels except the base model. ABS helps provide improved steering control while preventing wheel lock-up during braking. It also includes Electronic brake force distribution, which helps provide optimum braking regardless of load, traction or braking speed.
- An available engine- and brake-managed full-function traction control system works with the ABS system to help ensure stable acceleration on a variety of road conditions.
- Pretensioners are standard on the front safety belts, which help minimize forward movement during a frontal collision and new, more effective load-limiting retractors. The retractors have more "take-up" force, cinching the belt more tightly.
- Three-point safety belts for all seating positions.
- LATCH (Lower Anchors & Tethers for CHildren) child seat attachment system is included in all second row seating positions.
- Revised head protection from impacts to the upper interior structure is provided by energy-absorbing material placed strategically along the roof rails behind the A-, B- and C-pillars.
- Strengthened front seat structure.
- Headlamps that provide more down-the-road visibility than previous models, with higher-intensity bulbs and a new four-bulb burn configuration in which the low beams stay on when the high beam is activated.
- Tire Pressure Monitoring System is standard on models equipped with 17- and 18-inch wheels.

- An upgraded standard remote keyless entry (RKE) system now provides a second function for the red panic button. Drivers can use the button to locate their cars, without sounding the panic alarm.

OnStar-equipped Monte Carlo models feature OnStar dual-mode (analog-digital) equipment. OnStar's digital equipment also includes enhanced hands-free voice recognition capabilities including more intuitive continuous digit dialing and improved voice recognition accuracy. OnStar is the leading provider of in-vehicle safety, security and information services in the United States and Canada . Using the GPS satellite network and wireless technology, OnStar features core safety services and OnStar Hands-Free Calling that allows drivers to make and receive voice-activated phone calls using an externally mounted antenna for greater reception.

The OnStar service standard on the 2006 Monte Carlo includes the General Motors Advanced Automatic Crash Notification (AACN) system, making crash data available to the participating 911 centers to help them dispatch the appropriate live-saving personnel and equipment to crash scenes faster.

* *Horsepower and torque SAE certified. A new voluntary power and torque certification procedure developed by the SAE Engine Test Code committee was approved March 31, 2005 . This procedure (J2723) ensures fair, accurate ratings for horsepower and torque by allowing manufacturers to certify their engines through third-party witness testing. GM was the first auto manufacturer to begin using the procedure and expects to use it for all newly rated engines in the future.*

New For 2006

- Enhanced exterior styling with new front and rear fascias; bold headlamps and taillamps
- All-new family of 3.5L and 3.9L V-6 engines with variable valve timing
- SS model features new 5.3L small-block V-8 with Displacement on Demand technology
- Sporty interior with revised instrument panel and controls
- New family of audio systems
- Standard dual-stage frontal air bags
- Available side-impact (seat-mounted) air bags
- Standard OnStar

Model Lineup

	Engines			Transmission
	3500 3.5L V-6 (LZE – U.S. , LZ4 – Canada)	**3900 3.9L V-6 (LZ9)**	**5300 5.3L V-8 (LS4)**	**4-spd auto (Hydra-Matic 4T65-E)**
LS	s	–	–	s
LT	s	o	–	s
LTZ	–	s	–	s
SS	–	–	s	s*

* heavy-duty version

Standard	s
Optional	o
Not available	–

Specifications

Overview	
Models:	Chevrolet Monte Carlo LS, LT, LTZ and SS
Body style / driveline:	5-passenger, 2-door, front-engine, front-drive coupe
Construction:	2-sided galvanized steel (except roof); Quiet Steel (F.O.D.)
EPA vehicle class:	mid-size coupe
Manufacturing location:	Oshawa, Ontario, Canada
Key competitors:	primary: Chrysler Sebring; secondary: Honda Accord Coupe, Toyota Camry Solara

Engines	3500 3.5L V-6 (LZE	3900 3.9L V-6 (LZ9)	5.3L V-8 (LS4)
Application:	LS, LT	LT, LTZ	SS
Type:	3.5L V-6	3.9L V-6	5.3L V-8
Displacement (cu in / cc):	213 / 3490	237 / 3880	325 / 5328
Bore & stroke (in / mm):	3.90 x 2.99 / 99 x 76	3.90 x 3.31 / 99 x 84	3.78 x 3.62 / 96 x 92
Block material:	cast iron	cast iron	cast aluminum
Cylinder head material:	cast aluminum	cast aluminum	cast aluminum
Valvetrain:	overhead valve, 2 valves per cylinder, continuously variable valve timing	overhead valve, 2 valves per cylinder, continuously variable valve timing	overhead valve, 2 valves per cylinder, continuously variable valve timing , hydraulic roller lifters
Ignition system:	Quick Sync 58X; direct Iridium electrode tip / iridium core spark plugs, low resistance spark plug wires	Quick Sync 58X; direct Iridium electrode tip / iridium core spark plugs, low resistance spark plug wires	coil-near-plug, Iridium electrode tip / iridium core spark plugs, low resistance spark plug wires
Fuel:	sequential fuel injection	sequential fuel injection	Displacement on Demand; sequential fuel injection
Compression ratio:	9.8:1	9.8:1	10:1
Horsepower (hp/ kw @ rpm):	211 / 157 @ 5900*	242 / 180 @ 6000*	303 / 226 @ 5600 (est.)
Torque (lb-ft / Nm @ rpm):	214 / 290 @ 4000*	242 / 328 @ 4400*	323 / 438 @ 44 00 (est.)
Fuel:	(LZ4) regular unleaded; (LZE) regular unleaded, E85-capable	regular unleaded	premium recommended but not required
Maximum engine speed (rpm):	6400	6400	6000
Emissions controls:	close-coupled catalytic converter, Quick Sync 58X ignition, returnless fuel rail, fast-response O^2 sensor	close-coupled catalytic converter, Quick Sync 58X ignition, returnless fuel rail, fast-response O^2 sensor	underfloor catalytic converter, Quick Sync 24X ignition, returnless fuel rail, fast-response O^2 sensor
Estimated fuel economy (mpg city / hwy / combined):	TBD	TBD	TBD

Transmission	
Type:	Hydra- Matic 4T65-E, 4-speed automatic, front-wheel drive
Gear ratios (:1):	
First:	2.92
Second:	1.56
Third:	1.00
Fourth:	0.70
Reverse:	2.38
Final drive ratio:	3.5L – 2.86:1 3.9L – 3.29:1 5.3L – 3.29:1
Overall drive ratio:	3.5L – 2.86:1 3.9L – 3.29:1 5.3L – 2.93:1

Chassis/Suspension	
Suspension type:	std. with 3.5L, 3.9L: FE1; std with 5.3L: FE3
Front:	independent MacPherson strut coil-over-spring, twin-tube dampers with gas-charged valving; coil springs; hollow 30-mm stabilizer bar (FE3 has hollow 34-mm stabilizer bar)
Rear:	independent tri-link coil over strut, twin-tube dampers, variable-rate coil springs, 16-mm solid stabilizer bar (FE1); (SS FE3 has dual rate coil springs, hollow 19.4-mm stabilizer bar)
Steering type:	power rack-and-pinion (all models)
Steering ratio:	13.3:1 (all models)
Steering wheel turns, lock-to-lock:	3.5L and 3.9L: 2.4 5.3L: 2.3
Turning circle, curb-to-curb (ft / m):	3.5L and 3.9L: 38 / 11.6 5.3L: 40 / 12.2

Brakes	
Type:	4-wheel disc with power assist, vented front, solid rear
Rotor diameter x thickness (mm):	front: 303 x 30; rear: 278 x 11
ABS	opt. LS, std: LT, LTZ, SS

Wheels/Tires			
	w/ 3.5L engine	**w/ 3.9L engine**	**w/ 5.3L engine**
Wheel size and type:	std: 16 x 6.5-inch, steel wheel w/ five-spoke composite wheel cover; opt: same size painted aluminum wheels	std: five-spoke 17x 6.5-inch machine face aluminum wheel	std: 18x 7-inch machine face or polished finish aluminum wheel
Tires:	P225/60R16 ALS all-season Goodyear Integrity blackwall	P225/55R17 AL2 touring Goodyear Eagle LS2 blackwall	P235/50R18 W-rated AL3 Goodyear Eagle RS-A blackwall

Dimensions

Exterior		
Wheelbase (in / mm):	110.5 / 2807	
Overall length (in / mm):	196.7 / 4995	
Overall width (in / mm):	72.9 / 1851	
Overall height (in / mm):	55.8 / 1418	
Track (in / mm):	(all) front: 62.4 / 1585.5; rear: 61.5 / 1562	
Curb weight (lb / kg):	LS: 3354.2 / 1521.2 LT: 3396.2 / 1540.2 SS: 3489.6 / 1582.6	
Weight distribution (% front / rear):	LS: 63 / 37 LT: 64 / 36 SS: 64 / 36	
Drag coefficient:	0.36	
Interior		
	Front	**Rear**
Seating capacity:	All models: 2	All models: 3
Headroom (in / mm):	38.1 / 968	36.5 / 927
Legroom (in / mm):	42.4 / 1072	35.8 / 909
Shoulder room (in / mm):	58.3 / 1481	57.0 / 1468
Hip room (in / mm):	55.2 / 1402	55.5 / 1410
Rear pass-through (in / mm):	All models: 2	All models: 3
Capacities		
EPA interior volume (cu ft / L):	98.2 / 2781	
Cargo volume (cu ft / L):	15.8 / 447	
Trailer towing maximum (lb / kg):	1000 / 454	
Fuel tank (gal / L):	17.5/ 66.2	
Engine oil (qt / L):	3.5L: 4.5 / 4.3 3.9L: 4.5 / 4.3 5.3L: 6.0/ 5.7	
Cooling system (qt / L):	3.5L: 11.7 / 11.1 3.9L: 12.2 / 11.5 5.3L: TBD	

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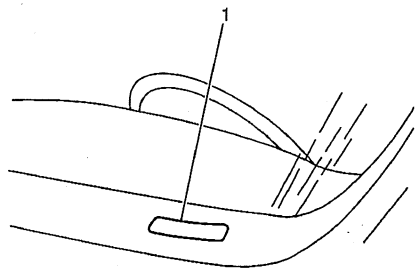
Vehicle Identification

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	1	Canada
2	Manufacturer	G	General Motors
3	Make	1	Chevrolet
4 5	Carline/Series	W/B W/C W/D	Monte Carlo Base LS Monte Carlo LT Monte Carlo SS
6	Body Style	2	Two-Door Sedan
7	Restraint System	2	Active Manual Belts W/Driver and Passenger Supplemental Inflatable Restraint Frontal
8	Engine Type	1 1 8 C	Gas, 6 Cyl, 3.5L, SFI, V6, Flexible Fuel, (Gas/Ethanol), 6 Cyl, 3.5L, SFI, V6, Gas, 6 Cyl, 3.9L, SFI, V6 Gas, 8 Cyl, 5.3L, SFI, Alum, Cylinder Deactivation, GM
9	Check Digit	--	Check Digit
10	Model Year	6	2006
11	Plant Location	9	Oshawa #1, ON
12-17	Plant Sequence Number	w	100001

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	Model Year	6	2006
3	Assembly Plant	9	Oshawa #1
4-9	Plant Sequence Number	--	--

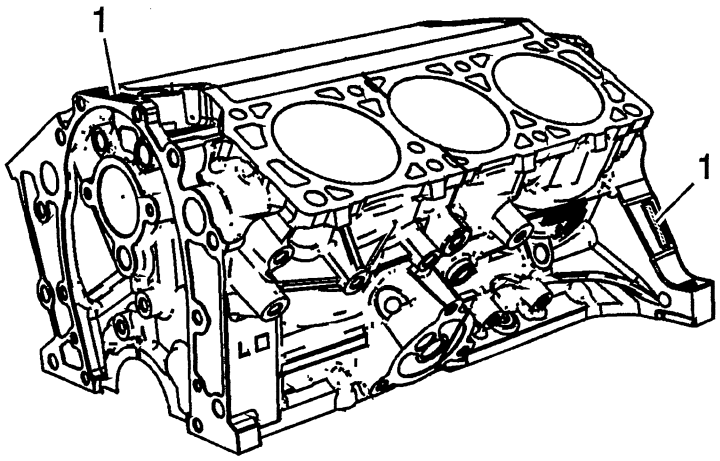
A VIN derivative can be used to determine if a vehicle contains the original engine or transmission, by matching the VIN derivative positions to their accompanying positions in the complete VIN:

VIN Derivative Position	Equivalent VIN Position
1	3
2	10
3	11
4-9	12-17

Engine ID and VIN Derivative Location

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 more information on the VIN derivative, refer to VIN Derivative above.

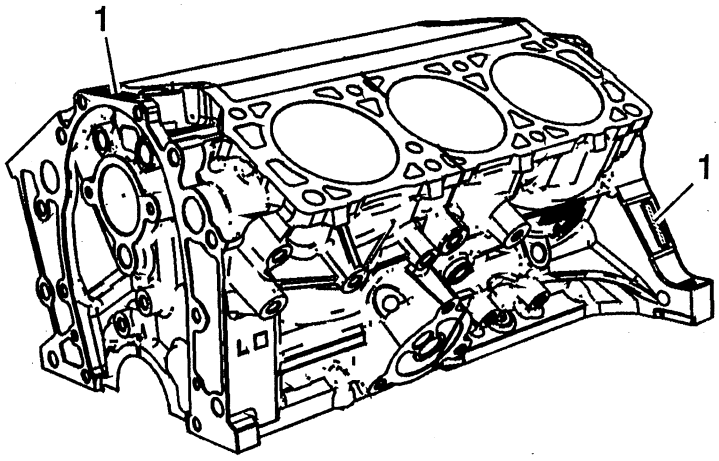
3.5L RPO LZ4/LZE Engine VIN Derivative Location(c)



The Vehicle Identification Number for the LZ4 is stamped or laser etched on the front and left side of the engine block - derivative is nine digits long and can be used to determine if a vehicle contains the original engine.

- The first digit identifies the division.
- The second digit identifies the model year.
- The third digit identifies the assembly plant.
- The fourth through ninth digit are the last six of the Vehicle Identification Number - VIN.

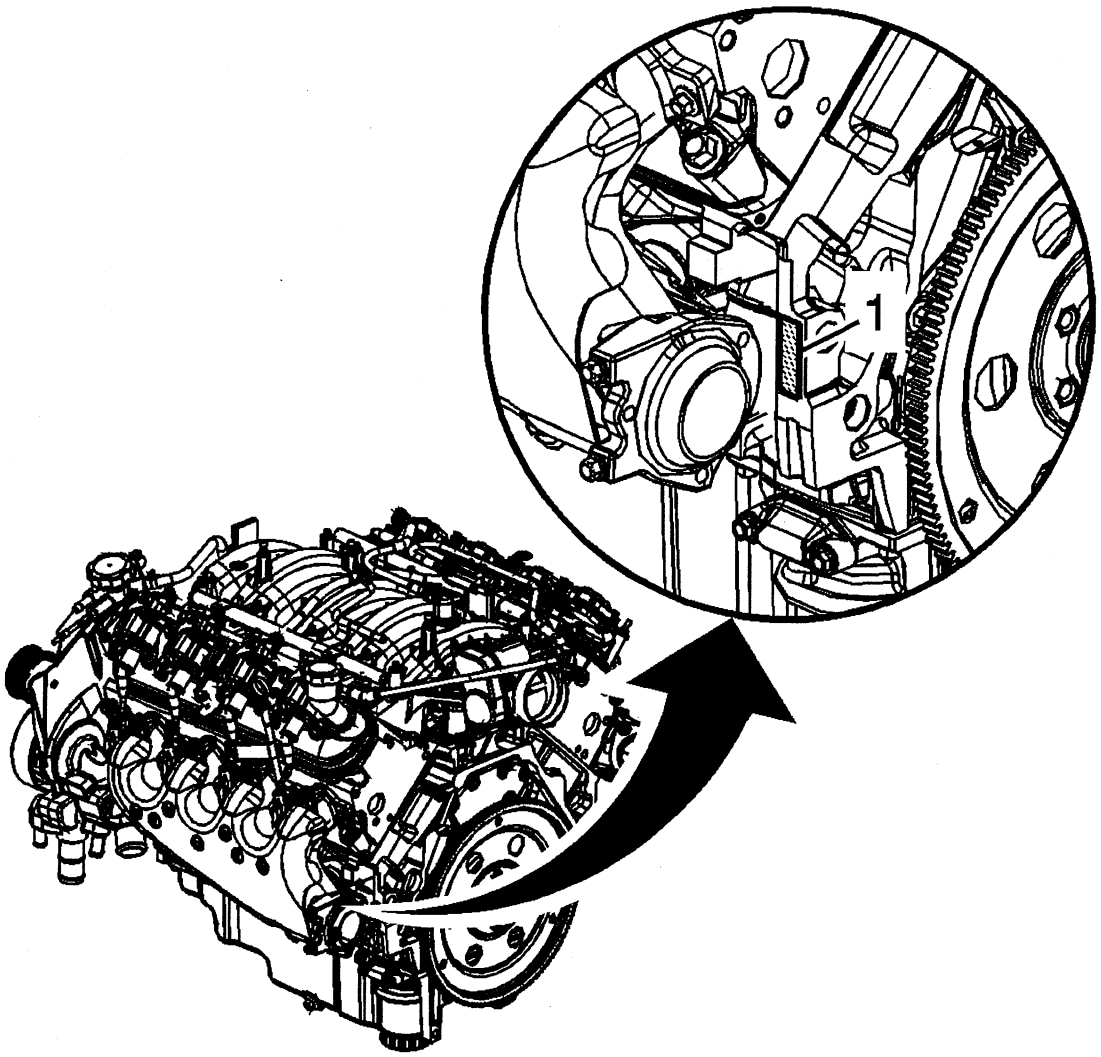
3.9L RPO LZ9 Engine VIN Derivative Location(c)



The Vehicle Identification Number for the LZ9 is stamped or laser etched on the front and left side of the engine block - derivative is nine digits long and can be used to determine if a vehicle contains the original engine.

- The first digit identifies the division.
- The second digit identifies the model year.
- The third digit identifies the assembly plant.
- The fourth through ninth digit are the last six of the Vehicle Identification Number - VIN.

5.3L RPO LS4 Engine VIN Derivative Location(c)

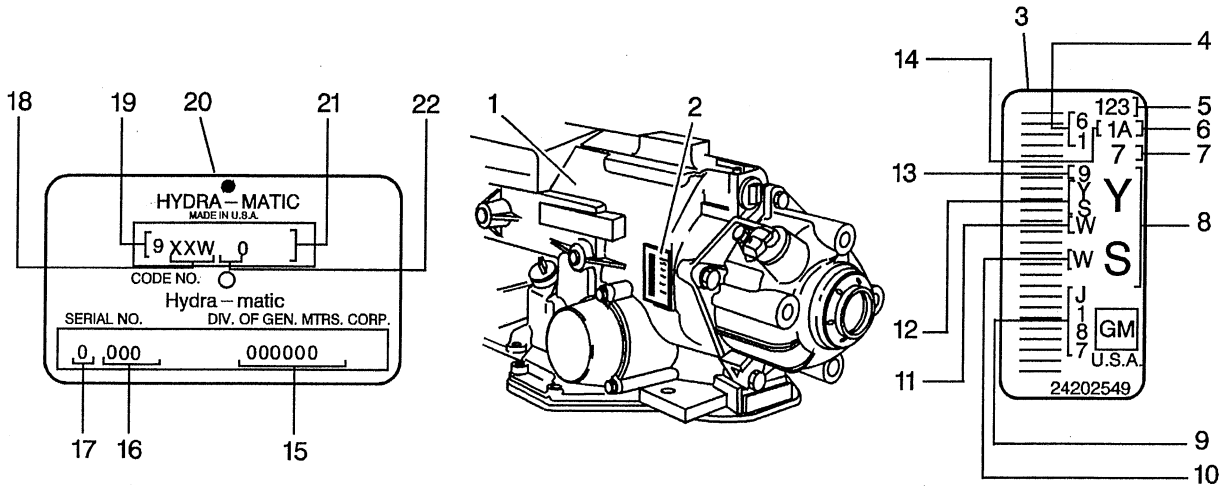


The vehicle identification number (VIN) is located on the left side rear of the engine block (1) and is typically a 9 digit number stamped or laser-etched onto the engine at the vehicle assembly plant.

- The first digit identifies the division.
- The second digit identifies the model year.
- The third digit identifies the assembly plant.
- The fourth through ninth digits are the last 6 digits of the VIN.

Transmission ID and VIN Derivative Location

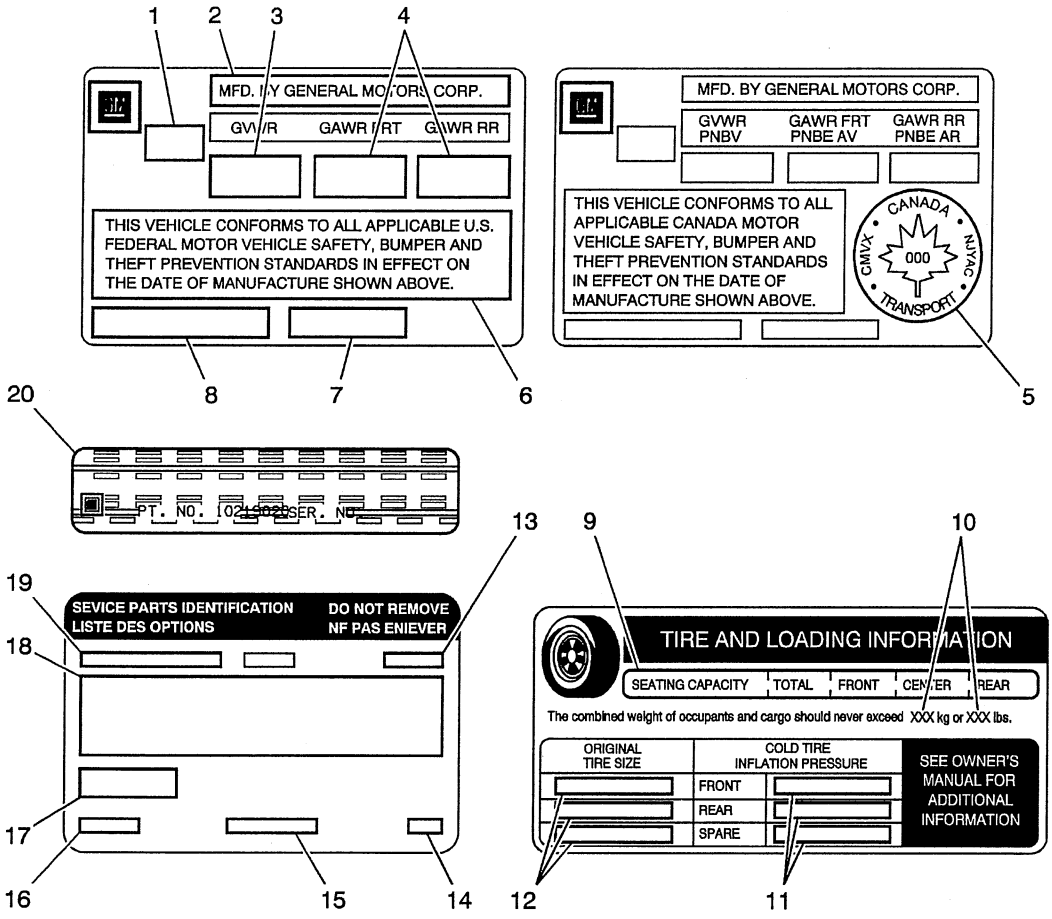
Transmission ID and VIN Derivative Location 4T65-E(c)



(1) Goodwrench® Tag Location
(2) Year
(3) Not Used
(4) Remanufacturing Site Code
(5) Serial Number
(6) Julian Date
(7) Year Remanufactured
(8) Model
(9) Transmission Identification Plate Location
(10) Model Year
(11) Line Build
(12) GM Production Code
(13) Julian Date
(14) Shift
(15) Model
(16) Serial Number in Base Code 31
(17) W = Warren Assembly Plant
(18) 4T65-E
(19) Model
(20) Vehicle Identification Number (VIN) Derivative Stamping Location

All automatic transmissions have a metal identification (ID) nameplate (9) attached to the case exterior.

Label - Vehicle Certification, Tire Place Card, Anti-Theft and Service Parts ID



Callout	Description
Vehicle Certification Label	
The vehicle certification label is located on the driver door and displays the following assessments: Gross Vehicle Weight Rating (GVWR) Gross Axle Weight Rating (GAWR), front and rear The gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. The GVW must not exceed the GVWR. Include the following items when figuring the GVW: The base vehicle weight (factory weight) The weight of all vehicle accessories The weight of the driver and the passengers The weight of the cargo	
1	Name of Manufacturer
2	Gross Vehicle Weight Rating
3	Gross Axle Weight Rating (Front, Rear)
4	Canadian Safety Mark (w/RPO Z49)
5	Certification Statement
6	Vehicle Class Type (Pass Car, etc.)
7	Vehicle Identification Number
8	Date of Manufacture (Mo/Yr)

Callout	Description
Tire Placard	
The tire placard label is located on the driver door and displays the following assessments:	
9	Specified Occupant Seating Positions
10	Maximum Vehicle Capacity Weight
11	Original Equipment Tires Size
12	Tire Pressure, Front, Rear, and Spare (Cold)
Service Parts ID Label	
The vehicle service parts identification label is located in the rear compartment under the spare tire cover. The label is use to help identify the vehicle original parts and options.	
13	Vehicle Identification Number
14	Engineering Model Number (Vehicle Division, Line and Body Style)
15	Interior Trim Level and Decor
16	Exterior (Paint Color) WA Number
17	Paint Technology
18	Special Order Paint Colors and Numbers
19	Vehicle Option Content
Anti-Theft Label	
20	The Federal law requires that General Motors label certain body parts on this vehicle with the VIN. The purpose of the law is to reduce the number of motor vehicle thefts by helping in the tracing and recovery of parts from stolen vehicles. Labels are permanently affixed to an interior surface of the part. The label on the replacement part contains the letter R, the manufacturer's logo, and the DOT symbol. The anti-theft label must be covered before any painting, and rustproofing procedures, and uncovered after the procedures. Failure to follow the precautionary steps may result in liability for violation of the Federal Vehicle Theft Prevention Standard and possible suspicion to the owner that the part was stolen.

