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RAM 1500 Special Service Vehicle Overview, Maintenance, and Up-fitting



Student Guide

SAFETY NOTICE

This publication's purpose is to provide technical training information to individuals in the automotive trade. All test and repair procedures must be performed in accordance with manufacturer's service and diagnostic manuals. All **warnings**, **cautions**, and **notes** must be observed for safety reasons. The following is a list of general guidelines:

- Proper service and repair is critical to the safe, reliable operation of all motor vehicles.
- The information in this publication has been developed for service personnel, and can help when diagnosing and performing vehicle repairs.
- Some service procedures require the use of special tools. These special tools must be used as recommended throughout this Technical Training Publication, the diagnostic manual, and the service manual.
- Special attention should be exercised when working with spring- or tension-loaded fasteners and devices such as E-Clips, Cir-clips, snap rings, etc. Careless removal may cause personal injury.
- Always wear safety goggles when working on vehicles or vehicle components.
- Improper service methods may damage the vehicle or render it unsafe.
- Observe all **warnings** to avoid the risk of personal injury.
- Observe all **cautions** to avoid damage to equipment and vehicles.
- **Notes** are intended to add clarity and should help make your job easier.

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RAM 1500 Special Service Vehicle Overview, Maintenance, and Up-fitting



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INTRODUCTION

Welcome, the area of special service vehicles is large and diverse with localities and municipalities using these vehicles for a wide range applications. Each application needs a unique and specific up-fitting. The up-fitting community for these vehicles is diverse with regards to adherence of industry up-fitting standards.

This one-day instructor-led course provides a complete vehicle overview that includes all vehicle systems, fluid types, maintenance intervals, and procedures. The course also highlights the contents of the RAM 1500 Special Services Vehicle (SSV) package as compared to the civilian RAM 1500 4X4 pickup. The up-fitter's guide can be used in conjunction with the Student Guide both for diagnosis and up-fitting. Specific system theories, diagnosis, repair, and up-fitting will be covered. The up-fitting will be addressed from both Chrysler engineering and industry approved up-fitting procedures.

In addition to this Introduction, this course includes the following lessons:

- Lesson 1 - Introduction to the Vehicle
- Lesson 2 - Vehicle Labels and Placards
- Lesson 3 - Vehicle Maintenance
- Lesson 4 - Powertrain
- Lesson 5 - Chassis
- Lesson 6 - Electrical
- Lesson 7 - Up-fitting

STUDENT LEARNING OBJECTIVES

Upon successful completion of this course, you will be able to:

- Locate and interpret all vehicle labels and placards
- Identify all vehicle module locations and module functionality
- Correctly raise and support the vehicle
- Select, check, drain, and replace all vehicle fluids, filters, and spark plugs
- Locate all restraint system components, both active and passive
- Identify all base brake system components, their location, system operation, and unique service procedures
- Identify all ABS, ESP, traction control components, and system operation
- Identify, diagnose, and program the tire pressure monitoring system
- Identify network topology and communication circuits
- Locate all up-fitting systems, components, and connectors
- Explain WIN system operation of the FOBIK system

The following is a list of acronyms used throughout this course:

• ABS	Antilock brake module
• ACC	Accessory
• AH	Ampere-hours
• ALR	Automatic locking retractor
• API	American Petroleum Institute
• ASD	Automatic shutdown relay
• BCI	Battery Council International
• BTSI	Brake transmission shifter/ignition interlock
• CAN	Controller area network
• CCA	Cold cranking amperage
• CHMSL	Center high mounted stop lamp
• CVI	Clutch volume index
• DLC	Data link connector
• DLO	Day light opening
• DTC	Diagnostic trouble code
• DTCM	Drivetrain control module
• EARS	Enhanced accident response support
• ECM	Electronic control module
• ECM	Engine control module
• ELR	Emergency locking retractor
• EMIC	Electromechanical instrument cluster
• ERS	Electronic range selection
• EVIC	Electronic vehicle information center
• EVR	Electronic voltage regulator
• FOBIK	FOB integrated key
• GAWR	Gross actual weight rating
• GCWR	Gross combined weight rating
• GTW	Gross trailer weight
• GVWR	Gross vehicle weight rating
• HVAC	Heating, ventilation, and air conditioning
• HOAT	Hybrid organic additive technology
• ISO	International vehicle control and display symbols
• ITBM	Integrated trailer brake module
• LCD	Liquid crystal display
• LED	Light-emitting diode
• LIN	Local interface network
• MAP	Manifold absolute pressure

