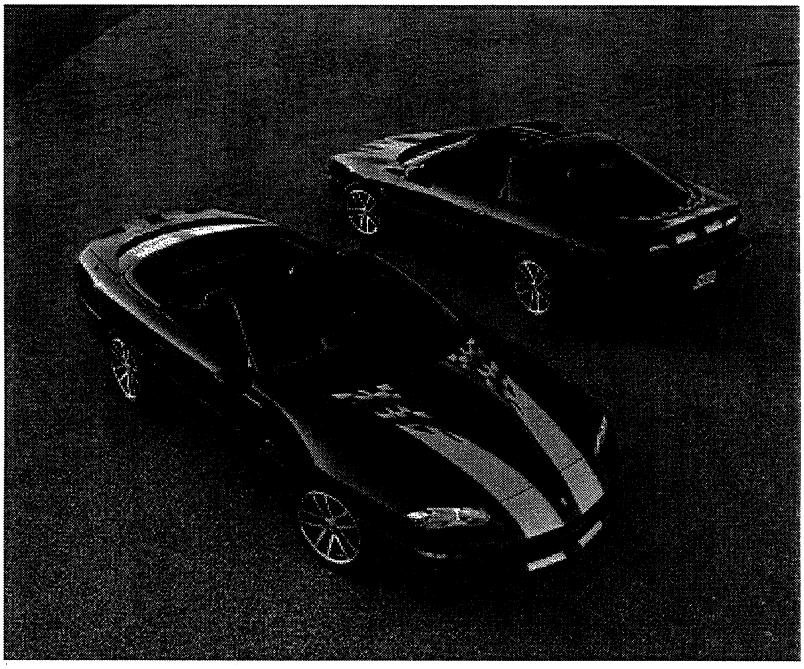
Chevrolet

Camaro



2002

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Product Information

2002 Chevrolet Camaro Celebrates 35 Years As An American Classic

Camaro is the purest, most uncompromising expression of the breed, "America's honest sports car." And it celebrates its 35-year heritage by introducing a limited edition 35th Anniversary Package in 2002, available on SS Coupes and SS Convertibles. All are finished in Bright Rallye Red. Coupes include removable T-tops roof panels and body-color roof halo; convertibles have a black top. Wide dual stripes, fading solid silver into a checkered flag, run the length of the vehicle from the front fascia, over the hood and onto the rear decklid and spoiler.

Other distinguishing features are black SS wheels with machine-faced surfaces, a silver debossed Camaro name on the front grille and rear fascia, and commemorative front fender emblems.

Inside, the 35th Anniversary logo is embroidered onto the front headrests and a special trophy/rear shelf mat. Also included is an Ebony leather interior trim with Medium Gray leather inserts as well as a special-issue owner's portfolio. And all 2002 Camaros sport a 35th anniversary badge on the dashboard.

Camaro continues in coupe or convertible form. Eager to perform, Camaro offers four unique models, a trio of transmission options and other option packages such as the SS. Customers have a choice of affordable performance-oriented sporty cars with traditional rear-wheel drive and muscular pushrod V8 engines versus higher-priced domestic or import models.

Choice of coupes & convertibles

The four available models are Camaro Coupe and Convertible, and Z28 Coupe and Convertible. Coupe models are also available with removable roof panels, exclusive among the non-GM vehicles in its market segment.

In addition, two option packages transform Camaro into something sportier still. The Sport Appearance Package includes specific front and rear fascias and a rear spoiler extension, and is available on any Camaro model except the SS.

The SS Performance/Appearance Package adds even more 'beef' to the already muscular Z28 coupe or convertible. It includes more power–325 horsepower vs. Z28's 310–a forced-air induction composite hood, unique rear spoiler and low-restriction/dual-outlet exhaust with larger pipes, and can be ordered with either a six-speed manual or four-speed automatic transmission.

Additionally, a host of performance and appearance options are available on the Camaro SS, such as a grille insert, a "cat-back" exhaust system with center-mounted rear exhaust outlets, special purpose suspension packages and more.

The Camaro RS package is also available on the Camaro V6 coupe.

Standard features list expanded

Several significant adjustments have been made to the list of standard equipment for Camaro in 2002. For instance, all V6-equipped models receive P235/55R-16 touring tires and painted 16-inch cast aluminum wheels, which replace P215/55R16 ties and bolt-on wheel covers. All V8-powered models benefit from wider speed rated P245/50ZR-16 Goodyear Eagle RS-A all-season tires for increased road-holding capability. The new tires replace P235/55R16 Goodyear Eagle GA non-speed rated tires.

Additionally, a four-speed automatic becomes standard issue on V6-equipped convertibles, and a power steering cooler is outfitted on all Z28 models. Sebring Silver Metallic joins the Camaro exterior color palette, replacing Mystic Teal Metallic.

A well-equipped driver's car

Driving excitement is standard equipment with Camaro, yet Chevrolet has not overlooked comfort, convenience and safety.

High-back bucket seats, driver-oriented instrumentation and center armrest/console provide the front occupants with a cockpit-like feel. Every Camaro also features power-assisted four-wheel anti-lock disc brakes, power-assisted rack-and-pinion steering, a tilt steering column, air conditioning and a Firm Ride & Handling suspension.

Sound systems include an AM/FM stereo with in-dash CD player and extended range speakers for V6-equipped coupes. The V6 convertibles and all Z28s also get an upgrade with standard installation of a Monsoon AM/FM Premium Sound system with in-dash CD. All systems feature an electronically tuned receiver (ETR) and include TheftLock, seek-scan and auto tone control. A 12-disc remote CD changer is optional across the Camaro family.

Standard safety and security items include dual front air bags, battery run-down protection, a passive theft-deterrent system, engine oil life monitor and daytime running lamps.

New For 2002

- A limited edition 35th Anniversary Package available on SS Coupe and SS Convertible models
- P235/55R16 tires and painted 16-inch cast aluminum wheels now standard on V6 models
- P245/50ZR16 Goodyear Eagle RSA tires now standard on Z28 models
- Four-speed automatic transmission now standard on V6-powered convertibles
- Power steering cooler now standard on all Z28 models
- AM/FM stereo with in-dash CD player and extended-range speakers now standard on V6-powered coupes
- Monsoon AM/FM Premium Sound System with in-dash CD player now standard on V6-equipped convertibles and all Z28 models
- New Sebring Silver Metallic exterior color
- Carpeted floor mats are now standard for front and rear

Model Lineup

	Engines		Transmissions		
	3800 V6	5.7-liter V8	4-spd auto	5-spd man	6 spd man
Coupe	S	–	o	S	–
Convertible	S	–	S	–	–
Z28 Coupe	–	S	S	–	O
Z28 Convertible	–	S	S	–	O

Standard S
Optional 0
Not available –

Specifications

Overview

Model:	Chevrolet Camaro: Base Coupe, Base Convertible, Z28 Coupe, Z28 Convertible
Body style / driveline:	rear-drive, front-engine two-door coupe and convertible
Construction:	steel unibody construction for quarter panels and hood. Sheet-molded compound (SMC) for the roofs, doors, hatch, rear spoiler and, on SS models, the hood. "RIM" (Reaction Injection Molding) plastic for the front fenders and front/rear fascias.
EPA vehicle class:	subcompact
Manufacturing location:	Boisbriand, Quebec, Canada
Key competitors:	
Camaro:	Ford Mustang, Honda Prelude, Hyundai Tiburon, Mercury Cougar, Mitsubishi Eclipse, Toyota Celica
Camaro Z28:	Ford Mustang GT and Mustang Cobra, Toyota Celica GT

Engine

	3.8L 3800 V6 (L36)	5.7L V8 (LS1)
Type:	3.8-liter OHV V6	5.7-liter OHV V8
Application:	standard on Camaro	standard on Camaro Z28
Block material:	cast iron	cast aluminum
Displacement (cu in / cc):	231 / 3791	346 / 5665
Bore x stroke (in / mm):	3.80 x 3.40 / 96.50 x 86.36	3.90 x 3.62 / 99.00 x 92.00
Cylinder head material:	cast iron	cast aluminum
Valvetrain:	overhead valve	overhead valve
Ignition system:	direct	direct
Fuel delivery:	SFI	SFI
Compression ratio:	9.4:1	10.1:1
Horsepower (hp / kw @ rpm):	200 / 149 @ 5200	310 / 231 @ 5200 325/ 242 @ 5200 (SS)
Torque (lb-ft / Nm @ rpm):	225 / 305 @ 4000	340/ 461 @ 4000 350/ 475 @ 4000 (SS)
Recommended fuel:	87 octane	87 octane
Maximum engine speed (rpm):	6000	6200
Emission control system:	catalytic converter/EGR	catalytic converter/EGR
Estimated fuel economy		
(mpg city / hwy / combined):	5-speed manual: 19 / 31 / 24	6-speed manual: 19 / 28 / 23
	4-speed automatic: 19 / 31 / 24	4-speed automatic: 18 / 26 / 22

Transmission

	M49, five-speed manual	MM6, six-speed manual	4L60-E
Application	standard on Camaro	optional on Camaro Z28 (at no cost)	OPT: Camaro; STD: Z28 and Camaro Convertible
Gear ratios (:1):			
First:	3.75	2.66	3.06
Second:	2.19	1.78	1.63
Third:	1.41	1.30	1.00
Fourth:	1.00	1.00	0.70
Fifth:	0.72	0.74	—
Sixth:	—	0.50	—
Reverse:	3.53	2.90	2.29
Final drive ratio:	3.23:1	3.42:1	3.08:1 (2.73:1 Z28)

Chassis/Suspension

Front:	• short/long arm (SLA). Upper control arms mounted high to reduce loads. • De Carbon gas-charged monotube shock absorbers. 28-mm hollow front stabilizer bar (30-mm with Z28)
Rear:	• Salisbury rear axle design. Lightweight stamped-steel lower control arms. • 15-mm solid rear stabilizer bar (19-mm with Z28)
Steering type:	power-assisted rack-and-pinion
Steering ratio:	coupe and convertible: 16.9:1; Z28 and Y87 package: 14.4:1
Steering wheel turns, lock-to-lock:	coupe and convertible: 2.67; Z28 and Y87 package: 2.28
Turning circle, curb-to-curb (ft / m):	40.8 / 12.4

Brakes

Type:	power-assisted disc with ABS, front and rear
Front (in / mm):	11.8 x 1.27 / 299 x 32
Rear (in / mm):	11.85 x 1.02 / 301 x 26
Swept area (sq in / sq cm):	front: 238.6 / 1539.0; rear: 169.0 / 1094.0

Wheels/Tires

Wheel size and type:	
Standard:	• 16-inch aluminum wheel with painted surface • 17-inch aluminum wheel with painted surface (with optional SS Performance / Appearance Package on Z28 models)
Optional:	• 16-inch aluminum wheel with chromed surface (all models except Z28 with SS Package)
Tire size and type:	
Standard:	• P235/55R-16 touring tires (coupe and convertible) • P245/50ZR-16 Goodyear Eagle RS-A all-season performance tires (Z28 models and recommended with traction control) • P275/40ZR-17 Goodyear Eagle F1 performance tires(with optional SS Performance / Appearance Package on Z28 models)
Optional:	• P245/50ZR-16 Goodyear Eagle GS-C performance tires (Z28 models and recommended for competition driving only)

Dimensions

Exterior

	Coupe	Convertible
Wheelbase (in / mm):	101.1 / 2566	101.1 / 2566
Overall length (in / mm):	193.5 / 4914	193.5 / 4914
Overall width (in / mm):	74.1 / 1881	74.1 / 1881
Overall height (in / mm):	51.2/ 1300	51.8 / 1315
Track (in / mm):		
Front:	60.7 / 1542	60.7 / 1542
Rear:	60.6 / 1540	60.6 / 1540
Min. ground clearance (in / mm):	4.5 / 115.4	4.5 / 115.4
Curb weight (lbs / kg):		
Camaro manual:	3323 / 1507	3466 / 1572
Camaro automatic:	3380 / 1533	3524 / 1598
Z28 manual:	3411 / 1547	3554 / 1612
Z28 automatic:	3433 / 1557	3577 / 1622
Weight distribution (%, front / rear):		
Camaro coupe & Z28 convertible:	55 / 45	55 / 45
Camaro Z28 coupe:	56 / 44	56 / 44
Camaro convertible:	54 / 46	54 / 46
Drag coefficient (cd.):	0.33 (0.34 for Z28)	0.33 (0.34 for Z28)

Interior

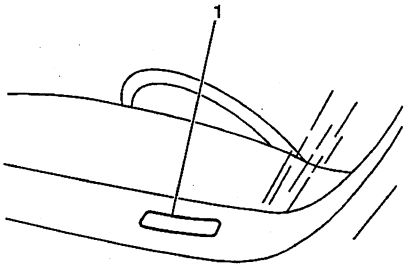
	Coupe	Convertible
Seating capacity (front / rear):	2 / 2	2 / 2
Head room (in / mm):		
Front:	37.2 / 944	38.7 / 984
Rear:	35.2 / 894	39.4 / 1001
Leg room (in / mm):		
Front:	43.0 / 1092	43.0 / 1092
Rear:	26.8 / 681	26.8 / 681
Shoulder room (in / mm):		
Front:	57.4 / 1457	57.4 / 1457
Rear:	55.8 / 1418	43.5 / 1104
Hip room (in / mm):		
Front:	53.5 / 1360	53.5 / 1360
Rear:	49.5 / 1165	43.7 / 1110

Capacities

Interior volume (cu ft / liters):	
Including trunk:	Coupe: 94.8 / 2691.6; Convertible: 88.2 / 2504.2
Excluding trunk:	Coupe: 81.9 / 2325.4; Convertible: 80.6 / 2288.5
Cargo volume (cu ft / liters):	Coupe: 12.9 / 366.3, 32.8 / 928.8 with rear seat folded down Convertible: 7.6 / 215.8
Fuel tank capacity (gals / liters):	16.8 / 63.6
Engine oil w/filter (qts / liters):	3800 V6: 4.5 / 4.2; 5700 V8: 5.5 / 5.2
Cooling system (qts / liters):	3800 V6: 12.4 / 11.7; 5700 V8: 13.58 / 12.85

Vehicle Identification

Vehicle Identification Number (VIN)