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
AG1	Adjuster, Driver Seat Power Multidirectional
AG2	Adjuster, Passenger Seat Power Multidirectional
AH5	Adjuster Frt Seat Power, 8-Way, No Memory, Driver
AK5	Restraint System, Front Seat Inflatable Driver and Passenger
AMF	Lock Control Additional, Programmable, Remote Entry, Multiple Units
AM6	Seat, Front Split Bench
AM9	Split Folding Rear Seat
AN3	Seat Frt, Individual (Non BKT)
AP3	Lock Control, Entry Remote, Keyless Entry, Start
AP8	Lock Control, Remote Entry, Extended Range
AP9	Convenience Net
AR9	Seat Front Bucket, Deluxe
AU0	Lock Control, Remote Entry
AW6	Restraint System Seat, Inflatable, Driver and Passenger Front, Inflatable Driver Side
AY1	Restraint System Seat, Inflatable, Driver and Passenger, Roof Side
A75	Seat Cushion Back Front, HD
A76	Seat Cushion Back Rear, HD
A98	Lock Control Rear Compartment Lid, Remoter Control Electric Release, Ignition Powered
BAG	Parts Package Export
BNB	Ornamentation Extr, Unpainted
BYP	Sales Sport Equipment Package
B3V	Test Extended Water
B34	Covering, Front Floor Mats, Carpeted Inserts
B35	Covering, Rear Floor Mats, Carpeted Inserts
B42	Covering Floor Mat, Luggage Compartment, Fitted
B86	Molding Body Side Color
CD5	Wiper System Windshield, High Speed Antilift
CF5	Roof, Sun Glass, Sliding Electric
CJ3	HVAC System, Air Conditioner Front, Manual Temperature Control, Auxiliary Temperature Control
CKD	Vehicle Completely Knocked Down CKD
C67	HVAC System, Air Conditioner FRT, Electronic Controls
C79	Interior Lamp, Roof Rail, Courtesy and Single Reading
DD6	Mirror, Inside Rear View Light Sensitive, Dual Reading Lamps
DG7	Mirror Outside LH and RH, Remote Control, Electric, Color
DH6	Mirror, Inside Sunshade Illuminated LH and RH
DK2	Mirror O/S LH and RH, Remote Control, Electric, Heated Color
DK6	Console Roof Interior
DL5	Decal, Roadside Service Information
D55	Console Front Compartment, Floor
D58	Spoiler Rear, Delete
D81	Aero Wing Rear Spoiler
EXP	Export
E27	Handle, Assist, Pass
E28	Handle, Assist
FE1	Suspension System, Soft Ride
FE2	Suspension System, Ride, Handling

RPO	Description
FE3	Suspension System, Sport
FE4	Suspension System Specil Ride and Handling
FE9	Certification Emission, Federal
FQ3	Ratio, Transaxle Final Drive, 2.86
FR2	Ratio Transaxle Final Drive 2.93
FR9	Ratio, Transaxle Final Drive, 3.29
F83	Ratio, Transaxle Final Drive, 3.05
GFO	Appearance Package Exterior
JA9	Brake, Heavy Weight, Disc/Disc
JB9	Brake, Light Weight, Disc/Disc
JL9	Brake System, Power Front and Rear Disc, Antilock Front and Rear Wheel
J65	Brake System, Power Front and Rear Disc
KA1	Heater, Seat, Frt
KD1	Cooling System Trans, Oil
KG4	Generator, 150 Amp
KG7	Generator, 125 Amp
KW3	Generator, 135 Amp
K05	Heater, Engine Block
K20	Module, Electronic Control
K34	Cruise Control, Automatic, Electronic
K43	Generator, 102-Amp
LA1	Engine Gas, 6 CYL, 3.4L, MFI, HO, GM
LZE	Engine Flexible Fuel, (Gas/Ethanol), 6 Cyl, 3.5L, SFI, V6, Offset Bore, GM
LS4	Engine Gas, 8 Cyl, 5.3L, SFI, ALUM, Cylinder Deactivation, GM
LZ4	Engine Gas, 6 Cyl, 3.5L, SFI, V6, Offset Bore, GM
LZ9	Engine Gas, 6 Cyl, 3.9L, SFI, V6, Offset Bore, GM
L36	Engine, Gas, 6 CyL, 3.8L, MFI, HO, ERV6 Series
L67	Engine Gas, 6 Cyl, 3.8L, MFI, V6, Supercharged
MN7	Transmission, Automatic 4-Speed HMD, 4T65-E, Heavy Duty
MXO	Merchandised Transmission Automatic Provisions, O/D
M15	Transmission, Automatic 4-Speed 4T65-E, Enhanced Electronic
NB8	Emission Override California System
NC7	Emission Override Federal System
NE1	Certification Emission, Geographically Restricted Registration for Vehicles up to 14,000 lbs GVW (Use 2003 Mdl Yr)
NF4	Emission System Clean Fuel Fleet
NF9	Emission System General Unleaded
NK5	Steering Wheel, Standard
NP5	Steering Wheel, Leather-Wrapped
NT7	Emission System Federal, Tier 2 Phase-Out
NT9	Emission System Federal, Tier 2 Phase-Out
NU1	Emission System California A, Lev 2
NU4	Emission System California Lev 2 Plus
NW1	Wheel 18 X 7, Aluminum, Polished
NW5	Wheel 18 X 7, Aluminum, Polished
NW9	Electronic Traction Control
NX5	Wheel, 16 x 16.5, Aluminum, Sport
N05	Lock Control, Fuel Filler Cap
N81	Tire, Spare, Full Size
N92	Cover, Wheel, Bolt-on
N99	Wheel, Heavy Duty
OSH	Plant Code Oshawa 1, Ontario Canada

RPO	Description
PA9	Wheel 17 X 6.5, aluminum, 5 Spoke, Chrome
PFH	Wheel 17 X 6.5, Aluminum, Machined
PO4	Wheel 17 x 6.5, Aluminum, Sport
PYO	Wheel 16 X 6.5, Aluminum
P01	Trim, Disc Wheel, VAR 1
QB5	Wheel 16 x 6.5, Steel
QDG	Tire All-P235/50R18-97W BW R/PE ST TL AL3
QD2	Wheel 16 x 6.5, Aluminum, 5 Spokes
QD5	Wheel Spare Compact, Aluminum
QG9	Wheel 16 X 6.5, Aluminum, Machined Face
QNX	Tire, All P225/60R16/N BL R/PE ST TL AL2
QPP	Tire All-P225/60R16-97V BW R/PE ST TL AL3
QPX	Tire All-P225/60R16-97S BW R/PE ST TL ALS
QTI	Tire, All P225/60R16-97H BW R/PE ST TL AL3, Police Usage
QUF	Tire All 225/60R16-98S BW TL ALS
QVG	Tire, All P225/60R16-97S BL R/PE ST TL AL3
QVS	Tire All-P225/55R17-95T BW R/PE ST TL AL2
QWM	Tire All P235/55R17-98W BW R/PE ST TL AL3
T53	Lamp Package Emergency Vehicle Rear Compartment Lid
T62	Lamp System Daytime Running
UA6	Theft Deterrent System
UB3	Cluster Instrument, Oil, Coolant, Temperature, Volts, Trip Odometer, Tachometer
UC9	Cluster INST, Oil, Cool TEMP, Trip Odom, TACH, Super Charger Boost
UE0	Communication System Vehicle, G.P.S., Not Installed
UE1	Communication System Vehicle, G.P.S. 1
UG1	Garage Door Opener, Universal
UH8	Cluster, Instrument, Coolant Temperature, Trip Odometer, Tachometer
UJ6	Indicator, Low Tire Pressure
UK3	Control Steering Wheel, Accessory
UL0	Radio, AM/FM Stereo, Seek/Scan, Automatic Reverse Music Search Cassette, Automatic Tone, Clock, ETR
UL2	European Frequencies
UN0	Radio, AM/FM Stereo, Seek/Scan, CD, Auto Tone, Clock, ETR
UN9	Radio Equipment, Supression
UP0	Radio, AM/FM Stereo, Seek/Scan, Automatic Reverse Music Search Cassette, CD, Auto Tone, Clock ETR
UQ3	Speaker System, Performance-Enhanced Audio
US8	Radio AM/FM Stereo, Seek/Scan, CD, Auto Tone, Clock, ETR, MP3, RDS
US9	Radio AM/FM Stereo, Seek/Scan, RDS, Multiple Compact Disc, Auto Tone Control, Clock, ETR, MP3
UT7	Provision Auxiliary Electrical System Ground
UW6	Speaker System 6, Custom
U1C	Radio AM/FM Stereo, Seek/Scan, CD, Clock, ETR
U11	Cluster Instrument, Police, Certified Speedo
U19	Speedometer, Instrument Cluster, Kilometer and Miles, Kilometer Odometer
U2E	Instrument Cluster, Coolant Temperature, Trip Odometer
U2K	Digital Audio System S-Band
U62	Speaker System 4, Dual Coax Front, Dual Coax Package Shelf
U68	Display Driver Information Center
U77	Antenna, Rear Window Radio
VCL	Certification Emission, Clean Fuel Vehicle, Fleet
VC1	Label Price/Fuel Econ, Courtesy Delivery

RPO	Description
VC4	Label Price/Fuel Econ, Puerto Rico and Virgin Islands
VC5	Label Shipping, Except US, US Possessions, or Japan
VG1	Protector Underhood Compound, Corrosion Preventive, Waterbased, Clear
VG4	Protector Under Vehicle Compound, Corrosion Preventive, Waterbased, Black
VG6	Label Information Bumper Impact, 5 MPH, California
VG9	Protector Wax, Exterior Body
VH3	Label Information Bumper Impact, 5 MPH, Hawaii
VH9	Envelope, Owner Information Manual
VK3	License Plate Mounting Package, Front
VL7	Label Information Bumper Impact, 5 MPH, Front and Rear, New York
VM3	Label Information Consumer, Contains BPR IMP Standard for Front 5 MPH and Rear 5 MPH
VPM	Modification Noise Control, Mexico
VR6	Hook Tie-Down Shipping
V08	Cooling System Heavy Duty
WL9	Model Conversion Police Vehicle
WU1	Switch Instrumentation Lighting Shut Off
WX7	Wiring Provisions
W86	Equipment, Misc Equipment for Venezuela GMV Controlled
W87	Parts, North American Parts Sourced in Venezuela GMV Controlled
W99	Equipment, Misc Equipment for Venezuela GM Platform Controlled
YF5	Certification Emission, California
Z49	English/French SIR Warning Label
Z7B	Model Conversion Impala SS
Z7C	Model Conversion Monte Carlo Hi-Sport SS
6A3	Covering Floor Mats, Front and Rear, H.D.
6B2	Handle Rear Door, Inoperative
6B7	Wiring Provisions, Roof Panel Access Hole Center
6C7	Lamp Dome Pass
6C8	Cable RG58 A/U Coax Radio Antenna
6E2	Cylinder Unit Single Key System, Coded DF81
6E8	Cylinder Unit Single Key System, Coded NU97
6F5	Wiring Provisions, Roof
6J1	Wiring Provisions, Ignition and Main Power Supply
6J3	Wiring Provisions, Headlamp Flasher, Grille Lamps & Speakers
6J4	Wiring Provisions, Horn/Siren Circuit
6J5	Wiring Provisions, Roof Panel Access Hole RH SI
6J6	Lamp Package Emergency Vehicle R/WDO Panel
6J7	Flasher Headlamp
6N5	Handle Inoperative, RR Window
6N6	Lock Control RR Door, Inoperative
6S1	Lever Auto Transmission, Reduced Length
7B3	Suspension System, Special Handling
7M9	Cooling System Steering Oil and Engine Oil
7X6	Spotlamp Left Pillar Mounted, Halogen
7X7	Spotlamp Left and Right Pillar Mounted, Halogen
7X8	Spotlamp Provisions, Left
7X9	Spotlamp Provisions, Left and Right
7Y6	Switch Dome Lamp, Door Jamb Inoperative
8X1	Vehicle Label, Fasten Seat Belts
9C1	SEO Vehicle Police Car
9C3	SEO Vehicle Police Car, Limited Content
9G8	Equipment, Daytime Running Lamp and Headlamps Control, Delete

Technical Information

Maintenance and Lubrication

Capacities - Approximate Fluid

Application	Specification	
	Metric	English
Cooling System		
3.5L RPO (LX9)	11.6 liters	12.2 quarts
3.9L RPO (L29)	11.6 liters	12.2 quarts
5.3L RPO (LS4)	12.1 liters	12.8 quarts
Engine Oil With Filter		
3.5L RPO (LX9)	4.3 liters	4.5 quarts
3.9L RPO (L29)	3.8 liters	4.0 quarts
5.3L RPO (LS4)	5.7 liters	6.0 quarts
Engine Oil without Filter		
3.5L RPO (LX9)	3.8 liters	4.0 quarts
3.9L RPO (L29)	3.3 liters	3.5 quarts
Fuel Tank	66.2 liters	17.5 gallons
Transmission/Transaxle - 4T65-E		
Automatic - Drain and Refill (2WD)	7.0 liters	7.4 quarts
Automatic - Complete Overhaul (2WD)	9.5 liters	10.0 quarts
Automatic - Dry (2WD)	12.7 liters	13.1 quarts

Maintenance Items

Part	GM Part Number	AC Delco Part Number
Automatic Transaxle Filter	24224522	--
Engine Air Cleaner/Filter	10350737	--
Engine Oil Filter		
3.5L V6 Engine and 3.9L V6 Engine	89017342	PF61
3.5L Flexible Fuel V6 Engine	89017342	PF61
5.3L V8	88984215	PF46
Passenger Compartment Air Filter	15284938	CF132
Spark Plugs		
3.5L V6, 3.5L Flexible Fuel and 3.9L V6 Engine	12591131	41-100
5.3L V8 Engine	12571164	41-985
Windshield Wiper Blades		
Driver's - 22 inches (56.0 cm)	19120351	--
Passenger's-Driver's - 22 inches (56.0 cm)	19120352	--

Fluid and Lubricant Recommendations

Usage	Fluid/Lubricant
Engine Oil	Engine oil which meets GM Standard GM6094M and displays the American Petroleum Institute Certified for Gasoline Engines starburst symbol. GM Goodwrench® oil meets all the requirements for your vehicle.
Engine Coolant	50/50 mixture of clean, drinkable water and use only DEX-COOL® Coolant.
Hydraulic Brake System	Delco® Supreme 11 Brake Fluid or equivalent DOT-3 brake fluid.
Windshield Washer	GM Optikleen Washer Solvent.
Power Steering System	GM Power Steering Fluid (GM Part No. U.S. 89021184, in Canada 89021186).
Automatic Transaxle	DEXRON®-VI Automatic Transmission Fluid.
Key Lock Cylinders	Multi-Purpose Lubricant, Superlube (GM Part No. U.S. 12346241, in Canada 10953474).
Hood Latch Assembly, Secondary Latch, Pivots, Spring Anchor, and Release Pawl	Lubriplate Lubricant Aerosol (GM Part No. U.S. 12346293, in Canada 992723) or lubricant meeting requirements of NLGI #2, Category LB or GC-LB.
Hood and Door Hinges	Multi-Purpose Lubricant, Superlube (GM Part No. U.S. 12346241, in Canada 10953474).
Weatherstrip Conditioning	Dielectric Silicone Grease (GM Part No. U.S. 12345579, in Canada 992887).

GM Oil Life System - Resetting

The Engine Oil Life System calculates when to change your engine oil and filter based on vehicle use. Anytime your oil is changed, reset the system so it can calculate when the next oil change is required. If a situation occurs where you change your oil prior to a CHANGE ENGINE OIL SOON message being turned on, reset the system.

After changing the engine oil, the system must be reset. To reset the CHANGE ENGINE OIL SOON message, do the following procedures:

1. Turn the ignition to RUN, with the engine off.
2. Fully press and release the accelerator pedal slowly three times within five seconds. If the CHANGE ENGINE OIL SOON message flashes, the system is reset. However, if it stays on, it did not reset. Repeat the procedure.
3. Turn the key to OFF.

If the CHANGE ENGINE OIL SOON message comes back on when you start your vehicle, the engine oil life system has not reset. Repeat the procedure.

Descriptions and Operations

Power Steering System

General Description

The hydraulic power steering pump is a constant displacement vane-type pump that provides hydraulic pressure and flow for the power steering gear. The hydraulic power steering pumps are either belt-driven or direct-drive, cam-driven.

The power steering fluid reservoir holds the power steering fluid and may be integral with the power steering pump or remotely located. The following locations are typical locations for the remote reservoir:

- Mounted to the front of the dash panel
- Mounted to the inner fender
- Mounted to a bracket on the engine

The 2 basic types of power steering gears are listed below:

- A recirculating ball system
- A rack and pinion system

In the recirculating ball system, a worm gear converts steering wheel movement to movement of a sector shaft. A pitman arm attached to the bottom of the sector shaft actually moves one tie rod and an intermediate rod move the other tie rod.

In the rack and pinion system, the rack and the pinion are the 2 components that convert steering wheel rotation to lateral movement. The steering shaft is attached to the pinion in the steering gear. The pinion rotates with the steering wheel. Gear teeth on the pinion mesh with the gear teeth on the rack. The rotating pinion moves the rack from side to side. The lateral action of the rack pushes and pulls the tie rods in order to change the direction of the vehicle's front wheels.

The power steering pressure hose connects the power steering pump union fitting to the power steering gear and allows pressurized power steering fluid to flow from the pump to the gear.

The power steering return hose returns fluid from the power steering gear back to the power steering fluid reservoir. The power steering return line may contain an integral fin-type or line-type power steering fluid cooler.

In a typical power steering system, a pump generates hydraulic pressure, causing fluid to flow, via the pressure hose, to the steering gear valve assembly. The steering gear valve assembly regulates the incoming fluid to the right and left chambers in order to assist in right and left turns.

Turning the steering wheel activates the valve assembly, which applies greater fluid pressure and flow to 1 side of the steering gear piston, and lower pressure and flow to the other side of the piston. The pressure assists the movement of the gear piston. Tie rods transfer this force to the front wheels, which turn the vehicle right or left.

Steering Wheel and Column

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 navigation/OnStar® features
- 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.

Ignition Lock Cylinder Control Actuator

If the vehicle is equipped with a floor-mounted console gear shifter, an added safety feature is an ignition lock cylinder control actuator system in the steering column. The ignition lock cylinder control actuator system prevents the steering wheel from being locked when the transmission is in gear and the vehicle may be moving. The column ignition lock system consists of a ignition lock cylinder control actuator and a ignition lock cylinder control switch, that is located in the A/T shift lock control switch. The ignition lock cylinder control actuator contains a spring-loaded pin that mechanically prevents the ignition key cylinder from being turned to the Lock position when the transmission is not in the Park position. If vehicle power is lost or the transmission is not in the Park position, the operator will not be able to turn the ignition key to the Lock position and will not be able to remove the ignition key from the column.

Steering Wheel Controls Description and Operation

The steering wheel control switches duplicate the function of the primary controls of the associated component, through a network of multiple momentary contact switches and a series of resistors. The body control module (BCM) supplies voltage to the switches and monitors the return signal for when a switch is pressed, a specific voltage drop occurs. The BCM identifies the one selected, then sends a serial data message that is received by the component controlled, activating the feature.

This section is intended to diagnosis the circuits between the BCM and the steering wheel control switches. If the primary control for the device is inoperative, refer to the appropriate section for the component the steering wheel control switch is functioning.

Suspension Description and Operation

Front Suspension

The front suspension has 2 primary purposes:

- Isolate the driver from irregularities in the road surface.
- Define the ride and handling characteristics of the vehicle.

The front suspension absorbs the impact of the tires travelling over irregular road surfaces and dissipates this energy throughout the suspension system. This process isolates the vehicle occupants from the road surface. The rate at which the suspension dissipates the energy and the amount of energy that is absorbed is how the suspension defines the vehicles ride characteristics. Ride characteristics are designed into the suspension system and are not adjustable. The ride characteristics are mentioned in this description in order to aid in the understanding of the functions of the suspension system. The suspension system must allow for the vertical movement of the tire and wheel assembly as the vehicle travels over irregular road surfaces while maintaining the tire's horizontal relationship to the road.

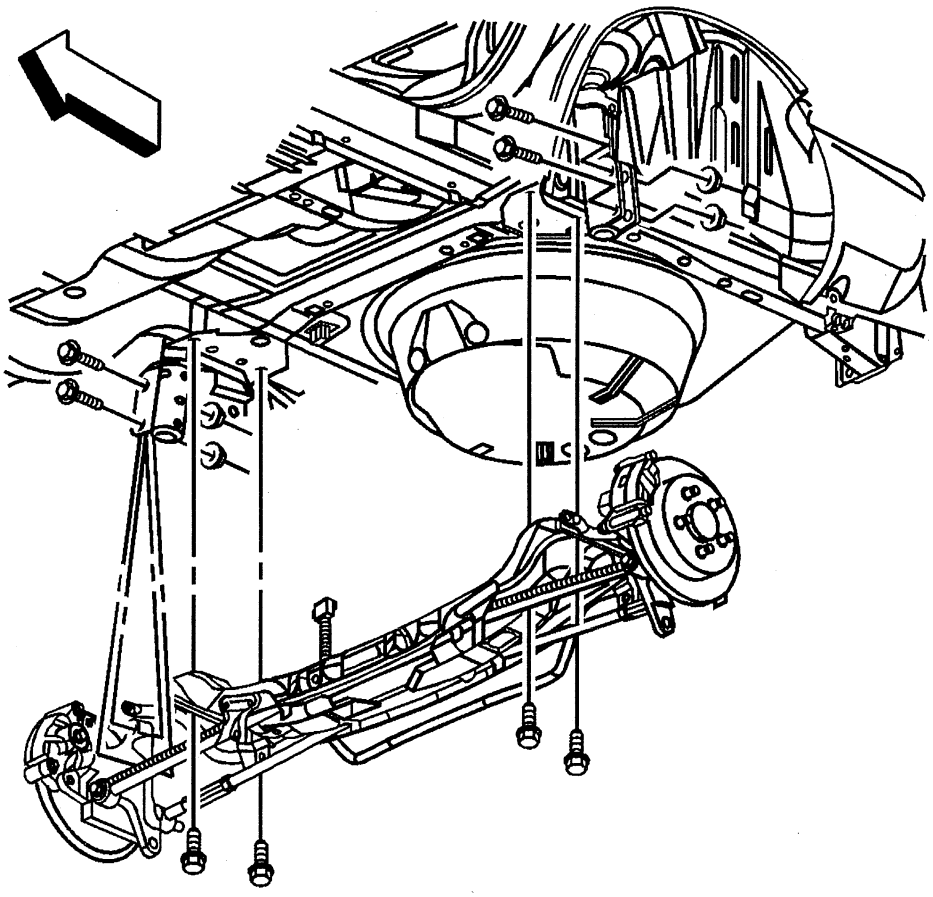
This requires that the steering knuckle be suspended between a lower control arm and a strut assembly. The lower control arm attaches from the steering knuckle at the outermost point of the control arm. The attachment is through a ball and socket type joint. The innermost end of the control arm attached at 2 points to the vehicle frame through semi-rigid bushings. The upper portion of the steering knuckle is attached to a strut assembly. The strut assembly then connects to the vehicle body by way of an upper bearing. The steering knuckle is allowed to travel up and down independent of the vehicle body structure and frame.

This up and down motion of the steering knuckle as the vehicle travels over bumps is absorbed predominantly by the coil spring. This spring is retained under tension over the strut assembly. A strut is used in conjunction with this system in order to dampen out the oscillations of the coil spring. A strut is a basic hydraulic cylinder. The strut is filled with oil and has a moveable shaft that connects to a piston inside the strut. Valves inside the shock absorber offer resistance to oil flow and consequently inhibit rapid movement of the piston and shaft. Each end of the shock absorber is connected in such a fashion to utilize this recoil action of a spring alone. Each end of the strut is designed as the connection point of the suspension system to the vehicle and acts as the coil spring seat. This allows the strut to utilize the dampening action to reduce the recoil of a spring alone. The lower control arm is allowed to pivot at the vehicle frame in a vertical fashion. The ball joint allows the steering knuckle to maintain the perpendicular relationship to the road surface.

Front suspensions systems utilize a stabilizer shaft. The stabilizer bar connects between the left and right lower control arm assemblies through the stabilizer link and stabilizer shaft insulators. This bar controls the amount of independent movement of the suspension when the vehicle turns. Limiting the independent movement defines the vehicles handling characteristics on turns.

Rear Suspension

The rear suspension utilizes coil springs over struts and light weight aluminum knuckles. Each wheel is mounted to a tri-link independent suspension system. The 3 links are identified as the inverted U-channel trailing arm and the tubular front and rear rods.



Parallel links allow the rear wheels to deflect upward when the rear wheels hit a road hazard, without moving the toe angle in a positive direction. An advantage of this suspension system is the reduction of unsprung and overall weight. Handling is improved with the independent action of each rear wheel. The rods control the lateral wheel deflection.

Several techniques are employed to achieve this independent wheel movement. The tri-link design may be compared to a right angle. The wheel is located at the right angle formed by the rods and the trailing arm. The ends of the tri-links hinge in order to provide vertical wheel travel. The solid links force the wheel to travel through a controlled arc whose fore-aft position is determined by the trailing arm, and whose lateral position is determined by the rods.

Aside from maintaining geometric wheel location, each portion of the suspension has additional functions. The knuckle supports the brake caliper. All brake torque and braking forces are transmitted through the tri-links and the strut. The final duty of the rods is to maintain the camber angle of the wheel throughout the wheel's travel, and to allow for setting the toe. The overall result of this rear suspension geometry is to maintain the rear wheels in a near vertical position at all times.

The stabilizer shaft attaches to the stabilizer bar drop link and extends rearward, where the stabilizer connects to the rear suspension support by 2 rubber bushings and mounting brackets.

A non-serviceable unit hub and bearing bolts to the knuckle. This hub and bearing is a sealed, maintenance-free unit.

Check the suspension system periodically for the following conditions:

- Shock absorbency
- Bushing durability
- Tightness of attaching bolts
- Visible damage
- Misalignment
- Excessive wear

Wheels and Tires

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Wheel Nuts	140 N·m	100 lb ft

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.

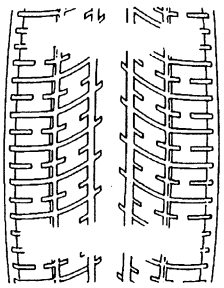
The following factors have an important influence on tire life:

- 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

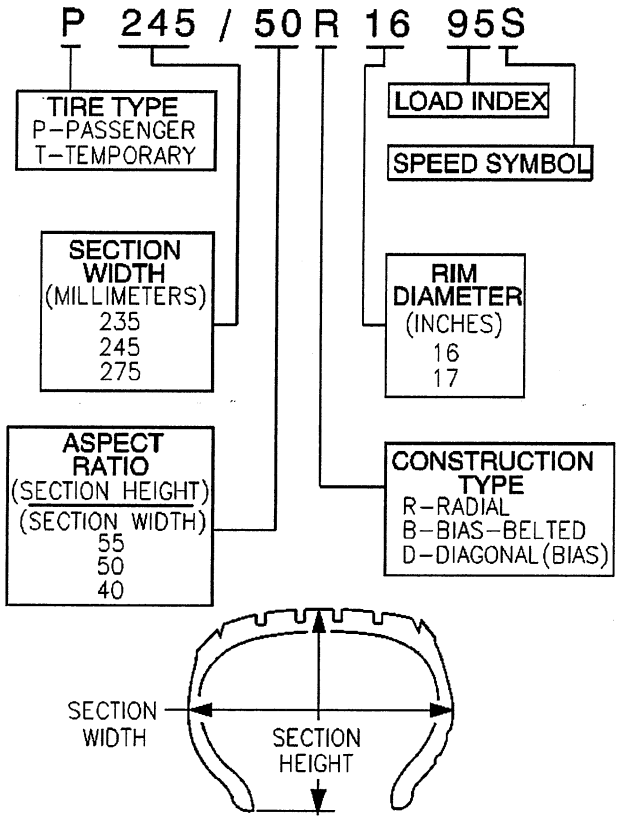
Tires with a lower than recommended pressure can cause the following conditions:

- 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.

Tire Inflation Monitoring System Operation

The tire pressure monitor (TPM) system warns the driver when a significant loss, or gain of tire pressure occurs in any of the 4 tires and allows the driver to display the individual tire pressures and their locations on the driver information center (DIC).

The system uses the powertrain control module (PCM), body control module (BCM), instrument panel cluster (IPC), DIC, remote control door lock receiver (RCDLR), a radio frequency (RF) transmitting pressure sensor in each wheel/tire assembly, and the serial data circuit to perform the system functions.

When the vehicle is stationary, the sensors internal accelerometer is inactive, which puts the sensors into a stationary state. In this state the sensors sample tire pressure once every 30 seconds and do not transmit at all if the tire pressure does not change. As vehicle speed increases, centrifugal force activates the sensors internal accelerometer causing the sensors to go into rolling mode. In this mode the sensors

sample tire pressure once every 30 second and transmit in rolling mode once every 60 seconds. The RCDLR receives and translates the data contained in each sensors RF transmission into sensor presence, sensor mode, and tire pressure. The RCDLR sends the tire pressure and tire location data to the DIC via the serial data circuit where they are displayed as follows:

- XX TIRE OK XX PSI
- XX TIRE LOW XX PSI
- XX TIRE HIGH XX PSI

The sensors continuously compare their last pressure sample to their current pressure sample and will transmit in re-measure mode if a 1.2 psi change in tire pressure has been detected in either a stationary, or rolling state. When the TPM system detects a significant loss, or gain of tire pressure, the CHECK TIRE PRESSURE message is displayed on the DIC and the low tire pressure indicator is displayed on the IPC. Both the message and indicator can be cleared by adjusting the tire pressures to the recommended kPa/psi. The sensors pressure range is 0-116 psi. The sensors pressure accuracy from -10 to +70° C is +/- 13.7 kPa (2 psi).

The RCDLR has the ability to detect malfunctions within the TPM system. Any malfunction detected will cause the DIC to display the SERVICE TIRE MONITOR message. For more information on other functions of the RCDLR, refer to Keyless Entry System Description and Operation.

Driveline System Description and Operation

Wheel Drive Shafts

Front wheel drive axles are flexible assemblies.

Front wheel drive axles consist of the following components:

- A front wheel drive shaft tri-pot joint (inner joint)
- A front wheel drive shaft constant velocity joint (outer joint)
- A front wheel drive shaft The front wheel drive shaft connects the front wheel drive shaft tri-pot joint and the front wheel drive shaft constant velocity joint.