• MDS	Multiple displacement system
• MTC	Manual temperature control
• OBD	On-board diagnostics
• ORC	Occupant restraint controller
• PCM	Powertrain control module
• PDC	Power distribution center
• PWM	Pulse-width modulation
• RC	Reserve capacity
• RF	Radio frequency
• SgRP	Seating reference point
• SKIS	Sentry key immobilizer system
• TCM	Transmission control module
• TIPM	Totally integrated power module
• TPM	Tire pressure monitor
• VCI	Vehicle certification label
• VCT	Variable camshaft timing
• VECI	Vehicle emissions certification label
• VIN	Vehicle Identification number
• VTSS	Vehicle theft security system
• SCM	Steering control module
• SRS	Supplemental restraint system
• SSV	Special services vehicle
• SVC	Service
• WIN	Wireless ignition node
• WOT	Wide open throttle

BODY CODES

CODE	DESCRIPTION	YEARS APPLICABLE
DC	Ram Chassis Cab 3500	2007-2010
DD	Ram Chassis Cab 3500	2011
DH/D1	Ram Pickup HD (Heavy Duty)	2005-2009
DJ/D2	Ram Pickup HD (Heavy Duty)	2010-Current
DM	Ram 4500/5500 Chassis Cab	2008-2010
DP	Ram 4500/5500 Chassis Cab	2011
DS	Ram Truck	2009-Current
HB	Durango	2005-2009
HG	Aspen	2007-2009
JC	Journey	2008-Current
JK	Wrangler	2007-Current
JS	Sebring/Avenger	2007-Current
KA	Nitro	2007-Current
KK	Liberty	2008-Current
LC	Challenger	2008-Current
LD	Charger	2011
LX	300	2011
LX	300, Charger	2005-2010
MK49	Compass	2007-Current
MK74	Patriot	2007-Current
ND	Dakota	2005-Current
PF	Dart	2013-Current
PM	Caliber	2007-Current
RT	Caravan, Town & Country	2008-Current
WD	Durango	2011-Current
WK	Grand Cherokee	2005-Current
XK	Commander	2006-2010
ZB	Viper	2003-2010

Table 1 Chrysler Group LLC Body Codes

Notes:

LESSON 1 INTRODUCTION TO THE VEHICLE

FEATURES OF THE SPECIAL SERVICES TRUCK



Figure 1 RAM 1500 Special Services Truck

The RAM 1500 Special Service Vehicle is equipped with unique features that make it fit municipalities' unique needs.

Introduction to the Vehicle

Included in these features are:

- 5.7L HEMI V8 engine
- 6-speed automatic transmission
- Multi-link coil spring rear suspension
- Electronic stability control
- Four-wheel drive
- Reinforced front door hinges
- 10-way power cloth driver's seat
- Available fold-up vinyl rear bench seat
- Column-mounted shifter
- 115-volt auxiliary A/C outlet
- Unique headliner/auxiliary dome light

Available options include:

- Engine oil cooler
- 220-amp alternator
- RamBox® Cargo Management System
- Additional key fob
- Remote keyless entry
- Instrument cluster with certified speedometer with engine hour/idle meter
- Cruise control

UNDER-HOOD COMPONENTS

Radiator Coolant

The cooling system of the RAM 1500 Special Services Vehicle (SSV) utilizes an ambient overflow bottle for coolant recovery/reservoir. The coolant is a Mopar® Antifreeze/Coolant, 5 Year/100,000 Mile Formula (MS-9769). The coolant is ethylene-glycol based with Hybrid Organic Additive Technology (HOAT) inhibitors.

Notes: _____

Powertrain Control Module (PCM)

The PCM on the RAM 1500 SSV is a next generation controller, V4(NGC4). The controller is responsible for engine functions and also handles the control of the transmission. The controller has four connectors and is located on the passenger side of the front-of-dash under-hood. The controller has unique programming specific to the special services application

Notes: _____

A/C Service Ports

Two refrigerant system service ports are used to recover, recycle, evacuate, charge, and test the A/C refrigerant system. Unique sizes are used on the service ports for the R-134a refrigerant system.

The high-side service port is located on the A/C liquid line. The low-side service port is located on the A/C suction line.