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

Position	Definition	Character	Description
1	Country of Origin	2	Canada
2	Manufacturer	G	General Motors
3	Division	1 2	Chevrolet Pontiac
4-5	Carline/Series	F/P F/S F/V	Camaro Sport Coupe and Convertible Firebird and Convertible Formula/Trans Am and Convertible
6	Body Type	2 3	87 - Coupe, Two Door Hatchback/Liftback 67 - Coupe, Two Door Convertible
7	Restraint System	2	Active (Manual) Belts with Driver and Passenger Inflatable Restraint System
		4	Active (Manual) Belts with Driver and Passenger Inflatable Restraints (Frontal and Side)
8	Engine	G	RPO LS1, V8, 5.7L, MFI, United States Production, Mid/Lux Division
		K	RPO L36, V6, 3.8L, MFI, United States Production, Mid/Lux Division
9	Check Digit	--	--
10	Model Year	2	2002
11	Assembly Plant	2	Ste. Therese, Quebec
12-17	Plant Sequence Number	--	--

VIN Derivative

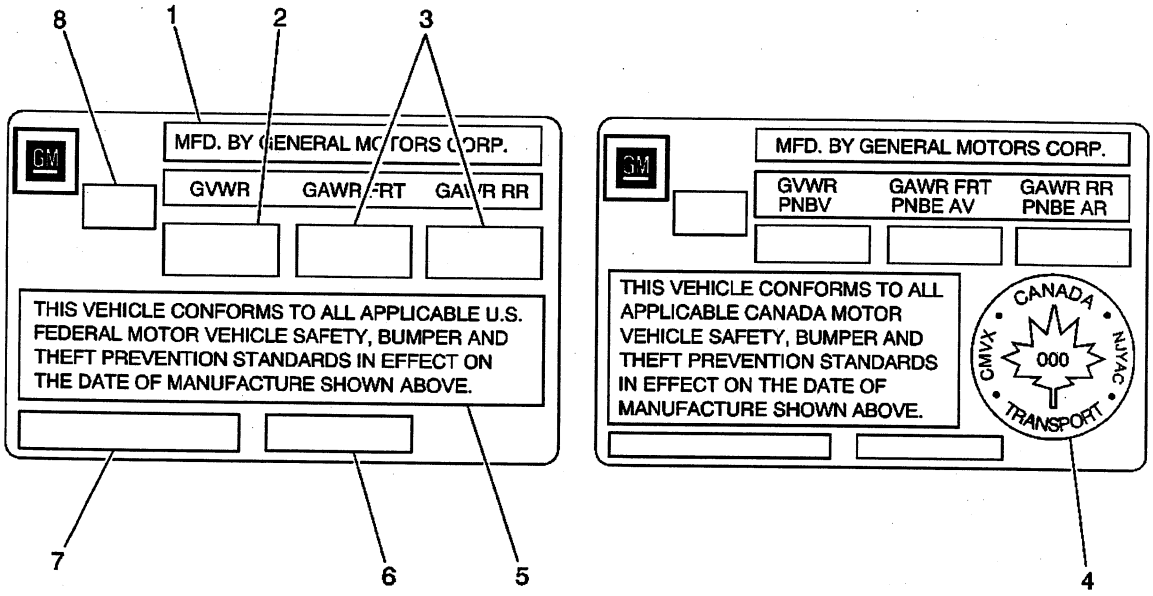
All engines and transmissions are stamped or laser etched with a partial vehicle identification number (VIN), which was derived from the complete VIN. A VIN derivative contains the following nine positions:

Position	Definition	Character	Description
1	GM Division Identifier	1	Chevrolet
		2	Pontiac
2	Model Year	2	2002
3	Assembly Plant	2	St. Therese
4-9	Plant Sequence Number	--	--

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

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

Label - Vehicle Certification



The vehicle certification label displays the following assessments:

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

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

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

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

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

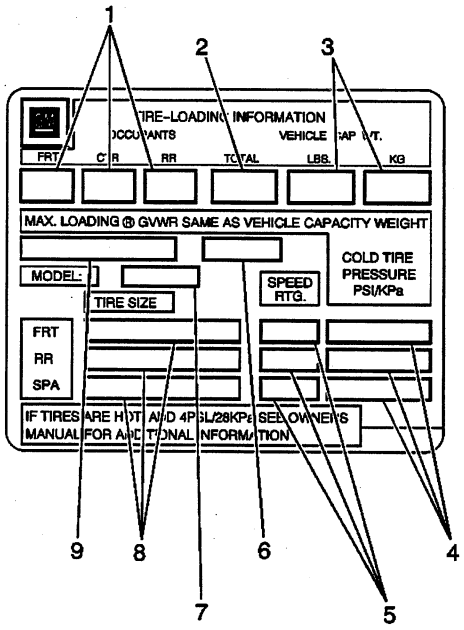
The payload rating defines the vehicle's maximum allowable cargo load. The cargo load includes the driver and the passengers. The payload rating is based on the vehicle's factory installed equipment.

Deduct the weight of accessories added to the vehicle after the final date of manufacture from the payload rating.

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

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

Tire Placard

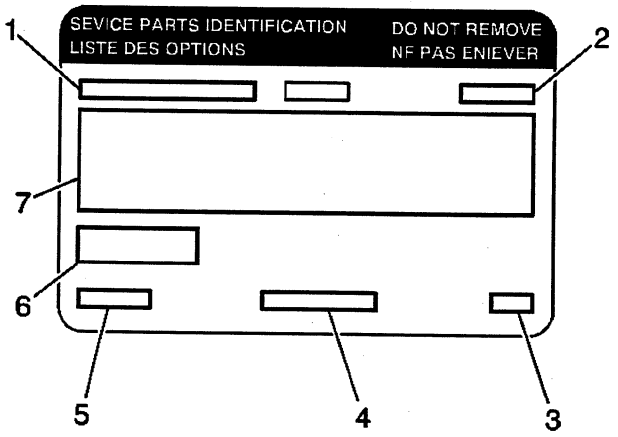


(1) Specified Occupant Seating Positions
(2) Total Occupant Seating
(3) Maximum Vehicle Capacity Weight
(4) Tire Pressures, Front, Rear, and Spare
(5) Tire Speed Rating, Front, Rear, and Spare
(6) Tire Label Code
(7) Engineering Model Minus First Character
(8) Tire Sizes, Front, Rear, and Spare
(9) Vehicle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

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

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

Service Parts Identification Label (SPID)

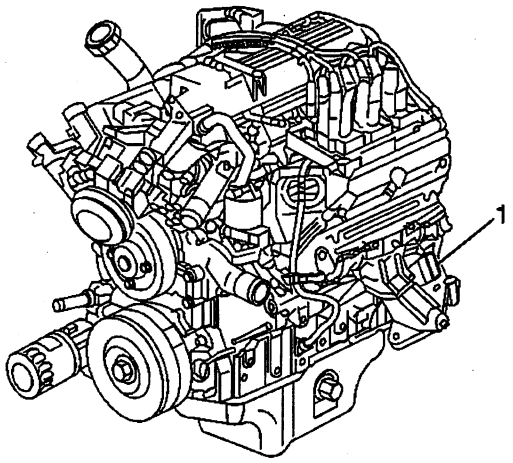


(1) Vehicle Identification Number
(2) Engineering Model Number (Vehicle Division, Vehicle Line and Body Style)
(3) Interior Trim and Decor Level
(4) Exterior (Paint Color) WA Number
(5) Paint Technology
(6) Special Order Paint Colors and Numbers
(7) Vehicle Option Content

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

Engine ID and VIN Derivative Location RPO L36

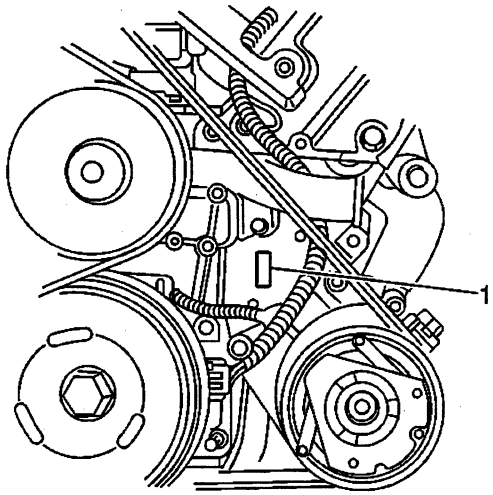
The eighth character in the Vehicle Identification Number (VIN) identifies the engine. Adhesive-backed labels attached to the engine, laser etching, or stampings on the engine block indicate the engine unit number/date code. All engines are stamped with a VIN derivative. For added information on VIN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



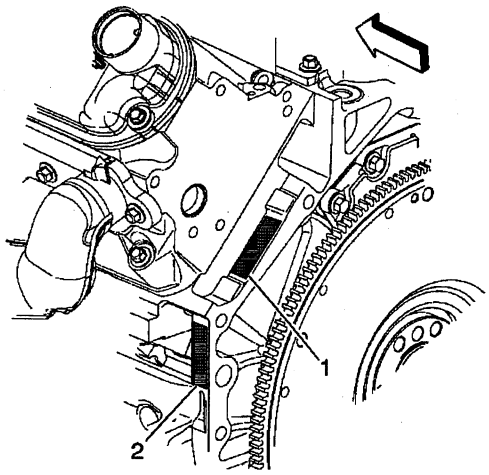
The primary location of the VIN derivative for the 3800 engine is above the starter motor on the engine block (1).

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

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



Engine ID and VIN Derivative Location RPO LS1

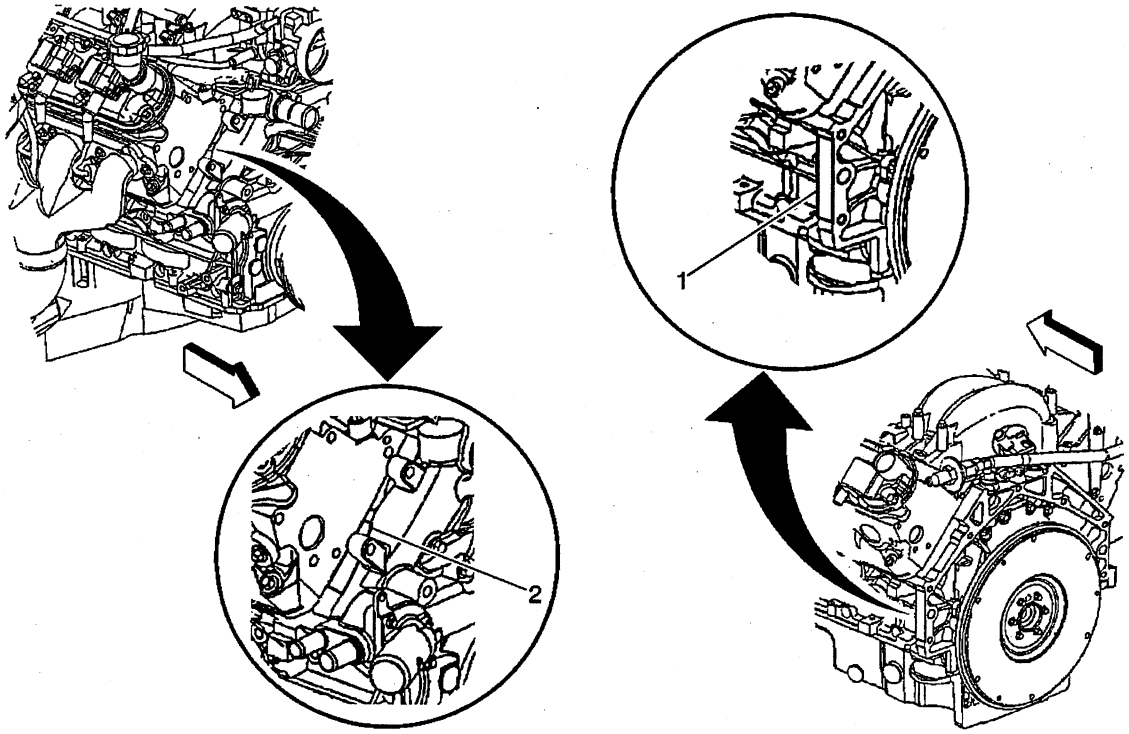


(1) Engine ID Number, Primary Location
(2) Engine ID Number, Secondary Location

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

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

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

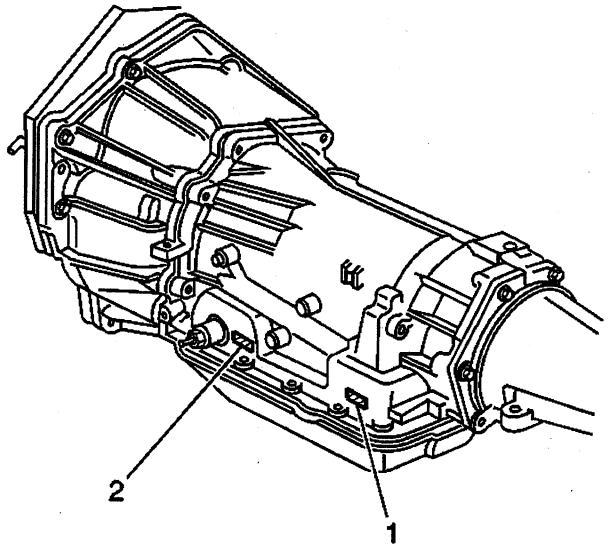


(1) VIN Derivative, Primary Location
(2) VIN Derivative, Secondary Location

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

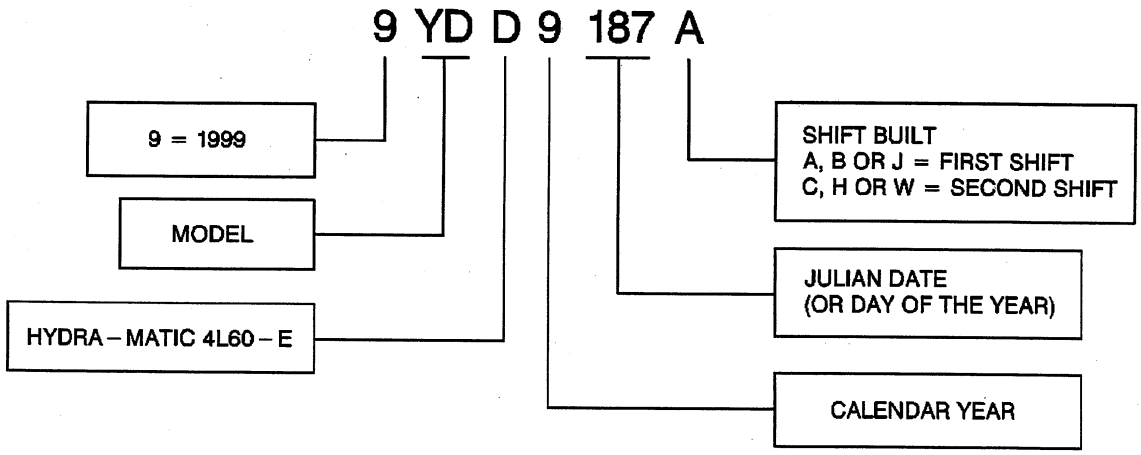
Transmission ID and VIN Derivative Location

Automatic Transmission



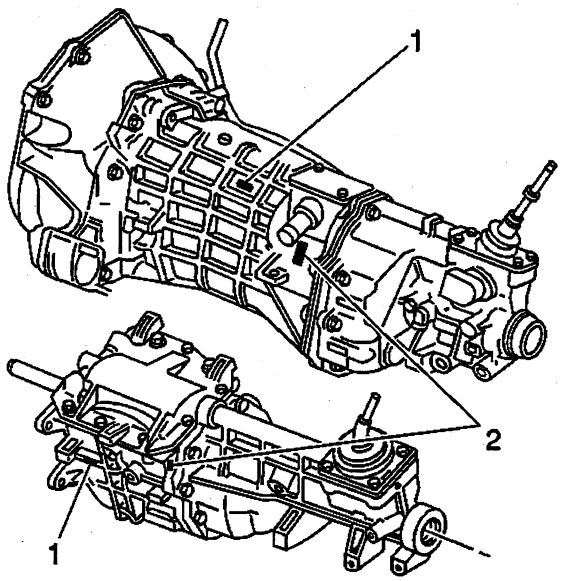
The transmission ID and the VIN derivative for the M30 transmission are located on the left side of the transmission just above the transmission pan.