The front wheel drive shaft tri-pot joint is completely flexible. The front wheel drive shaft tri-pot joint can move in and out.

The front wheel drive shaft constant velocity joint is flexible, but the front wheel drive shaft constant velocity joint cannot move in and out.

Boots (Seals) And Clamps

The front wheel drive shaft constant velocity joint and the front wheel drive shaft tri-pot joint boots (seals) in the front wheel drive axle are made of a thermoplastic material.

The clamps in front wheel drive axle are made of stainless steel.

The boot (seal) provides the following functions:

- Protection of the internal parts of the front wheel drive shaft constant velocity joint and the front wheel drive shaft tri-pot joint. The boot (seal) protects the grease from the following sources of damage:
  - Harmful atmospheric conditions (such as extreme temperatures or ozone gas)
  - Foreign material (such as dirt or water)
- Allows angular movement and the axial movement of the front wheel drive shaft tri-pot joint.
- Allows angular movement of the front wheel drive shaft constant velocity joint.

Important

Protect the boots (seals) from sharp tools and from the sharp edges of the surrounding components.

Any damage to the boots (seals) or the clamps will result in leakage. Leakage will allow water to leak into the front wheel drive shaft tri-pot joint and the front wheel drive shaft constant velocity joints. Leakage will

also allow grease to leak out of the front wheel drive shaft tri-pot joints and the front wheel drive shaft constant velocity joints.

Leakage may cause noisy front wheel drive axle operation and eventual failure of the internal components.

The clamps provide a leak proof connection for the front wheel drive shaft tri-pot joint and the front wheel drive shaft constant velocity joint at the following locations:

- The housing
- The front wheel drive shaft

The thermoplastic material performs well under normal conditions and normal operation. However, the material is not strong enough to withstand the following conditions:

- Abusive handling
- Damage from sharp objects (such as sharp tools or any sharp edges of the surrounding components in the vehicle).

Front Wheel Drive Shaft Tri-pot Joint (Inner Joint)

The front wheel drive shaft tri-pot joint is made with the tri-pot design without an over-extension limitation retainer.

The joint is constructed as follows for vehicles that are equipped with an automatic transmission:

- The left front wheel drive axle has a female spline. The female spline installs over a stub shaft that protrudes from the transaxle.
- The right front wheel drive axle has a male spline. The right front wheel drive axle uses barrel type snap rings in order to interlock with the transaxle gears.

Front Wheel Drive Shaft Constant Velocity Joint (Outer Joint)

The front wheel drive shaft constant velocity joint is made with the Rzeppa joint design.

The shaft end (which mates with the knuckle/hub) has a helical spline. The helical spline ensures a tight, press-type fit.

This design prevents end play between the hub bearing and the front wheel drive axle.

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.

Park Brake System Description and Operation

System Component Description

The park brake system consists of the following:

Park Brake Pedal Assembly

Receives, multiplies, and transfers park brake system apply input force from operator to park brake cable system.

Releases applied park brake system when lever is returned to at-rest, lowered, position.

Park Brake Cables

Transfers input force received from park brake lever, through park brake cable equalizer, to park brake apply levers.

Park Brake Cable Equalizer

Evenly distributes input force to both the left and right park brake units.

Park Brake Apply Lever

Multiplies and transfers input force to park brake actuator/adjuster.

Park Brake Actuator/Adjuster

Uses multiplied input force from apply lever to expand drum brake shoes toward the friction surface of the brake drum.

Threaded park brake actuators/adjusters are also used to control clearance between the drum brake shoes and the friction surface of the brake drum.

Parking Brake Shoe

Applies mechanical output force from park brake actuator to friction surface of the drum-in-hat portion of the rear brake rotor

System Operation

Park brake apply input force is received by the park brake lever assembly being applied. The input force is multiplied by the lever assembly, transferred, and evenly distributed, through the park brake cables and the park brake cable equalizer, to the left and right park brake apply levers. The park brake apply levers multiply and transfer the apply input force to the park brake actuators/adjusters which expand the drum brake shoes toward the friction surface of the brake drum in order to prevent the rotation of the rear tire

and wheel assemblies. The park brake lever assembly releases an applied park brake system when it is returned to the at-rest, lowered, position.

ABS Description and Operation

Antilock Brake System

When wheel slip is detected during a brake application, the ABS enters antilock mode. During antilock braking, hydraulic pressure in the individual wheel circuits is controlled to prevent any wheel from slipping. A separate hydraulic line and specific solenoid valves are provided for each wheel. The ABS can decrease, hold, or increase hydraulic pressure to each wheel brake. The ABS cannot, however, increase hydraulic pressure above the amount which is transmitted by the master cylinder during braking.

During antilock braking, a series of rapid pulsations is felt in the brake pedal. These pulsations are caused by the rapid changes in position of the individual solenoid valves as the EBCM responds to wheel speed sensor inputs and attempts to prevent wheel slip. These pedal pulsations are present only during antilock braking and stop when normal braking is resumed or when the vehicle comes to a stop. A ticking or popping noise may also be heard as the solenoid valves cycle rapidly. During antilock braking on dry pavement, intermittent chirping noises may be heard as the tires approach slipping. These noises and pedal pulsations are considered normal during antilock operation.

Vehicles equipped with ABS may be stopped by applying normal force to the brake pedal. Brake pedal operation during normal braking is no different than that of previous non-ABS systems. Maintaining a constant force on the brake pedal provides the shortest stopping distance while maintaining vehicle stability.

Engine Description and Operation

Engine Mechanical – 3.5L

Mechanical Specifications

Application	Specification	
	Metric	English
General Data		
Engine Type	60 degree V-6	
Displacement	3.5L	214 cu in
RPO	LZ4 (LZE-E85)	
VIN	N (K-E85)	
Bore	99 mm	3.90 in
Stroke	76 mm	2.99 in
Compression Ratio	9.8:1	
Firing Order	123456	
Spark Plug Gap	1.00 mm	0.040 in
Block		
Camshaft Bearing Bore Diameter - Front and Rear	51.03-51.08 mm	2.009-2.011 in
Camshaft Bearing Bore Diameter - Middle #2, #3	50.77-50.82 mm	1.999-2.001 in
Crankshaft Main Bearing Bore Diameter	72.1535-72.0695 mm	2.840-2.841 in
Crankshaft Main Bearing Bore Out-of-Round	0.008 mm	0.00031 in
Cylinder Bore Diameter	99.000-99.018 mm	3.897-3.898 in
Cylinder Bore Out-of-Round - Diameter - Production	0.020 mm	0.0008 in
Cylinder Bore Out-of-Round - Diameter - Service	0.025 mm	0.001 in
Cylinder Bore Taper - Production	0.020 mm	0.0008 in
Cylinder Bore Taper - Service	0.025 mm	0.001 in
Cylinder Head Deck Height	224 mm	8.818 in
Cylinder Head Deck Surface Flatness	0.05 mm per 152 mm	0.0019 in per 6 in
Valve Lifter Bore Diameter	21.417-21.455 mm	0.843-0.844 in
Camshaft		
Camshaft Bearing Inside Diameter	51.500-51.525 mm	2.028-2.029 in
Camshaft Journal Diameter	51.415-51.440 mm	2.024-2.025 in
Camshaft Journal Out-of-Round	0.025 mm	0.001 in
Camshaft Lobe Lift - Exhaust	6.9263 mm	0.2727 in
Camshaft Lobe Lift - Intake	6.9263 mm	0.2727 in
Cooling System		
Capacity	12.4 liters	13.1 quarts
Thermostat Full Open Temperature	195 degrees	
Connecting Rod		
Connecting Rod Bearing Clearance	0.18-0.062 mm	0.0007-0.017 in
Connecting Rod Bore Diameter	60.322-60.338 mm	2.375-2.376 in
Connecting Rod Bore Out-of-Round	0.006 mm	0.00023 in
Connecting Rod Length - Center to Center	150 mm	5.9 in
Connecting Rod Side Clearance	0.200-0.241 mm	0.008-0.009 in
Crankshaft		
Connecting Rod Journal Diameter	50.768-50.784 mm	1.9987-1.9994 in
Connecting Rod Journal Out-of-Round	0.005 mm	0.0002 in

Application	Specification	
	Metric	English
Connecting Rod Journal Taper	0.005 mm	0.0002 in
Connecting Rod Journal Width	21.92-22.08 mm	0.863-0.869 in
Crankshaft End Play	0.060-0.210 mm	0.0024-0.0083 in
Crankshaft Main Bearing Journal Width	23.9-24.1 mm	0.941-0.949 in
Crankshaft Main Bearing Clearance - Except #3	0.019-0.064 mm	0.0008-0.0025 in
Crankshaft Main Bearing Clearance - #3 Thrust Bearing	0.032-0.077 mm	0.0012-0.0030 in
Crankshaft Main Journal Diameter	67.239-67.257 mm	2.6473-2.6483 in
Crankshaft Main Journal Out-of-Round	0.005 mm	0.0002 in
Crankshaft Main Journal Taper	0.005 mm	0.0002 in
Crankshaft Rear Flange Runout	0.04 mm	0.0016 in
Cylinder Head		
Combustion Chamber Depth - at Measurement Point	2.2 mm	0.087 in
Surface Finish - Maximum	2.8 RA	
Surface Flatness - Block Deck	0.08 mm Per 152 mm	0.003 in Per 6 in
Surface Flatness - Exhaust Manifold Deck	0.1 mm	0.004 in
Surface Flatness - Intake Manifold Deck	0.1 mm	0.004 in
Valve Guide Bore - Exhaust	8.01 mm	0.315 in
Valve Guide Bore - Intake	8.01 mm	0.315 in
Valve Guide Installed Height	16.6 mm	0.654 in
Lubrication System		
Oil Capacity - with Filter	3.8 liter	4.0 quarts
Oil Capacity - without Filter	3.3 liter	3.5 quarts
Oil Pressure - @ 1850 RPM	207-310 kPa	30-45 PSI
Oil Pump		
Gear Diameter	38.05-38.10 mm	1.498-1.500 in
Gear Pocket - Depth	30.52-30.58 mm	1.202-1.204 in
Gear Pocket - Diameter	38.176-38.226 mm	1.503-1.505 in
Gears Lash	0.094-0.195 mm	0.0037-0.0077 in
Relief Valve-to-Bore Clearance	0.038-0.089 mm	0.0015-0.0035 in
Piston Ring End Gap		
First Compression Ring	0.18-0.39 mm	0.007-0.015 in
Second Compression Ring	0.48-0.74 mm	0.019-0.029 in
Oil Control Ring	0.25-0.74 mm	0.010-0.029 in
Piston Ring to Groove Clearance		
First Compression Ring	0.03-0.076 mm	0.001-0.003 in
Second Compression Ring	0.04-0.078 mm	0.002-0.003 in
Oil Control Ring	0.09 mm	0.004 in
Piston Ring Thickness		
First Compression Ring	1.164-1.190 mm	0.046-0.047 in
Second Compression Ring	1.472-1.490 mm	0.058 in
Oil Control Ring - Maximum	2.440 mm	0.096 in
Piston		
Piston Diameter - production	98.970-99.008 mm	3.896-3.897 in
Piston Diameter - service limit	98.950 mm	3.895 in
Piston Pin Bore Diameter	24.008-24.013 mm	0.9452-0.9454 in
Piston Ring Groove Width	1.23-1.255 mm	0.048-0.049 in
Piston to Bore Clearance - production	-0.029-0.029 mm	-0.0011-0.011 in

Application	Specification	
	Metric	English
Piston to Bore Clearance - service limit - Maximum	0.080 mm	0.003 in
Pin		
Piston Pin Clearance to Connecting Rod Bore - Press Fit	-0.022--0.044 mm	-0.0008--0.0017 in
Piston Pin Clearance to Piston Pin Bore	0.008-0.016 mm	0.0003-0.0006 in
Piston Pin Diameter	23.997-24.000 mm	0.9447-0.9448 in
Piston Pin Length	59.87-60.13 mm	2.35-2.36 in
Valves		
Valve Face Angle	45 degrees	
Valve Seat Angle	46 degrees	
Valve Seat Depth - Exhaust - from deck face	8.9-9.1 mm	0.350-0.358 in
Valve Seat Depth - Intake - from deck face	7.9-8.1 mm	0.311-0.318 in
Valve Seat Width - Exhaust	1.70-2.0 mm	0.067-0.079 in
Valve Seat Width - Intake	1.55-1.80 mm	0.061-0.071 in
Valve Stem-to-Guide Clearance	0.026-0.068 mm	0.0010-0.0027 in
Valve Lifters/Push Rods		
Push Rod Length - Intake	146.0 mm	5.75 in
Push Rod Length - Exhaust	152.5 mm	6.0 in
Valve Springs		
Valve Spring Free Length	48.5 mm	1.89 in
Valve Spring Installed Height	43.2 mm	1.701 in
Valve Spring Load - Closed	320 N 43.2 mm	75 lb 1.701 in
Valve Spring Load - Open	1036 N 32 mm	230 lb 1.260 in
Valve Spring Total Number of Coils	7.10	

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Compressor Bracket Bolt	50 N·m	37 lb ft
Camshaft Position Actuator Assembly Bolt	16 N·m	12 lb ft
Camshaft Position Actuator Magnet Bolt	10 N·m	89 lb in
Camshaft Position Sensor Bolt	10 N·m	89 lb in
Camshaft Thrust Plate Screw	10 N·m	89 lb in
Clutch Pressure Plate Bolt	25 N·m	18 lb ft
Connecting Rod Bearing Cap Bolt		
• First Pass	25 N·m	18 lb ft
• Final Pass	110 degrees	
Coolant Crossover Pipe Bolt - Front	50 N·m	37 lb ft
Coolant Crossover Pipe Bolt - Side	10 N·m	89 lb in
Coolant Drain Plug	19 N·m	14 lb ft
Coolant Temperature Sensor	23 N·m	17 lb ft
Crankshaft Balancer Bolt		
• First Pass	70 N·m	52 lb ft
• Final Pass	70 degrees	
Crankshaft Main Bearing Cap Bolt/Stud		
• First Pass	50 N·m	37 lb ft
• Final Pass	77 degrees	
Crankshaft Oil Deflector Nut	25 N·m	18 lb ft
Crankshaft Position Sensor Shield Nut	11 N·m	98 lb in
Crankshaft Position Sensor Stud	11 N·m	98 lb in
Cylinder Head Bolt		

Application	Specification	
	Metric	English
• First Pass	60 N·m	44 lb ft
• Final Pass	95 degrees	
Drive Belt Idler Pulley Bolt - 13 mm	30 N·m	22 lb ft
Drive Belt Idler Pulley Bolt - 15 mm	50 N·m	37 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
Engine Block Heater	50 N·m	37 lb ft
Engine Block Plug	60 N·m	44 lb ft
Engine Front Cover Bolt	25 N·m	18 lb ft
Engine Lift Bracket Bolt -	70 N·m	52 lb ft
Engine Oil Pressure Switch	16 N·m	12 lb ft
Engine Wiring Harness Bracket Bolt	13 N·m	115 lb in
EVAP Purge Valve Bolt	12 N·m	106 lb in
Exhaust Crossover Heat Shield Bolts	10 N·m	89 lb in
Exhaust Crossover Pipe Nuts	25 N·m	18 lb ft
Exhaust Crossover Pipe Studs	25 N·m	18 lb ft
Exhaust Manifold Bolt	20 N·m	15 lb ft
Exhaust Manifold Heat Shield Bolt	10 N·m	89 lb in
Exhaust Manifold Lower Heat Shield Bolt	10 N·m	89 lb in
Engine Mount Strut and Engine Lift Bracket Bolts	50 N·m	37 lb ft
Engine Mount Support and Strut Bracket Bolts	50 N·m	37 lb ft
Flywheel Bolt		
Automatic Transmission	70 N·m	52 lb ft
Manual Transmission - First Pass	50 N·m	37 lb ft
Manual Transmission - Final Pass	70 degrees	
Front Oil Gallery Plug	33 N·m	24 lb ft
Fuel Injector Rail Bolt	10 N·m	89 lb in
Heated Oxygen Sensor	42 N·m	31 lb ft
Heater Inlet and Outlet Pipe Bolt - 10 mm	10 N·m	89 lb in
Heater Inlet and Outlet Pipe Bolt/Nut - 13 mm	25 N·m	18 lb ft
Heater Inlet Pipe Stud	35 N·m	26 lb ft
Ignition Coil Bracket Bolt/Nut/Stud	25 N·m	18 lb ft
Knock Sensor	25 N·m	18 lb ft
Lower Intake Manifold Bolt - Center		
• First Pass	7 N·m	62 lb in
• Final Pass	13 N·m	115 lb in
Lower Intake Manifold Bolt - Corner		
• First Pass	7 N·m	62 lb in
• Final Pass	25 N·m	18 lb ft
Oil Filter	30 N·m	22 lb ft
Oil Filter Adapter Bolt	25 N·m	18 lb ft
Oil Filter Adapter Heat Shield Nuts	25 N·m	18 lb ft
Oil Filter Fitting	39 N·m	29 lb ft
Oil Level Indicator Tube Bolt	25 N·m	18 lb ft
Oil Pan Bolt	25 N·m	18 lb ft
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pan Side Bolt	50 N·m	37 lb ft
Oil Pan Support Bracket Bolt	50 N·m	37 lb ft
Oil Pump Cover Bolt	10 N·m	89 lb in
Oil Pump Drive Gear Clamp Bolt	36 N·m	27 lb ft
Oil Pump Mounting Bolt	41 N·m	30 lb ft
Piston Oil Nozzle Bolt	10 N·m	89 lb in

Application	Specification	
	Metric	English
Rear Oil Gallery Plug - 3/8 inch	33 N·m	24 lb ft
Spark Plug	15 N·m	11 lb ft
Throttle Body Bolt/Nut	10 N·m	89 lb in
Throttle Body Stud	6 N·m	53 lb in
Timing Chain Tensioner Bolt	21 N·m	15 lb ft
Upper Intake Manifold Bolt/Stud	25 N·m	18 lb ft
Valve Lifter Guide Bolt	10 N·m	89 lb in
Valve Lifter Oil Manifold Cover Plate Bolt	25 N·m	18 lb ft
Valve Rocker Arm Bolt	34 N·m	25 lb ft
Valve Rocker Arm Cover Bolt	10 N·m	89 lb in
Water Outlet Bolt/Stud	25 N·m	18 lb ft
Water Pump Bolt	10 N·m	89 lb in
Water Pump Pulley Bolt	25 N·m	18 lb ft

Engine Component Description

The cylinder block is made of cast alloy iron. The cylinder block has 6 cylinders that are arranged in a V shape. There are 3 cylinders in each bank. The cylinder banks are set at a 60 degree angle from each other.

Starting from the front of the engine (accessory belt end), the right bank cylinders are 2, 4, 6. The left bank cylinders are 1, 3, 5.

Four main bearings support the crankshaft. The crankshaft is retained by the bearing caps. The bearing caps are machined with the block for proper alignment and clearances. The main bearing caps are drilled and tapped for the structural oil pan side bolts.

The aluminum cylinder heads have individual intake and exhaust ports for each cylinder. The valve guides are pressed in. The roller rocker arms are located on a pedestal in a slot in the cylinder head. The roller rocker arms are retained on individual threaded bolts.

The crankshaft is forged steel with deep rolled fillets on all 6 crankpins and all 4 main journals. Four steel-backed aluminum bearings are used. The #3 bearing is the end-thrust bearing.

The camshaft is made from a new metal composite design. The camshaft profile is a hydraulic roller design. The camshaft is supported by 4 journals. The camshaft includes an oil pump drive gear.

The pistons are cast aluminum using 2 compression rings and 1 oil control ring. The pistons also have 2 polymer coated patches on the skirt for noise reduction. The piston pin is offset 0.8 mm (0.031 in) towards the major thrust side. This placement allows for a gradual change in thrust pressure against the cylinder wall as the piston travels its path. The pins are made of chromium steel and have a floating fit in the pistons. The pins are retained in the connecting rods by piston pin retainer clips.

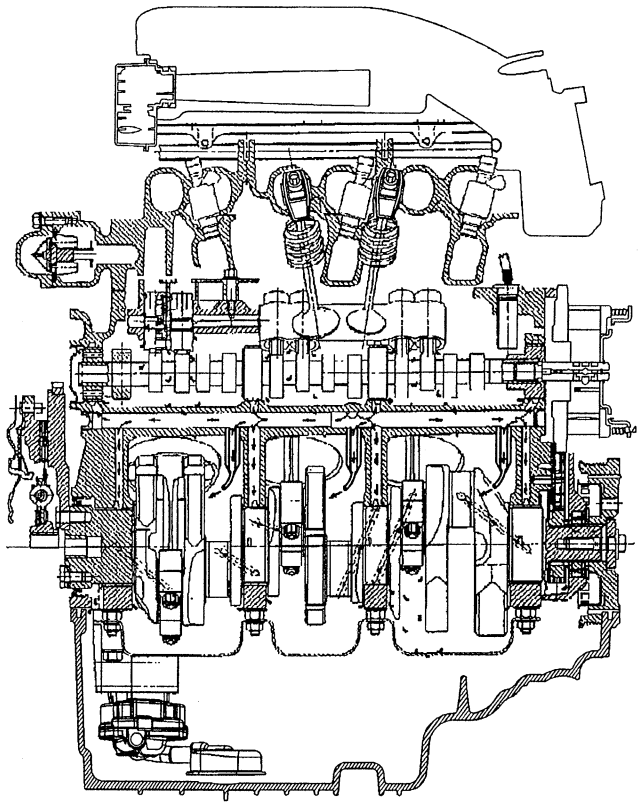
The connecting rods are made of forged steel. Full pressure lubrication is directed to the connecting rods by drilled oil passages from the adjacent main bearing journal.

A roller rocker type valve train is used. Motion is transmitted from the camshaft through the hydraulic roller lifter and from the pushrod to the roller rocker arm. The rocker arm pivots on the needle roller bearings. The rocker arm transmits the camshaft motion to the valve. The rocker arm pedestal is located in a slot in the cylinder head. The rocker arm is retained in the cylinder head by a bolt. The pushrod is located by the rocker arm.

The intake manifold is a 2-piece cast aluminum unit. The intake manifold centrally supports a fuel rail with 6 fuel injectors.

The exhaust manifolds are cast nodular iron.

Lubrication



Full pressure lubrication, through a full flow oil filter, is furnished by a gear type oil pump. The oil is drawn up through the pickup screen and the tube. The oil passes through the pump to the oil filter.

The oil filter is a full flow paper element unit. An oil filter bypass is used in order to ensure oil supply during the following conditions:

- On a cold start
- If the filter is plugged
- If the filter develops excessive pressure drop

The bypass is designed to open at 69-83 kPa (10-12 psi).

A priority oil delivery system supplies oil first to the crankshaft journals. The oil from the crankshaft main bearings is supplied to the connecting rod bearings by intersecting the passages drilled in the crankshaft. The passages supply the oil to the crankshaft main bearings and the camshaft bearings through the intersecting vertical drilled holes. The oil passages from the camshaft journals supply oil to the hydraulic lifters, and the piston oil nozzles. The camshaft phaser is fed oil from the number 1 camshaft bearing journal.

The piston oil nozzles lubricate the pistons and cylinder walls. A not-serviceable check valve integrated into the nozzle prevents oil bleed down from the nozzle when the engine is not running.

The hydraulic lifters pump oil up through the pushrods to the rocker arms. The cast dams in the crankcase casting direct the oil that drains back from the rocker arms onto the camshaft lobes. The camshaft chain drive is lubricated by indirect oil splash.

Drive Belt System Description

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The crankshaft balancer pulley
- The accessory drive components
  - The generator
  - The A/C compressor
  - The power steering

The drive belt system uses one belt. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. The drive belt is 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.

Crankcase Ventilation System Description

A close crankcase ventilation system is used in order to provide a more complete scavenging of the crankcase vapors. Fresh air from the throttle body is supplied to the crankcase, mixed with blow-by gases, and then passed through a crankcase ventilation valve into the intake manifold.

The primary control is through the crankcase ventilation valve which meters the flow at a rate depending on manifold vacuum. To maintain idle quality, the crankcase ventilation valve restricts the flow when intake manifold vacuum is high. If abnormal operating conditions arise, the system is designed to allow excessive amounts of blow-by gases to back flow through the crankcase vent tube into the engine air inlet to be consumed by normal combustion.

Filtered fresh air is routed from upstream of the throttle blade to the front of the right rocker arm cover via a formed nylon tube. To reduce the potential of oil pullover into the throttle bore area due the back flow of the ventilation system, the fitting in the right rocker arm cover is shielded from the rocker arms. From there, fresh air and gases are routed through the crankcase and up to the opposite rocker arm cover where the positive crankcase ventilation (PCV) valve is located. Gases are then routed through a formed nylon tube to the intake manifold.