Note: The RAM 1500 SSV is delivered from the manufacturer with refrigerant dye pre-installed in the A/C system. The label identifying this is located on the A/C line directly below the PCM.

Notes: _____

Introduction to the Vehicle

Antilock Brake System

The RAM 1500 SSV has an antilock brake system (ABS) that is an electronically operated, four channel brake control system that includes electronic stability control (ESC). The vehicle also has electronic variable brake proportioning (EVBP) designed into the system, which eliminates the combination/proportioning valve. A specially programmed ABS module operates the system components.

ABS system bleeding requires conventional bleeding methods plus the use of a scan tool. The ABS module is located on the driver's side front of dash under-hood, directly below the up-fitter PDC.

Notes: _____

Up-fitter PDC

The up-fitter power distribution center (PDC) is located in the engine compartment near the totally integrated power module (TIPM). This PDC contains fuses and relays that enable an up-fitter to connect to the vehicle's electrical system with the provided circuit protection and control circuits available in one location. The fuse and relay information is located in the owner's manual.

Notes: _____

Battery

The RAM 1500 SSV is equipped with a flooded cell lead acid battery located on the driver's side under-hood directly behind the totally integrated power module (TIPM) in front of the power distribution center (PDC).

Notes: _____

Totally Integrated Power Module (TIPM)

The totally integrated power module (TIPM) is a combination unit that performs the functions of the power distribution center (PDC) and the front control module. The TIPM provides the primary means of voltage distribution and protection for the entire vehicle.

The TIPM is located in the engine compartment, next to the battery, and connects directly to the B+ cable via a stud located on top of the unit.

Notes: _____

INTERIOR COMPONENTS

Integrated Trailer Brake Module (ITBM)

The truck is equipped with an integrated trailer brake module (ITBM) that communicates with other vehicle systems and controls electric braking on trailers.

Notes: _____

Instrument Cluster

The instrument cluster is located in the instrument panel above the steering column opening to serve as an electronic control module for body and lighting functions. Besides analog gauges and indicators, the cluster module also incorporates an electronic vehicle information center (EVIC) to display mileage and other engine parameters.

Notes: _____

Jack Storage

The jack and jack tools are located on the passenger side, under the front seat.

Note: See the vehicle maintenance section for information related to proper jack usage.

Notes: _____

Data Link Connector (DLC)

The data link connector is located on the left side of the instrument panel and allows access to the vehicle diagnostic system.

Notes: _____

Introduction to the Vehicle

Headliner

The headliner for the RAM 1500 SSV features a headliner that increases headroom for headgear an operator may be wearing.

Notes: _____

Hands-free Module

All RAM DS SSV include a hands-free module to allow Bluetooth communication with a cell phone or other hands-free device. See the owner's manual for connection instructions.

Notes: _____

Police Dome Light

The police dome light has a three position switch that is controlled by a direct battery feed and is independent of all other functions of the vehicle lighting. Position one turns on a white light. When the switch is moved to position two, the light changes to red, and position three (center) turns the light off.

Notes: _____

Restraints

The RAM 1500 SSV is equipped with a three-point shoulder and lap belt system as well as a supplemental restraint system. The supplemental restraint system includes the following:

- Driver and passenger air bags
- Side curtain air bags on both the driver and passenger sides
- Seatbelt pre-tensioners

Notes: _____

EXTERIOR FEATURES

Heated/Fold Away Mirror

These mirrors are heated to melt frost or ice. This feature is activated whenever the rear window defroster is activated.

Caution: **It is recommended to fold the mirrors into the full rearward position to resist damage when entering a car wash or a narrow location.**

Notes: _____

Reinforced Door Hinge

The front door hinges on the Ram 1500 SSV are reinforced to allow for extra weight that would be present if ballistic material were to be added to the door.

Notes: _____

RAMBox Option

The Ram Box system is an integrated lockable pickup box storage and cargo management system consisting of three features:

- Integrated box side storage bins
- Cargo extender/divider
- Bed rail tie-down system

Caution: **Failure to follow these instructions could cause damage to the vehicle. Ensure that all cargo inside the storage bins is properly secured. Do not exceed the cargo weight rating of 150 lb (68 kg) per bin.**

Notes: _____

Introduction to the Vehicle

TOWING CAPACITY AND PAYLOAD

The RAM DS SSV is equipped with a Class IV hitch. This type of hitch is a weight-carrying hitch. Care should be taken not to exceed the maximum limits of the hitch and payload.