VIN Derivative Breakdown



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

Manual Transmission ID Location

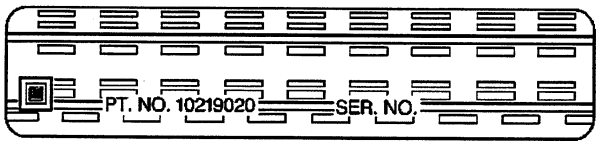


The transmission model identification is located on a label or tag on the transmission case. If this label is missing or unreadable, use the service parts identification label in order to identify the vehicle's transmission.

Transmission Usage

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

Labeling - Anti-Theft



Notice

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

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

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

RPO Code List

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

RPO	Description
AG1	Power Adjuster, Driver Front Seat, Multi-Directional
AK5	Inflatable Restraint System, Driver and Passenger Seat
AQ9	Front Bucket Seat, Driver and Passenger Recline
AR9	Front Bucket Seat, Driver and Passenger Recline, European Style
AU0	Remote Entry Lock Control
AU3	Side Door Electric Lock Control
AX4	Restraint Conversion Seat, Manual European
A26	Window Glazing, European
A31	Window, Power Operated, All Doors
A90	Lock Control, Right Component Lid, Remote Control Electronic Release
BAG	Parts Package Export
BBS	Knob Shifter Hurst
B9W	Wiring Provisions, DRL Override
CC1	Roof Hatch Removable Panels, Glass
C49	Rear Window Defogger, Electric
C60	HVAC System AC Manual Controls, Front
DD9	Mirror, Breakaway, O/S LH & RH Remote Control Electric Color
DE4	Sunshade, Removable Hatch Roof
DG7	Mirror, O/S LH & RH Remote Control Electric Color
DL5	Decal, Roadside Service Information
D21	Sunshade, Windshield
D35	Mirror, O/S LH Remote Control, RH Manual Control, Color
ETA	Harness, I/P Wiring #1
FE2	Suspension System, Ride and Handling
FE4	Suspension System, Special Ride and Handling
FE9	Certification, Federal Emission
F41	Suspension System, Front and Rear Firm Ride and Handling
GU2	Axle Ratio 2.73, Rear
GU4	Axle Ratio 3.08, Rear
GU5	Axle Ratio 3.23, Rear
GU6	Axle Ratio 3.42, Rear
G80	Axle Positraction, Limited Slip
JAF	Brake Provisions, European
J65	Brake System, Power, Front and Rear Disc
K05	Heater, Engine Block
K29	Module Powertrain Control
K34	Cruise Control, Automatic, Electronic
K43	Generator, 102 Amp
K68	Generator, 105 Amp
LS1	Engine, Gas V8 5.7L, MFI Aluminum
L36	Engine, Gas V6 3.8L, MFI HO
MM5	Merchandised Transmission, Manual 5 Speed
MM6	Transmission, Manual 6 Speed O/D
MN6	Merchandised Transmission, Manual 6 Speed
MX0	Merchandised Transmission, Automatic O/D
M30	Transmission, Auto 4 Speed Electronic
M49	Transmission, Manual 5 Speed O/D

NK3	Steering Wheel, Sport, Soft Rim, Simulated Leather
NP5	Steering Wheel, Leather Wrapped
NP7	Steering Column, EEC Approved
NW9	Traction Control, Electronic
N36	Steering Wheel, 4 Spoke Sport
N60	Wheel, Aluminum, Painted
N73	Wheel, Custom Sport Var4 17"
N96	Wheel, 16 X 8 Cast Aluminum
PA6	Wheel, Styled Painted
PW7	Wheel, 16 X 8 Aluminum Styled
P05	Wheel, Chrome, VAR 1
QA9	Wheel, 17 X 9, Aluminum, Painted
QB6	Wheel, 17 X 9, Aluminum, Polished
QB3	Wheel, 16 X 7.5 Steel
QCB	Tire, All P235/55R16-96T BW, R/PE ST TL AL2
QFK	Tire, All P275/40R17-93W BW R/PE ST TL HW4
QFZ	Tire, All P245/50R16 BW R/ PE ST TL AL3
QG4	Wheel, 17 X 9, Aluminum, Machined Faced
QII	Tire, All P215/60R16-94H BW R/PE ST TL AL3
QLC	Tire, All P245/50R16/N BL R/PE ST TL HW4
RPA	Rear Parking Assist
TR7	Headlamps, Control Leveling System, Automatic
T2H	Ornamentation Exterior, Export Unique Requirements
T2J	Ornamentation Interior, Export Unique Requirements
T37	Lamp, Fog, Deluxe
T39	Lamp, Turn Signal, Auxiliary
T43	Spoiler, Rear
T65	Lamp System, Daytime Running, Export
T72	Headlamps, LH, Rule of the Road
T78	Headlamp Control, Delete
T79	Lamp, Fog Rear
T82	Headlamp Control, Automatic ON-OFF
T84	Headlamps, RH Rule of the Road
T85	Headlamps, LH Rule of the Road
T89	Lamp, Tail & Stop, Export
T90	Lamp, Signaling and Marker, Export
T96	Lamp, Fog
UA6	Theft Deterrent System
UB3	Cluster, Instrument, Oil Cool Temp Volts Trip Odom Tach
UC2	Speedometer, Instrument, Kilo & Miles, Positive Bias
UD4	Alarm, Vehicle Speed, 120 K/H
UK1	Frequencies, Japanese
UK2	Lever, Directional Signal, Includes Multi-Functions
UK3	Control, Steering Wheel, Accessory
UL0	Radio, AM/FM Stereo Seek/Scan Auto Rev Music Search Cass Auto-Tone Clock ETR
UN0	Radio, AM/FM Stereo Seek/Scan Compact Disc Auto Tone Clock ETR
UQ0	Speaker System, 4 Dual Front Door Mounted, Dual STD RGE, Qtr/Shelf
UW3	Radio, AM/FM Stereo Seek/Scan, Auto Rev Music Search Cass Data System Clock ETR
UZ7	Speaker System 8, Quad Front Door Mounted, Dual Sail Panel, Dual Rear Hatch Amplifier
U1S	Player Multiple Compact Disc
U12	Speedometer, Dual Scale with Kilometer Odometer
U19	Speedometer, Instrument, Kilo & Miles, Kilo Odometer
U59	Speaker System 8, Dual Front Door Mounted, Quad Sail Panel, Amplifier

U73	Antenna, Fixed Radio
U75	Antenna, Power Radio
VH5	Plate Vehicle Identification
VP6	Noise Control
VR6	Hook, Tie-Down, Shipping
VR7	Hook, Tow, Second, Rear
V12	Cooling System, Power Steering Fluid
V76	Hook, Tow
WX7	Wiring Provisions
W53	Entertainment System Option C
W54	Entertainment System Option D
W55	Entertainment System Option E
W66	Merchandised Package, Formula
W68	Sales Package, Firebird Ground Effects
X10	Entertainment System, Option L
X20	Entertainment System, Option M
Y3F	Sales Package, Sport, Appearance Upfitter
Y4A	Exhaust Cat Back
Y4B	Provisions Level II Ultra Performance Suspension
Y4C	Lubricant Engine Oil & Performance
Y4D	Axle Torque Sensing Differential
Y4E	Cooling System Engine Oil
Y4F	Provisions Hurst Shifter
Y4G	Provisions Chrome Wheels
Y4H	Ornamentation Dash Plaque & Key Fobs
Y4J	Covering Floor Front Mats
Y4K	Protector Car Cover
Y4L	Provisions Spoiler
Y81	Merchandised Package, Firebird
Y82	Merchandised Package, Firebird, Trans Am
Y84	Merchandised Package, Firebird Trans Am, GTA
Y87	Merchandised Package, Performance Enhancement

Technical Information

Capacities - Approximate Fluid

Description	Specification	
	Metric	English
Engine Cooling System		
• 3.8 L With Manual Transmission	11.0 liters	11.6 quarts
• 3.8 L With Automatic Transmission	10.8 liters	11.4 quarts
• 5.7 L With Manual Transmission	11.3 liters	11.9 quarts
• 5.7 L With Automatic Transmission	11.2 liters	11.8 quarts
Engine Crankcase		
• 3.8 L With Filter	4.2 liters	4.5 quarts
• 5.7 L With Filter	5.2 liters	5.5 quarts
Transmission		
• 4L60-E	4.7 liters	5.0 quarts
• After Complete Overhaul (L36)	8.3 liters	8.8 quarts
• After Complete Overhaul (LS1)	10.2 liters	10.8 quarts
• M49 5-Speed Manual Transmission	3.2 liters	3.4 quarts
• MM6 6-Speed Manaual Transmission	3.8 liters	4.0 quarts
Approximate Fuel Capacities (All Vehicles)	63.6 liters	16.8 quarts
Power Steering Fluid		
• 3.8 L	1.05 L	1.11 qt
• 5.7 L	0.95 L	1.00 qt
Rear Axle Lubricant	1.7 L	1.75 qt

Maintenance Items

Usage	Type
Air Cleaner/Filter	
• 3.8 L and 5.7 L	AC Type A917C
Engine Oil Filter	
• 3.8 L (L36)	AC Type PF-47
• 5.7 L (LS1)	AC Type PF-44
Fuel Filter	
• 3.8 L (L36)	AC Type G627
• 5.7 L (LS1)	AC Type GF-578
PCV Valve	
• 3.8 L (L36)	AC Type CV892C
• 5.7 L (LS1)	AC Type CV948C
Radiator Cap	
• 3.8 L (L36) and 5.7 L (LS1)	AC Type RC-24

Spark Plugs and Gaps	
• 3.8 L (L36)	AC Type 41-921 (GAP 1.52 mm, 0.060 in)
• 5.7 L (LS1)	AC Type 41-952 (GAP 1.52 mm, 0.060 in)

Fluid and Lubricant Recommendations

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

Tire Inflation Pressure Specifications Tire Inflation Specifications

Application	Specification	
	Metric	English
Compact spare tire	420 kPa	60 psi
Tires under normal driving conditions	210 kPa	30 psi
Tires Inflation, w/17"	240 kPa	35 psi
Tires under sustained high speed driving of 160 km/h (100 mph) or higher	265 kPa	38 psi

Descriptions and Operations

Power Steering System Description and Operation

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.

Power Steering Pump Specifications

Engine Code	Engine Size	High Flow		Pressure Relief	
		LPM	GPM	kPa	PSI
L36	3.8L	9.1/10.6	2.4/2.8	8274/8963	1200/1300
LS1	5.7L	10.2/11.7	2.7/3.1		

Power Steering Pump Description

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

The power steering pump contains the following major components:

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

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

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

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

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

Power Steering Gear Description

The power steering gear includes the following major internal components:

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

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

Manual steering is always available during the following situations:

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

Steering effort is increased when the above conditions exists.

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

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

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

Steering Wheel and Column

The steering wheel and column has 4 primary functions:

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

Vehicle Steering

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

Vehicle Security

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

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

Driver Convenience

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

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

Driver Safety

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

Suspension Description and Operation

Front Suspension

The 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 vehicle's 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 an upper and a lower control arm. 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 control arm attaches to the frame in the same fashion. Between the lower control arm and a spring seat on the vehicle's frame, under tension, is a coil spring.

This up and down motion of the steering knuckle as the vehicle travels over bumps is absorbed predominantly by the coil spring. The vertical movement of the steering knuckle as the vehicle travels over irregular road surfaces will tend to compress the spring and spring tension will lead the spring to return to the original, at-rest state. This action isolates the vehicle from the road surface. The upper and lower control arms are 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.

A shock absorber is used in conjunction with this system in order to dampen out the oscillations of the coil spring. A shock absorber is a basic hydraulic cylinder. The shock is filled with oil and has a moveable shaft that connects to a piston inside the shock absorber. 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.

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 vehicle's handling characteristics on turns.