Engine Mechanical – 3.9L

Mechanical Specifications

Application	Specification	
	Metric	English
General Data		
Engine Type	60 degree V-6	
Displacement	3.9L	238 cu in
RPO	LZ9	
VIN	1	
Bore	99 mm	3.90 in
Stroke	84 mm	3.31 in
Compression Ratio	9.8:1	
Firing Order	123456	
Spark Plug Gap	1.00 mm	0.040 in
Block		
Camshaft Bearing Bore Diameter - Front and Rear	55.26-55.31 mm	2.175-2.177 in
Camshaft Bearing Bore Diameter - Middle #2, #3	54.75-54.80 mm	2.155-2.157 in
Crankshaft Main Bearing Bore Diameter	72.1535-72.0695 mm	2.840-2.841 in
Crankshaft Main Bearing Bore Out-of-Round	0.008 mm	0.00031 in
Cylinder Bore Diameter	99.000-99.018 mm	3.897-3.898 in
Cylinder Bore Out-of-Round - Diameter - Production	0.026 mm	0.0010 in
Cylinder Bore Out-of-Round - Diameter - Service	0.030 mm	0.0011 in
Cylinder Bore Taper - Production	0.026 mm	0.0010 in
Cylinder Bore Taper - Service	0.030 mm	0.0011 in
Cylinder Head Deck Height	224 mm	8.818 in
Cylinder Head Deck Surface Flatness	0.05 mm per 150 mm	0.0019 in per 5.905 in
Valve Lifter Bore Diameter	21.417-21.455 mm	0.843-0.844 in
Camshaft		
Camshaft Bearing Inside Diameter	51.500-51.525 mm	2.028-2.029 in
Camshaft Journal Diameter	51.415-51.440 mm	2.024-2.025 in
Camshaft Journal Out-of-Round	0.025 mm	0.001 in
Camshaft Lobe Lift - Exhaust	6.9263 mm	0.2727 in
Camshaft Lobe Lift - Intake	6.9263 mm	0.2727 in
Cooling System		
Capacity	12.4 liters	13.1 quarts
Thermostat Full Open Temperature	195 degrees	
Connecting Rod		
Connecting Rod Bearing Clearance	0.18-0.062 mm	0.0007-0.017 in
Connecting Rod Bore Diameter	60.322-60.338 mm	2.375-2.376 in
Connecting Rod Bore Out-of-Round	0.006 mm	0.00023 in
Connecting Rod Length - Center to Center	150 mm	5.9 in
Connecting Rod Side Clearance	0.200-0.241 mm	0.008-0.009 in
Crankshaft		
Connecting Rod Journal Diameter	57.122-57.138 mm	2.248-2.249 in
Connecting Rod Journal Out-of-Round	0.005 mm	0.0002 in
Connecting Rod Journal Taper	0.005 mm	0.0002 in
Connecting Rod Journal Width	21.92-22.08 mm	0.863-0.869 in
Crankshaft End Play	0.060-0.210 mm	0.0024-0.0083 in

Application	Specification	
	Metric	English
Crankshaft Main Bearing Journal Width	23.9-24.1 mm	0.941-0.949 in
Crankshaft Main Bearing Clearance - Except #3	0.019-0.064 mm	0.0008-0.0025 in
Crankshaft Main Bearing Clearance - #3 Thrust Bearing	0.032-0.077 mm	0.0012-0.0030 in
Crankshaft Main Journal Diameter	67.239-67.257 mm	2.6473-2.6483 in
Crankshaft Main Journal Out-of-Round	0.005 mm	0.0002 in
Crankshaft Main Journal Taper	0.005 mm	0.0002 in
Crankshaft Rear Flange Runout	0.04 mm	0.0016 in
Cylinder Head		
Combustion Chamber Depth - at Measurement Point	2.2 mm	0.087 in
Surface Finish - Maximum	2.8 RA	
Surface Flatness - Block Deck	0.08 mm Per 152 mm	0.003 in Per 6 in
Surface Flatness - Exhaust Manifold Deck	0.1 mm	0.004 in
Surface Flatness - Intake Manifold Deck	0.1 mm	0.004 in
Valve Guide Bore - Exhaust	8.01 mm	0.315 in
Valve Guide Bore - Intake	8.01 mm	0.315 in
Valve Guide Installed Height	16.6 mm	0.654 in
Lubrication System		
Oil Capacity - with Filter	3.8 liter	4.0 quarts
Oil Pressure - @ 1850 RPM	207-310 kPa	30-45 PSI
Oil Pump		
Gear Diameter	38.05-38.10 mm	1.498-1.500 in
Gear Pocket - Depth	30.52-30.58 mm	1.202-1.204 in
Gear Pocket - Diameter	38.176-38.226 mm	1.503-1.505 in
Gears Lash	0.094-0.195 mm	0.0037-0.0077 in
Relief Valve-to-Bore Clearance	0.038-0.089 mm	0.0015-0.0035 in
Piston Ring End Gap		
First Compression Ring	0.15-0.30 mm	0.006-0.011 in
Second Compression Ring	0.25-0.45 mm	0.009-0.017 in
Oil Control Ring	0.15-0.65 mm	0.06-0.025 in
Piston Ring to Groove Clearance		
First Compression Ring	0.03-0.065 mm	0.001-0.002 in
Second Compression Ring	0.02-0.055 mm	0.0007-0.002 in
Oil Control Ring	0.01 mm	0.004 in
Piston Ring Thickness		
First Compression Ring	1.175-1.190 mm	0.046-0.047 in
Second Compression Ring	1.475-1.490 mm	0.058 in
Oil Control Ring - Maximum	2.50 mm	0.098 in
Piston		
Piston Diameter - production	98.970-99.008 mm	3.896-3.897 in
Piston Diameter - service limit	98.950 mm	3.895 in
Piston Pin Bore Diameter	23.957-23.962 mm	0.943 in
Piston Ring Groove Width	1.22-1.24 mm	0.048-0.049 in
Piston to Bore Clearance - production	-0.008-0.048 mm	-0.0003-0.0018 in
Piston to Bore Clearance - service limit - Maximum	0.080 mm	0.003 in
Pin		
Piston Pin Clearance to Connecting Rod Bore - Press Fit	-0.004--0.021 mm	-0.0001--0.0008 in
Piston Pin Clearance to Piston Pin Bore	0.002-0.010 mm	0.00008-0.0004 in

Application	Specification	
	Metric	English
Piston Pin Diameter	23.952-23.955 mm	0.942-0.943 in
Piston Pin Length	64.21-64.44 mm	2.57-2.53 in
Valves		
Valve Face Angle	45 degrees	
Valve Seat Angle	46 degrees	
Valve Seat Depth - Intake - from deck face	7.9-8.1 mm	0.311-0.318 in
Valve Seat Depth - Exhaust - from deck face	8.9-9.1 mm	0.350-0.358 in
Valve Seat Width - Intake	1.55-1.80 mm	0.061-0.071 in
Valve Seat Width - Exhaust	1.70-2.0 mm	0.067-0.079 in
Valve Stem-to-Guide Clearance	0.026-0.068 mm	0.0010-0.0027 in
Valve Lifters/Push Rods		
Push Rod Length - Intake	146.0 mm	5.75 in
Push Rod Length - Exhaust	152.5 mm	6.0 in
Valve Springs		
Valve Spring Free Length	48.5 mm	1.89 in
Valve Spring Installed Height	43.2 mm	1.701 in
Valve Spring Load - Closed	320 N 43.2 mm	75 lb 1.701 in
Valve Spring Load - Open	1036 N 32 mm	230 lb 1.260 in
Valve Spring Total Number of Coils	6.55	

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Compressor Bracket Bolt	50 N·m	37 lb ft
Camshaft Position Actuator Assembly Bolt	16 N·m	12 lb ft
Camshaft Position Actuator Magnet Bolt	10 N·m	89 lb in
Camshaft Position Sensor Bolt	10 N·m	89 lb in
Camshaft Thrust Plate Screw	10 N·m	89 lb in
Clutch Pressure Plate Bolt	25 N·m	18 lb ft
Connecting Rod Bearing Cap Bolt		
First Pass	25 N·m	18 lb ft
Final Pass	110 degrees	
Coolant Crossover Pipe Bolt - Front	50 N·m	37 lb ft
Coolant Crossover Pipe Bolt - Side	10 N·m	89 lb in
Coolant Drain Plug	19 N·m	14 lb ft
Coolant Temperature Sensor	23 N·m	17 lb ft
Crankshaft Balancer Bolt		
• First Pass	70 N·m	52 lb ft
• Final Pass	70 degrees	
Crankshaft Main Bearing Cap Bolt/Stud		
• First Pass	50 N·m	37 lb ft
• Final Pass	77 degrees	
Crankshaft Oil Deflector Nut	25 N·m	18 lb ft
Crankshaft Position Sensor Stud	11 N·m	98 lb in
Crankshaft Postition Sensor Shield Nut	11 N·m	98 lb in
Cylinder Head Bolt		
• First Pass	60 N·m	44 lb ft
• Final Pass	95 degrees	
Drive Belt Idler Pulley Bolt - 13 mm	30 N·m	22 lb ft
Drive Belt Idler Pulley Bolt - 15 mm	50 N·m	37 lb ft

Application	Specification	
	Metric	English
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
Engine Block Heater	50 N·m	37 lb ft
Engine Block Plug	60 N·m	44 lb ft
Engine Front Cover Bolt	25 N·m	18 lb ft
Engine Lift Bracket Bolt -	70 N·m	52 lb ft
Engine Oil Pressure Switch	16 N·m	12 lb ft
Engine Mount Strut and Engine Lift Bracket Bolts	50 N·m	37 lb ft
Engine Mount Support and Strut Bracket Bolts	50 N·m	37 lb ft
Engine Wiring Harness Bracket Bolt	13 N·m	115 lb in
EVAP Purge Valve Bolt	12 N·m	106 lb in
Exhaust Crossover Heat Shield Bolts	10 N·m	89 lb in
Exhaust Crossover Pipe Nuts	25 N·m	18 lb ft
Exhaust Crossover Pipe Studs	25 N·m	18 lb ft
Exhaust Manifold Bolt	20 N·m	15 lb ft
Exhaust Manifold Heat Shield Bolt	10 N·m	89 lb in
Exhaust Manifold Lower Heat Shield Bolt	10 N·m	89 lb in
Flywheel Bolt - Automatic Transmission	70 N·m	52 lb ft
Flywheel Bolt - Manual Transmission		
• First Pass	50 N·m	37 lb ft
• Final Pass	70 degrees	
Front Oil Gallery Plug	33 N·m	24 lb ft
Fuel Injector Rail Bolt	10 N·m	89 lb in
Heater Inlet Pipe Stud	35 N·m	26 lb ft
Heated Oxygen Sensor	42 N·m	31 lb ft
Heater Inlet and Outlet Pipe Bolt - 10 mm	10 N·m	89 lb in
Heater Inlet and Outlet Pipe Bolt/Nut - 13 mm	25 N·m	18 lb ft
Ignition Coil Bracket Bolt/Nut/Stud	25 N·m	18 lb ft
Knock Sensor	25 N·m	18 lb ft
Lower Intake Manifold Bolt - Center		
• First Pass	7 N·m	62 lb in
• Final Pass	13 N·m	115 lb ft
Lower Intake Manifold Bolt - Corner		
• First Pass	7 N·m	62 lb in
• Final Pass	25 N·m	18 lb ft
Oil Filter Adapter Bolt	25 N·m	18 lb ft
Oil Filter Adapter Heat Shield Nuts	25 N·m	18 lb ft
Oil Filter	30 N·m	22 lb ft
Oil Filter Fitting	39 N·m	29 lb ft
Oil Level Indicator Tube Bolt	25 N·m	18 lb ft
Oil Pan Bolt	25 N·m	18 lb ft
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pan Side Bolt	50 N·m	37 lb ft
Oil Pan Support Bracket Bolt	50 N·m	37 lb ft
Oil Pump Cover Bolt	10 N·m	89 lb in
Oil Pump Drive Gear Clamp Bolt	36 N·m	27 lb ft
Oil Pump Mounting Bolt	41 N·m	30 lb ft
Piston Oil Nozzle Bolt	10 N·m	89 lb in
Rear Oil Gallery Plug - 3/8 inch	33 N·m	24 lb ft
Spark Plug	15 N·m	11 lb ft
Throttle Body Bolt/Nut	10 N·m	89 lb in
Throttle Body Stud	6 N·m	53 lb in

Application	Specification	
	Metric	English
Timing Chain Tensioner Bolt	21 N·m	15 lb ft
Upper Intake Manifold Bolt/Stud	25 N·m	18 lb ft
Valve Lifter Guide Bolt	10 N·m	89 lb in
Valve Lifter Oil Manifold Cover Plate Bolt	25 N·m	18 lb ft
Valve Rocker Arm Bolt	34 N·m	25 lb ft
Valve Rocker Arm Cover Bolt	10 N·m	89 lb in
Water Outlet Bolt/Stud	25 N·m	18 lb ft
Water Pump Bolt	10 N·m	89 lb in
Water Pump Pulley Bolt	25 N·m	18 lb ft

Engine Component Description

The cylinder block is made of cast alloy iron. The cylinder block has 6 cylinders that are arranged in a V shape. There are 3 cylinders in each bank. The cylinder banks are set at a 60 degree angle from each other.

Starting from the front of the engine (accessory belt end), the right bank cylinders are 2, 4, 6. The left bank cylinders are 1, 3, 5.

Four main bearings support the crankshaft. The crankshaft is retained by the bearing caps. The bearing caps are machined with the block for proper alignment and clearances. The main bearing caps are drilled and tapped for the structural oil pan side bolts.

The aluminum cylinder heads have individual intake and exhaust ports for each cylinder. The valve guides are pressed in. The roller rocker arms are located on a pedestal in a slot in the cylinder head. The roller rocker arms are retained on individual threaded bolts.

The crankshaft is forged steel with deep rolled fillets on all 6 crankpins and all 4 main journals. Four steel-backed aluminum bearings are used. The #3 bearing is the end-thrust bearing.

The camshaft is made from a new metal composite design. The camshaft profile is a hydraulic roller design. The camshaft is supported by 4 journals. The camshaft includes an oil pump drive gear.

The pistons are cast aluminum using 2 compression rings and 1 oil control ring. The pistons also have 2 polymer coated patches on the skirt for noise reduction. The piston pin is offset 0.8 mm (0.031 in) towards the major thrust side. This placement allows for a gradual change in thrust pressure against the cylinder wall as the piston travels its path. The pins are made of chromium steel and have a floating fit in the pistons. The pins are retained in the connecting rods by piston pin retainer clips.

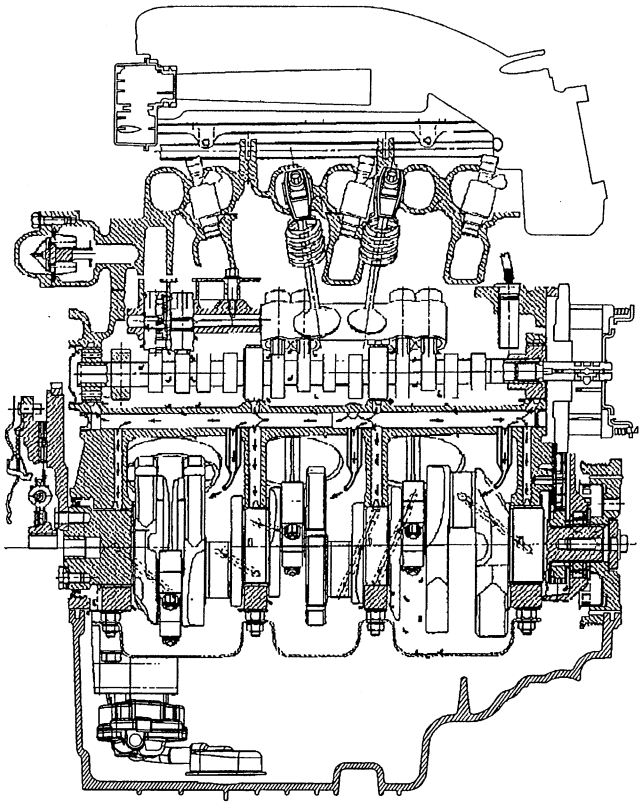
The connecting rods are made of forged steel. Full pressure lubrication is directed to the connecting rods by drilled oil passages from the adjacent main bearing journal.

A roller rocker type valve train is used. Motion is transmitted from the camshaft through the hydraulic roller lifter and from the pushrod to the roller rocker arm. The rocker arm pivots on the needle roller bearings. The rocker arm transmits the camshaft motion to the valve. The rocker arm pedestal is located in a slot in the cylinder head. The rocker arm is retained in the cylinder head by a bolt. The pushrod is located by the rocker arm.

The intake manifold is a 2-piece cast aluminum unit. The intake manifold centrally supports a fuel rail with 6 fuel injectors.

The exhaust manifolds are cast nodular iron.

Lubrication Description



Full pressure lubrication, through a full flow oil filter, is furnished by a gear type oil pump. The oil is drawn up through the pickup screen and the tube. The oil passes through the pump to the oil filter.

The oil filter is a full flow paper element unit. An oil filter bypass is used in order to ensure oil supply during the following conditions:

- On a cold start
- If the filter is plugged
- If the filter develops excessive pressure drop

The bypass is designed to open at 69-83 kPa (10-12 psi).

A priority oil delivery system supplies oil first to the crankshaft journals. The oil from the crankshaft main bearings is supplied to the connecting rod bearings by intersecting the passages drilled in the crankshaft. The passages supply the oil to the crankshaft main bearings and the camshaft bearings through the intersecting vertical drilled holes. The oil passages from the camshaft journals supply oil to the hydraulic lifters, and the piston oil nozzles. The camshaft phaser is fed oil from the number 1 camshaft bearing journal.

The piston oil nozzles lubricate the pistons and cylinder walls. A not-serviceable check valve integrated into the nozzle prevents oil bleed down from the nozzle when the engine is not running.

The hydraulic lifters pump oil up through the pushrods to the rocker arms. The cast dams in the crankcase casting direct the oil that drains back from the rocker arms onto the camshaft lobes. The camshaft chain drive is lubricated by indirect oil splash.

Drive Belt System Description

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The crankshaft balancer pulley
- The accessory drive components
  - The generator
  - The A/C compressor
  - The power steering

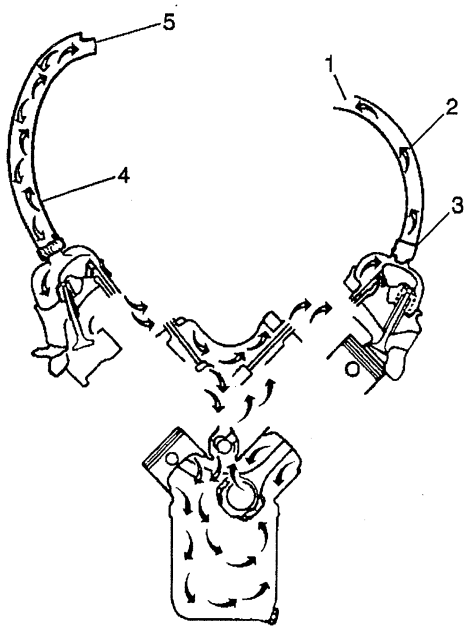
The drive belt system uses one belt. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. The drive belt is made of different types of rubbers (chloroprene or EPDM) and have different layers or plys containing either fiber cloth or cords for reinforcement.

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.

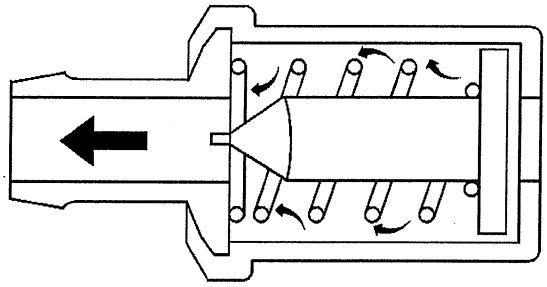
Crankcase Ventilation System Description

General Description



A crankcase ventilation system is used to consume crankcase vapors (1) in the combustion process instead of venting them to atmosphere. Fresh air from the throttle body is supplied to the crankcase, mixed with blow by gases, and then passed through a positive crankcase ventilation (PCV) valve (3) into the intake manifold.

Operation



The primary control is through the positive crankcase ventilation (PCV) valve which meters the flow at a rate depending on inlet vacuum. To maintain idle quality, the PCV valve restricts the flow when inlet vacuum is high. If abnormal operating conditions arise, the system is designed to allow excessive amounts of blow by gases to back flow through the crankcase vent into the throttle body to be consumed by normal combustion.

Engine Mechanical – 5.3L

Mechanical Specifications

Application	Specification	
	Metric	English
General		
Engine Type	V8	
Displacement	5.3L	325 CID
RPO	LS4	
VIN	C	
Bore	96.0-96.018 mm	3.779-3.78 in
Stroke	92.0 mm	3.622 in
Compression Ratio	9.9:1	
Firing Order	1-8-7-2-6-5-4-3	
Displacement on Demand Cylinders	1-4-6-7	
Spark Plug Gap	1.02 mm	0.04 in
Block		
Camshaft Bearing Bore 1 and 5 Diameter	59.58-59.63 mm	2.345-2.347 in
Camshaft Bearing Bore 2 and 4 Diameter	59.08-59.13 mm	2.325-2.327 in
Camshaft Bearing Bore 3 Diameter	58.58-58.63 mm	2.306-2.308 in
Crankshaft Main Bearing Bore Diameter	69.871-69.889 mm	2.75-2.751 in
Crankshaft Main Bearing Bore Out-of-Round	0.006 mm	0.0002 in
Cylinder Bore Diameter	96.0-96.018 mm	3.779-3.78 in
Cylinder Head Deck Height - Measuring from the Centerline of Crankshaft to the Deck Face	234.57-234.82 mm	9.235-9.245 in
Cylinder Head Deck Surface Flatness - Measured Within a 152.4 mm (6.0 in) Area	0.11 mm	0.004 in

Application	Specification	
	Metric	English
Cylinder Head Deck Surface Flatness - Measuring the Overall Length of the Block Deck	0.22 mm	0.008 in
Valve Lifter Bore Diameter	21.417-21.443 mm	0.843-0.844 in
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 Out-of-Round	0.025 mm	0.001 in
Camshaft Lobe Lift - Intake - Non Displacement on Demand Cylinders	7.2 mm	0.283 in
Camshaft Lobe Lift - Intake - Displacement on Demand Cylinders	7.33 mm	0.289 in
Camshaft Lobe Lift - Exhaust - Non Displacement on Demand Cylinders	7.2 mm	0.283 in
Camshaft Lobe Lift - Exhaust - Displacement on Demand Cylinders	7.33 mm	0.289 in
Camshaft Runout - Measured at the Intermediate Journals	0.05 mm	0.002 in
Connecting Rod		
Connecting Rod Bearing Clearance - Production	0.023-0.065 mm	0.0009-0.0025 in
Connecting Rod Bearing Clearance - Service	0.023-0.076 mm	0.0009-0.003 in
Connecting Rod Bore Diameter - Bearing End	56.505-56.525 mm	2.224-2.225 in
Connecting Rod Bore Out-of-Round - Bearing End - Production	0.004-0.008 mm	0.00015-0.0003 in
Connecting Rod Bore Out-of-Round - Bearing End - Service	0.004-0.008 mm	0.00015-0.0003 in
Connecting Rod Side Clearance	0.11-0.51 mm	0.00433-0.02 in
Crankshaft		
Connecting Rod Journal Diameter - Production	53.318-53.338 mm	2.0991-2.0999 in
Connecting Rod Journal Diameter - Service	53.308 mm	2.0987 in
Connecting Rod Journal Out-of-Round - Production	0.005 mm	0.0002 in
Connecting Rod Journal Out-of-Round - Service	0.01 mm	0.0004 in
Connecting Rod Journal Taper - Maximum for 1/2 of Journal Length - Production	0.005 mm	0.0002 in
Connecting Rod Journal Taper - Maximum for 1/2 of Journal Length - Service	0.02 mm	0.00078 in
Crankshaft End Play	0.04-0.2 mm	0.0015-0.0078 in
Crankshaft Main Bearing Clearance - Production	0.02-0.052 mm	0.0008-0.0021 in
Crankshaft Main Bearing Clearance - Service	0.02-0.065 mm	0.0008-0.0025 in
Crankshaft Main Journal Diameter - Production	64.992-65.008 mm	2.558-2.559 in
Crankshaft Main Journal Diameter - Service	64.992 mm	2.558 in
Crankshaft Main Journal Out-of-Round - Production	0.003 mm	0.000118 in
Crankshaft Main Journal Out-of-Round - Service	0.008 mm	0.0003 in
Crankshaft Main Journal Taper - Production	0.01 mm	0.0004 in
Crankshaft Main Journal Taper - Service	0.02 mm	0.00078 in
Crankshaft Rear Flange Runout	0.05 mm	0.002 in
Crankshaft Reluctor Ring Runout - Measured 1.0 mm (0.04 in) Below Tooth Diameter	0.7 mm	0.028 in
Crankshaft Thrust Surface - Production	26.14-26.22 mm	1.029-1.0315 in
Crankshaft Thrust Surface - Service	26.22 mm	1.0315 in
Crankshaft Thrust Surface Runout	0.025 mm	0.001 in

Application	Specification	
	Metric	English
Cylinder Head		
Cylinder Head Height/Thickness - Measured from the Cylinder Head Deck to the Valve Rocker Arm Cover Seal Surface	120.2 mm	4.732 in
Surface Flatness - Block Deck - Measured Within a 152.4 mm (6.0 in) Area	0.08 mm	0.003 in
Surface Flatness - Block Deck - Measuring the Overall Length of the Cylinder Head	0.1 mm	0.004 in
Surface Flatness - Exhaust Manifold Deck	0.13 mm	0.005 in
Surface Flatness - Intake Manifold Deck	0.08 mm	0.0031 in
Valve Guide Installed Height - Measured from the Spring Seat Surface to the Top of the Guide	17.32 mm	0.682 in
Intake Manifold		
Surface Flatness - Measured at Gasket Sealing Surfaces and Measured Within a 200 mm (7.87 in) Area that Includes 2 Runner Port Openings	0.3 mm	0.118 in
Lubrication System		
Oil Capacity - with Filter	5.7 liters	6.0 quarts
Oil Capacity - without Filter	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
Displacement on Demand Relief Valve Oil Pressure - as Measured at Oil Pressure Sensor Location	379-517 kPa Maximum	55-75 psig Maximum
Oil Pan		
Front Cover Alignment - at Oil Pan Surface	0.0-0.5 mm	0.0-0.02 in
Crankshaft Rear Oil Seal Housing Alignment - at Oil Pan Surface	0.0-0.5 mm	0.0-0.02 in
Oil Pan Alignment - to Rear of Engine Block at Transmission Bell Housing Mounting Surface	0.0-0.25 mm	0.0-0.01 in
Piston Rings		
Piston Ring End Gap - First Compression Ring - Measured in Cylinder Bore - Production	0.23-0.44 mm	0.009-0.017 in
Piston Ring End Gap - First Compression Ring - Measured in Cylinder Bore - Service	0.23-0.5 mm	0.009-0.0196 in
Piston Ring End Gap - Second Compression Ring - Measured in Cylinder Bore - Production	0.44-0.7 mm	0.017-0.027 in
Piston Ring End Gap - Second Compression Ring - Measured in Cylinder Bore - Service	0.44-0.76 mm	0.0173-0.03 in
Piston Ring End Gap - Oil Control Ring - Measured in Cylinder Bore - Production	0.18-0.75 mm	0.007-0.029 in
Piston Ring End Gap - Oil Control Ring - Measured in Cylinder Bore - Service	0.18-0.81 mm	0.007-0.032 in
Piston Ring to Groove Clearance - First Compression Ring - Production	0.04-0.085 mm	0.00157-0.00335 in
Piston Ring to Groove Clearance - First Compression Ring - Service	0.04-0.085 mm	0.00157-0.00335 in

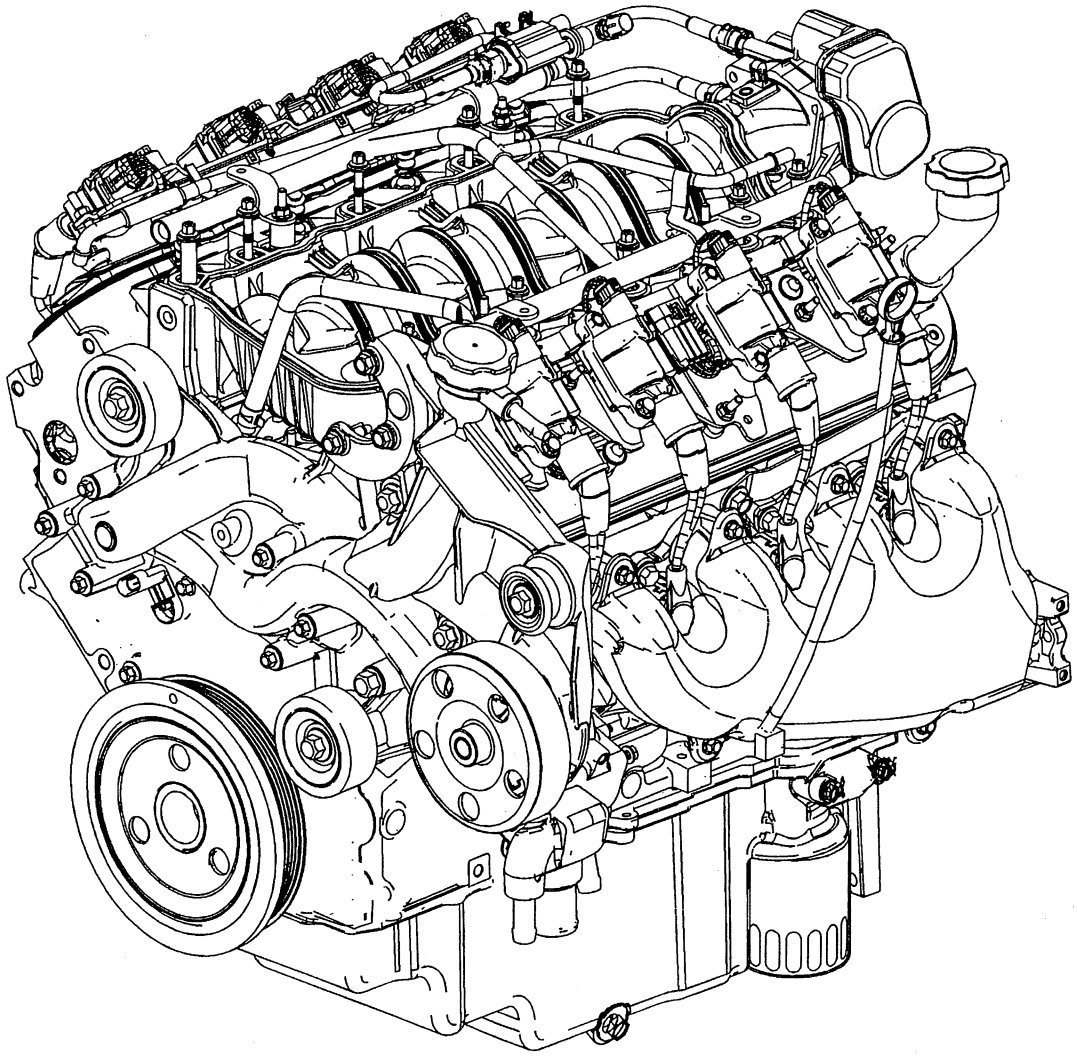
Application	Specification	
	Metric	English
Piston Ring to Groove Clearance - Second Compression Ring - Production	0.04-0.078 mm	0.00157-0.0031 in
Piston Ring to Groove Clearance - Second Compression Ring - Service	0.04-0.078 mm	0.00157-0.0031 in
Piston Ring to Groove Clearance - Oil Control Ring - Production	0.012-0.2 mm	0.0005-0.0078 in
Piston Ring to Groove Clearance - Oil Control Ring - Service	0.012-0.2 mm	0.0005-0.0078 in
Pistons and Pins		
Piston - Piston Diameter - Measured Over Skirt Coating	96.002-96.036 mm	3.779-3.78 in
Piston - Piston to Bore Clearance - Production	-0.036 to +0.016 mm	-0.0014 to +0.0006 in
Piston - Piston to Bore Clearance - Service Limit with Skirt Coating Worn Off	0.071 mm	0.0028 in
Pin - Piston Pin Clearance-to-Piston Pin Bore - Production	0.002-0.01 mm	0.00008-0.00004 in
Pin - Piston Pin Clearance-to-Piston Pin Bore - Service	0.002-0.015 mm	0.00008-0.00006 in
Pin - Piston Pin Fit in Connecting Rod Bore - Production	0.007-0.02 mm	0.00027-0.00078 in
Pin - Piston Pin Fit in Connecting Rod Bore - Service	0.007-0.022 mm	0.00027-0.00086 in
Pin - Piston Pin Diameter	23.997-24.0 mm	0.9447-0.9448 in
Valve System		
Valves - Valve Face Angle	45 degrees	
Valves - Valve Face Width	1.25 mm	0.05 in
Valves - Valve Lash	Net Lash - No Adjustment	
Valves - Valve Lift - Intake - Non Displacement on Demand (DoD)	12.24 mm	0.482 in
Valves - Valve Lift - Exhaust - Non Displacement on Demand (DoD)	12.24 mm	0.482 in
Valves - Valve Lift - Intake - Displacement on Demand (DoD)	12.46 mm	0.49 in
Valves - Valve Lift - Exhaust - Displacement on Demand (DoD)	12.46 mm	0.49 in
Valves - Valve Lift - Exhaust	11.85 mm	0.466 in
Valves - Valve Seat Angle	46 degrees	
Valves - Valve Seat Runout	0.05 mm	0.002 in
Valves - Valve Seat Width - Exhaust	1.78 mm	0.07 in
Valves - Seat Width - Intake	1.02 mm	0.04 in
Valves - Valve Stem Diameter - Production	7.955-7.976 mm	0.313-0.314 in
Valves - Valve Stem Diameter - Service	7.95 mm	0.313 in
Valves - Valve Stem-to-Guide Clearance - Production - Intake	0.025-0.066 mm	0.001-0.0026 in
Valves - Valve Stem-to-Guide Clearance - Service - Intake	0.093 mm	0.0037 in
Valves - Valve Stem-to-Guide Clearance - Production - Exhaust	0.025-0.066 mm	0.001-0.0026 in
Valves - Valve Stem-to-Guide Clearance - Service - Exhaust	0.093 mm	0.0037 in
Rocker Arms - Valve Rocker Arm Ratio	1.70:1	
Valve Springs - Valve Spring Free Length	52.9 mm	2.08 in
Valve Springs - Valve Spring Installed Height	45.75 mm	1.8 in
Valve Springs - Valve Spring Load - Closed	340 N at 45.75 mm	76 lb at 1.8 in
Valve Springs - Valve Spring Load - Open	980 N at 33.55 mm	220 lb at 1.32 in