See additional cautions and warnings regarding trailering.

Table 2 Towing Capacity and Payload

TOWING CAPACITY and PAYLOAD		
CLASS	MAX. TOWING	PAYLOAD
Class IV - extra heavy duty	4540 kg (10,000 lbs.)*	685 kg (1510 lbs.)-max

* with equalizer hitch/without equalizer hitch Max. Towing is 5000 lbs. (2270 kg)

The towing information is located in the towing manual along with the owner's manual information package. The information is also located on the RAM Trucks.com website.

Four-way/Seven-way Electrical Connector

The trailer tow package will include a four- and seven-pin wiring harness. The electrical connections to the vehicle are all complete.

Note: Do not cut or splice wiring into the vehicle's wiring harness.

WARNING: IT IS IMPORTANT THAT YOU DO NOT EXCEED THE MAXIMUM FRONT OR REAR GAWR. A DANGEROUS DRIVING CONDITION CAN RESULT IF EITHER RATING IS EXCEEDED. YOU COULD LOSE CONTROL OF THE VEHICLE AND HAVE A COLLISION.

WARNING: ANY WORK DONE TO THE VEHICLE'S ELECTRICAL SYSTEM OR WIRING SHOULD BE PERFORMED BY A QUALIFIED AUTOMOTIVE TECHNICIAN. IF DONE IMPROPERLY, IT MAY CAUSE DAMAGE TO THE ELECTRICAL SYSTEM WIRING AND COULD RESULT IN SERIOUS OR FATAL INJURY.

Notes:

[illegible]

LESSON 2 VEHICLE LABELS AND PLACARDS

VEHICLE LABELS AND PLACARDS

Locating Labels and Placards



Figure 2 Locate Labels and Placards

To safely and accurately diagnose, repair, and order parts for any vehicle, it is important to know what equipment is in the vehicle. Through the use of various vehicle labels and placards, it is possible to identify various equipment installed such as the type of occupant restraint systems, fuel tank type and location, engine type, transmission, brakes, and more. The following will provide a basis on how to locate and interpret the various labels located on the RAM 1500 SSV.

DealerCONNECT and Tech Authority can be accessed to help locate the various labels and placards on the vehicle.

- International vehicle control and display symbols (ISO)
- Vehicle emission certification information (VECI)
- Vehicle certification labels (VCI)
- Vehicle identification number (VIN)

Notes: _____

Vehicle Labels and Placards

Vehicle Information Plus

VIP Summary Report			
Dealer: 99952 - KANSAS CITY FLEET		Date: March 17, 2012 Time: 12:28:19	
VIN: 1C6RD7KT2CS139204		Dealer Entered Name:	Dealer Entered Odometer: 110 miles
STRICTLY CONFIDENTIAL: This information is provided to DEALER, in accordance with Section 4 of DEALER's Software License, Data Exchange and Electronic Commerce Agreement with Chrysler Group LLC. All information provided is based on entries provided by DEALER.			
<hr/>			
Warning Messages			
OWNER'S LAST NAME WAS NOT ENTERED.			
Vehicle Restrictions - No Vehicle Restriction			
Vehicle Service Information			
Year/Model:	2012 DODGE RAM ST 4X4 1500 CREW CAB PICKU	Last Odometer:	0 miles on
Body Style:	DS6L98	In-Service Date:	October 14, 2011
Engine:	EZH-5.7L V8 HEMI MDS VVT Engine	In-Service Odometer:	0 miles
Transmission:	DG1-6-Spd Automatic 65RFE Transmission	Odometer Type:	miles
Color 1:	PA17 Bright White Clear Coat	Car Line:	2034-133_0004

Figure 3 VIP

Vehicle information plus (VIP) is part of DealerCONNECT. This resource can be used to find the following information on the vehicle.