Rear Suspension

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

Wheels and Tires

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Jack Stowage Bolt/Screw	6.5 N·m	58 lb in
Wheel Nut - M12 x 1.5	140 N·m	100 lb ft
Wheel Nut Cap	6 N·m	53 lb in

General Description

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

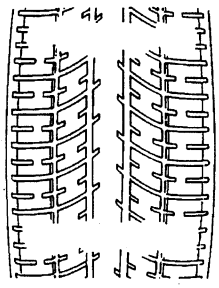
The following factors have an important influence on tire life:

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

The following factors increase tire wear:

- Heavy cornering
- Excessively rapid acceleration
- Heavy braking

Tread Wear Indicators Description



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

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

Metric Wheel Nuts and Bolts Description

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

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

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

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

Tire Inflation Description

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

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

Inspect the tire pressure when the following conditions apply:

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

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

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

Inflation Pressure Conversion (Kilopascals to PSI)

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

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

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

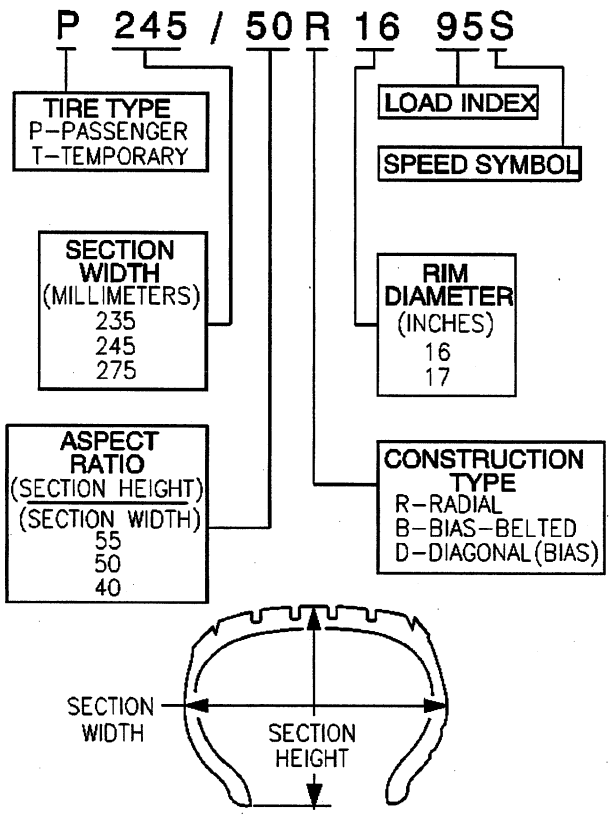
Tires with a lower than recommended pressure can cause the following conditions:

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

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

- Uneven braking
- Steering lead
- Reduced vehicle handling

P-Metric Sized Tires Description



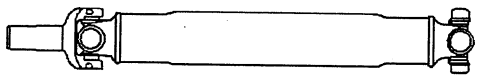
Most P-metric tire sizes do not have exact corresponding alphanumeric tire sizes. Replacement tires should be of the same tire performance criteria (TPC) specification number including the same size, the same load range, and the same construction as those originally installed on the vehicle. Consult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

Driveline System Description and Operation

Driveline/Axle – Propeller Shaft

Propeller Shaft Description and Operation

One Piece Shaft



Important

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

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

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

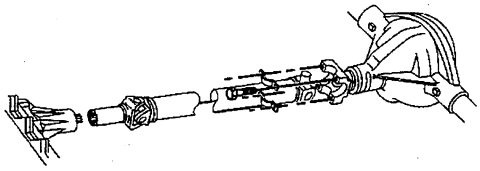
Vehicles with the 5.7L (VIN G) engine and both the 6-speed (MM6) and the automatic transmission (M30) are equipped with a one-piece propeller shaft of either stamped steel design or a lightweight aluminum.

Two Piece Shaft

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

The bearing is prelubricated and sealed by the manufacturer.

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



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

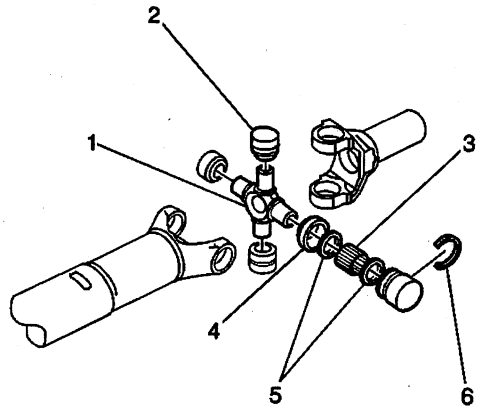
Vehicles with two or more propeller shafts use a center bearing. The center bearing is usually near the rear of the front propeller shaft. The slip joint is at the forward end of the rear propeller shaft.

Propeller Shaft Phasing Description

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

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

Universal Joint Description



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

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

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

Center Bearing Description

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

Rear Drive Axle Description and Operation

Rear Axle Specifications

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

Rear Axle Usage

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

Rear Axle Description

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

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

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

A universal joint connects the rear end of the propeller shaft to the drive pinion gear yoke. The drive pinion gear yoke has a splined end that fits over the drive pinion gear. The splined end of the drive pinion gear yoke also drives the pinion gear. Two preloaded tapered drive pinion gear bearings support the drive pinion gear in the rear axle housing. The races of the following components are press fit into the rear axle housing:

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

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

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

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

The drive pinion gear spacer performs the following actions:

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

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

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

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

- The differential side bearings
- The rear axle housing

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

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

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

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

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

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

The following components turn freely on the pinion gear shaft:

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

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

The following components back the differential pinion gears:

- Differential pinion thrust washers
- Differential side gear thrust washers

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

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

Operation

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

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

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

Limited Slip Rear Axle

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

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

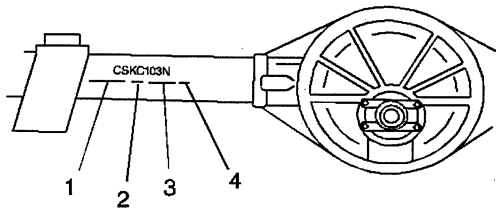
All the following rear axle components are interchangeable (except for the differentials):

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

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

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

Rear Axle Identification



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

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

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

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

Braking System Description and Operation

Hydraulic Brake System Description and Operation

System Component Description

The hydraulic brake system consists of the following:

Hydraulic Brake Master Cylinder Fluid Reservoir

Contains supply of brake fluid for the hydraulic brake system.

Hydraulic Brake Master Cylinder

Converts mechanical input force into hydraulic output pressure.

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

Hydraulic Brake Pressure Balance Control System

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

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

Hydraulic Brake Pipes and Flexible Brake Hoses

Carries brake fluid to and from hydraulic brake system components.

Hydraulic Brake Wheel Apply Components

Converts hydraulic input pressure into mechanical output force.

System Operation

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

Brake Assist System Description and Operation

System Component Description

The brake assist system consists of the following:

Brake Pedal

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

Brake Pedal Pushrod

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

Vacuum Brake Booster

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

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

Vacuum Source

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

Vacuum Source Delivery System

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

System Operation

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

Disc Brake System Description and Operation

System Component Description

The disc brake system consists of the following components:

Disc Brake Pads

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

Disc Brake Rotors

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

Disc Brake Pad Hardware

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

Disc Brake Caliper Hardware

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

System Operation

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

Parking Brake System Description and Operation

System Component Description

The park brake system consists of the following:

Park Brake Lever Assembly

Receives and transfers park brake system apply input force from driver to park brake cable system.

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

Park Brake Cables

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

Park Brake Cable Equalizer

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

An auto adjust spring is used to remove the slack in the park brake cables.

Park Brake Actuator/Adjuster

Uses multiplied input force from apply lever via the cables to expand park brake shoe toward the friction surface of the drum-in-hat portion of the rear brake rotor.

Threaded park brake actuators/adjusters are also used to control clearance between the park brake shoe and the friction surface of the drum-in-hat portion of the rear brake rotor.

Park Brake Shoe (Rear Disc, Drum-In-Hat System)

Applies mechanical output force from park brake actuator/adjuster 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 raised, 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 park brake shoe toward the friction surface of the drum-in-hat portion of the rear brake rotor 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 the lever is returned to the at-rest rest position.

ABS Description and Operation

General System Description

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

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

ABS Description

Brake Pressure Modulator Valve (BPMV)

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

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

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

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

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

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

Pump Motor

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

ABS Valves

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

TCS Master Cylinder Isolation Valves

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

TCS Prime Valves

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

Electronic Brake And Traction Control Module

The EBCM/EBTCM performs the following primary functions:

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

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

Wheel Speed Sensors

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

Traction Control System ON/OFF Switch

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

Stoplamp Switch

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

Engine Description and Operation

3.8L V-6 Engine

Engine Mechanical Specifications

Application	Specification	
	Metric	English
General Data		
• Engine Type	90° V-6	
• Displacement	231 cu in	
• Liter (VIN)	3.8L (K), (1)	
• RPO	L36, L67	
• Bore	96.52 mm	3.8 in
• Stroke	86.36 mm	3.4 in
• Compression Ratio (VIN K)	9.4:1	
• Compression Ratio (VIN 1)	8.5:1	
• Firing Order	1-6-5-4-3-2	
Lubrication System		
• Oil Capacity with Oil Filter Change	4.25 L	4.5 qt
• Oil Capacity without Oil Filter Change	3.75 L	4 qt
• Oil Pressure @ Operating Temperature (1850 RPM) Using 10W-30 Oil	414 kPa	60 psi min
• Oil Filter Type	Throw Away Element and Can	
• Gear Pocket Depth	11.71-11.75 mm	0.461-0.4625 in
• Gear Pocket Diameter	89.10-89.20 mm	3.508-3.512 in
• Inner Gear Tip Clearance	0.152 mm	0.006 in
• Outer Gear Diameter Clearance	0.203-0.381 mm	0.008-0.015 in
• End Clearance	0.025-0.089 mm	0.001-0.0035 in
• Valve-to-Bore Clearance	0.038-0.076 mm	0.0015-0.003 in
Type of Lubrication		
• Main Bearings	Pressure	
• Connecting Rods	Pressure	
• Piston Pins	Splash	
• Balance Shaft Bearing - Front	Splash	
• Balance Shaft Bushing - Rear	Pressure	
• Camshaft Bearings	Pressure	
• Timing Chain	Splash	
• Cylinder Walls	Splash	
• Oil Pump Type	Gerotor	
• Oil Pressure Sending Unit	Electrical	
• Oil Intake	Stationary	
• Oil Filter System	Full Flow	
Cylinder Bore		
• Diameter	96.5 mm	3.8 in
• Out-Of-Round Maximum	0.0254 mm	0.001 in
• Taper	0.0254 mm	0.001 in
Piston (VIN K)		
• Used Piston Clearance (41 mm from Top of Piston)	0.050-0.091 mm	0.0020-0.0036 in
• New Piston Clearance (41 mm from Top of Piston)	0.010-0.051 mm	0.0004-0.0020 in

Piston (VIN 1)		
• Used Piston Clearance (41 mm from Top of Piston)	0.0193-0.0997 mm	0.0008-0.0039 in
• New Piston Clearance (41 mm from Top of Piston)	0.0207-0.0437 mm	0.0008-0.0017 in
Piston Ring Groove Depth		
• Top Compression	4.019-4.146 mm	0.158-0.163 in
• 2nd Compression	4.214-4.341 mm	0.0166-0.171 in
• Oil Control	3.814-3.941 mm	0.150-0.155 in
Piston Ring End Gap		
• Top Compression	0.25-0.46 mm	0.010-0.018 in
• 2nd Compression	0.58-0.84 mm	0.023-0.033 in
• Oil Control	0.254-0.762 mm	0.010-0.030 in
Piston Ring Side Clearance		
• Top Compression	0.033-0.079 mm	0.0013-0.0031 in
• 2nd Compression	0.033-0.079 mm	0.0013-0.0031 in
• Oil Control	0.023-0.201 mm	0.0009-0.0079 in
Piston Ring Width		
• Top Compression	1.176-1.197 mm	0.0463-0.0471 in
• 2nd Compression	1.476-1.497 mm	0.0581-0.0589 in
• Oil Control	1.854-2.007 mm	0.073-0.079 in
Piston Pin (VIN K)		
• Diameter	21.9950-22.0000 mm	0.8659-0.8661 in
• Clearance in Piston	0.0020-0.0130 mm	0.00008-0.00051 in
• Fit-In-Rod (Clearance)	0.0066-0.0217 mm	0.0003-0.0009 in
Piston Pin (VIN 1)		
• Diameter	22.995-23.0000 mm	0.90531-0.90551 in
• Clearance in Piston	0.0065-0.0155 mm	0.00061-0.00026 in
• Fit-In-Rod (Clearance)	0.0073-0.0225 mm	0.00029-0.00089 in
Crankshaft		
• Main Journal Diameter-All	63.470-63.495 mm	2.4988-2.4998 in
• Rod Journal Diameter-All	57.1170-57.1475 mm	2.2487-2.2499 in
• Main Journal Taper-Maximum	0.00889 mm	0.00035 in
• Rod Journal Taper-Maximum	0.00889 mm	0.00035 in
• Main Journal Out-of-Round-Maximum	0.00635 mm	0.00025 in
• Rod Journal Out-of-Round-Maximum	0.00508 mm	0.00020 in
• Main Bearing to Journal Clearance 1	0.0178-0.0406 mm	0.0007-0.0016 in
• Main Bearing to Journal Clearance 2, 3 and 4	0.0229-0.0457 mm	0.0009-0.0018 in
• Rod Bearing Clearance	0.0127-0.0660 mm	0.0005-0.0026 in
• Crankshaft End Play	0.076-0.276 mm	0.003-0.011 in
Connecting Rod		
• Rod Side Clearance	0.102-0.508 mm	0.004-0.0200 in
• Connecting Rod Large End Bore ID	60.295-60.312 mm	2.37378-2.3745 in
Camshaft		
• Journal Diameter	47.655-46.858 mm	1.8462-1.8448 in
• Bearing Inside Diameter 1 and 4	46.970-46.934 mm	1.8428-1.8492 in
• Bearing Inside Diameter 2 and 3	46.977-46.942 mm	1.8481-1.8495 in
• Bearing-to-Journal Clearance	0.041-0.119 mm	0.0016-0.0047 in
• Intake Maximum Lobe Lift	6.56 mm	0.258 in
• Exhaust Maximum Lobe Lift	6.56 mm	0.258 in

Balance Shaft		
• End Play	0.0-0.171 mm	0.0-0.0067 in
• Rear Journal Diameter	38.085-38.105 mm	1.4994-1.5002 in
• Radial Play-Front, Bearing Clearance	0.0-0.026 mm	0.0-0.0010 in
• Rear Bearing to Journal Clearance	0.012-0.109 mm	0.0005-0.0043 in
• Drive Gear Lash	0.050-0.125 mm	0.002-0.0049 in
• Bearing Bore Diameter-Front	51.973-51.999 mm	2.0462-2.0472 in
• Bearing Bore Diameter-Rear, In Block	47.584-47.612 mm	1.8735-1.8745 in
• Bearing Inside Diameter-Rear	38.118-38.194 mm	1.5007-1.5037 in
Valve System		
• Lifter	Hydraulic Roller	
• Rocker Arm Ratio	1.66:1	
• Face Angle	46 degrees	
• Seat Angle	45 degrees	
• Minimum Margin	0.635 mm	0.025 in
• Seat Runout-Maximum	0.050 mm	0.002 in
• Seat Width-Intake	1.53-2.03 mm	0.060-0.080 in
• Seat Width-Exhaust	2.29-2.79 mm	0.090-0.110 in
• Stem Height-All	49.15-50.17 mm	1.93-1.975 in
• Stem Clearance-Intake	0.031-0.071 mm	0.0012-0.0028 in
• Stem Clearance-Exhaust	0.036-0.074 mm	0.0014-0.0029 in
Valve Spring		
• Free Length	49.78 mm	1.960 in
• Load-Closed	334 N @ 43.69 mm	75 lb @ 1.72 in
• Load-Open	1014 N @ 32.4 mm	228 lb @ 1.277 in
• Installed Height	42.93-44.45 mm	1.690-1.750 in
• Approximate Number of Active Coils	4.48	
• Approximate Number of Total Coils	6.60	
Flywheel		
• Runout-Maximum	0.38 mm	0.015 in