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Camshaft Position (CMP) Sensor Bolt	12 N·m	106 lb in
Camshaft Retainer Bolts - Hex Head Bolts	25 N·m	18 lb ft
Camshaft Retainer Bolts - TORX® Head Bolts	15 N·m	11 lb ft
Camshaft Sprocket Bolts	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 Air Bleed Pipe and Cover Bolts	12 N·m	106 lb in
Coolant Temperature 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 M10 Bolts - First Pass in Sequence	20 N·m	15 lb ft
Crankshaft Bearing Cap M10 Bolts - Final Pass in Sequence	80 degrees	
Crankshaft Bearing Cap M10 Studs - First Pass in Sequence	20 N·m	15 lb ft
Crankshaft Bearing Cap M10 Studs - Final Pass in Sequence	51 degrees	
Crankshaft Bearing Cap M8 Bolts	25 N·m	18 lb ft
Crankshaft Oil Deflector Nuts	25 N·m	18 lb ft
Crankshaft Position (CKP) Sensor Bolt	25 N·m	18 lb ft
Crankshaft Rear Oil Seal Housing Bolts	25 N·m	18 lb ft
Cylinder Head M11 Bolts - First Pass in Sequence	30 N·m	22 lb ft
Cylinder Head M11 Bolts - Second Pass in Sequence	90 degrees	
Cylinder Head M11 Bolts - Final Pass in Sequence	70 degrees	
Cylinder Head M8 Bolts - in Sequence	30 N·m	22 lb ft
Cylinder Head Coolant Plug	20 N·m	15 lb ft
EN 47699 Bolt	60 N·m	44 lb ft
Engine Block Coolant Drain Hole Plug	60 N·m	44 lb ft
Engine Block Coolant Heater	50 N·m	37 lb ft
Engine Block Oil Gallery Plugs	60 N·m	44 lb ft
Exhaust Crossover Pipe Nuts	25 N·m	18 lb ft
Exhaust Manifold Bolts - First Pass	15 N·m	11 lb ft
Exhaust Manifold Bolts - Final Pass	20 N·m	15 lb ft
Exhaust Manifold Heat Shield Bolts	9 N·m	80 lb in
Exhaust Manifold Studs	20 N·m	15 lb ft
Flywheel Bolts - First Pass	20 N·m	15 lb ft
Flywheel Bolts - Second Pass	50 N·m	37 lb ft
Flywheel Bolts - Final Pass	100 N·m	74 lb ft
Front Cover Bolts	25 N·m	18 lb ft
Fuel Rail Bolts	10 N·m	89 lb in
Ignition Coil Bracket-to-Valve Rocker Arm Cover Studs	12 N·m	106 lb in
Ignition Coil-to-Bracket Bolts	10 N·m	89 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
J 41798 M8 Bolt	25 N·m	18 lb ft
J 41798 M10 Bolts	50 N·m	37 lb ft
Knock Sensor Bolts	20 N·m	15 lb ft
Oil Filter	30 N·m	22 lb ft
Oil Filter Fitting	55 N·m	40 lb ft

Application	Specification	
	Metric	English
Oil Level Indicator Tube Bolt	25 N·m	18 lb ft
Oil Level Sensor Bolt	20 N·m	15 lb ft
Oil Pan Closeout Cover Bolt - Left Side	9 N·m	80 lb in
Oil Pan Closeout Cover Bolt - Right Side	9 N·m	80 lb in
Oil Pan Cover Bolts	12 N·m	106 lb in
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pan M6 Bolts - Oil Pan-to-Rear Housing	12 N·m	106 lb in
Oil Pan M8 Bolts - Oil Pan-to-Engine Block and Oil Pan-to-Front Cover	25 N·m	18 lb ft
Oil Pressure Sensor	35 N·m	26 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
Oil Pump-to-Engine Block Bolts	25 N·m	18 lb ft
Sight Shield Studs	12 N·m	106 lb in
Spark Plugs	15 N·m	11 lb ft
Throttle Body Bolts	10 N·m	89 lb in
Timing Chain Dampener Bolts	25 N·m	18 lb ft
Valve Lifter Guide Bolts	12 N·m	106 lb in
Valve Lifter Oil Manifold (VLOM) Bolts	25 N·m	18 lb ft
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 Manifold - M8 Bolts	30 N·m	22 lb ft
Water Manifold - M10 Bolts	60 N·m	44 lb ft
Water Pump Bolts	10 N·m	89 lb in

Engine Component Description



The 5.3 Liter V8 engine is identified as RPO LS4 VIN C.

Camshaft and Drive System

A billet steel 1 piece camshaft is supported by 5 bearings pressed into the engine block. 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 camshaft position (CMP) sensor lobes are incorporated into the front face of the camshaft sprocket with the CMP sensor mounted in the engine front cover. A timing chain dampener is mounted to the front of the engine block above the crankshaft sprocket. The externally splined crankshaft sprocket is positioned to the crankshaft by a key and keyway. The crankshaft sprocket external splines drive the oil pump drive 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 5 crankshaft bearings. The bearings are retained by crankshaft bearing caps which are machined with the engine block for proper alignment and clearance. The crankshaft journals are undercut and rolled. The center main journal is the thrust journal. A crankshaft position (CKP) reluctor ring is press fit mounted at the rear of the crankshaft. The reluctor ring is not serviceable separately.

Cylinder Heads

The cylinder heads 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 of each cylinder head. The valve rocker arm covers are retained to the cylinder heads by 4 center mounted rocker arm cover bolts.

Engine Block

The engine block is a cam-in-block deep skirt 90 degree V configuration with 5 crankshaft bearing caps. The engine block is cast aluminum. The 5 crankshaft bearing caps each have 4 vertical M10 and 2 horizontal M8 mounting bolts. The camshaft is supported by 5 camshaft bearings pressed into the block.

Exhaust Manifolds

The exhaust manifolds are a 1 piece cast iron design. The exhaust manifolds direct exhaust gasses from the combustion chambers to the exhaust system. Each manifold also has an externally mounted heat shield that is retained by bolts.

Intake Manifold

The intake manifold is a 1 piece composite design that incorporates brass threaded inserts for mounting the fuel rail and throttle body. Each side of the intake manifold is sealed to the cylinder head by 8 non-reusable silicone sealing gaskets. The electronically actuated throttle body bolts to the front of the intake manifold. The throttle body is sealed by a 1 piece push in place silicone gasket. The fuel rail assembly, with 8 separate fuel injectors, is retained to the intake by 4 bolts. The injectors are seated into their individual manifold bores with O-ring seals to provide sealing. The manifold absolute pressure (MAP) sensor is installed and retained to the top of the intake manifold and sealed by an O-ring seal. The evaporative emission (EVAP) canister purge solenoid valve is retained to the manifold by a mounting bracket. There are no coolant passages within the intake manifold. The manifold is installed with the throttle body facing the rear of the engine.

Oil Pan

The structural rear-sump oil pan is cast aluminum. Incorporated into the design is the oil filter mounting boss, the displacement on demand (DoD) oil pressure relief valve and the drain plug opening. Filtered oil is returned to the engine block through the oil filter to the engine block upper oil galleries. The press-fit oil pressure relief valve is located at the left rear of the oil pan and can be inspected by removing the oil pan cover. The alignment of the structural oil pan to the rear of the engine block and transmission bell housing is critical.

Piston and Connecting Rod Assembly

The pistons are cast aluminum. The pistons use 2 compression rings and 1 oil control ring assembly. The piston is a low friction, lightweight design with a flat or recessed top and barrel shaped skirt. The piston pins are chromium steel and are a full-floating design. The connecting rods are powdered metal. The connecting rods are fractured at the connecting rod journal and then machined for the proper clearance. All applications use a piston with a graphite coated skirt. The piston and pin 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 silicon gasket for sealing. Mounted to each rocker cover are the coil and bracket assemblies. Incorporated into the left cover is the oil fill tube and the positive crankcase ventilation (PCV) fresh air passage. Incorporated into the right cover is the PCV system dirty air passage.

Valve Train

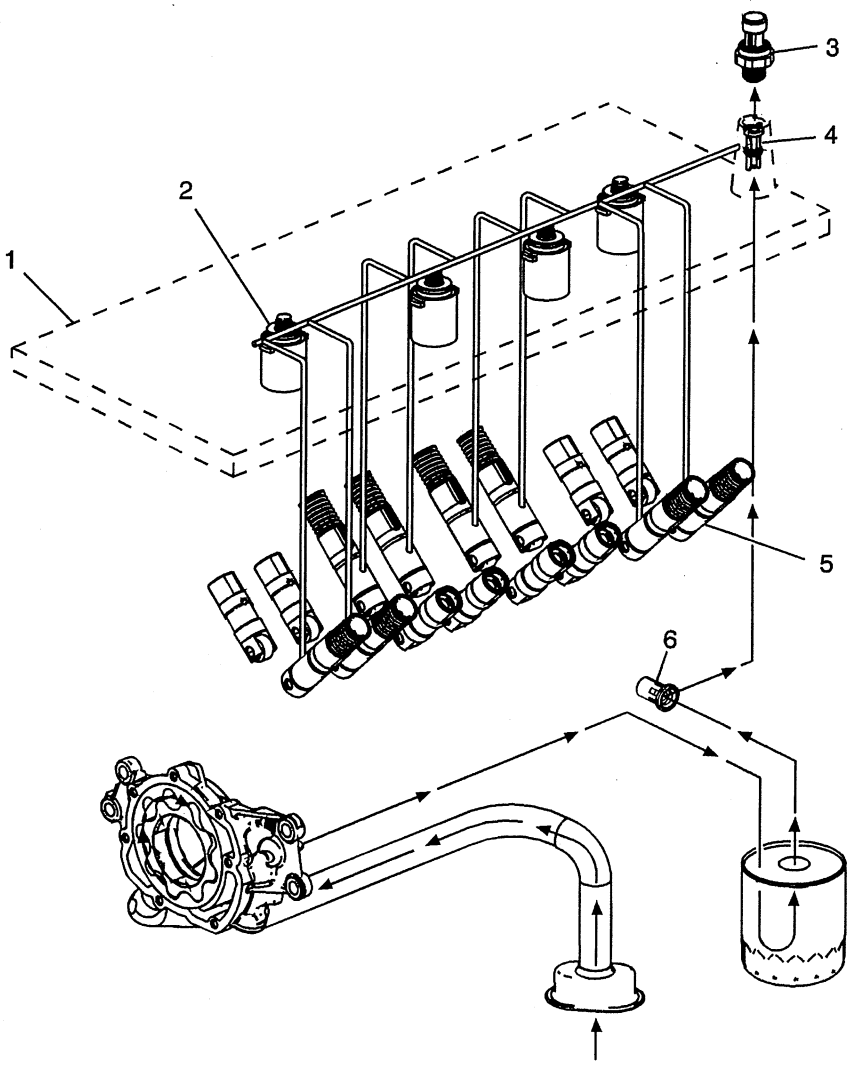
Motion is transmitted from the camshaft through the hydraulic roller valve lifters and tubular pushrods to the roller type rocker arms. The nylon valve lifter guides position and retain the valve lifters. The valve rocker arms for each bank of cylinders are mounted on pedestals or pivot supports. Each rocker arm is retained on the pivot support and cylinder head by a bolt. Valve lash is net build. Cylinders 1, 4, 6, and 7 are displacement on demand. Refer to Displacement on Demand (DoD) System below.

Displacement on Demand (DoD) System Description

System Operation

General Motors Displacement on Demand® (DoD) engine control system has the ability, under certain light load driving conditions, to provide maximum fuel economy by deactivating 4 of the engines 8 cylinders. The engine will normally operate on 8 cylinders in V8 mode during, starting, idling, and medium or heavy throttle conditions. When commanded ON, the powertrain control module (PCM) will direct the DoD system and deactivate cylinders 1 and 7 on the left bank and cylinders 4 and 6 on the right bank, forcing V4 mode.

Valve Lifter Oil Manifold Assembly



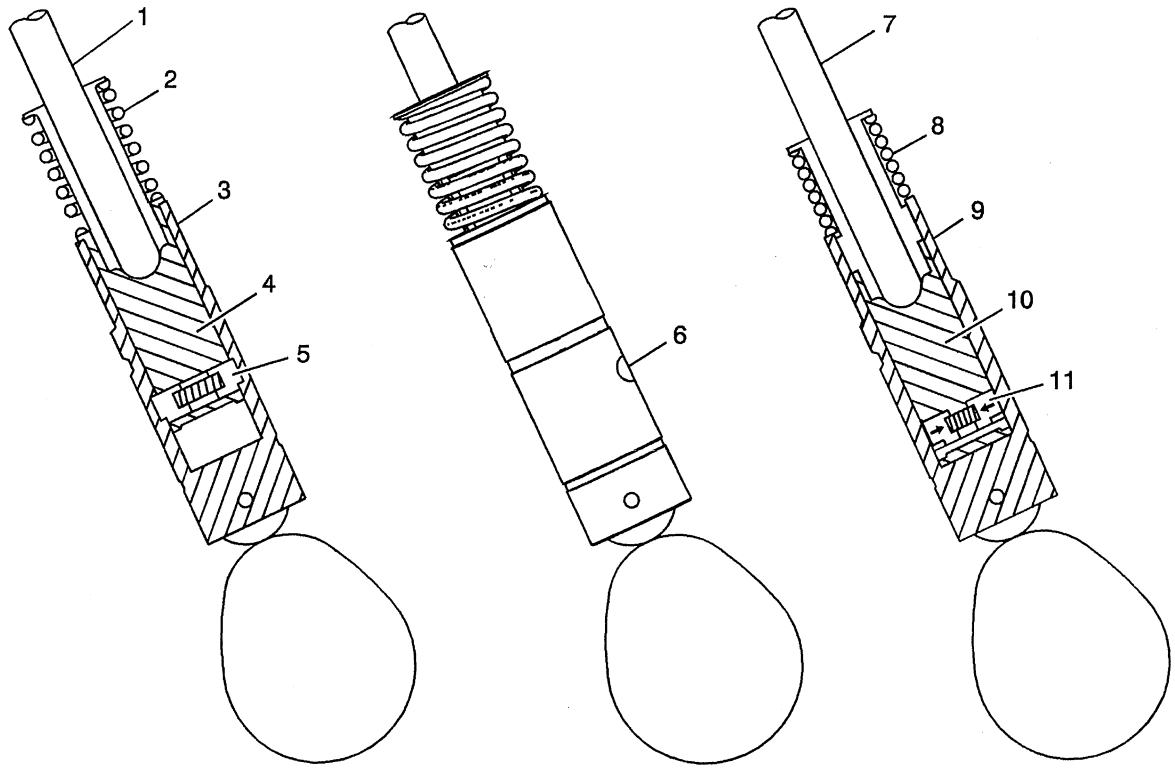
The valve lifter oil manifold (VLOM) assembly (1) is bolted to the top of the engine block beneath the intake manifold assembly. The oil manifold consists of 4 electrically operated and normally-closed solenoids (2). Each solenoid directs the flow of pressurized engine oil to the DoD intake and exhaust valve lifters (5). The oil pressure relief valve (6), located in the left rear area of the oil pan, regulates engine oil pressure to the lubrication system and the oil manifold.

When enabling conditions are met for DoD operation, the ECM will ground each solenoid control circuit in firing order sequence, allowing current to flow through the solenoid windings. With the windings energized, the solenoid valves open and direct pressurized engine oil through the manifold into 8 vertical

passages in the engine block lifter valley. The 8 vertical passages, 2 per cylinder, direct pressurized oil to the valve lifter bores of the cylinders to be deactivated. When vehicle operating conditions require a return to V8 mode, the ECM will turn OFF the ground circuit for the solenoids, allowing the solenoid valves to close. When the solenoid valves are closed, remaining oil pressure is exhausted through the bleed passages of the manifold into the engine block lifter valley. The housing of the oil manifold incorporates several oil bleed passages that continually purge trapped air from the manifold and engine block.

To help control contamination within the DoD hydraulic system, a small replaceable oil filter (4) is located in the manifold oil inlet passage. The oil pressure sensor (3) monitors engine oil pressure and provides information to the ECM.

Displacement on Demand Valve Lifters



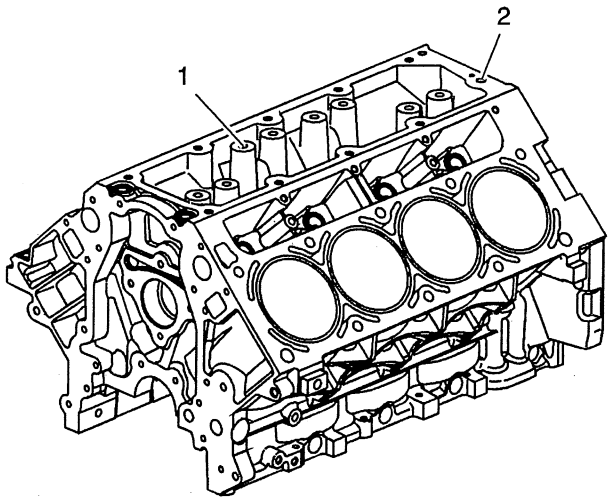
When operating in V8 mode, the DoD valve lifters function similar to the non-DoD valve lifters. The DoD oil manifold solenoids are in the closed position with no pressurized oil directed to the valve lifters. The pushrod (1) travels upward and downward to actuate the rocker arm and valve. The spring loaded locking pins (5) of the lifter are extended outward and mechanically lock the pin housing (4) to the outer body of the valve lifter (3).

When the DoD system is commanded ON, the ECM will direct the solenoids of the oil manifold to open and direct pressurized oil to the valve lifters. Oil travels through the manifold and engine block oil galleries and enters the inlet port (6) of the valve lifter.

When operating in V4 mode, pressurized oil forces the locking pins (11) inward. The pushrod (7) remains in a constant position and does not travel upward and downward. The outer body of the lifter (9) moves upward and downward independently from the pin housing (10). The valve lifter spring (8) retains tension on the valve train components to eliminate valve train noise.

When the DoD system is commanded OFF, the ECM directs the solenoids of the oil manifold to close, stopping the flow of pressurized oil to the valve lifters. The oil pressure within the lifter will decrease and the locking pins will move outward to mechanically lock the pin housing and outer body.

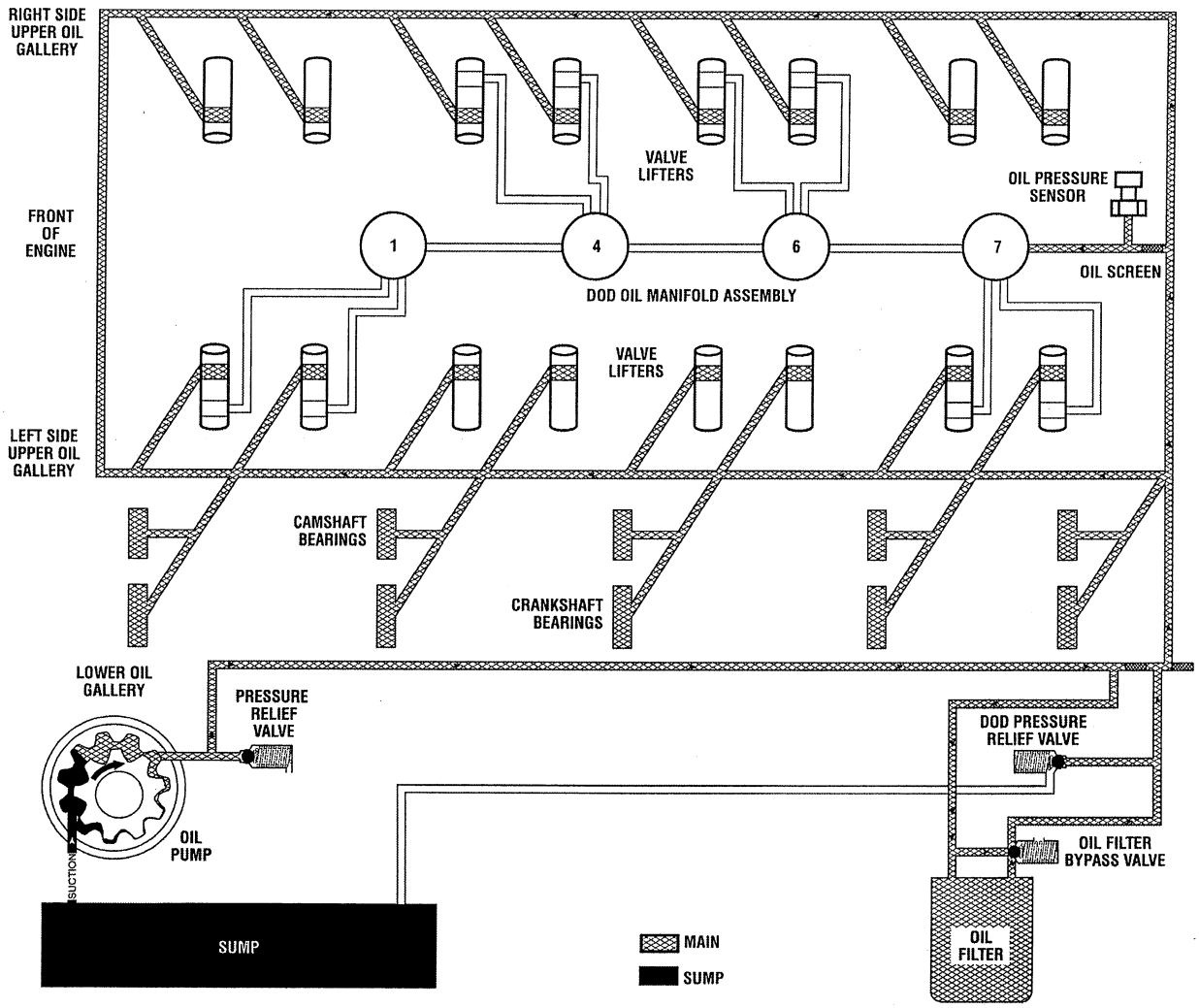
Engine Block



The DoD engine block incorporates additional features to support DoD system operation. Engine oil pressure is routed to the manifold assembly from an oil gallery (2) in the rear of the cylinder block. Cylinders 1, 4, 6, and 7 each have 2 vertical, cast-in-block oil passages (1). The vertical oil passages permit oil flow from the manifold assembly to the valve lifter bores.

Lubrication Description

Lubrication Description (Main Pressure Below 65 psi - DoD Off)



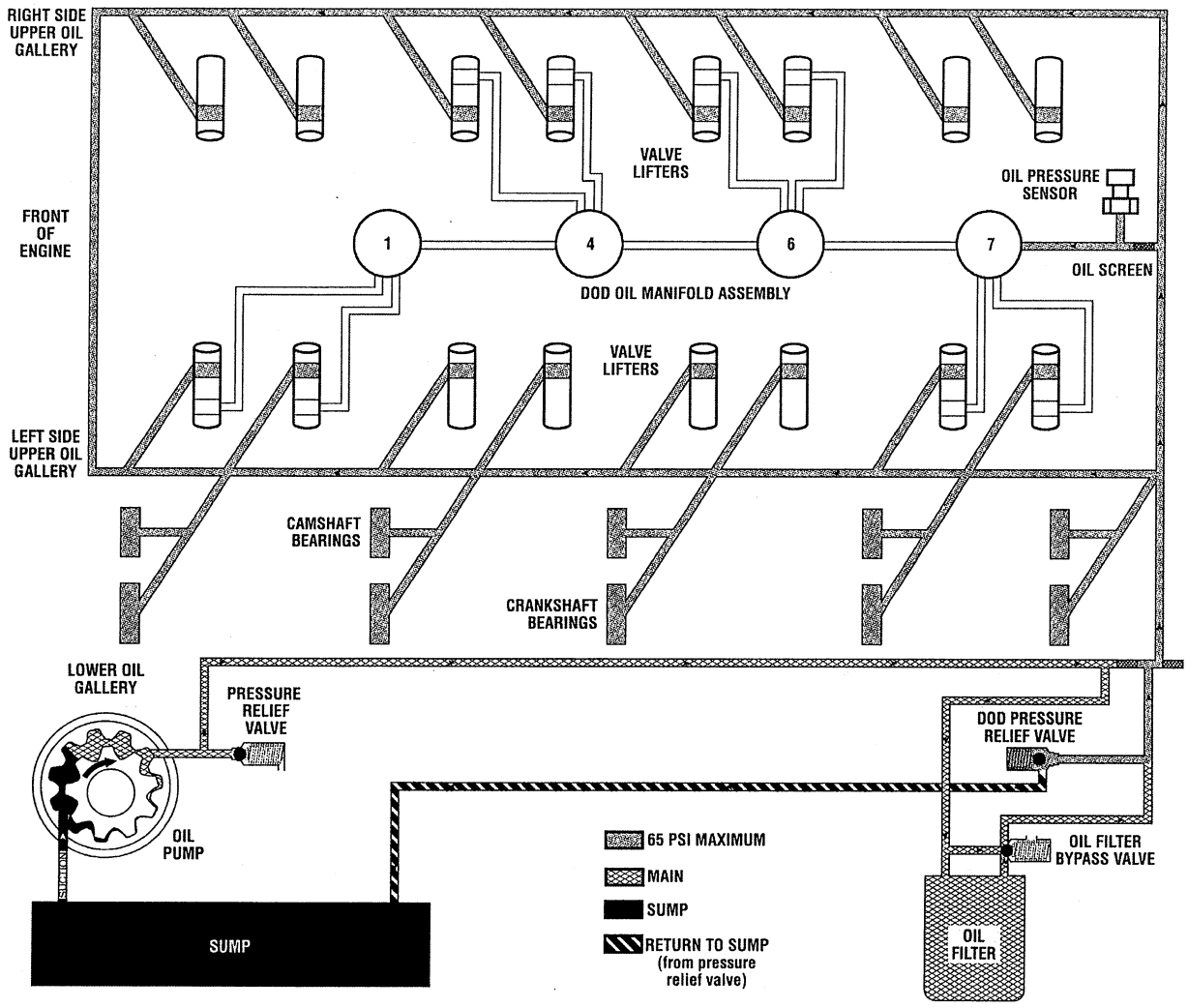
Engine lubrication is supplied by a gerotor type oil pump assembly. The pump is mounted on the front of the engine block and driven directly by the crankshaft sprocket. The pump gears rotate and draw oil from the oil pan sump through a pick-up screen and pipe. The oil is pressurized as it passes through the pump and is sent through the engine block lower oil gallery. 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 engine block lower oil gallery to the full flow oil filter where harmful contaminants are removed. A bypass valve is incorporated into the oil pan at the oil filter boss, which permits oil flow in the event the filter becomes restricted. A second valve, the displacement on demand (DoD) oil pressure relief valve is incorporated into the left rear side of the oil pan. The DoD oil pressure relief valve limits oil pressure directed to the upper oil galleries and oil manifold assembly to 448 kPa (65 psi) at 3,000 RPM and 21°C (70°F).