- Repair history
- Warranty coverages
- Vehicle options

Notes: _____

Vehicle Identification Number

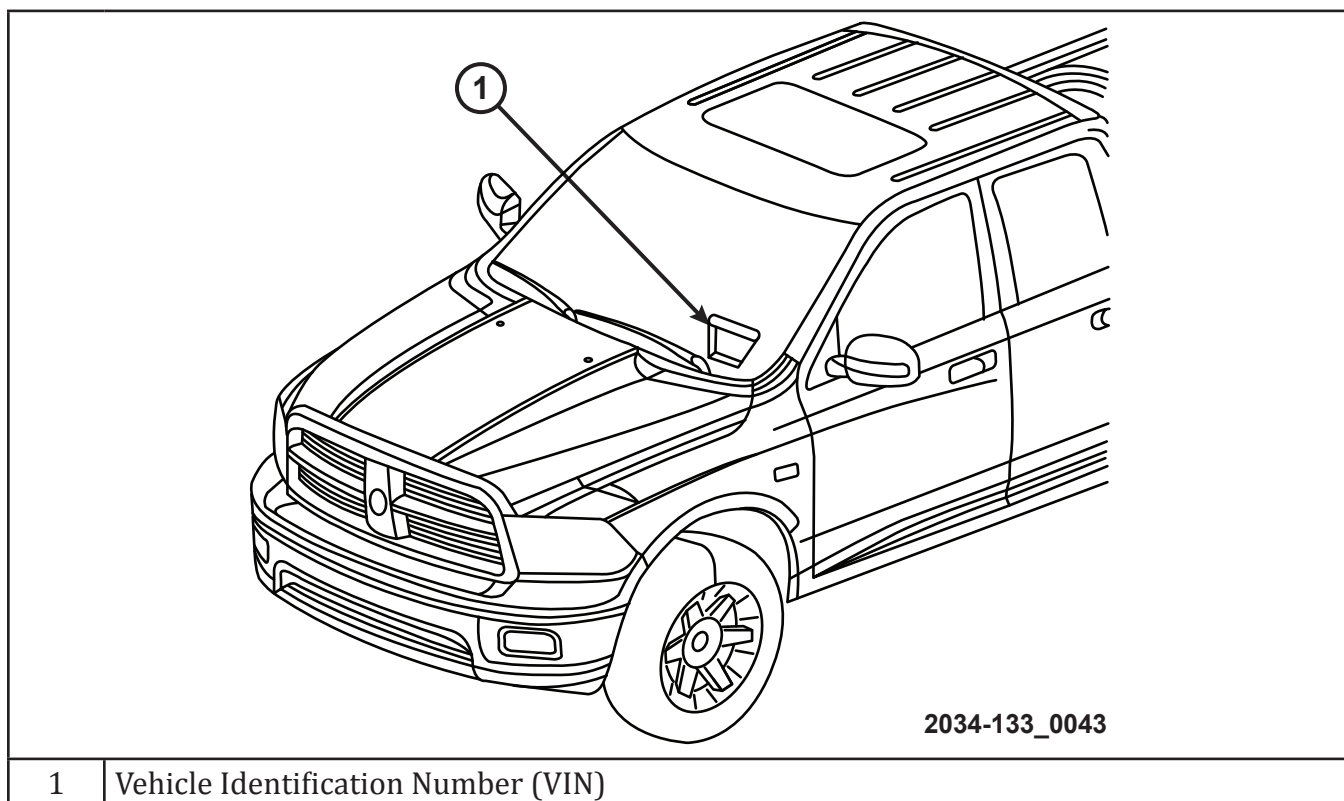


Figure 4 VIN Location

The vehicle identification number is in four locations on the vehicle. All of the locations are accessible but may require additional work to read them. The vehicle identification number (VIN) plate is located on the lower windshield fence near the left a-pillar. The VIN contains 17 characters that provide data concerning the vehicle.

The other locations are as follows:

- Equipment identification plate
- Vehicle safety certification Label
- Frame rail

Notes: _____

Vehicle Labels and Placards

Table 3 Vehicle Identification Number

Position	Interpretation	Code=Description
1	Country of Origin	1=Chrysler Group LLC (USA)
2	Make	C=Chrysler
3	Vehicle Type	6=Truck
4	Brake System GVWR Restraint System	R=Hydraulic Brakes 6001-7000 lbs (2722-3175 KG) Active Belts, Air Bags, Side Bags-All Rows
5	Brand, Marketing Name, Drive Wheels, Cab/Body Type, Drive Position, and Price Series	D7K=4 Wheel Drive, Quad Cab, ST trim level
6		
7		
8	Engine	T=5.7L V8, Non-turbo, Gasoline, (EZC, EZH)
9	Check Digit	0 through 9 or X
10	Model Year	C=2012 D=2013 E=2014
11	Assembly Plant	S=Warren Assembly Plant
12 - 17	Vehicle Build Sequence	Six Digit Number Assigned by the Assembly Plant