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
A/C Compressor and Condenser at the Accumulator	48 N·m	36 lb ft
A/C Compressor and Condenser Hose Bolt at the Compressor	33 N·m	24 lb ft
A/C Compressor and Condenser Hose Nut	16 N·m	12 lb ft
Auto Left Side Trans Support to Transmission Bolt	8.5 N·m	75 lb in
Auto Left Side Trans Support to Engine Bolts	28 N·m	21 lb ft
Auto Left Side Trans Support Nut	80 N·m	59 lb ft
Auto Right Side Trans Support to Trans Bolt	8.5 N·m	75 lb in
Auto Right Side Trans Support to Engine Bolts	50 N·m	75 lb in
Battery Positive Cable Harness Nut	25 N·m	18 lb ft
Camshaft Sprocket Bolt	100 N·m + 90°	74 lb + 90°ft
Camshaft Thrust Plate Bolt	15 N·m	11 lb ft
Coolant Pump Bolt	15 N·m + 80°	11 lb ft + 80°ft
Coolant Pump Pulley Bolt	13 N·m	116 lb in
Crankshaft Balancer Bolt	150 N·m + 114°	111 lb ft + 114°ft
Crankshaft Position Sensor Stud	30 N·m	22 lb ft

Crankshaft Rear Oil Seal Housing Bolt	15 N·m + 50°	11 + 50° lb ft
Cylinder Head Bolt	50 N·m + 120°	37 lb ft + 120°
Drive Belt Idler Pulley Bolt	50 N·m	37 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
EGR Valve Adapter Bolt	25 N·m	18 lb ft
EGR Valve Adapter Nut	50 N·m	37 lb ft
EGR Valve Nut	29 N·m	21 lb ft
EGR Valve Outlet Pipe Bolt/Nut (Except Upper Intake Manifold)	30 N·m	22 lb ft
Engine Coolant Temperature Sensor	25 N·m	18 lb ft
Engine Flywheel Bolt	15 N·m + 50°	11 lb ft + 50°
Engine Front Cover Bolt/Stud	20 N·m + 40°	15 lb ft+ 40°
Engine Ground Strap Bolt	25 N·m	18 lb ft
Engine Harness Clamp Bolt	6 N·m	53 lb in
Engine Lift Bracket Bolt/Nut/Stud	30 N·m	22 lb ft
Engine Mount Bracket Bolt	102 N·m	75 lb ft
Engine Mount Bolts	58 N·m	43 lb ft
Engine Mount Strut Bracket Stud at Engine, Left	87 N·m	64 lb ft
Engine Mount Strut Bracket Bolt at Engine, Right	50 N·m	37 lb ft
Engine Mount Through Bolt Nut	80 N·m	59 lb ft
Engine Wiring Harness Ground Bolt	25 N·m	18 lb ft
EVAP Canister Purge Valve Bolts	10 N·m	89 lb in
Flywheel Housing Inspection Cover Bolts	9 N·m	80 lb in
Fuel Pipe Heat Shield Nut	5 N·m	44 lb in
ICM Assembly Bolt	50 N·m	37 lb ft
Lower Intake Manifold Bolt	15 N·m	11 lb ft
Manifold Vacuum Source Screws	10 N·m	89 lb in
Manual Transmission to Engine Bolts	95 N·m	70 lb ft
Manual Transmission Support Brace Bolts to Transmission	50 N·m	37 lb ft
Manual Transmission Support Brace Bolts to Engine	28 N·m	21 lb ft
Oil Filter Adapter Bolt	15 N·m + 50°	11 lb ft + 50°
Oil Level Indicator Tube Nut	19 N·m	14 lb ft
Oil Pan Bolt	14 N·m	124 lb in
Oil Pan Drain Plug	30 N·m	22 lb ft
Oil Pressure Sensor	16 N·m	12 lb ft
Oil Pump Cover Screw	11 N·m	98 lb in
Oil Pump Screen Bolt	15 N·m	11 lb ft
Right Side Transmission Support Nut	80 N·m	59 lb ft
Shock Absorber Bolts	65 N·m	48 lb ft
Throttle Body Bolt/Nut	10 N·m	89 lb in
Timing Chain Dampener Bolt	22 N·m	16 lb ft
Transmission Oil Cooler Pipe Brack Bolt	17 N·m	13 lb ft
Transmission Suport Bolts	57 N·m	42 lb ft
Upper Ball Joint Nuts	53 N·m	39 lb ft
Upper Intake Manifold Bolts (Long)	30 N·m	22 lb ft
Upper Intake Manifold Bolts (Short)	15 N·m	11 lb ft
Valve Lifter Guide Retainer Bolt	30 N·m	22 lb ft
Valve Rocker Arm Bolt	15 N·m + 90°	11 lb + 90°ft
Valve Rocker Arm Cover Bolt	10 N·m	89 lb in
Wiring Harness Ground Bolt to Front Rail	12 N·m	106 lb in

Engine Component Description

Engine Construction

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

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

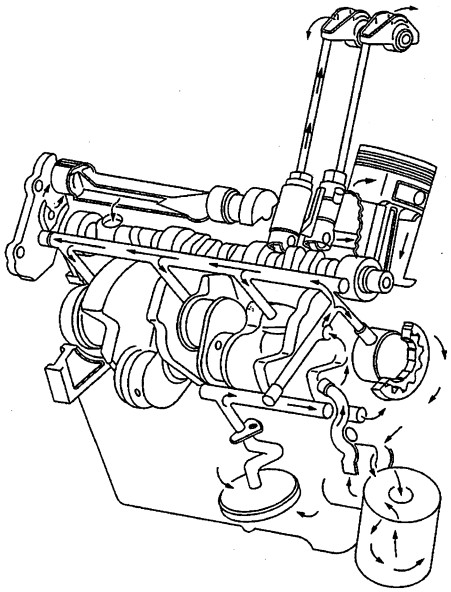
In addition to its normal function of a cam follower, each valve lifter also serves as an automatic adjuster which maintains zero lash in the valve train under all operating conditions. By eliminating all lash in the valve train and also providing a cushion of oil to absorb operating shocks, the valve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

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

Drive Belt System Description

See Drive Belt System Description in the next section.

Lubrication Description



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

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

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

5.7L V-8 Engine

Engine Mechanical Specifications

Application	Specification	
	Metric	English
General Data		
• Engine Type	V8	
• Displacement	5.7L 5665 cc	346 CID
• Bore	99.0-99.018 mm	3.897-3.898 in
• Stroke	92.0 mm	3.622 in
• Compression Ratio	10.1:1	
• Firing Order	1-8-7-2-6-5-4-3	
• Spark Plug Gap	1.524 mm	0.06 in
Lubrication System		
• Oil Capacity - without Oil Filter Change	4.7 Liters	5.0 Quarts
• Oil Capacity - with Oil Filter Change	5.2 Liters	5.5 Quarts
• Oil Pressure - Minimum - Hot	41 kPa at 1,000 engine RPM 124 kPa at 2,000 engine RPM 165 kPa at 4,000 engine RPM	6 psig at 1,000 engine RPM 18 psig at 2,000 engine RPM 24 psig at 4,000 engine RPM
• Oil Type	5W-30	
Camshaft		
• Camshaft End Play	0.025-0.305 mm	0.001-0.012 in
• Camshaft Journal Diameter	54.99-55.04 mm	2.164-2.166 in
• Camshaft Journal Diameter Out-of-Round	0.025 mm	0.001 in
• Camshaft Lobe Lift - Intake	6.96 mm	0.274 in
• Camshaft Lobe Lift - Exhaust	7.13 mm	0.281 in
• Camshaft Runout - Measured at the Intermediate Journals	0.05 mm	0.002 in
Connecting Rod		
• Connecting Rod Bearing Bore Diameter	56.505-56.525 mm	2.224-2.225 in
• Connecting Rod Bearing Bore Out-of-Round - Production	0.006 mm	0.00023 in
• Connecting Rod Bearing Bore Out-of-Round - Service Limit	0.006 mm	0.00023 in
• Connecting Rod Bearing Clearance - Production	0.023-0.065 mm	0.0009-0.0025 in
• Connecting Rod Bearing Clearance - Service Limit	0.023-0.076 mm	0.0009-0.003 in
• Connecting Rod Side Clearance	0.11-0.51 mm	0.00433-0.02 in
Crankshaft		
• Crankshaft Bearing Clearance - Production	0.020-0.052 mm	0.0008-0.0021 in
• Crankshaft Bearing Clearance - Service	0.020-0.065 mm	0.0008-0.0025 in
• Crankshaft Connecting Rod Journal Diameter - Production	53.318-53.338 mm	2.0991-2.0999 in
• Crankshaft Connecting Rod Journal Diameter - Service Limit	53.308 mm	2.0987 in
• Crankshaft Connecting Rod Journal Taper - Production	0.005 mm - Maximum for 1/2 of the Journal Length	0.0002 in - Maximum for 1/2 of the Journal Length

• Crankshaft Connecting Rod Journal Taper - Service Limit	0.02 mm - Maximum	0.00078 in - Maximum
• Crankshaft Connecting Rod Journal Out-of-Round - Production	0.005 mm	0.002 in
• Crankshaft Connecting Rod Journal Out-of-Round - Service Limit	0.01 mm	0.00039 in
• Crankshaft End Play	0.04-0.2 mm	0.0015-0.0078 in
• Crankshaft Main Journal Diameter - Production	64.993-65.007 mm	2.558-2.559 in
• Crankshaft Main Journal Diameter - Service Limit	64.993 mm - Minimum	2.558 in - Minimum
• Crankshaft Main Journal Out-of-Round - Production	0.003 mm	0.000118 in
• Crankshaft Main Journal Out-of-Round - Service Limit	0.008 mm	0.00031 in
• Crankshaft Main Journal Taper - Production	0.01 mm	0.00039 in
• Crankshaft Main Journal Taper - Service Limit	0.02 mm	0.00078 in
• Crankshaft Reluctor Ring Runout - Measured 1.0 mm (0.04 in) Below the Tooth Diameter	0.7 mm	0.028 in
• Crankshaft Runout - at Rear Flange	0.05 mm - Maximum	0.002 in - Maximum
• Crankshaft Thrust Wall Runout	0.025 mm	0.001 in
• Crankshaft Thrust Wall Width - Production	26.14-26.22 mm	1.029-1.0315 in
• Crankshaft Thrust Wall Width - Service	26.2 mm - Maximum	1.0315 in - Maximum
Cylinder Bore		
• Cylinder Bore Diameter	99.0-99.018 mm	3.897-3.898 in
• Cylinder Bore Taper Thrust Side	0.018 mm - Maximum	0.0007 in - Maximum
Cylinder Head		
• Cylinder Head Engine Block Deck Flatness - Measured within a 152.4 mm (6.0 in) area	0.08 mm	0.003 in
• Cylinder Head Engine Block Deck Flatness - Measuring the Overall Length of the Cylinder Head	0.1 mm	0.004 in
• Cylinder Head Exhaust Manifold Deck Flatness	0.22 mm	0.008 in
• Cylinder Head Intake Manifold Deck Flatness	0.22 mm	0.008 in
• Cylinder Head Height - Measured from the Cylinder Head Deck to the Valve Rocker Arm Cover Seal Surface	120.2 mm - Minimum	4.732 in - Minimum
Engine Block		
• Camshaft Bearing Bore 1 and 5 Diameter	59.08-59.13 mm	2.325-2.327 in
• Camshaft Bearing Bore 2 and 4 Diameter	58.83-58.88 mm	2.316-2.318 in
• Camshaft Bearing Bore 3 Diameter	58.58-58.63 mm	2.306-2.308 in
Engine Block Cylinder Head Deck Surface Flatness - Measured within a 152.4 mm (6.0 in) area	0.08 mm	0.003 in
Engine Block Cylinder Head Deck Surface Flatness - Measuring the Overall Length of the Block Deck	0.22 mm	0.008 in
Engine Block Cylinder Head Deck Height - Measuring from the Centerline of Crankshaft to the Deck Face	234.57-234.82 mm	9.235-9.245 in
• Main Bearing Bore Diameter - Production	69.871-69.889 mm	2.75-2.751 in
• Main Bearing Bore Out-of-Round	0.005 mm	0.0002 in
• Valve Lifter Bore Diameter - Production	21.417-21.443 mm	0.843-0.844 in

Intake Manifold		
• Intake Manifold Cylinder Head Deck Flatness - Measured at Gasket Sealing Surfaces	0.5 mm	0.02 in
Oil Pan and Front/Rear Cover Alignment		
• Oil Pan to Rear of Engine Block Alignment - at Transmission Bellhousing Mounting Surface	0.0-0.25 mm - Maximum	0.0-0.01 in - Maximum
• Front Cover Alignment - at Oil Pan Surface	0.0-0.5 mm	0.0-0.02 in
• Rear Cover Alignment - at Oil Pan Surface	0.0-0.5 mm	0.0-0.02 in
Piston		
• Piston Outside Diameter - Non Coated Skirt - at Size Point	98.969-98.987 mm	3.8964-3.897 in
• Piston - Piston Diameter - Measured Over Skirt Coating	98.984-99.027 mm	3.897-3.899 in
• Piston to Bore Clearance - Non Coated Skirt - Production	0.013-0.049 mm	0.0005-0.0019 in
• Piston to Bore Clearance - Non Coated Skirt - Service	0.013-0.074 mm	0.0005-0.0029 in
• Piston - Piston to Bore Clearance - Coated Skirt - Production	-0.027 to +0.029 mm	-0.001 to +0.0011 in
• Piston - Piston to Bore Clearance - Coating Worn Off - Service Limit	0.074 mm	0.0029 in
Piston Pin		
• Piston Pin Clearance to Piston Bore - Production	0.01-0.02 mm	0.0004-0.00078 in
• Piston Pin Clearance to Piston Bore - Service Limit	0.01-0.022 mm - Maximum	0.0004-0.00086 in - Maximum
• Piston Pin Diameter	23.997-24.0 mm	0.9447-0.9448 in
• Piston Pin Fit in Connecting Rod	0.02-0.043 mm - Interference	0.00078-0.00169 in - Interference
Piston Rings		
• Piston Compression Ring End Gap - Production - Top - Measured in Cylinder Bore	0.23-0.44 mm	0.009-0.017 in
• Piston Compression Ring End Gap - Production - 2nd - Measured in Cylinder Bore	0.44-0.7 mm	0.017-0.027 in
• Piston Oil Ring End Gap - Production - Measured in Cylinder Bore	0.18-0.75 mm	0.007-0.029 in
• Piston Compression Ring End Gap - Service - Top - Measured in Cylinder Bore	0.23-0.50 mm - Maximum	0.009-0.0196 in - Maximum
• Piston Compression Ring End Gap - Service - 2nd - Measured in Cylinder Bore	0.44-0.76 mm - Maximum	0.0173-0.03 in - Maximum
• Piston Oil Ring End Gap - Service Limit - Measured in Cylinder Bore	0.18-0.81 mm - Maximum	0.007-0.032 in - Maximum
• Piston Compression Ring Groove Clearance - Production - Top	0.04-0.086 mm	0.00157-0.0033 in
• Piston Compression Ring Groove Clearance - Production - 2nd	0.05-0.088 mm	0.002-0.0034 in
• Piston Oil Ring Groove Clearance - Production	-0.008 to +0.176 mm	-0.0003 to +0.0069 in
• Piston Compression Ring Groove Clearance - Service - Top	0.04-0.086 mm - Maximum	0.00157-0.0033 in - Maximum
• Piston Compression Ring Groove Clearance - Service - 2nd	0.05-0.088 mm - Maximum	0.002-0.0034 in - Maximum