Oil is then directed from the filter to the upper main oil galleries and the DoD manifold assembly. Oil from the left upper oil gallery is directed to the crankshaft and camshaft bearings. Oil that has entered both 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. The oil pressure sensor is located at the top rear of the engine.

Lubrication Description (Main Pressure Above 65 psi - DoD Off)



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 lower oil gallery. Contained within the oil pump assembly is a pressure relief valve that maintains oil pressure within a specified range.

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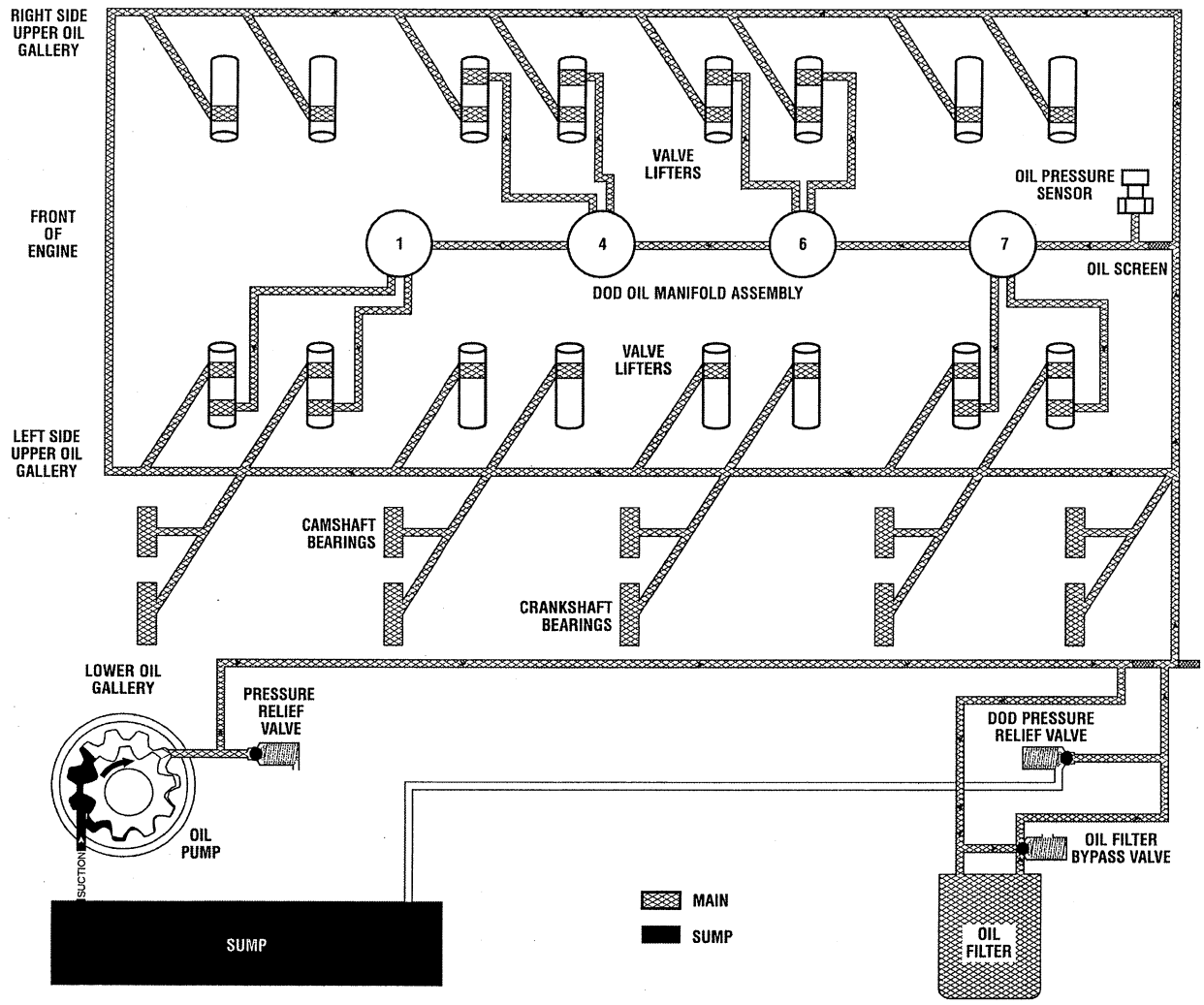
Oil is then directed from the filter to the upper main oil galleries and the DoD manifold assembly. Oil from the left upper oil gallery is directed to the crankshaft and camshaft bearings. Oil that has entered both the

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. The oil pressure sensor is located at the top rear of the engine.

Lubrication Description (Main Pressure Below 65 psi - DoD On)



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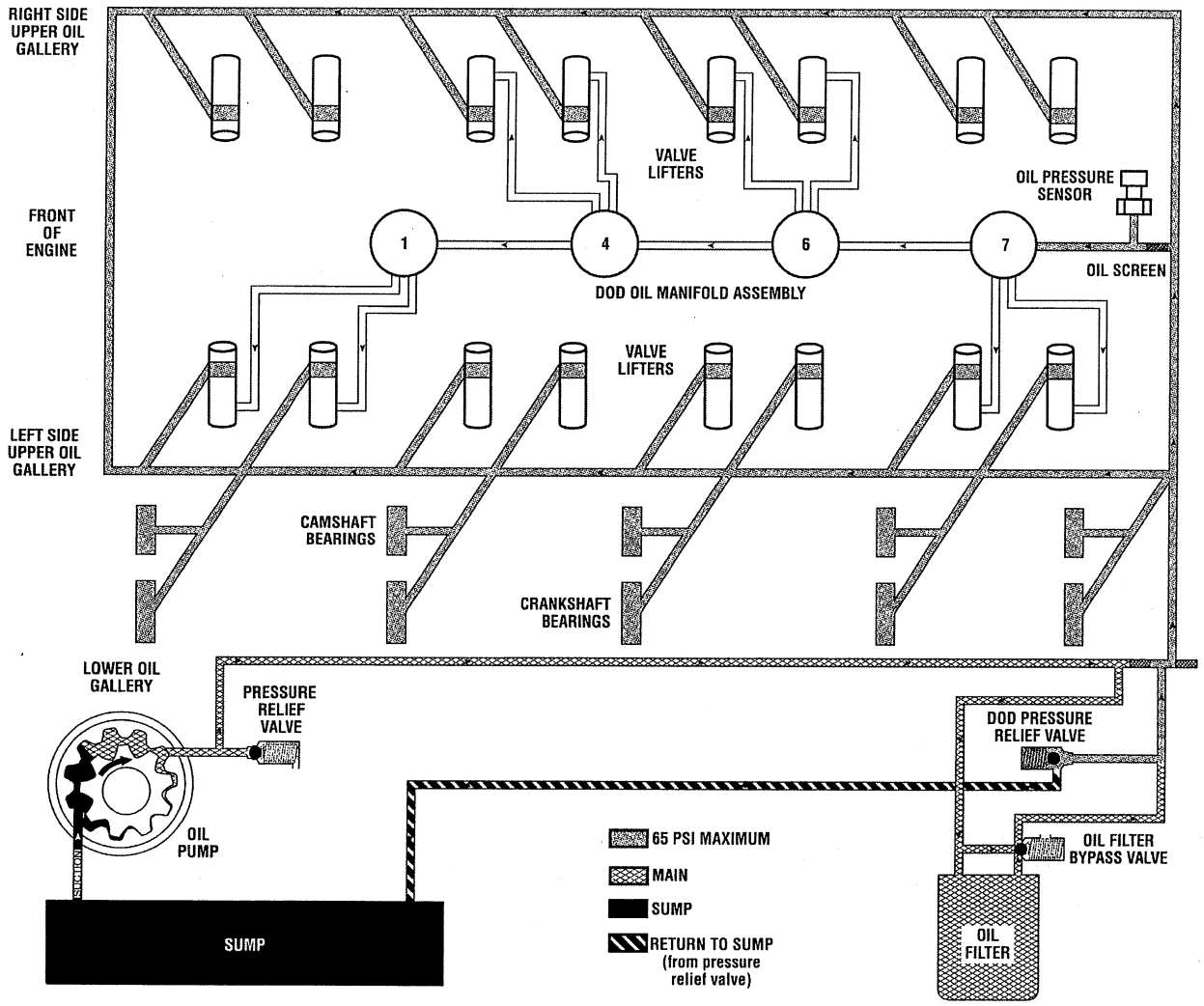
With DoD activated, the ECM commands the 4 solenoids to open, directing oil through the engine block oil galleries to the intake and exhaust valve lifters for cylinders 1, 4, 6, and 7.

Lubrication Description (Main Pressure Above 65 psi - DoD On)



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With DoD activated, the ECM commands the 4 solenoids to open, directing oil through the engine block oil galleries to the intake and exhaust valve lifters for cylinders 1, 4, 6, and 7.

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 1 belt or 2 belts. The drive belt is thin so that it can bend backwards and has several ribs to match the grooves in the pulleys. 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.

Crankcase Ventilation System Description

A closed crankcase ventilation system is used in order to provide a more complete scavenging of crankcase vapors. Fresh air from the throttle body is supplied to the crankcase, mixed with blow-by gases, and then passed through a crankcase ventilation pipe/passage into the intake manifold.

Results of Incorrect Operation

A plugged PCV Pipe/passage way may cause:

- Rough idle
- Stalling or slow idle speed
- Oil leaks
- Sludge in engine

Engine Cooling

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Condenser-to-Radiator Bolt	6 N·m	53 lb in
Coolant Crossover Pipe Bolt (RPO's LZE/LZ9)	50 N·m	37 lb ft
Coolant Heater (RPO LS4)	50 N·m	37 lb ft
Coolant Heater (RPO's LZE/LZ9)	60 N·m	44 lb ft
Engine Coolant Air Bleed Pipe/Cover Bolt (RPO LS4)	12 N·m	106 lb in
Lower Radiator Support Bracket Bolt	60 N·m	44 lb ft
Thermostat Bypass Pipe-to-Engine Front Cover Bolt (RPO's LZE/LZ9)	11 N·m	98 lb in
Thermostat Bypass Pipe-to-Throttle Body Nut (RPO's LZE/LZ9)	25 N·m	18 lb ft
Thermostat Housing Bolt/Stud (RPO's LZE/LZ9)	25 N·m	18 lb ft
Transmission Oil Cooler Pipe Attachment Nut	7 N·m	62 lb in
Upper Radiator Support Bracket Bolt	10 N·m	89 lb in
Water Outlet Housing Bolt (RPO LS4)	15 N·m	11 lb ft
Water Pump Bolt (RPO LS4)	10 N·m	89 lb in
Water Pump Bolt (RPO's LZE/LZ9)	10 N·m	89 lb in
Water Pump Manifold Bolt (M8) (RPO LS4)	30 N·m	22 lb ft
Water Pump Manifold Bolt (M10) (RPO LS4)	60 N·m	44 lb ft
Water Pump Pulley Bolt (RPO's LZE/LZ9)	25 N·m	18 lb ft

Cooling System Description and Operation

Coolant Heater

The optional engine coolant heater (RPO K05) operates using 110-volt AC external power and is designed to warm the coolant in the engine block area for improved starting in very cold weather -29°C (-20°F). The coolant heater helps reduce fuel consumption when a cold engine is warming up. The unit is equipped with a detachable AC power cord. A weather shield on the cord is provided to protect the plug when not in use.

Cooling System

The cooling system's function is to maintain an efficient engine operating temperature during all engine speeds and operating conditions. The cooling system is designed to remove approximately one-third of the heat produced by the burning of the air-fuel mixture. When the engine is cold, the coolant does not flow to the radiator until the thermostat opens. This allows the engine to warm quickly.

Cooling Cycle

Coolant flows from the radiator outlet and into the water pump inlet. Some coolant flows from the water pump, to the heater core, then back to the water pump. This provides the passenger compartment with heat and defrost capability as the coolant warms up.

Coolant also flows from the water pump outlet and into the engine block. In the engine block, the coolant circulates through the water jackets surrounding the cylinders where it absorbs heat.

The coolant then flows through the cylinder head gasket openings and into the cylinder heads. In the cylinder heads, the coolant flows through the water jackets surrounding the combustion chambers and valve seats, where it absorbs additional heat.

From the cylinder heads, the coolant flows to the thermostat. The flow of coolant will either be stopped at the thermostat until the engine reaches normal operating temperature, or it will flow through the thermostat and into the radiator where it is cooled. At this point, the coolant flow cycle is completed.

Efficient operation of the cooling system requires proper functioning of all cooling system components. The cooling system consists of the following components:

Coolant

The engine coolant is a solution made up of a 50-50 mixture of DEX-COOL and suitable drinking water. The coolant solution carries excess heat away from the engine to the radiator, where the heat is dissipated to the atmosphere.

Radiator

The radiator is a heat exchanger. It consists of a core and two tanks. The aluminum core is a tube and fin crossflow design that extends from the inlet tank to the outlet tank. Fins are placed around the outside of the tubes to improve heat transfer to the atmosphere.

The inlet and outlet tanks are a molded, high temperature, nylon reinforced plastic material. A high temperature rubber gasket seals the tank flange edge to the aluminum core. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core.

The radiator also has a drain cock located in the bottom of the left hand tank. The drain cock unit includes the drain cock and drain cock seal.

The radiator removes heat from the coolant passing through it. The fins on the core transfer heat from the coolant passing through the tubes. As air passes between the fins, it absorbs heat and cools the coolant.

Pressure Cap

The pressure cap seals the cooling system. It contains a blow off or pressure valve and a vacuum or atmospheric valve. The pressure valve is held against its seat by a spring, which protects the radiator from excessive cooling system pressure. The vacuum valve is held against its seat by a spring, which permits opening of the valve to relieve vacuum created in the cooling system as it cools off. The vacuum, if not relieved, might cause the radiator and/or coolant hoses to collapse.

The pressure cap allows cooling system pressure to build up as the temperature increases. As the pressure builds, the boiling point of the coolant increases. Engine coolant can be safely run at a temperature much higher than the boiling point of the coolant at atmospheric pressure. The hotter the coolant is, the faster the heat transfers from the radiator to the cooler, passing air.

The pressure in the cooling system can get too high. When the cooling system pressure exceeds the rating of the pressure cap, it raises the pressure valve, venting the excess pressure.

As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum causes the vacuum valve to open, allowing outside air into the surge tank. This equalizes the pressure in the cooling system with atmospheric pressure, preventing the radiator and coolant hoses from collapsing.

Coolant Recovery System

The coolant recovery system consists of a plastic coolant recovery reservoir and overflow tube. The recovery reservoir is also called a recovery tank or expansion tank. It is partially filled with coolant and is connected to the radiator fill neck with the overflow tube. Coolant can flow back and forth between the radiator and the reservoir.

In effect, a cooling system with a coolant recovery reservoir is a closed system. When the pressure in the cooling system gets too high, it will open the pressure valve in the pressure cap. This allows the coolant, which has expanded due to being heated, is allowed to flow through the overflow tube and into the recovery reservoir. As the engine cools down, the temperature of the coolant drops and a vacuum is created in the cooling system. This vacuum opens the vacuum valve in the pressure cap, allowing some of the coolant in the reservoir to be siphoned back into the radiator. Under normal operating conditions, no coolant is lost. Although the coolant level in the recovery reservoir goes up and down, the radiator and cooling system are kept full. An advantage to using 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.

Air Baffles and Seals

The cooling system uses deflectors, air baffles and air seals to increase cooling system capability. Deflectors are installed under the vehicle to redirect airflow beneath the vehicle and through the radiator to increase engine cooling. Air baffles are also used to direct airflow through the radiator and increase cooling capability. Air seals prevent air from bypassing the radiator and A/C condenser, and prevent recirculation of hot air for better hot weather cooling and A/C condenser performance.

Water Pump

The water pump is a centrifugal vane impeller type pump. The pump consists of a housing with coolant inlet and outlet passages and an impeller. The impeller is mounted on the pump shaft and consists of a series of flat or curved blades or vanes on a flat plate. When the impeller rotates, the coolant between the vanes is thrown outward by centrifugal force.

The impeller shaft is supported by one or more sealed bearings. The sealed bearings never need to be lubricated. Grease cannot leak out, dirt and water cannot get in as long as the seal is not damaged or worn.

The purpose of the water pump is to circulate coolant throughout the cooling system. The water pump is driven by the crankshaft via the drive belt.

Thermostat

The thermostat is a coolant flow control component. It's purpose is to help regulate the operating temperature of the engine. It utilizes a temperature sensitive wax-pellet element. The element connects to a valve through a small piston. When the element is heated, it expands and exerts pressure against the small piston. This pressure forces the valve to open. As the element is cooled, it contracts. This contraction allows a spring to push the valve closed.

When the coolant temperature is below the rated thermostat opening temperature, the thermostat valve remains closed. This prevents circulation of the coolant to the radiator and allows the engine to warm up. After the coolant temperature reaches the rated thermostat opening temperature, the thermostat valve will open. The coolant is then allowed to circulate through the thermostat to the radiator where the engine heat is dissipated to the atmosphere. The thermostat also provides a restriction in the cooling system, after it has opened. This restriction creates a pressure difference which prevents cavitation at the water pump and forces coolant to circulate through the engine block.

Engine Oil Cooler

The engine oil cooler is a heat exchanger. It is located inside the left side end tank of the radiator. The engine oil temperature is controlled by the temperature of the engine coolant that surrounds the oil cooler in the radiator.

The engine oil pump, pumps the oil through the engine oil cooler line to the oil cooler. The oil then flows through the cooler where the engine coolant absorbs heat from the oil. The oil is then pumped through the oil cooler return line, to the oil filter, to the engine block oil system.

Transmission Oil Cooler

The transmission oil cooler is a heat exchanger. It is located inside the right side end tank of the radiator. The transmission fluid temperature is regulated by the temperature of the engine coolant in the radiator.

The transmission oil pump, pumps the fluid through the transmission oil cooler line to the transmission oil cooler. The fluid then flows through the cooler where the engine coolant absorbs heat from the fluid. The fluid is then pumped through the transmission oil cooler return line, to the transmission.

Engine Electrical

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Battery Hold Down Bolt (RPOs LZE/LZ9)	18 N·m	13 lb ft
Battery Retainer Bolt (LS4)	18 N·m	13 lb ft
Battery Tray Bolt	5 N·m	44 lb in
Generator Bolt/Stud	50 N·m	37 lb ft
Generator Bracket Bolt (RPO LS4)	50 N·m	37 lb ft
Generator Output BAT Terminal Nut	30 N·m	22 lb ft
Ground Wire Bolt	10 N·m	89 lb in
Negative Battery Cable Terminal Nut	15 N·m	11 lb ft
Positive Battery Cable Junction Block Lead Nut	10 N·m	89 lb in
Positive Battery Cable Terminal Nut	15 N·m	11 lb ft
Starter Bolt	43 N·m	32 lb ft
Starter Solenoid "BAT" Terminal Nut	10 N·m	89 lb in
Transaxle Stud Nut	30 N·m	22 lb ft

Battery Usage

Application	Specification
3.5L LX3/LZE	
Cold Cranking Amperage	600 A
Amp Hour Rating	70 AH
Reserve Capacity Rating	115 Minutes
Replacement Battery Number	34-7YR
3.9L LZ9	
Cold Cranking Amperage	750 A
Amp Hour Rating	70 AH
Reserve Capacity Rating	115 Minutes
Replacement Battery Number	34-7YR
5.3L LS4	
Cold Cranking Amperage	625 A
Amp Hour Rating	66 AH
Reserve Capacity Rating	110 Minutes
Replacement Battery Number	85H - 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

Generator Usage

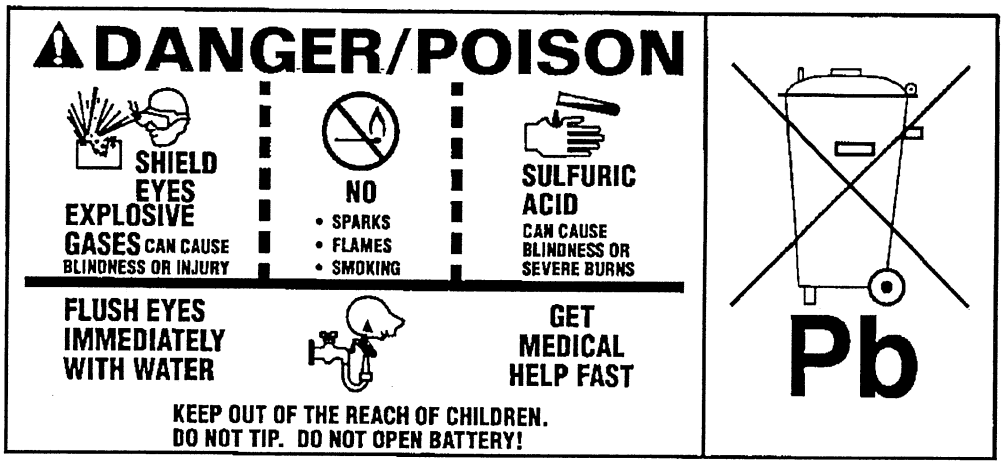
Application	Specification
LX3, LZE, LZ9	
Generator Model	Bosch
Rated Output	125 A
Load Test Output	87 A
LS4	
Generator Model	Denso SC1
Rated Output	135 A
Load Test Output	94 A

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.**



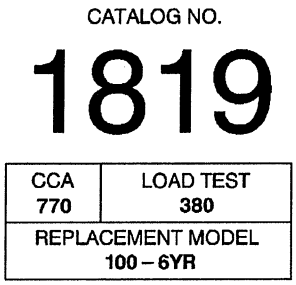
The maintenance free battery is standard. There are no vent plugs in the cover. The battery is completely sealed except for two small vent holes in the side. These vent holes allow the small amount of gas that is produced in the battery to escape.

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

The starter motors are non-repairable starter motors. They have pole pieces that are arranged around the armature. Both solenoid windings are energized. The pull-in winding circuit is completed to the ground through the starter motor. The windings work together magnetically to pull and hold in the plunger. The plunger moves the shift lever. This action causes the starter drive assembly to rotate on the armature shaft spline as it engages with the flywheel ring gear on the engine. Moving at the same time, the plunger also closes the solenoid switch contacts in the starter solenoid. Full battery voltage is applied directly to the starter motor and it cranks the engine.

As soon as the solenoid switch contacts close, current stops flowing thorough the pull-in winding because battery voltage is applied to both ends of the windings. The hold-in winding remains energized. Its magnetic field is strong enough to hold the plunger, shift lever, starter drive assembly, and solenoid switch contacts in place to continue cranking the engine. When the engine starts, pinion overrun protects the armature from excessive speed until the switch is opened.

When the ignition switch is released from the START position, the START relay opens and battery voltage is removed from the starter solenoid S terminal. Current flows from the motor contacts through both windings to the ground at the end of the hold-in winding. However, the direction of the current flow through the pull-in winding is now opposite the direction of the current flow when the winding was first energized.

The magnetic fields of the pull-in and hold-in windings now oppose one another. This action of the windings, along with the help of the return spring, causes the starter drive assembly to disengage and the solenoid switch contacts to open simultaneously. As soon as the contacts open, the starter circuit is turned off.

Circuit Description (Key Start)

When the ignition switch is placed in the Start position, a discrete 12-volt signal is supplied to the body control module (BCM) notifying it that the ignition is in the Start position. The BCM then sends a message to the engine control module (ECM) notifying it that CRANK has been requested. The ECM verifies that the transmission is in Park or Neutral. If it is, the ECM then supplies 12 volts to the control circuit of the crank relay. When this occurs, battery positive voltage is supplied through the switch side of the crank relay to the S terminal of the starter solenoid.

Charging System Description and Operation

Generator

- The generators feature the following major components:
- The delta stator
- The rectifier bridge
- The rotor with slip rings and brushes
- A conventional pulley
- 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 the A/C RLY fuse in the under-hood junction block. This voltage is used by the regulator as the reference for system voltage control.

Engine Controls

Engine Controls – 3.5L

Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-2-3-4-5-6	
Spark Plug Gap	1.02 mm	0.040 in
Spark Plug Torque	15 N·m	11 lb ft
Spark Plug Type	GM P/N 12591131 AC Delco #41-100	
Spark Plug Wire Resistance	4,018 ohms per meter (1,225 ohms per ft)	

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Pedal Position (APP) Sensor Bolt	5 N·m	44 lb in
Air Cleaner Outlet Duct Clamp	3 N·m	27 lb in
Camshaft Position (CMP) Sensor Bolt	10 N·m	89 lb in
Crankshaft Position (CKP) Sensor Stud	10 N·m	89 lb in
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Bolt	16 N·m	12 lb ft
Evaporative Emission (EVAP) Canister Vent Solenoid Valve Bracket Bolt	10 N·m	89 lb in
Fuel/Brake Line Retainer Bolt	10 N·m	89 lb in
Fuel Fill Hose Clamp	2.5 N·m	22 lb in
Fuel Fill Pipe Bracket Bolt	13 N·m	115 lb in
Fuel Fill Pipe to Fill Pocket Bolt	2.5 N·m	22 lb in
Fuel Injector Harness Connector Bracket Bolt	8 N·m	71 lb in
Fuel Rail Bolt	10 N·m	89 lb in
Fuel Tank Strap Bolt	48 N·m	35 lb ft
Heated Oxygen Sensor (HO2S)	42 N·m	31 lb ft
Heater Inlet/Outlet Hose/Pipe Clip Nut	10 N·m	89 lb in
Ignition Coil Bolt/Stud/Nut	25 N·m	15 lb ft
Intake Manifold - Upper Bolt	25 N·m	18 lb ft
Knock Sensor (KS)	25 N·m	18 lb ft
Mass Air Flow(MAF)/Intake Air Temperature Sensor Bolt	10 N·m	89 lb in
Spark Plug		
New Cylinder Head	20 N·m	15 lb ft
Used Cylinder Head	15 N·m	11 lb ft
Throttle Body Bolt/Stud	10 N·m	89 lb in

Engine Controls – 3.9L

Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-2-3-4-5-6	
Spark Plug Gap	1.02 mm	0.040 in
Spark Plug Torque	15 N·m	11 lb ft
Spark Plug Type	GM P/N 12591131 AC Delco #41-100	
Spark Plug Wire Resistance	4,018 ohms per meter (1,225 ohms per ft)	

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Pedal Position (APP) Sensor Bolt	5 N·m	44 lb in
Air Cleaner Outlet Duct Clamp	3 N·m	27 lb in
Camshaft Position (CMP) Sensor Bolt	10 N·m	89 lb in
Crankshaft Position (CKP) Sensor Stud	10 N·m	89 lb in
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Evaporative Emission (EVAP) Canister Purge Solenoid Valve Bolt	16 N·m	12 lb ft
Evaporative Emission (EVAP) Canister Vent Solenoid Valve Bracket Bolt	10 N·m	89 lb in
Fuel/Brake Line Retainer Bolt	10 N·m	89 lb in
Fuel Fill Hose Clamp	2.5 N·m	22 lb in
Fuel Fill Pipe Bracket Bolt	13 N·m	115 lb in
Fuel Fill Pipe to Fill Pocket Bolt	2.5 N·m	18 lb in
Fuel Injector Harness Connector Bracket Bolt	8 N·m	71 lb in
Fuel Rail Bolt	10 N·m	89 lb in
Fuel Tank Strap Bolt	48 N·m	35 lb ft
Heated Oxygen Sensor (HO2S)	42 N·m	31 lb ft
Heater Inlet/Outlet Hose/Pipe Clip Nut	10 N·m	89 lb in
Ignition Coil Bolt/Stud/Nut	25 N·m	15 lb ft
Intake Manifold Tuning Valve Bolt	10 N·m	89 lb in
Intake Manifold - Upper Bolt	25 N·m	18 lb in
Knock Sensor (KS)	25 N·m	18 lb ft
Mass Air Flow (MAF)/Intake Air Temperature Sensor Bolt	10 N·m	89 lb in
Spark Plug		
New Cylinder Head	20 N·m	15 lb ft
Used Cylinder Head	15 N·m	11 lb ft
Throttle Body Bolt/Nut	10 N·m	89 lb in

Engine Controls – 5.3L

Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-8-7-2-6-5-4-3	
Spark Plug Wire Resistance	188-312 ohms	
Spark Plug Torque	15 N·m	11 lb ft
Spark Plug Gap	1.02 mm	0.040 in
Spark Plug Type	GM P/N 12571164 AC Spark Plug P/N 41-985	

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
Camshaft Position Sensor Bolt	12 N·m	106 lb in
Crankshaft Position Sensor Bolt	25 N·m	18 lb ft
Engine Coolant Temperature Sensor	20 N·m	15 lb ft
Evaporative Emission Canister Vent Valve Bracket Bolt	10 N·m	89 lb in
Fuel Fill Hose to Fuel Tank Clamp	2.5 N·m	22 lb in
Fuel Fill Pipe Bracket Bolt	13 N·m	115 lb in
Fuel Fill Pipe Clamp	2.5 N·m	22 lb in
Fuel Fill Pipe to Filler Pocket Screw	2.5 N·m	22 lb in
Fuel Rail Bolt	10 N·m	89 lb in
Fuel Tank Strap Bolt	48 N·m	35 lb ft
Heated Oxygen Sensor	42 N·m	31 lb ft
Ignition Coil Bolt	8 N·m	71 lb in
Knock Sensor	20 N·m	15 lb ft
Mass Air Flow/Intake Air Temperature Sensor Bolt	10 N·m	89 lb in
Throttle Body Bolt	10 N·m	89 lb in

Exhaust System

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter Nut	60 N·m	44 lb ft
Catalytic Converter Pipe Stud Nut	35 N·m	26 lb ft
Exhaust Crossover Pipe Nut (LS4)	25 N·m	18 lb ft
Exhaust Hanger Bracket Bolt	25 N·m	18 lb ft
Exhaust Manifold Bolt (LS4)		
First Pass	15 N·m	11 lb ft
Final Pass	20 N·m	15 lb ft
Exhaust Manifold Heat Shield Bolt (LS4)	9 N·m	80 lb in
Exhaust Pipe Rear Hanger Bolt	25 N·m	18 lb ft
Rear Bumper Impact Bar Bolt	25 N·m	18 lb ft
Tail Pipe Extension Clamp	68 N·m	50 lb ft

Exhaust System Description

Important

Use of non-OEM parts may cause driveability concerns.

The exhaust system carries exhaust gases, treated by the catalytic converter, through a resonator, if applicable and into the exhaust muffler where exhaust noise is lessened.

In order to secure the exhaust pipe to the exhaust manifold, a flange and seal-joint coupling is utilized. The exhaust system may utilize a slip-joint coupling design with a clamp and a U-bolt or a flange connection with a gasket.

Exhaust hangers and rubber insulators help to support the weight of the exhaust pipe along with insulating any exhaust system vibration, rattle, or noise.

Exhaust hangers also space the exhaust system away from the underbody of the vehicle and allows the exhaust system to expand as the exhaust system warms up.

Exhaust heat shields are used to protect the body and other components from damage due to the heat from the exhaust system.

The exhaust system may be comprised of the following components:

- Exhaust manifold
- Exhaust pipes
- Catalytic converters
- Exhaust muffler
- Exhaust resonator, if equipped
- Exhaust tail pipe, if equipped
- Exhaust hangers
- Exhaust heat shields

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/Transaxle Description and Operation

Automatic Transmission – 4T65E

Transmission General Specifications

Name	Hydra-matic 4T65-E
RPO Codes	M15, MN7
Production Location	Warren, MI
Vehicle Platform Engine/Transmission Usage	W
Transaxle Drive	Transverse Mounted Front Wheel Drive
1st Gear Ratio	2.921:1
2nd Gear Ratio	1.568:1
3rd Gear Ratio	1.000:1
4th Gear Ratio	0.705:1
Reverse	2.385:1
Torque Converter Size Diameter of Torque Converter Turbine	245 mm (M15) 258 mm (MN7)
Pressure Taps	Line Pressure
Transaxle Fluid Type	DEXRON® III
Transaxle Fluid Capacity Approximate	Bottom Pan Removal: 7.0 L (7.4 qts) Complete Overhaul: 9.5 L (10.0 qts) Dry: 12.7 L (13.4 qts)
Transaxle Type: 4	Four Forward Gears
Transaxle Type: T	Transverse Mount
Transaxle Type: 65	Product Series
Transaxle Type: E	Electronic Controls
Chain Ratios Designates Number of Teeth on the Drive/Driven Sprockets	37/33 35/35
Final Drive Ratios	2.86, 3.05, 3.29
Overall Final Drive Ratios	2.86, 3.05, 3.29
Position Quadrant	P, R, N, D, 3, 2, 1
Case Material	Die Cast Aluminum
Transaxle Weight Dry	87.9 kg (194.2 lbs)
Transaxle Weight Wet	97.0 kg (214.4 lbs)
Maximum Trailer Towing Capacity	907 kg (2,000 lbs)
Maximum Gross Vehicle Weight (GVW)	2903 kg (6,400 lbs)

Fastener Tightening Specifications

Description of Usage	Specification	
	Metric	English
2-1 Servo to Case	25 N·m	18 lb ft
Accumulator Cover to Case	12 N·m	106 lb in
Case Cover to Case	12 N·m	106 lb in
Case Cover to Case	12 N·m	106 lb in
Case Cover to Driven Sprocket Support	25 N·m	18 lb ft
Case Cover to Driven Sprocket Support (TORX®)	12 N·m	106 lb in
Case to Drive Sprocket Support	25 N·m	18 lb ft
Case Extension to Case	36 N·m	26 lb ft
Case Side Cover to Case	25 N·m	18 lb ft
Case Side Cover to Case (Stud)	25 N·m	18 lb ft
Case Side Cover to Case (TORX® Special)	25 N·m	18 lb ft
Detent Spring to Case Cover	12 N·m	106 lb in
Forward Band Servo Cover to Case	12 N·m	106 lb in

Manual Shaft/Detent Nut	32 N·m	23 lb ft
Oil Cooler Quick Connector	38 N·m	28 lb ft
Oil Cooler Quick Connector with Checkball	38 N·m	28 lb ft
Oil Pan to Case	14 N·m	10 lb ft
Oil Pressure Test Hole Plug	12 N·m	106 lb in
Pump Body to Case	16 N·m	11 lb ft
Pump Cover to Case Cover	12 N·m	106 lb in
Pump Cover to Pump Body	8 N·m	70 lb in
Speed Sensor to Case	12 N·m	106 lb in
TFP Switch to Case	16 N·m	11 lb ft
TFP Switch to Case Cover	12 N·m	106 lb in
TFP Switch to Valve Body	8 N·m	70 lb in
Valve Body to Case	12 N·m	106 lb in
Valve Body to Case	12 N·m	106 lb in
Valve Body to Case Cover	12 N·m	106 lb in
Valve Body to Case Cover	12 N·m	106 lb in
Valve Body to Case Cover (TORX®)	12 N·m	106 lb in
Valve Body to Driven Sprocket Support	25 N·m	18 lb ft

Fluid Capacity Specifications

Application	Specification	
	Metric	English
Bottom Pan Removal	7.0 liters	7.4 quarts
Complete Overhaul	9.5 liters	10.0 quarts
Dry	12.7 liters	13.4 quarts

Transmission Component and System Description

Transmission General Description

The 4T65-E is a fully automatic front wheel drive electronically controlled transmission. The 4T65-E provides four forward ranges including overdrive. The PCM controls shift points by means of two shift solenoids. A vane-type oil pump supplies the oil pressure. The PCM regulates oil pressure by means of a pressure control solenoid valve.

All vehicles equipped with a 4T65-E transmission have an electronically controlled capacity clutch (ECCC) system. In the ECCC system, the pressure plate does not fully lock to the torque converter cover. It is instead, precisely controlled to maintain a small amount of slippage between the engine and the turbine, reducing driveline torsional disturbances.

You can operate the transmission in any one of the following seven modes:

- P -- Park position prevents the vehicle from rolling either forward or backward. For safety reasons, use the parking brake in addition to the park position.
- R -- Reverse allows the vehicle to be operated in a rearward direction.
- N -- Neutral allows the engine to be started and operated while driving the vehicle. If necessary, you may select this position in order to restart the engine with the vehicle moving.
- D -- Overdrive is used for all normal driving conditions. Overdrive provides four gear ratios plus a converter clutch operation. Depress the accelerator in order to downshift for safe passing.
- 3 -- Drive position is used for city traffic and hilly terrain. Drive provides three gear ranges and drive range prevents the transmission from operating in fourth gear. Depress the accelerator in order to downshift.
- 2 -- Manual Second provides two gear ratios under most operating conditions. Manual Second provides acceleration and engine braking. Select this range at any vehicle speed, but the transmission will not downshift into Second gear until the vehicle speed drops below approximately 100 km/h (62 mph)
- 1 -- Manual Lo provides maximum engine braking. You may also select this range at any vehicle speed, but the transmission will not downshift into First gear until the vehicle speed drops below approximately 60 km/h (37 mph).

Mechanical Componants

The mechanical components of this unit are as follows:

- A torque converter with an Electronically Controlled Capacity Clutch (ECCC)
- A drive link assembly
- 4 multiple disk clutch assemblies: Input, Second, Third and Fourth
- 3 friction bands: Forward band, 2/1 band and Reverse band
- 2 planetary gear sets: Input and Reaction
- 3 one-way clutches: a roller clutch (1-2 support) and 2 sprag clutches (Third and Input)
- A final drive and differential assembly
- A control valve assembly
- A vane type oil pump

The electrical components of this unit are as follows:

- 2 shift solenoid valves
- A torque converter clutch pulse width modulation (TCC PWM) solenoid valve
- A pressure control (PC) solenoid valve

- An automatic transmission fluid temperature (TFT) sensor
- 2 speed sensors: input shaft and vehicle speed sensors
- An automatic transmission fluid pressure (TFP) manual valve position switch
- Either an Internal Mode Switch or an exterior-mounted Transmission Range Switch.
- An automatic transmission (A/T) wiring harness assembly

Adapt Function

The 4T65-E transmission uses a line pressure control system, that has the ability to adapt line pressure to compensate for normal wear of the following parts:

- The clutch fiber plates
- The springs and seals
- The apply bands

The PCM maintains information for the following transmission adaptive systems:

Upshift Adapts (1-2, 2-3 and 3-4)

The PCM monitors the automatic transmission input shaft speed (AT ISS) sensor and the vehicle speed sensor (VSS) in order to determine when an upshift has started and completed. The PCM measures the time for the upshift. If the upshift time is longer than a calibrated value, then the PCM will adjust the current to the pressure control (PC) solenoid valve to increase the line pressure for the next shift in the same torque range. If the upshift time is shorter than the calibrated value, then the PCM will decrease the line pressure for the next shift in the same torque range.

Steady State Adapts

The PCM monitors the AT ISS sensor and the VSS after an upshift in order to determine the amount of clutch slippage. If excessive slippage is detected, then the PCM will adjust the current to the PC solenoid valve in order to increase the line pressure to maintain the proper gear ratio for the commanded gear.

The TAP information is divided into 13 units, called cells. The cells are numbered 4 through 16. Each cell represents a given torque range. TAP cell 4 is the lowest adaptable torque range and TAP cell 16 is the highest adaptable torque range. It is normal for TAP cell values to display zero or negative numbers. This indicates that the PCM has adjusted line pressure at or below the calibrated base pressure.

Automatic Transmission Shift Lock Control Description

The automatic transmission shift lock control system is a safety device that prevents an inadvertent shift out of PARK when the engine is running. 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 body control module (BCM).
- The powertrain control module (PCM).

With the ignition in the ON position, battery positive voltage is supplied 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 body control module (BCM) provides a ground for the automatic transmission shift lock control solenoid when the transmission is in the PARK position. The body control module (BCM) receives the transmission gear position information via class2 serial data from the powertrain control module (PCM). This causes the automatic transmission shift lock control solenoid to energize and lock the shift lever in the PARK position. When the driver presses the brake pedal, the contacts in the automatic transmission shift lock control switch open. This causes the automatic transmission shift lock control solenoid to release. This allows the shift lever to move from the PARK position. The body control module (BCM) turns off the automatic transmission shift lock control solenoid ground circuit when the transmission is out of the PARK position.

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
5/8	0.625	15.875
41/64	0.640625	16.27187

Fraction (in)	Decimal (in)	Metric (mm)
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

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Fasteners

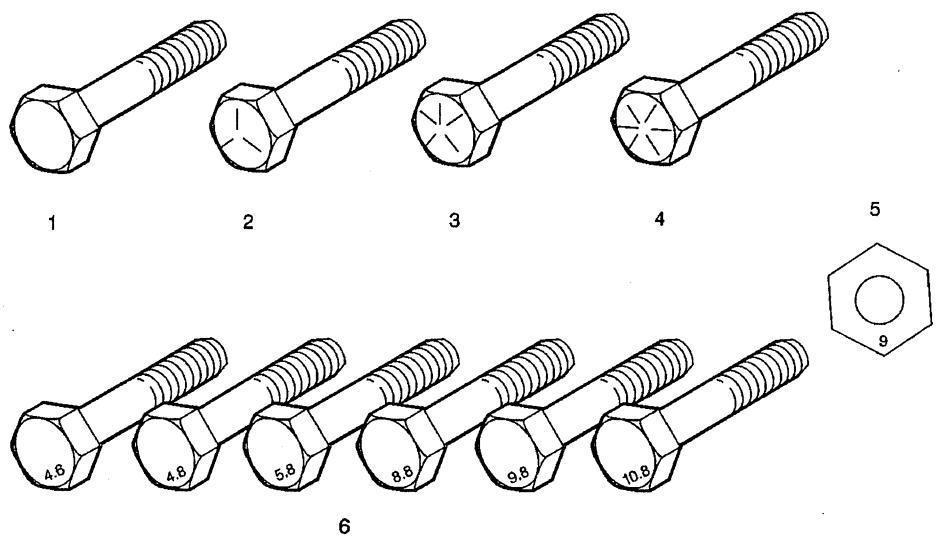
Metric Fasteners

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.

The correct fasteners are available through GM SPO. Many metric fasteners available in the aftermarket parts channels are designed to metric standards of countries other than the United States, and may exhibit the following:

- Lower strength
- No numbered head marking system
- Wrong thread pitch

The metric fasteners on GM products are designed to new, international standards. The following are the common sizes and pitches, except for special applications:

- M6.0 X 1
- M8 X 1.25
- M10 X 1.5
- M12 X 1.75
- M14 X 2.00
- M16 X 2.00

Prevailing Torque Fasteners

Prevailing torque fasteners create a thread interface between the fastener and the fastener counterpart in order to prevent the fastener from loosening.

All Metal Prevailing Torque Fasteners

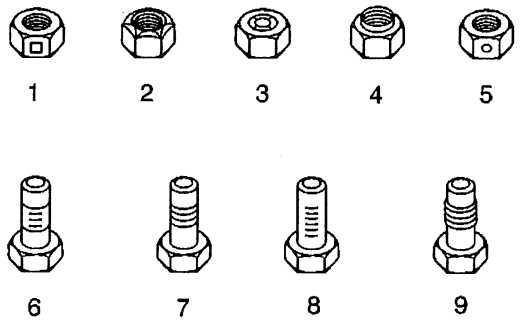
These fasteners accomplish the thread interface by a designed distortion or deformation in the fastener.

Nylon Interface Prevailing Torque Fasteners

These fasteners accomplish the thread interface by the presence of a nylon material on the fastener threads.

Adhesive Coated Fasteners

These fasteners accomplish the thread interface by the presence of a thread-locking compound on the fastener threads. Refer to the appropriate repair procedure in order to determine if the fastener may be reused and the applicable thread-locking compound to apply to the fastener.



1. Prevailing Torque Nut, Center Lock Type
2. Prevailing Torque Nut, Top Lock Type
3. Prevailing Torque Nut, Nylon Patch Type
4. Prevailing Torque Nut, Nylon Washer Insert Type
5. Prevailing Torque Nut, Nylon Insert Type

6. Prevailing Torque Bolt, Dry Adhesive Coating Type
7. Prevailing Torque Bolt, Thread Profile Deformed Type
8. Prevailing Torque Bolt, Nylon Strip Type
9. Prevailing Torque Bolt, Out-of-Round Thread Area Type

A prevailing torque fastener may be reused ONLY if:

- The fastener and the fastener counterpart are clean and not damaged
- There is no rust on the fastener
- The fastener develops the specified minimum torque against its counterpart prior to the fastener seating

Metric Prevailing Torque Fastener Minimum Torque Development

Application	Specification	
	Metric	English
All Metal Prevailing Torque Fasteners		
6 mm	0.4 N·m	4 lb in
8 mm	0.8 N·m	7 lb in
10 mm	1.4 N·m	12 lb in
12 mm	2.1 N·m	19 lb in
14 mm	3 N·m	27 lb in
16 mm	4.2 N·m	37 lb in
20 mm	7 N·m	62 lb in
24 mm	10.5 N·m	93 lb in
Nylon Interface Prevailing Torque Fasteners		
6 mm	0.3 N·m	3 lb in
8 mm	0.6 N·m	5 lb in
10 mm	1.1 N·m	10 lb in
12 mm	1.5 N·m	13 lb in
14 mm	2.3 N·m	20 lb in
16 mm	3.4 N·m	30 lb in
20 mm	5.5 N·m	49 lb in
24 mm	8.5 N·m	75 lb in

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

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Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
	AK5	**Air bags,** dual-stage, frontal, driver and right front passenger **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.**	S[1]	S[1]	S[1]	S[1]	S[1]	S[1]
	C67	**Air conditioning,** front manual, single zone with air filtration	S	--	--	--	--	--
	CJ3	**Air conditioning,** dual-zone, manual, includes individual climate settings for driver and right front passenger, manual climate control and air filtration	--	S	S	S	S	S
		Applique, metallic film on instrument panel and door	S	S	S	S	S	--
		Applique, techno metallic on instrument panel and door	--	--	--	--	--	S
		Assist handle, front passenger	S	S	S	S	S	S
	AP9	**Cargo convenience net,** trunk	--	S	S	S	S	S
PDG		**Convenience Package**, includes (UG1) Universal Home Remote, (DD6) Mirror, inside rearview, auto-dimming and (DK2) Mirror, outside rearview, power, heated	--	--	--	--	S	A
	K34	**Cruise control**, electronic with set and resume speed	S	S	S	S	S	S
		Defogger, rear-window, electric	S	S	S	S	S	S
		Door locks, power programmable, includes lockout protection	S	S	S	S	S	S
B34		**Floormats,** carpeted, front, includes (B35) Floormats, rear **1 - Requires a Fleet or Federal Government order type.**	A[1]	S	S	S	S	S
	U2E	**Instrumentation,** analog, 4-gauge cluster, includes speedometer, tachometer, coolant temperature, fuel, trip odometer and DIC	S	--	--	--	--	--
	UH8	**Instrumentation,** analog, 4-gauge, deluxe, includes speedometer, tachometer, coolant temperature, fuel, trip odometer, DIC, outside temperature, compass and content theft alarm	--	S	S	S	S	S
		LATCH system, (Lower Anchors and Top tethers for CHildren), for child safety seats	S	S	S	S	S	S
		Lighting, interior, dome, center-mounted	S	S	S	S	S	S
		Mirror, inside rearview, manual day/night	S	S	S	S	--	S

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
	DD6	**Mirror,** inside rearview, auto-dimming **1 - Included and only available with (PDG) Convenience Package.**	--	--	--	--	S	A[1]
	UE1	**OnStar**, 1-year Safe and Sound Service, includes automatic notification of air bag deployment, emergency services, roadside assistance, stolen vehicle tracking, AccidentAssist, remote door unlock, remote diagnostics, online concierge and remote horn and lights. Drivers can also opt for other available OnStar services, including making and receiving voice-activated, hands-free phone calls with Personal Calling and getting location-based traffic and weather reports with Virtual Advisor **1 - Visit www.onstar.com for system information and details.**	S[1]	S[1]	S[1]	S[1]	S[1]	S[1]
	AU0	**Keyless entry,** remote	S	--	--	--	--	--
	AP3	**Remote vehicle starter system**, includes (AU0) Keyless entry, remote, programmable	--	S	S	S	S	S
	AR9	**Seats,** front Cloth, 40/40 bucket	S	S	S	S	--	S
AR9		**Seats**, front Leather seating surfaces, 40/40 bucket, includes (KA1) Seats, heated driver and front passenger	--	--	--	A	S	A
	AM9	**Seat,** rear split-folding	S	S	S	S	S	S
	AG1	**Seat adjuster,** power, driver 6-way, includes manual lumbar adjuster	S	S	S	S	S	S
	KA1	**Seats,** heated, driver and front passenger **1 - Included and only available with Leather seating surfaces.**	--	--	--	A[1]	S	A[1]
	D55	**Shifter**, floor	S	S	S	S	S	S
	U1C	**Sound system,** ETR AM/FM stereo with CD player, includes seek-and-scan, digital clock, auto-tone control, automatic volume, Theftlock and auxiliary input jack	S	S	--	--	--	--
US8		**Sound system,** ETR AM/FM stereo with CD player and MP3 playback, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	A	■	S	S	S
	UW6	**Sound system feature,** 6-speakers	S	S	S	S	--	S
U87		**Sound system feature**, 8-speakers, uplevel	--	A	A	A	S	A

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
U2K		**Sound system feature,** XM Satellite Radio features 67 channels of 100% commercial-free music included in its over 150 channels of the best in music, news, sports, talk, comedy, XM Instant Traffic and Weather, and more. Digital quality sound with coast-to-coast signal coverage. Three trial months - no obligation. **1 - Subscription fees apply. Available only in the 48 contiguous U.S.**	--	A[1]	A[1]	A[1]	S[1]	A[1]
		Steering column, Tilt-Wheel	S	S	S	S	S	S
	NK5	**Steering wheel,** urethane	S	S	--	--	--	--
	NP5	**Steering wheel,** leather-wrapped, includes (UK3) Steering wheel, mounted audio controls	--	--	■	S	S	S
		Theft-deterrent system, PASSlock	S	S	S	S	S	S
		Tire pressure monitor	--	--	--	S	S	S
	A59	**Trunk release,** remote	S	S	S	S	S	S
		Trunk emergency release handle	S	S	S	S	S	S
	UG1	**Universal Home Remote,** includes overhead system **1 - Required and only available with (CF5) Sunroof. 2 - Included with (PDG) Convenience Package or Required with (CF5) Sunroof.**	--	--	A[1]	A[1]	S	A[2]
		Visors, vanity mirrors, driver and front passenger, covered	S	S	S	--	--	--
DH6		**Visors,** illuminated vanity mirrors, driver and front passenger, covered **1 - Requires (CF5) Sunroof, power.**	--	--	A[1]	S	S	S
		Windows, power, includes driver express-down	S	S	S	S	S	S
	U77	**Antenna,** integral, rear	S	S	S	S	S	S
		Daytime running lamps	S	S	S	S	S	S
		Fog lamps, front	--	--	--	S	S	S
		Glass, Solar-Ray light tinted	S	S	S	S	S	S
		Ground effects, lower	--	--	--	--	--	S
		Headlamps, halogen, composite, includes automatic exterior lamp control	S	S	S	S	S	S
		License plate bracket, front	S	S	S	S	S	S
	DG7	**Mirrors,** outside rearview, power	S	S	S	S	--	S
	DK2	**Mirrors,** outside rearview, power, heated **1 - Included and only available with (PDG) Convenience Package.**	--	--	--	--	S	A[1]
		Moldings, rocker, Black	S	S	S	S	S	--
		Moldings, rocker, body-color	--	--	--	--	--	S
		Spoiler, rear	S	S	S	--	--	--

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
		Spoiler, rear, race-inspired	--	--	--	S	S	S
		Tire, spare, compact	S	S	S	S	S	S
	QPX	**Tires,** P225/60R16, all-season, blackwall	S	S	S	--	--	--
	QVS	**Tires,** P225/55R17, touring, blackwall	--	--	--	S	S	--
	QDG	**Tires,** P235/50R18, performance W-rated	--	--	--	--	--	S
	QB5	**Wheels,** 16" (40.6 cm) steel with deluxe bolt-on wheel covers	S	S	--	--	--	--
PY0		**Wheels,** 16" (40.6 cm) 5-spoke, styled cast aluminum	--	A	S	--	--	--
	PFH	**Wheels,** 17" (43.2 cm), aluminum, machined	--	--	--	S	S	--
	NW5	**Wheels,** 18" (45.7 cm) aluminum, machined	--	--	--	--	--	S
		Wipers, intermittent, front	S	S	S	S	S	S
		Alternator, 125 amps	S	S	S	S	S	--
		Alternator, 135 amps	--	--	--	--	--	S
		Axle, 2.86 ratio	S	S	S	--	--	--
		Axle, 3.29 ratio	--	--	--	S	S	--
		Axle, 2.93 ratio	--	--	--	--	--	S
		Battery, maintenance free, includes rundown protection and retained accessory power **1 - 600 CCA.** **2 - 750 CCA.** **3 - 625 CCA.**	S[1]	S[1]	S[1]	S[2]	S[2]	S[3]
	J65	**Brakes,** 4-wheel disc	S	S	S	--	--	--
JL9		**Brakes,** 4-wheel antilock, 4-wheel disc, includes (NW9) Traction Control system	A	A	A	S	S	S
	LZE	**Engine**, 3.5L 3500 V6 SFI, includes E85 flexible fuel (gas ethanol) capability	S	S	S	--	--	--
	LZ9	**Engine,** 3.9L 3900 V6 SFI	--	--	--	S	S	--
	LS4	**Engine**, 5.3L small block V8 SFI , includes Displacement on Demand	--	--	--	--	--	S
		Exhaust, stainless-steel, single	S	S	S	--	--	--
		Exhaust, stainless-steel, dual outlet	--	--	--	S	S	--
		Exhaust, stainless-steel, dual outlet with bright tips	--	--	--	--	--	S
		Oil life monitoring system	S	S	S	S	S	S
		Oil level monitor	--	--	--	S	S	S
		Steering, power, rack-and-pinion	S	S	S	S	S	S
	FE2	**Suspension,** 4-wheel independent, Touring	S	S	S	S	S	--
	FE4	**Suspension,** 4-wheel independent, Performance Tuning	--	--	--	--	--	S

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
	NW9	**Traction control**, all-speed **1 - Included and only available with (JL9) Brakes, 4-wheel antilock.**	A[1]	A[1]	A[1]	S	S	S
	MX0/M15	**Transmission,** 4-speed automatic, electronically controlled with overdrive	S	S	S	S	S	--
	MX0/MN7	**Transmission,** 4-speed automatic, heavy-duty, electronically controlled with overdrive	--	--	--	--	--	S

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Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
US8		**Sound system,** ETR AM/FM stereo with CD player and MP3 playback, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	A	■	S	S	S
	NP5	**Steering wheel,** leather-wrapped, includes (UK3) Steering wheel, mounted audio controls	--	--	■	S	S	S

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			1LS	1LT	2LT	3LT	1LZ	1SS
US8		**Sound system,** ETR AM/FM stereo with CD player and MP3 playback, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	A	■	S	S	S
	NP5	**Steering wheel,** leather-wrapped, includes (UK3) Steering wheel, mounted audio controls	--	--	■	S	S	S