• Piston Oil Ring Groove Clearance - Service Limit	-0.008 to +0.176 mm - Maximum	-0.0003 to +0.0069 in - Maximum
Valve System		
• Valve Face Angle	45 degrees	
• Valve Guide Installed Height - Measured from the Cylinder Head Spring Seat Surface to the Top of the Valve Guide	17.32 mm	0.682 in
• Valve Lash	Net Lash - No Adjustment	
• Valve Lift - Exhaust	12.16 mm	0.4787 in
• Valve Lift - Intake	11.79 mm	0.464 in
• Valve Lifter	Hydraulic Roller	
• Valve Margin	1.25 mm - Minimum	0.05 in - Minimum
• Valve Rocker Arm Ratio	1.70:1	
• Valve Seat Angle	46 degrees	
• Valve Seat Runout	0.05 mm - Maximum	0.002 in - Maximum
• Valve Seat Width - Exhaust	1.78 mm	0.07 in
• Valve Seat Width - Intake	1.02 mm	0.04 in
• Valve Spring Free Length	52.9 mm	2.08 in
• Valve Spring Installed Height - Exhaust	45.75 mm	1.8 in
• Valve Spring Installed Height - Intake	45.75 mm	1.8 in
• Valve Spring Pressure - Closed	340 N at 45.75 mm	76 lb at 1.8 in
• Valve Spring Pressure - Open	980 N at 33.55 mm	220 lb at 1.32 in
• Valve Stem Clearance - Production - Exhaust	0.025-0.066 mm	0.001-0.0026 in
• Valve Stem Clearance - Production - Intake	0.025-0.066 mm	0.001-0.0026 in
• Valve Stem Clearance - Service - Exhaust	0.093 mm Maximum	0.0037 in - Maximum
• Valve Stem Clearance - Service - Intake	0.093 mm - Maximum	0.0037 in - Maximum
• Valve Stem Diameter - Production	7.955-7.976 mm	0.313-0.314 in
• Valve Stem Diameter - Service	7.95 mm - Minimum	0.313 in - Minimum
• Valve Stem Oil Seal Installed Height - Measured from the Valve Spring Shim to Top Edge of Seal Body - First Design Seal	18.1-19.1 mm	0.712-0.752 in

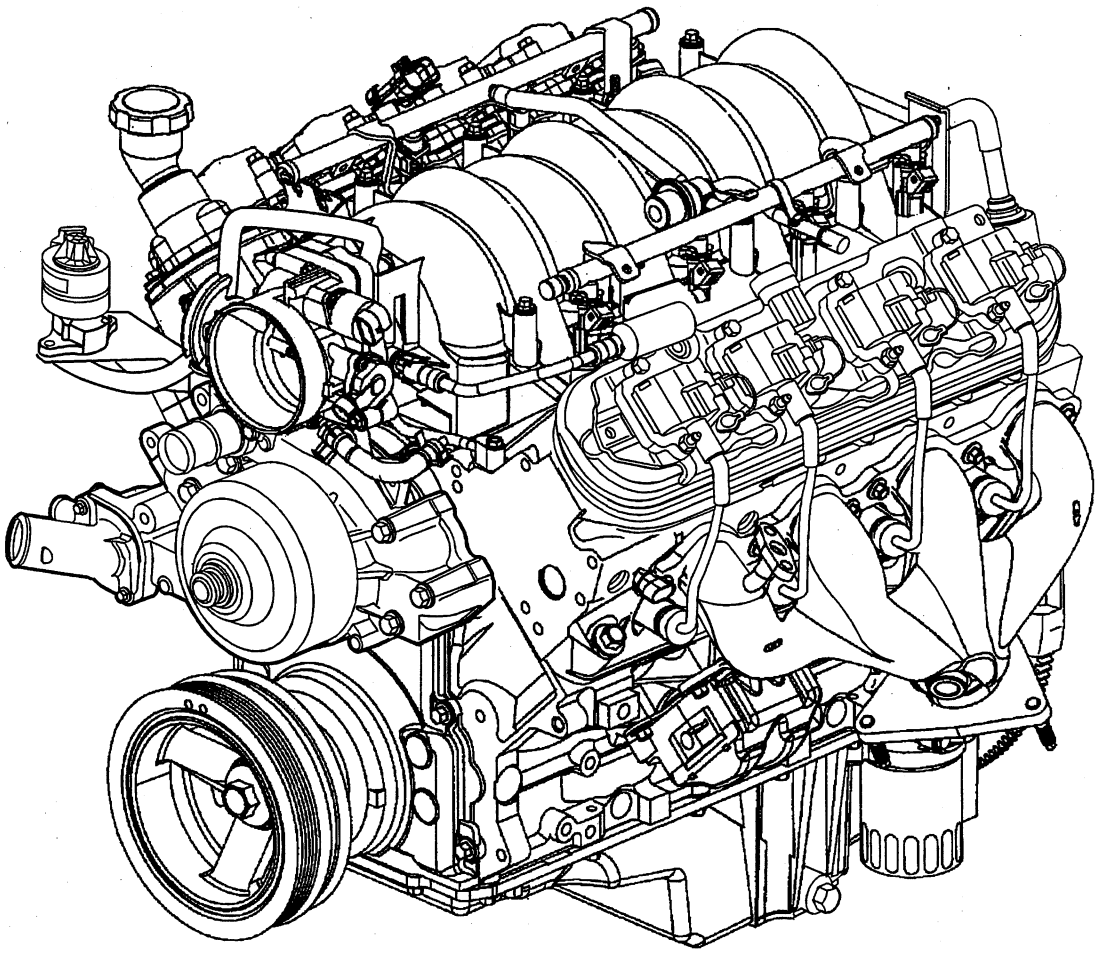
Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Belt Tensioner Bolt	25 N·m	18 lb ft
A/C Compressor and Condenser Hose Bolt (at Accumulator)	16 N·m	12 lb ft
A/C Compressor and Condenser Hose Bolt (at Compressor)	33 N·m	24 lb ft
A/C Compressor Bolts	50 N·m	37 lb ft
A/C Compressor Bracket Bolts	50 N·m	37 lb ft
A/C Condenser Tube Nut	16 N·m	12 lb ft
Accelerator Control Cable Bracket Nut	10 N·m	89 lb in
Air Conditioning (A/C) Belt Idler Pulley Bolt	50 N·m	37 lb ft
Battery Positive Cable Nut (at Generator Output Stud)	22 N·m	16 lb ft
Brake Pipe Fitting	15 N·m	11 lb ft
Camshaft Retainer Bolt	25 N·m	18 lb ft
Camshaft Sensor Bolt	25 N·m	18 lb ft
Camshaft Sprocket Bolt	35 N·m	26 lb ft
Catalytic Converter Nut	25 N·m	18 lb ft
Clutch Pressure Plate Bolt (In Sequence and Evenly Over 3 Increments)	70 N·m	52 lb ft
Cooler Line Fitting	27 N·m	20 lb ft

Crankshaft Balancer Bolt (First Pass-New Bolt)	50 N·m	37 lb ft
Crankshaft Balancer Bolt (Final Pass-New Bolt)	140 degrees	
Crankshaft Balancer Bolt (Used Bolt)	330 N·m	240 lb ft
Crankshaft Oil Deflector Nut	25 N·m	18 lb ft
Crossmember Bolt (Lower)	145 N·m	107 lb ft
Crossmember Bolt (Upper)	125 N·m	92 lb ft
Cylinder Head Bolts (First Pass all M11 Bolts in Sequence)	30 N·m	22 lb ft
Cylinder Head Bolts (Second Pass all M11 Bolts in Sequence)	90 degrees	
Cylinder Head Bolts (Final Pass all M11 Bolts in Sequence-Excluding the Medium Length Bolts at the Front and Rear of Each Cylinder Head)	90 degrees	
Cylinder Head Bolts (Final Pass M11 Medium Length Bolts at the Front and Rear of Each Cylinder Head in Sequence)	50 degrees	
Cylinder Head Bolts (M8 Inner Bolts in Sequence)	30 N·m	22 lb ft
Drive Belt Idler Pulley Bolt	50 N·m	37 lb ft
Drive Belt Tensioner Bolt	50 N·m	37 lb ft
End Link Nut	23 N·m	17 lb ft
Engine Coolant Air Bleed Pipe Bolts and Studs	12 N·m	106 lb in
Engine Flywheel Bolt (First Pass)	20 N·m	15 lb ft
Engine Flywheel Bolt (Second Pass)	50 N·m	37 lb ft
Engine Flywheel Bolt (Final Pass)	100 N·m	74 lb ft
Engine Front Cover Bolts	25 N·m	18 lb ft
Engine Mount Bolt	50 N·m	37 lb ft
Engine Mount Bracket Bolt	58 N·m	43 lb ft
Engine Mount Heat Shield Nut	10 N·m	89 lb in
Exhaust Manifold Pipe Nut	35 N·m	26 lb ft
Engine Mount Stud	50 N·m	37 lb ft
Engine Mount Through Bolt	95 N·m	70 lb ft
Engine Mount Through Bolt Nut	10 N·m	89 lb in
Engine Oil Filter	30 N·m	22 lb ft
Engine Rear Cover Bolts	25 N·m	18 lb ft
Engine Service Lift Bracket M10 Bolts	50 N·m	37 lb ft
Engine Service Lift Bracket M8 Bolt	25 N·m	18 lb ft
Engine Valley Cover Bolt	25 N·m	18 lb ft
Engine Wire Harness Clip Bolt	50 N·m	37 lb ft
Engine Wire Harness Clip Bolt (at Automatic Transmission)	2.5 N·m	22 lb in
Engine Wire Harness Ground Bolt	50 N·m	37 lb ft
Engine Wire Harness Ground Bolt (at Frame Rail)	12 N·m	106 lb in
Engine Wire Harness Ground Bolt (Left Side of Engine Block)	30 N·m	22 lb ft
Front Fuel Pipe Heat Shield Nut	5 N·m	44 lb in
Fuseblock Stud Nut	14 N·m	10 lb ft
Generator Bolt	50 N·m	37 lb ft
Generator Rear Bracket Bolt	25 N·m	18 lb ft
Ground Terminal Bolt	6 N·m	53 lb in
Ignition Coil Bracket Bolt	12 N·m	106 lb in
Ignition Coil Bolt	12 N·m	106 lb in
Intake Manifold Bolts (First Pass in Sequence)	5 N·m	44 lb in
Intake Manifold Bolts (Final Pass in Sequence)	10 N·m	89 lb in
Intermediate Steering Shaft Bolt	47 N·m	35 lb ft
Knock Sensors	20 N·m	15 lb ft
Negative Battery Cable Lead Bolt	32 N·m	24 lb ft
Oil Filter Fitting	55 N·m	40 lb ft
Oil Level Indicator Tube Bolt	25 N·m	18 lb ft
Oil Level Sensor	13 N·m	115 lb in
Oil Pan Bolt (M8)	25 N·m	18 lb ft

Oil Pan Cover Bolts	12 N·m	106 lb in
Oil Pan Drain Plug	25 N·m	18 lb ft
Oil Pan-to-Front Cover Bolt	25 N·m	18 lb ft
Oil Pan-to-Rear Cover Bolt	12 N·m	106 lb in
Oil Pressure Sensor	20 N·m	15 lb ft
Oil Pump Bolt	25 N·m	18 lb ft
Oil Pump Screen Bolt	12 N·m	106 lb in
Oil Pump Screen Nut	25 N·m	18 lb ft
Oxygen Sensor	42 N·m	31 lb ft
Positive Battery Cable Fitting	15 N·m	11 lb ft
Positive Crankcase Ventilation (PCV) Strap Nut	12 N·m	106 lb in
Powertrain Control Module (PCM) Connector Bolt	8 N·m	71 lb in
Power Steering Gear Bolt	85 N·m	63 lb ft
Power Steering Pump Bolt	25 N·m	18 lb ft
Power Steering Pump Bracket Bolt	50 N·m	37 lb ft
Secondary Air Injection (AIR) Pipe Bolt	20 N·m	15 lb ft
Secondary Air Injection (AIR) Switch Valve Bracket Bolt	20 N·m	15 lb ft
Secondary Air Injection (AIR) Switch Valve Bracket Nut	12 N·m	106 lb in
Shock Absorber Bolt	65 N·m	48 lb ft
Spark Plug (All Subsequent Installations)	15 N·m	11 lb ft
Spark Plug (New Cylinder Head)	20 N·m	15 lb ft
Stabilizer Bar Bracket Bolt/Stud	55 N·m	41 lb ft
Torque Converter Bolt	63 N·m	47 lb ft
Transmission Bolt (Automatic Transmission)	95 N·m	70 lb ft
Transmission Bolt (Manual Transmission)	50 N·m	37 lb ft
Transmission Cover Bolt	12 N·m	106 lb in
Transmission Fill Tube Bolt	50 N·m	37 lb ft
Transmission Oil Cooler Line Fitting	27 N·m	20 lb ft
Transmission Support Bolt	57 N·m	42 lb ft
Upper Control Arm Nut	53 N·m	39 lb ft
Valve Lifter Guide Bolt	12 N·m	106 lb in
Valve Rocker Arm Bolt	30 N·m	22 lb ft
Valve Rocker Arm Cover Bolt	12 N·m	106 lb in

Engine Component Description



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

Camshaft and Drive System

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

Crankshaft

The crankshaft is cast nodular iron. The crankshaft is supported by five crankshaft bearings. The bearings are retained by crankshaft bearing caps which are machined with the engine block for the proper alignment and clearance. The crankshaft journals are undercut and rolled. The center main journal is the thrust journal. A crankshaft position reluctor ring is mounted at the rear of the crankshaft. The reluctor ring is not serviceable separately.

Cylinder Heads

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

Engine Block

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

Exhaust Manifolds

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

Intake Manifold

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

Oil Pan

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

Piston and Connecting Rod Assemblies

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

Valve Rocker Arm Cover Assemblies

The valve rocker arm covers are cast aluminum and use a pre-molded silicone gasket for sealing. Mounted to each rocker cover is an ignition coil and bracket assembly. Incorporated into the covers are the oil fill tube, the Positive Crankcase Ventilation (PCV) system passages, and the engine fresh air

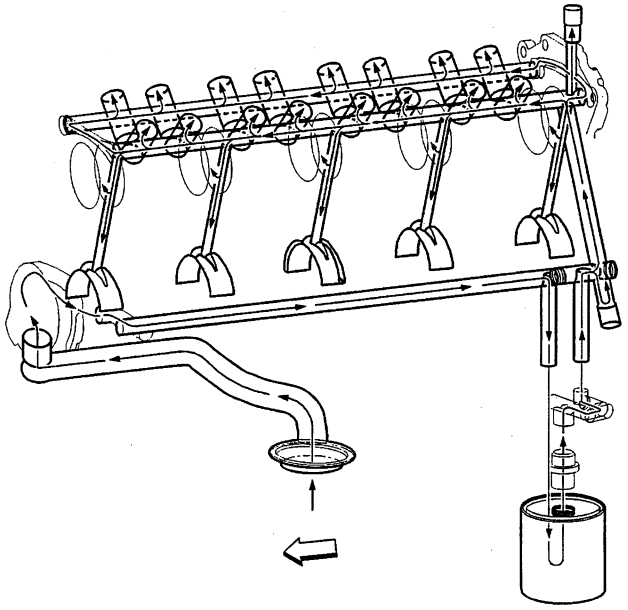
passages. Rocker arm cover design has changed. The covers are now retained to the cylinder head by four center mounted rocker cover bolts.

Valve Train

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

Lubrication

Lubrication Flow Schematic



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

Drive Belt System Description

The drive belt system consists of the following components:

- The drive belt
- The drive belt tensioner
- The drive belt idler pulley
- The crankshaft balancer pulley
- The accessory drive component mounting brackets

- The accessory drive components
  - The power steering pump, if belt driven
  - The generator
  - The A/C compressor, if equipped
  - The engine cooling fan, if belt driven
  - The water pump, if belt driven
  - The vacuum pump, if equipped
  - The air compressor, if equipped

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

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

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

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

Engine Cooling

Fastener Tightening Specifications

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

Cooling System Description and Operation

The cooling system consists of the following major components:

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

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

The coolant absorbs heat as it passes through the engine. Then the hot coolant flows through a radiator in which the heat in the coolant is passed on to the air that is flowing through the radiator. The cooled

coolant then flows back through the engine. This circulation of the coolant continually removes heat from the engine. The coolant is kept in circulation by the water pump.

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

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

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

Coolant Recovery System Description

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

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

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

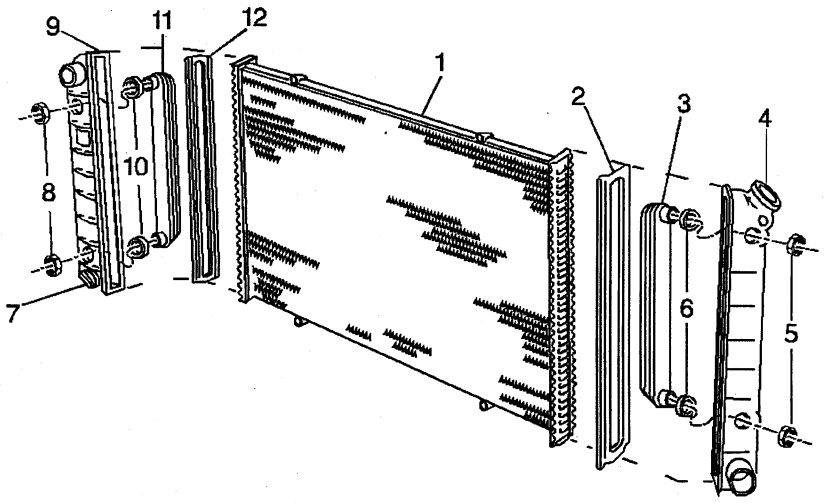
Throttle Body Coolant System Description

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

Coolant Heater Description

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

Radiator Assembly Description



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

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

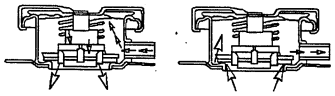
The inlet (4) and outlet (9) tanks are molded with high temperature nylon-reinforced plastic. A high temperature rubber gasket (2, 12) seals the tank flange edge. The tanks are clamped to the core with clinch tabs. The tabs are part of the aluminum header at each end of the core (1). A plastic serviceable drain cock (7) and rubber seal is used.

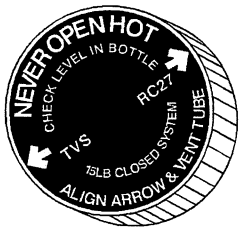
The integral transmission oil cooler (3) is housed inside the outlet (4) tank. The cooler provides the automatic transmission fluid cooling capacity. This maintains a fairly constant temperature under all operating conditions.

Pressure Cap Description

Caution

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





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

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

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

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

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

Engine Cooling Fan Description - Electric

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

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

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

Water Pump Description

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

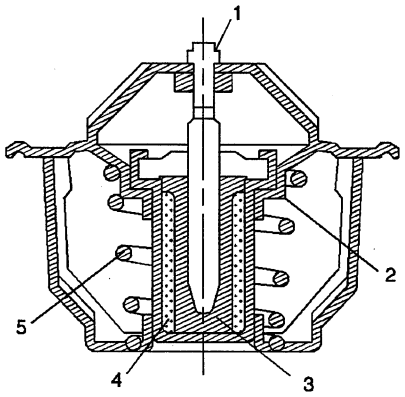
The impeller shaft is supported on one or more bearings. A seal prevents coolant from leaking out around the bearings. The water pump uses sealed bearings, which never need lubrication. With a sealed bearing, grease cannot leak out, and dirt and water cannot get in.

Thermostat Description

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

The thermostat performs the following functions:

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



The wax pellet element (4) in the thermostat expands with increasing temperatures, and contracts with decreasing temperatures. The element connects through a piston (1) to a thermostat valve (2). When the element is heated, pressure is exerted against a rubber diaphragm (3) which forces the thermostat valve to open. As the element is cooled, the contraction allows a spring (5) to close the thermostat valve. While the coolant is cold, the thermostat valve remains closed. This prevents circulation of coolant through the radiator. At this point, coolant is only allowed to circulate throughout the engine block and heater core in order to allow the engine to warm quickly. As the engine warms, the element expands and the thermostat valve opens. This permits coolant to flow through the radiator, where the heat dissipates to the atmosphere.

Engine Coolant Temperature Sensor Description

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

Air Baffles and Seals Description

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

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

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

Engine Electrical

Fastener Tightening Specifications

Application	Specification	
	Metric	English
ABS/SIR Electrical Ground Stud	14 N·m	10 lb ft
Accelerator and Cruise Control Servo Cable Adjuster Bolt (5.7 L)	7.5 N·m	66 lb in
Battery Hold Down Retainer Bolt	18 N·m	13 lb ft
Battery Side Terminal Adapters	15 N·m	11 lb ft
Coolant Recovery Reservoir Bolt	12 N·m	106 lb in
Engine Wiring Harness Ground Bolt to Engine Block (5.7 L)	25 N·m	18 lb ft
Forward Lamp Wiring Harness Grommet Bolt	2 N·m	71 lb in
Forward Lamp Harness Ground Stud	16 N·m	12 lb ft
Generator Brace Bracket Bolt (3.8 L)	50 N·m	37 lb ft
Generator Bracket Bolt (5.7 L)	50 N·m	37 lb ft
Generator Mounting Bolt (5.7 L)	50 N·m	37 lb ft
Generator Bolt (to drive belt tensioner lower) (3.8 L)	50 N·m	37 lb ft
Generator Bolt (to drive belt tensioner upper) (3.8 L)	30 N·m	22 lb ft
Generator Rear Brace Bolt (3.8 L)	25 N·m	20 lb ft
Generator Bolt (to rear brace) (3.8 L)	30 N·m	22 lb ft
Generator Mounting Bolt (5.7 L)	50 N·m	37 lb ft
Generator Mounting Bolt (rear to generator) (5.7 L)	25 N·m	18 lb ft
Ignition Coil Bolt (5.7 L)	12 N·m	106 lb in
Ignition Coil Bolt (3.8 L)	4 N·m	35 lb in
Ignition Control Module Bolt (3.8 L)	3 N·m	27 lb in
Ignition Control Module Nut	30 N·m	22 lb ft
Left Front Forward Lamp Wiring Ground Bolt	10 N·m	89 lb in
Lift Bracket to Ignition Control Module Bolt (3.8 L)	25 N·m	18 lb ft
Negative Battery Cable Bolt	15 N·m	11 lb ft
Negative Cable to Engine Block Stud Nut (3.8 L)	22 N·m	16 lb ft
Negative Cable to Engine Block Bolt (5.7 L)	32 N·m	24 lb ft
Negative Cable at Ground Terminal Nut	6 N·m	53 lb in
Positive Battery Cable Bolt	15 N·m	11 lb ft
Positive Cable RF Ground Nut (3.8 L)	25 N·m	18 lb ft
Positive Cable Nut to Generator Output Stud	22 N·m	16 lb ft
Positive Cable to Fuseblock Stud Nut	14 N·m	10 lb ft
Positive Cable to Starter Nut	10 N·m	89 lb in
Right Front Ground Bolt	10 N·m	89 lb in
Spark Plug (New Installation) (5.7 L)	20 N·m	15 lb ft
Spark Plug (Subsequent Installation) (5.7 L)	15 N·m	11 lb ft
Spark Plug (3.8 L)	27 N·m	20 lb ft
Starter Motor Bolt (3.8 L)	47 N·m	35 lb ft
Starter Motor Bolt (5.7 L)	50 N·m	37 lb ft
Starter Motor Stud (3.8 L)	45 N·m	33 lb ft
Starter Motor Shield Nut (3:8 L)	10 N·m	89 lb in
Starter Motor Shield Bolt (to transmission brace) (3.8 L)	10 N·m	89 lb in
Starter Motor Shield Bolt (to engine block) (3.8 L)	30 N·m	22 lb ft
Wiring Harness Ground Bolt	12 N·m	106 lb in
Wiring Harness Starter Lead Nut	2 N·m	18 lb in

Battery Usage

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

Battery Temperature vs Minimum Voltage

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

Starter Motor Usage

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

Generator Usage

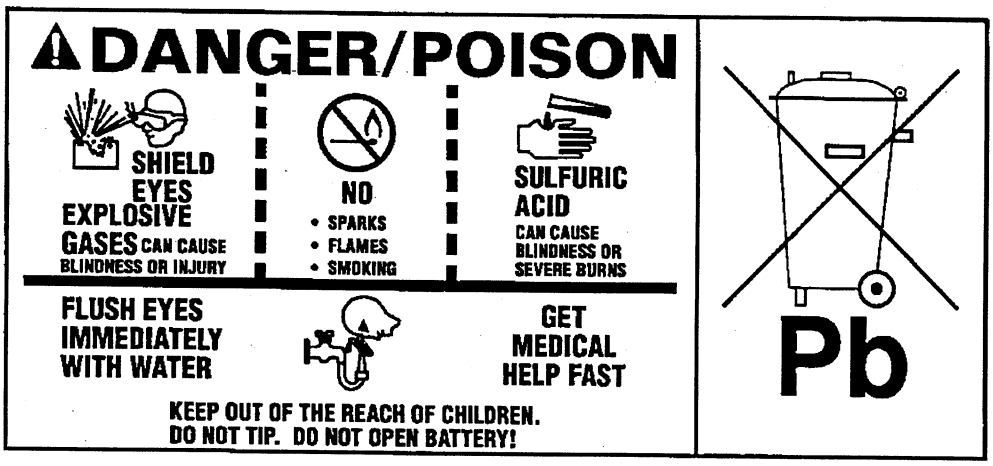
Application	Specification
Model	CS130D
Rated Output	105 A
Load Test	75 A

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

CATALOG NO.

1819

CCA	LOAD TEST
770	380
REPLACEMENT MODEL	
100 – 6YR	

A battery has 2 ratings:

- Reserve capacity
- Cold cranking amperage

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

Reserve Capacity

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

Cold Cranking Amperage

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

Circuit Description

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

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

Starting System Description and Operation

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

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

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

Starting System Circuit Description

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

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

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

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

Charging System Description and Operation

Generator

The generator features the following major components:

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

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

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

Regulator

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

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

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

Circuit Description

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

When the engine is running, the generator turn-on signal is sent to the generator from the PCM, turning on the regulator. The generator's voltage regulator controls current to the rotor, thereby controlling the output voltage. The rotor current is proportional to the electrical pulse width supplied by the regulator. When the engine is started, the regulator senses generator rotation by detecting AC voltage at the stator

through an internal wire. Once the engine is running, the regulator varies the field current by controlling the pulse width. This regulates the generator output voltage for proper battery charging and electrical system operation. The generator F terminal is connected internally to the voltage regulator and externally to the PCM. When the voltage regulator detects a charging system problem, it grounds this circuit to signal the PCM that a problem exists. The PCM monitors the generator field duty cycle signal circuit. The system voltage sense circuit receives battery positive voltage that is Hot At All Times through a fuse link that is connected to the starter motor. This voltage is used by the regulator as the reference for system voltage control.

Ignition System Description 3.8 L

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

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

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

The three twin-tower ignition coils are individually mounted to the ignition control module. Each end of a coils secondary winding is attached to a spark plug. Each cylinder is paired with the cylinder that is opposite it. These two spark plugs are on top dead center at the same time. When the ignition coil fires, both plugs fire at the same time to complete the circuit. The cylinder on compression is said to be the event cylinder and the one on exhaust is the waste cylinder. The cylinder on the exhaust stroke requires very little of the available energy to fire the plug. The remaining energy will be used as required by the cylinder on the compression stroke. The same process is repeated when the cylinders reverse roles. This method of ignition is called a waste spark ignition system.