ADDITIONAL OPTIONS

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
AJ7		**Air bags,** dual-stage, frontal, driver and right front passenger and side-impact, seat-mounted **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.**	A[1]	A[1]	A[1]	A[1]	A[1]	A[1]
PDG		**Convenience Package,** includes (UG1) Universal Home Remote, (DD6) Mirror, inside rearview, auto-dimming and (DK2) Mirror, outside rearview, power, heated	--	--	--	--	S	A
B34		**Floormats,** carpeted, front, includes (B35) Floormats, rear **1 - Requires a Fleet or Federal Government order type.**	A[1]	S	S	S	S	S
UE0		**OnStar,** delete **1 - Requires a Fleet or Federal Government order type and one of the following order types: FBC, FLS, FNR, FRC, FEF OR SGO. If the order type is FDR, (UE0) OnStar, delete will be forced on.** **2 - Requires a Fleet or Federal Government order type and one of the following order types: FBC, FLS, FNR, FRC, FEF OR SGO. If the order type is FDR, (UE0) OnStar, delete will be forced on. Not available with (CF5) Sunroof, power.**	A[1]	A[1]	A[2]	--	--	--
AP8		**Remote vehicle starter system,** prep for dealer install	A	--	--	--	--	--
AR9		**Seats,** front Leather seating surfaces, 40/40 bucket, includes (KA1) Seats, heated driver and front passenger	--	--	--	A	S	A
US8		**Sound system,** ETR AM/FM stereo with CD player and MP3 playback, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	A	■	S	S	S

ADDITIONAL OPTIONS								
Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
US9		**Sound system,** ETR AM/FM stereo with 6-disc CD changer and MP3 playback, in-dash, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	--	A	A	A	A
U87		**Sound system feature**, 8-speakers, uplevel	--	A	A	A	S	A
U2K		**Sound system feature,** XM Satellite Radio features 67 channels of 100% commercial-free music included in its over 150 channels of the best in music, news, sports, talk, comedy, XM Instant Traffic and Weather, and more. Digital quality sound with coast-to-coast signal coverage. Three trial months - no obligation. **1 - Subscription fees apply. Available only in the 48 contiguous U.S.**	--	A[1]	A[1]	A[1]	S[1]	A[1]
CF5		**Sunroof,** power, tilt-sliding, includes sunshade **1 - Requires (UG1) Universal Home Remote and (DH6) Visors, illuminated vanity mirrors.** **2 - Requires (UG1) Universal Home Remote.** **3 - Requires (PDG) Convenience Package or (UG1) Universal Home Remote.**	--	--	A[1]	A[2]	A	A[3]
DH6		**Visors,** illuminated vanity mirrors, driver and front passenger, covered **1 - Requires (CF5) Sunroof, power.**	--	--	A[1]	S	S	S
PY0		**Wheels,** 16" (40.6 cm) 5-spoke, styled cast aluminum	--	A	S	--	--	--
NW1		**Wheels**, 18" (45.7 cm) aluminum, polished	--	--	--	--	--	A
JL9		**Brakes,** 4-wheel antilock, 4-wheel disc, includes (NW9) Traction Control system	A	A	A	S	S	S
FE9		**Emissions,** Federal requirements	A	A	A	A	A	A
NE1		**Emissions,** Maine, Massachusetts, New York or Vermont state requirements	A	A	A	A	A	A
YF5		**Emissions,** California state requirements	A	A	A	A	A	A

ADDITIONAL OPTIONS								
Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
VCL		**Emissions Certification,** CFF (Clean Fuel Fleet) LEV (Low Emission Vehicle). Option (VCL) should ONLY be ordered to receive the CFF LEV certification. If (VCL) is not ordered, the vehicle will be produced with your normally selected emission system and may not be CFF LEV certified. Products ordered with the (VCL) option may not be certified to California emission requirements. Therefore, they may not be legal for registration in California, New York, Maine, Massachusetts and Vermont. Option (YF5) should be ordered for all vehicles ordered in California. Option (NE1) should be ordered for all vehicles ordered in Maine or Vermont. **1 - Requires (FE9) Emissions, Federal requirements and (NB8) Emissions override, California, Massachusetts or New York. Not available with (YF5) Emissions, California state requirements or (NE1) Emissions, Maine, Massachusetts, New York or Vermont state requirements.**	A[1]	A[1]	A[1]	A[1]	A[1]	--
NB8		**Emissions override**, California, Massachusetts or New York (for vehicles ordered by dealers in states of California, Massachusetts or New York with Federal emissions) **1 - Requires (FE9) Emissions, Federal requirements.**	A[1]	A[1]	A[1]	A[1]	A[1]	A[1]
NC7		**Emissions override,** Federal (for vehicles ordered by dealers in Federal emission states with California, New York, Vermont, Massachusetts or Maine emissions; may also be used by dealers in states of California, New York, Vermont, Massachusetts or Maine to order different state-specific emissions) **1 - Requires (YF5) Emissions, California state requirements or (NE1) Emissions, New York, Vermont, Massachusetts or Maine state requirements.**	A[1]	A[1]	A[1]	A[1]	A[1]	A[1]
K05		**Engine block heater**	A	A	A	A	A	A

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Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
US8		**Sound system,** ETR AM/FM stereo with CD player and MP3 playback			■			
	NP5	**Steering wheel,**			■			

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Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
	AK5	**Air bags,** dual-stage, frontal, driver and right front passenger **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.**	S[1]	S[1]	S[1]	S[1]	S[1]	S[1]
AJ7		**Air bags,** dual-stage, frontal, driver and right front passenger and side-impact, seat-mounted **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.**	A[1]	A[1]	A[1]	A[1]	A[1]	A[1]
	C67	**Air conditioning,** front manual, single zone with air filtration	S	--	--	--	--	--
	CJ3	**Air conditioning,** dual-zone, manual, includes individual climate settings for driver and right front passenger, manual climate control and air filtration	--	S	S	S	S	S
		Applique, metallic film on instrument panel and door	S	S	S	S	S	--
		Applique, techno metallic on instrument panel and door	--	--	--	--	--	S
		Assist handle, front passenger	S	S	S	S	S	S
	AP9	**Cargo convenience net,** trunk	--	S	S	S	S	S
PDG		**Convenience Package**, includes (UG1) Universal Home Remote, (DD6) Mirror, inside rearview, auto-dimming and (DK2) Mirror, outside rearview, power, heated	--	--	--	--	S	A
	K34	**Cruise control**, electronic with set and resume speed	S	S	S	S	S	S
		Defogger, rear-window, electric	S	S	S	S	S	S
		Door locks, power programmable, includes lockout protection	S	S	S	S	S	S
B34		**Floormats,** carpeted, front, includes (B35) Floormats, rear **1 - Requires a Fleet or Federal Government order type.**	A[1]	S	S	S	S	S
	U2E	**Instrumentation,** analog, 4-gauge cluster, includes speedometer, tachometer, coolant temperature, fuel, trip odometer and DIC	S	--	--	--	--	--
	UH8	**Instrumentation,** analog, 4-gauge, deluxe, includes speedometer, tachometer, coolant temperature, fuel, trip odometer, DIC, outside temperature, compass and content theft alarm	--	S	S	S	S	S

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
		LATCH system, (Lower Anchors and Top tethers for CHildren), for child safety seats	S	S	S	S	S	S
		Lighting, interior, dome, center-mounted	S	S	S	S	S	S
		Mirror, inside rearview, manual day/night	S	S	S	S	--	S
	DD6	**Mirror,** inside rearview, auto-dimming **1 - Included and only available with (PDG) Convenience Package.**	--	--	--	--	S	A[1]
	UE1	**OnStar**, 1-year Safe and Sound Service, includes automatic notification of air bag deployment, emergency services, roadside assistance, stolen vehicle tracking, AccidentAssist, remote door unlock, remote diagnostics, online concierge and remote horn and lights. Drivers can also opt for other available OnStar services, including making and receiving voice-activated, hands-free phone calls with Personal Calling and getting location-based traffic and weather reports with Virtual Advisor **1 - Visit www.onstar.com for system information and details.**	S[1]	S[1]	S[1]	S[1]	S[1]	S[1]
UE0		**OnStar,** delete **1 - Requires a Fleet or Federal Government order type and one of the following order types: FBC, FLS, FNR, FRC, FEF OR SGO. If the order type is FDR, (UE0) OnStar, delete will be forced on.** **2 - Requires a Fleet or Federal Government order type and one of the following order types: FBC, FLS, FNR, FRC, FEF OR SGO. If the order type is FDR, (UE0) OnStar, delete will be forced on. Not available with (CF5) Sunroof, power.**	A[1]	A[1]	A[2]	--	--	--
	AU0	**Keyless entry,** remote	S	--	--	--	--	--
	AP3	**Remote vehicle starter system**, includes (AU0) Keyless entry, remote, programmable	--	S	S	S	S	S
AP8		**Remote vehicle starter system**, prep for dealer install	A	--	--	--	--	--
	AR9	**Seats,** front Cloth, 40/40 bucket	S	S	S	S	--	S
AR9		**Seats**, front Leather seating surfaces, 40/40 bucket, includes (KA1) Seats, heated driver and front passenger	--	--	--	A	S	A
	AM9	**Seat,** rear split-folding	S	S	S	S	S	S
	AG1	**Seat adjuster,** power, driver 6-way, includes manual lumbar adjuster	S	S	S	S	S	S
	KA1	**Seats,** heated, driver and front passenger **1 - Included and only available with Leather seating surfaces.**	--	--	--	A[1]	S	A[1]
	D55	**Shifter**, floor	S	S	S	S	S	S
	U1C	**Sound system,** ETR AM/FM stereo with CD player, includes seek-and-scan, digital clock, auto-tone control, automatic volume, Theftlock and auxiliary input jack	S	S	--	--	--	--

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
US8		**Sound system,** ETR AM/FM stereo with CD player and MP3 playback, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	A	■	S	S	S
US9		**Sound system,** ETR AM/FM stereo with 6-disc CD changer and MP3 playback, in-dash, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack	--	--	A	A	A	A
	UW6	**Sound system feature,** 6-speakers	S	S	S	S	--	S
U87		**Sound system feature**, 8-speakers, uplevel	--	A	A	A	S	A
U2K		**Sound system feature,** XM Satellite Radio features 67 channels of 100% commercial-free music included in its over 150 channels of the best in music, news, sports, talk, comedy, XM Instant Traffic and Weather, and more. Digital quality sound with coast-to-coast signal coverage. Three trial months - no obligation. **1 - Subscription fees apply. Available only in the 48 contiguous U.S.**	--	A[1]	A[1]	A[1]	S[1]	A[1]
		Steering column, Tilt-Wheel	S	S	S	S	S	S
	NK5	**Steering wheel**, urethane	S	S	--	--	--	--
	NP5	**Steering wheel,** leather-wrapped, includes (UK3) Steering wheel, mounted audio controls	--	--	■	S	S	S
CF5		**Sunroof,** power, tilt-sliding, includes sunshade **1 - Requires (UG1) Universal Home Remote and (DH6) Visors, illuminated vanity mirrors.** **2 - Requires (UG1) Universal Home Remote.** **3 - Requires (PDG) Convenience Package or (UG1) Universal Home Remote.**	--	--	A[1]	A[2]	A	A[3]
		Theft-deterrent system, PASSlock	S	S	S	S	S	S
		Tire pressure monitor	--	--	--	S	S	S
	A59	**Trunk release,** remote	S	S	S	S	S	S
		Trunk emergency release handle	S	S	S	S	S	S
	UG1	**Universal Home Remote**, includes overhead system **1 - Required and only available with (CF5) Sunroof.** **2 - Included with (PDG) Convenience Package or Required with (CF5) Sunroof.**	--	--	A[1]	A[1]	S	A[2]
		Visors, vanity mirrors, driver and front passenger, covered	S	S	S	--	--	--
DH6		**Visors,** illuminated vanity mirrors, driver and front passenger, covered **1 - Requires (CF5) Sunroof, power.**	--	--	A[1]	S	S	S
		Windows, power, includes driver express-down	S	S	S	S	S	S

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Codes listed in the shaded column titled Ref. Only RPO Code are for internal use only and should not be ordered.

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
	U77	**Antenna,** integral, rear	S	S	S	S	S	S
		Daytime running lamps	S	S	S	S	S	S
		Fog lamps, front	--	--	--	S	S	S
		Glass, Solar-Ray light tinted	S	S	S	S	S	S
		Ground effects, lower	--	--	--	--	--	S
		Headlamps, halogen, composite, includes automatic exterior lamp control	S	S	S	S	S	S
		License plate bracket, front	S	S	S	S	S	S
	DG7	**Mirrors,** outside rearview, power	S	S	S	S	--	S
	DK2	**Mirrors,** outside rearview, power, heated **1 - Included and only available with (PDG) Convenience Package.**	--	--	--	--	S	A[1]
		Moldings, rocker, Black	S	S	S	S	S	--
		Moldings, rocker, body-color	--	--	--	--	--	S
		Spoiler, rear	S	S	S	--	--	--
		Spoiler, rear, race-inspired	--	--	--	S	S	S
		Tire, spare, compact	S	S	S	S	S	S
	QPX	**Tires,** P225/60R16, all-season, blackwall	S	S	S	--	--	--
	QVS	**Tires,** P225/55R17, touring, blackwall	--	--	--	S	S	--
	QDG	**Tires,** P235/50R18, performance W-rated	--	--	--	--	--	S
	QB5	**Wheels,** 16" (40.6 cm) steel with deluxe bolt-on wheel covers	S	S	--	--	--	--
PY0		**Wheels,** 16" (40.6 cm) 5-spoke, styled cast aluminum	--	A	S	--	--	--
	PFH	**Wheels,** 17" (43.2 cm), aluminum, machined	--	--	--	S	S	--
	NW5	**Wheels,** 18" (45.7 cm) aluminum, machined	--	--	--	--	--	S
NW1		**Wheels,** 18" (45.7 cm) aluminum, polished	--	--	--	--	--	A
		Wipers, intermittent, front	S	S	S	S	S	S

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Codes listed in the shaded column titled Ref. Only RPO Code are for internal use only and should not be ordered.

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
		Alternator, 125 amps	S	S	S	S	S	--
		Alternator, 135 amps	--	--	--	--	--	S
		Axle, 2.86 ratio	S	S	S	--	--	--
		Axle, 3.29 ratio	--	--	--	S	S	--
		Axle, 2.93 ratio	--	--	--	--	--	S
		Battery, maintenance free, includes rundown protection and retained accessory power **1 - 600 CCA.** **2 - 750 CCA.** **3 - 625 CCA.**	S[1]	S[1]	S[1]	S[2]	S[2]	S[3]
	J65	**Brakes,** 4-wheel disc	S	S	S	--	--	--
JL9		**Brakes,** 4-wheel antilock, 4-wheel disc, includes (NW9) Traction Control system	A	A	A	S	S	S
FE9		**Emissions,** Federal requirements	A	A	A	A	A	A
NE1		**Emissions,** Maine, Massachusetts, New York or Vermont state requirements	A	A	A	A	A	A
YF5		**Emissions,** California state requirements	A	A	A	A	A	A
VCL		**Emissions Certification,** CFF (Clean Fuel Fleet) LEV (Low Emission Vehicle). Option (VCL) should ONLY be ordered to receive the CFF LEV certification. If (VCL) is not ordered, the vehicle will be produced with your normally selected emission system and may not be CFF LEV certified. Products ordered with the (VCL) option may not be certified to California emission requirements. Therefore, they may not be legal for registration in California, New York, Maine, Massachusetts and Vermont. Option (YF5) should be ordered for all vehicles ordered in California. Option (NE1) should be ordered for all vehicles ordered in Maine or Vermont. **1 - Requires (FE9) Emissions, Federal requirements and (NB8) Emissions override, California, Massachusetts or New York. Not available with (YF5) Emissions, California state requirements or (NE1) Emissions, Maine, Massachusetts, New York or Vermont state requirements.**	A[1]	A[1]	A[1]	A[1]	A[1]	--
NB8		**Emissions override**, California, Massachusetts or New York (for vehicles ordered by dealers in states of California, Massachusetts or New York with Federal emissions) **1 - Requires (FE9) Emissions, Federal requirements.**	A[1]	A[1]	A[1]	A[1]	A[1]	A[1]

Free Flow RPO Code	Ref. Only RPO Code	Description	LS 1WJ27	LT 1WM27		LT 1WK27	LTZ 1WN27	SS 1WL27
			1LS	1LT	2LT	3LT	1LZ	1SS
NC7		**Emissions override,** Federal (for vehicles ordered by dealers in Federal emission states with California, New York, Vermont, Massachusetts or Maine emissions; may also be used by dealers in states of California, New York, Vermont, Massachusetts or Maine to order different state-specific emissions) **1 - Requires (YF5) Emissions, California state requirements or (NE1) Emissions, New York, Vermont, Massachusetts or Maine state requirements.**	A[1]	A[1]	A[1]	A[1]	A[1]	A[1]
	LZE	**Engine**, 3.5L 3500 V6 SFI, includes E85 flexible fuel (gas ethanol) capability	S	S	S	--	--	--
	LZ9	**Engine,** 3.9L 3900 V6 SFI	--	--	--	S	S	--
	LS4	**Engine**, 5.3L small block V8 SFI , includes Displacement on Demand	--	--	--	--	--	S
K05		**Engine block heater**	A	A	A	A	A	A
		Exhaust, stainless-steel, single	S	S	S	--	--	--
		Exhaust, stainless-steel, dual outlet	--	--	--	S	S	--
		Exhaust, stainless-steel, dual outlet with bright tips	--	--	--	--	--	S
		Oil life monitoring system	S	S	S	S	S	S
		Oil level monitor	--	--	--	S	S	S
		Steering, power, rack-and-pinion	S	S	S	S	S	S
	FE2	**Suspension,** 4-wheel independent, Touring	S	S	S	S	S	--
	FE4	**Suspension,** 4-wheel independent, Performance Tuning	--	--	--	--	--	S
	NW9	**Traction control**, all-speed **1 - Included and only available with (JL9) Brakes, 4-wheel antilock.**	A[1]	A[1]	A[1]	S	S	S
	MX0/M15	**Transmission,** 4-speed automatic, electronically controlled with overdrive	S	S	S	S	S	--
	MX0/MN7	**Transmission,** 4-speed automatic, heavy-duty, electronically controlled with overdrive	--	--	--	--	--	S

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Model	Seat Type	Seat Code	Seat Trim	Interior		
				Neutral	Ebony	Gray
LS, LT	Bucket, front	AR9	Cloth	52B	19B	83B
LT, LTZ	Bucket, front	AR9	Leather Seating Surfaces	522	192	832

Exterior Solid Paint	Color Code	Touch Up Paint Number	Interior		
			Neutral	Ebony	Gray
Laser Blue Metallic[1]	21U	WA-218M	--	A	A
Superior Blue Metallic	22U	WA-703J	--	A	A
White	40U	WA-8554	A	A	A
Black	41U	WA-8555	A	A	A
NEW! Dark Silver Metallic	42U	WA-911L	--	A	A
NEW! Amber Bronze Metallic	53U	WA-317N	A	A	--
Sport Red Metallic	63U	WA-817K	A	A	--
Silverstone Metallic	67U	WA-994L	--	A	A
Victory Red	74U	WA-9260	A	A	A

1 - Not available on LS models.

S = Standard Equipment A = Available -- (dashes) = Not Available
■ = Included in Equipment Group □ = Included in Equipment Group but upgradeable

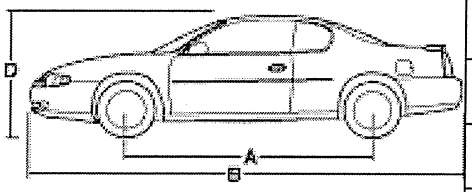
Model	Seat Type	Seat Code	Seat Trim	Interior	
				Ebony	Gray
SS	Bucket, front	AR9	Cloth	19B	84B
SS	Bucket, front	AR9	Leather Seating Surfaces	192	842

Exterior Solid Paint	Color Code	Touch Up Paint Number	Interior	
			Ebony	Gray
Laser Blue Metallic[1]	21U	WA-218M	A	A
White[1]	40U	WA-8554	A	A
Black[1]	41U	WA-8555	A	A
Silverstone Metallic	67U	WA-994L	A	A
Victory Red	74U	WA-9260	A	A

1 - To order lower color in Silverstone Metallic, must specify (67L) Silverstone Metallic.

There is no data available for Monte Carlo.

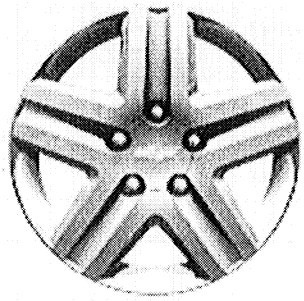
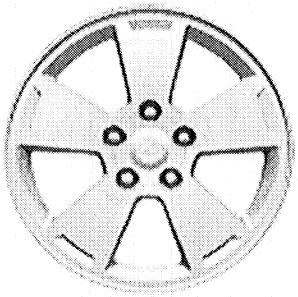
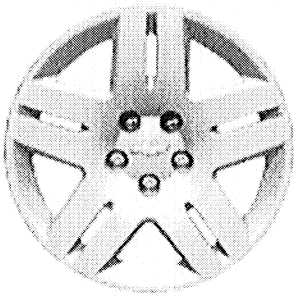
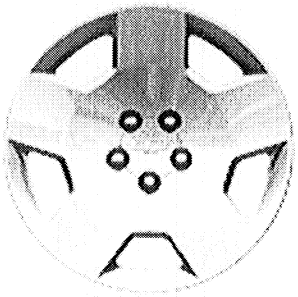
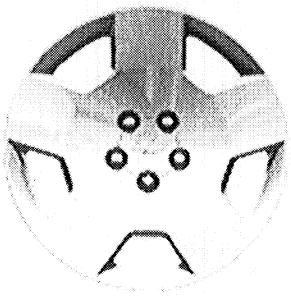
All dimensions in inches (mm) unless otherwise stated.

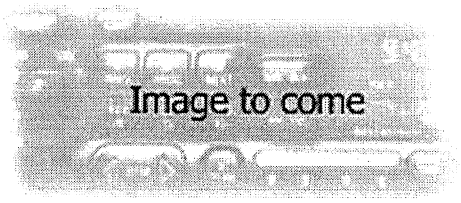


	Specifications	1WJ27 LS	1WM27 LT 3.5L	1WK27 LT 3.9L	1WN27 LTZ	1WL27 SS
A	**Wheelbase**	110.50 (2807)	110.50 (2807)	110.50 (2807)	110.50 (2807)	110.50 (2807)
B	**Overall length**	196.70 (4996)	196.70 (4996)	196.70 (4996)	196.70 (4996)	196.70 (4996)
	Body width	72.90 (1852)	72.90 (1852)	72.90 (1852)	72.90 (1852)	72.90 (1852)
D	**Overall height**	55.80 (1417)	55.80 (1417)	55.80 (1417)	55.80 (1417)	55.80 (1417)
	Front track width	62.40 (1585)	62.40 (1585)	62.40 (1585)	62.40 (1585)	62.40 (1585)
	Rear track width	61.50 (1562)	61.50 (1562)	61.50 (1562)	61.50 (1562)	61.50 (1562)
	Head room, front	38.10 (968)	38.10 (968)	38.10 (968)	38.10 (968)	38.10 (968)
	Head room, rear	36.50 (927)	36.50 (927)	36.50 (927)	36.50 (927)	36.50 (927)
	Shoulder room, front	58.30 (1481)	58.30 (1481)	58.30 (1481)	58.30 (1481)	58.30 (1481)
	Shoulder room, rear	57.00 (1448)	57.00 (1448)	57.00 (1448)	57.00 (1448)	57.00 (1448)
	Hip room, front	55.20 (1402)	55.20 (1402)	55.20 (1402)	55.20 (1402)	55.20 (1402)
	Hip room, rear	55.50 (1410)	55.50 (1410)	55.50 (1410)	55.50 (1410)	55.50 (1410)
	Leg room, front	42.40 (1077)	42.40 (1077)	42.40 (1077)	42.40 (1077)	42.40 (1077)
	Leg room, rear	35.80 (909)	35.80 (909)	35.80 (909)	35.80 (909)	35.80 (909)

Published dimensions indicated are without optional equipment or accessories. Additional accessories or equipment ordered at the customer's request can result in a minor change in these dimensions.

	1WJ27 LS	1WM27 LT 3.5L	1WK27 LT 3.9L	1WN27 LTZ	1WL27 SS
Capacities					
Cargo volume, cu. ft. (liters)	15.8 (447.5)	15.8 (447.5)	15.8 (447.5)	15.8 (447.5)	15.8 (447.5)
Fuel capacity, approximate, gallon (liters)	17 (64)	17 (64)	17 (64)	17 (64)	17 (64)
Seating capacity (front/rear)	2/3	2/3	2/3	2/3	2/3

	QB5 **Wheels,** 16" (40.6 cm) steel with deluxe bolt-on wheel covers
	PY0 **Wheels,** 16" (40.6 cm) 5-spoke, styled cast aluminum
	PFH **Wheels,** 17" (43.2 cm), aluminum, machined
	NW5 **Wheels,** 18" (45.7 cm) aluminum, machined
	NW1 **Wheels,** 18" (45.7 cm) aluminum, polished

	U1C **Sound system,** ETR AM/FM stereo with CD player, includes seek-and-scan, digital clock, auto-tone control, automatic volume, Theftlock and auxiliary input jack
	US8 **Sound system,** ETR AM/FM stereo with CD player and MP3 playback, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack
	US9 **Sound system,** ETR AM/FM stereo with 6-disc CD changer and MP3 playback, in-dash, includes Radio Data System (RDS), seek-and-scan, digital clock, auto-tone control, automatic volume, TheftLock and auxiliary input jack

Option Code	Description
A59	Trunk release, remote
AG1	Seat adjuster, power, driver 6-way
AJ7	Air bags, dual-stage, frontal
AK5	Air bags, dual-stage, frontal
AM9	Seat, rear split-folding
AP3	Remote vehicle starter system
AP8	Remote vehicle starter system, prep
AP9	Cargo convenience net, trunk
AR9	Seats, front Cloth
AR9	Seats
AU0	Keyless entry, remote
B34	Floormats, carpeted
C67	Air conditioning, front manual
CF5	Sunroof, power
CJ3	Air conditioning, dual-zone, manual
D55	Shifter, floor
DD6	Mirror, inside rearview
DG7	Mirrors, outside rearview, power
DH6	Visors, illuminated vanity mirrors, driver and front passenger
DK2	Mirrors, outside rearview
FE2	Suspension, 4-wheel independent
FE4	Suspension, 4-wheel independent, Performance
FE9	Emissions, Federal requirements
J65	Brakes, 4-wheel disc
JL9	Brakes, 4-wheel antilock, 4-wheel disc
K05	Engine block heater
K34	Cruise control
KA1	Seats, heated, driver and front passenger
LS4	Engine, 5.3L small block V8 SFI
LZ9	Engine, 3.9L 3900 V6 SFI
LZE	Engine, 3.5L 3500 V6 SFI
MX0/M15	Transmission, 4-speed automatic,
MX0/MN7	Transmission, 4-speed automatic, heavy-duty
NB8	Emissions override
NC7	Emissions override, Federal
NE1	Emissions, Maine, Massachusetts, New York or Vermont state requirements
NK5	Steering wheel
NP5	Steering wheel,
NW1	Wheels, 18" (45.7 cm) aluminum
NW5	Wheels, 18" (45.7 cm) aluminum
NW9	Traction control
PDG	Convenience Package
PFH	Wheels, 17" (43.2 cm), aluminum
PY0	Wheels, 16" (40.6 cm) 5-spoke, styled cast aluminum
QB5	Wheels, 16" (40.6 cm) steel
QDG	Tires, P235/50R18, performance W-rated
QPX	Tires, P225/60R16, all-season, blackwall
QVS	Tires, P225/55R17, touring, blackwall
U1C	Sound system, ETR AM/FM stereo with CD player

Option Code	Description
U2E	Instrumentation, analog
U2K	Sound system feature, XM Satellite Radio
U77	Antenna, integral, rear
U87	Sound system feature, 8-speakers
UE0	OnStar, delete
UE1	OnStar
UG1	Universal Home Remote
UH8	Instrumentation, analog
US8	Sound system, ETR AM/FM stereo with CD player and MP3 playback
US9	Sound system, ETR AM/FM stereo with 6-disc
UW6	Sound system feature, 6-speakers
VCL	Emissions Certification, CFF (Clean Fuel Fleet) LEV (Low Emission Vehicle).
YF5	Emissions, California state requirements