The electronic ignition system consists of the following components:

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

Ignition System Description 5.7 L

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

- No moving parts
- Less maintenance required
- Remove mounting capability
- No mechanical load on the engine

- More coil cool down time between firing
- Elimination of mechanical timing adjustments
- Increased available ignition coil saturation time

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

The electronic ignition system consists of the following components:

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

Engine Controls

Fuel System Specifications

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

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

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

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

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

Notice

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

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

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

Engine Controls – 3.8L

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Accelerator Control Assy to Interior Floor Retaining Bolt	25 N·m	19 lb ft
Accelerator Control Assy to Interior Floor Retaining Nut	20 N·m	15 lb ft
Accelerator Control Assy to Floor-Exterior Retaining Bolt	8 N·m	10 lb ft
Camshaft Position (CMP) Sensor Retaining Bolt	10 N·m	89 lb in
Crankshaft Balancer Bolt	150 N·m +76°	110 lb ft +76°
Crankshaft Position (CKP) Sensor Bolts	30 N·m	22 lb ft
EGR Valve Adapter Pipe Bolt	50 N·m	37 lb ft
EGR Valve Adapter Pipe Stud	50 N·m	37 lb ft
EGR Valve Intake Pipe to Exhaust Manifold Bolt	29 N·m	21 lb ft
EGR Valve Outlet Pipe to Adapter Nut	29 N·m	21 lb ft
EGR Valve Outlet Pipe to Intake Manifold Bolt	29 N·m	21 lb ft
EGR Valve to Retaining Nuts	30 N·m	22 lb ft
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Engine Oil Level Switch	22 N·m	17 lb ft
EVAP Vent Valve Bracket	2 N·m	18 lb in
Fuel Filler Neck Bolts	2 N·m	18 lb in
Fuel Injector Sight Shield	2 N·m	18 lb in
Fuel Line Retainer	12 N·m	106 lb in
Fuel Rail Attaching Nuts or Bolts	10 N·m	89 lb in
Fuel Rail Hold-Down Stud	25 N·m	18 lb ft
Fuel Tank Filler Pipe EVAP Pipe Hose Clamp	2.5 N·m	22 lb in
Fuel Tank Filler Pipe Ground Strap Screw	9 N·m	80 lb in
Fuel Tank Filler Pipe Hose Clamp	2.5 N·m	22 lb in
Fuel Tank Retaining Strap Bolts	48 N·m	35 lb ft
Heated Oxygen Sensor(s)	41 N·m	30 lb ft
Ignition Coil to Ignition Control Module Screws	4.5 N·m	40 lb in
Ignition Control Module 14 Way Connector To Module Bolt	2.1 N·m	19 lb in
In-Line Fuel Filter Outlet Nut	30 N·m	22 lb ft
Intake Air Duct Clamps	2 N·m	18 lb in
Knock Sensor	19 N·m	14 lb in
Knock Sensor Heat Shield Bolts	60 N·m	44 lb ft
Manifold Absolute Pressure (MAP) Sensor Retaining Screw	5 N·m	44 lb in
Mass Air (MAF) Flow Sensor Attaching Screws	3 N·m	27 lb in
PCM Harness Connector to PCM	8 N·m	71 lb in
Powertrain Control Module (PCM) Bolts	8 N·m	71 lb in
Spark Plugs	27 N·m	20 lb ft
TAC Module to Accelerator Control Bracket Bolts	6 N·m	53 lb in
Throttle Body Retaining Nuts or Bolts	10 N·m	89 lb in
Throttle Body Support Bracket Bolts	11 N·m	97 lb in
Transaxle Range Switch Attaching Bolts	28 N·m	20 lb ft
Wheel Lug Nuts	140 N·m	104 lb ft

Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-6-5-4-3-2	
Spark Plug Wire Resistance	3000 ohms per ft	
Spark Plug Wire Resistance - POLICE	600 ohms per ft	
Spark Plug Torque	15 N·m	11 lb ft
Spark Plug Gap	1.52 mm	0.060 in
Spark Plug Type	41-921 [AC plug type]	

Engine Controls – 5.7L

Fastener Tightening Specifications

Application	Specifications	
	Metric	English
Camshaft Position (CMP) Sensor Bolt	25 N·m	18 lb ft
Crankshaft Position (CKP) Sensor Bolt	25 N·m	18 lb ft
Engine Coolant Temperature (ECT) Sensor	20 N·m	15 lb ft
Fuel Feed Pipe Fitting	30 N·m	22 lb ft
Fuel Fill Hose Clamps	2.5 N·m	22 lb in
Fuel Fill Pipe Ground Strap Bolt	8 N·m	71 lb in
Fuel Filter Fitting	30 N·m	22 lb ft
Fuel Pipe Front Clip Bolts	4.5 N·m	40 lb in
Fuel Pipe Rear Clip Bolt	5.5 N·m	49 lb in
Fuel Pipe Shield Nuts and Bolts	5 N·m	44 lb in
Fuel Rail Attaching Bolts	10 N·m	89 lb in
Fuel Tank Fill Pipe Bolt	2.5 N·m	22 lb ft
Fuel Tank Fill Pipe Support Bracket Bolt	10 N·m	89 lb in
Fuel Tank Strap Bolts	45 N·m	33 lb ft
Heated Oxygen Sensor (HO2S)	41 N·m	30 lb ft
Idle Air Control (IAC) Valve Attaching Screws	3 N·m	27 lb ft
Ignition Coil Mounting Bolt	12 N·m	106 lb in
Knock Sensor (KS)	20 N·m	15 lb ft
Powertrain Control Module (PCM) Connector End Bolts	8 N·m	70 lb in
Powertrain Control Module (PCM) Mounting Bracket Assembly Fastener	7 N·m	62 lb in
PCV Hose Assembly Mounting Cable Nut	12 N·m	106 lb in
Secondary Air Injection (AIR) Check Valves	23 N·m	17 lb ft
Secondary Air Injection (AIR) Pipe to Exhaust Manifold Bolts	20 N·m	15 lb ft
Secondary Air Injection (AIR) Pump to Bracket	9 N·m	80 lb in
Secondary Air Injection (AIR) Shut Off Valve Bracket Bolt	20 N·m	14 lb ft
Secondary Air Injection (AIR) Shut Off Valve Retaining Nut	12 N·m	8 lb ft
Spark Plug New Cylinder Head	20 N·m	15 lb ft
Spark Plug Old Cylinder Head	15 N·m	11 lb ft
Throttle Body Attaching Bolts	12 N·m	106 lb in
Throttle Position (TP) Sensor Attaching Screws	2 N·m	18 lb in
Transmission Fluid Indicator Tube Bolt	50 N·m	37 lb ft

Ignition System Specifications

Application	Specification	
	Metric	English
Firing Order	1-8-7-2-6-5-4-3	
Spark Plug Gap	1.52 mm	0.060 in
Spark Plug Torque	15 N·m	11 lb ft
Spark Plug Type	41-952 [AC plug type]	
Spark Plug Wire Resistance	700 ohms per ft	

Exhaust System

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Catalytic Converter Hanger Bolt	41 N·m	30 lb ft
Catalytic Converter Heat Shield Bolt	2 N·m	18 lb in
Catalytic Converter Nut	25 N·m	18 lb ft
End Link Nut	23 N·m	17 lb ft
Engine Mount Heat Shield Nut	10 N·m	89 lb in
Exhaust Heat Shield Bolt	2 N·m	18 lb in
Exhaust Manifold Bolt (First Pass) (5.7 L Engine)	15 N·m	11 lb ft
Exhaust Manifold Bolt (Final Pass) (5.7 L Engine)	25 N·m	18 lb ft
Exhaust Manifold Nut (3.8 L Engine)	18 N·m	13 lb ft
Exhaust Manifold Nut (5.7 L Engine)	35 N·m	26 lb ft
Exhaust Manifold Pipe Bolt (3.8 L Engine)	48 N·m	35 lb ft
Exhaust Manifold Stud (3.8 L Engine)	15 N·m	11 lb ft
Exhaust Manifold Heat Shield Nut (3.8 L Engine)	10 N·m	89 lb in
Exhaust Manifold Nut	35 N·m	26 lb ft
Exhaust Muffler Hanger Bolt	10 N·m	89 lb in
Exhaust Muffler Hanger Bracket Bolt	10 N·m	89 lb in
Exhaust Muffler Heat Shield Bolt	2.0 N·m	18 lb in
Exhaust Pipe Clamp Bolt	48 N·m	35 lb ft
Exhaust Pipe Hanger Bracket Nut	20 N·m	15 lb ft
Exhaust Pipe Heat Shield Bolt	2 N·m	18 lb in
Heat Shield Bolt (5.7 L Engine)	9 N·m	80 lb in
Oxygen Sensor	42 N·m	31 lb ft
Rear Axle Torque Arm Bracket Nut	45 N·m	33 lb ft
Rear Shock Nut	90 N·m	66 lb ft
Spark Plug (3.8 L Engine)	27 N·m	20 lb ft
Torque Arm Bolt	130 N·m	96 lb ft
Torque Arm Nut	132 N·m	97 lb ft
Wheel Nut	120 N·m	89 lb ft

Exhaust System Description

Important

Use of non-OEM parts may cause driveability concerns.

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

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

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

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

Resonator

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

Catalytic Converter

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

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

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

The catalyst in the converter is not serviceable.

Muffler

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

Transmission Description and Operation

Automatic Transmission – 4L60E

Fastener Tightening Specifications

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

Transmission General Specifications

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

Fluid Capacity Specifications

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

Transmission Component and System Description

The 4L60E transmission consists primarily of the following components:

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

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

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

Adapt Function

Transmission Adapt Function

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

- The clutch fiber plates
- The seals
- The springs

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

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

Automatic Transmission Shift Lock Control Description

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

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

With the ignition in the ON position battery positive voltage is supplied to the park/neutral position switch. With the transmission in the PARK position the contacts in the park/neutral position switch are closed. This allows current to flow through the switch to the automatic transmission shift lock control switch. The circuit continues through the normally-closed switch to the automatic transmission shift lock control

solenoid. The automatic transmssion shift lock control soleniod is permanently grounded. This energizes the automatic transmission shift lock control solenoid, locking the shift linkage in the PARK position. When the driver presses the brake pedal the contacts in the automatic transmission shift lock control switch open, causing the automatic transmission shift lock control solenoid to release. This allows the shift lever to move from the PARK position.

Manual Transmission - M49

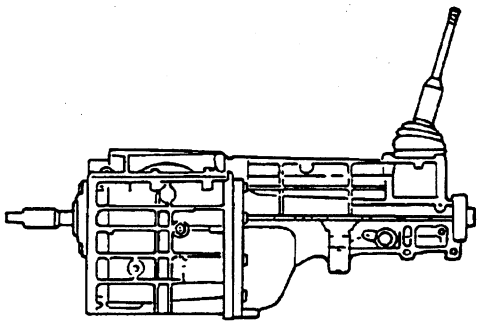
Fastener Tightening Specifications

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

Lubrication Specifications

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

Manual Transmission Description and Operation



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

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

Identify the manual transmission assembly as follows:

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

Notice

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

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

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

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

The manual transmission control cannot be adjusted.

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

Manual Transmission – MM6

Fastener Tightening Specifications

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

Lubrication Specifications

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

Manual Transmission Description and Operation

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

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

Gear Select (Skip Shift)

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

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

Reverse Lockout

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

Vehicle Speed Sensor

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

Clutch

Fastener Tightening Specifications

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

Sealers and Lubricants

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

Principal Components

The following are the principal components of the clutch system:

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

Clutch Driving Members

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

Clutch Driven Members

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

Clutch Operating Members

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

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

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

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

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

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Hydraulic Clutch Description

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

Hydraulic Clutch Fluid Description

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

Abbreviations and Meanings

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

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

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

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

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

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

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

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

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

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

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

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

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

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Conversion - English/Metric

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

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

Equivalents - Decimal and Metric

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

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

Fasteners

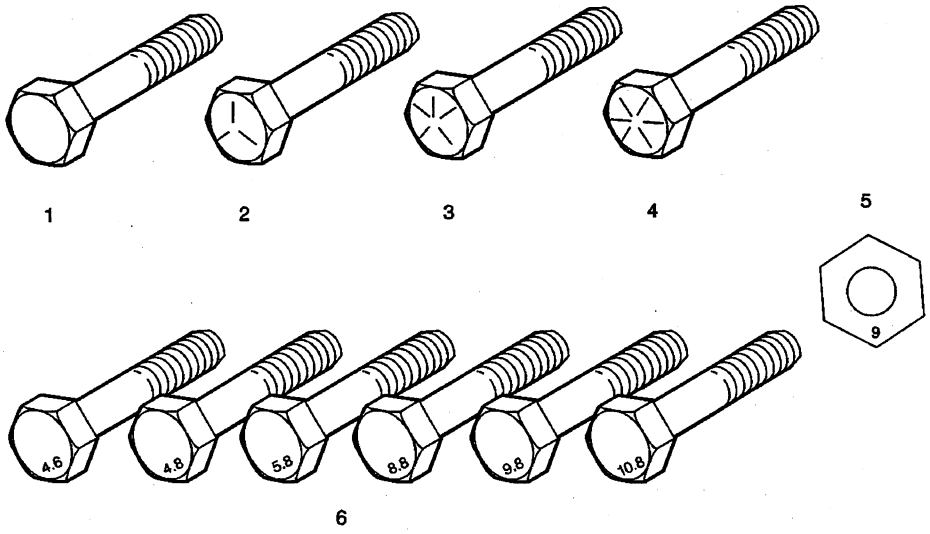
Metric Fasteners

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

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

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

Fastener Strength Identification



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

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

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

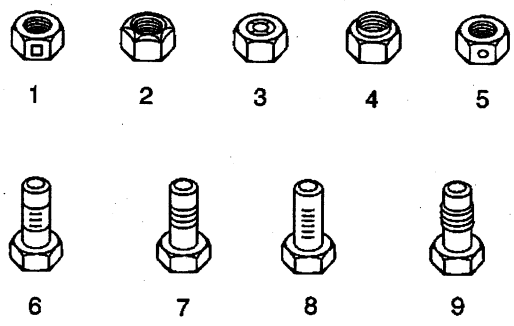
These fasteners accomplish the thread interface by a designed distortion or deformation in the fastener.

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