Notes: _____

Vehicle Certification Label

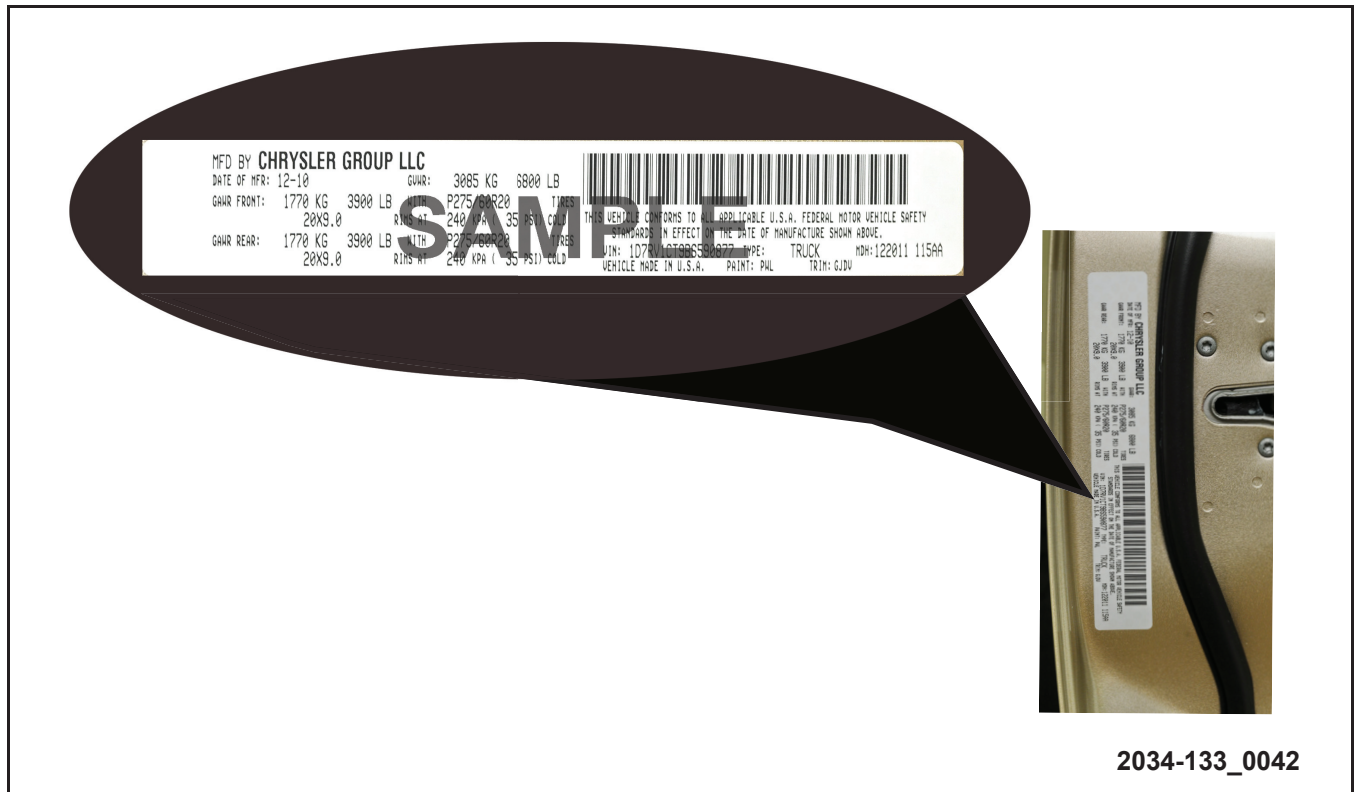


Figure 5 Vehicle Certification Label

The vehicle certification label is located on the inside rear portion of the driver's door. This label may not be present if the door has been replaced.

A vehicle certification label indicates that the vehicle conforms to all applicable Federal Motor Vehicle Standards.

The label also lists:

- Month and year of vehicle manufacture
- Gross vehicle weight rating (GVWR)
- VIN
- Type of vehicle
- Size of wheels
- Bar code
- Month, day, and hour (MDH) of final assembly
- Paint and trim codes
- Country of origin

Note: The gross front and rear axle weight ratings are based on the minimum tire size and the maximum cold tire inflation pressure.

Vehicle Labels and Placards

Vehicle Emissions Certification Label

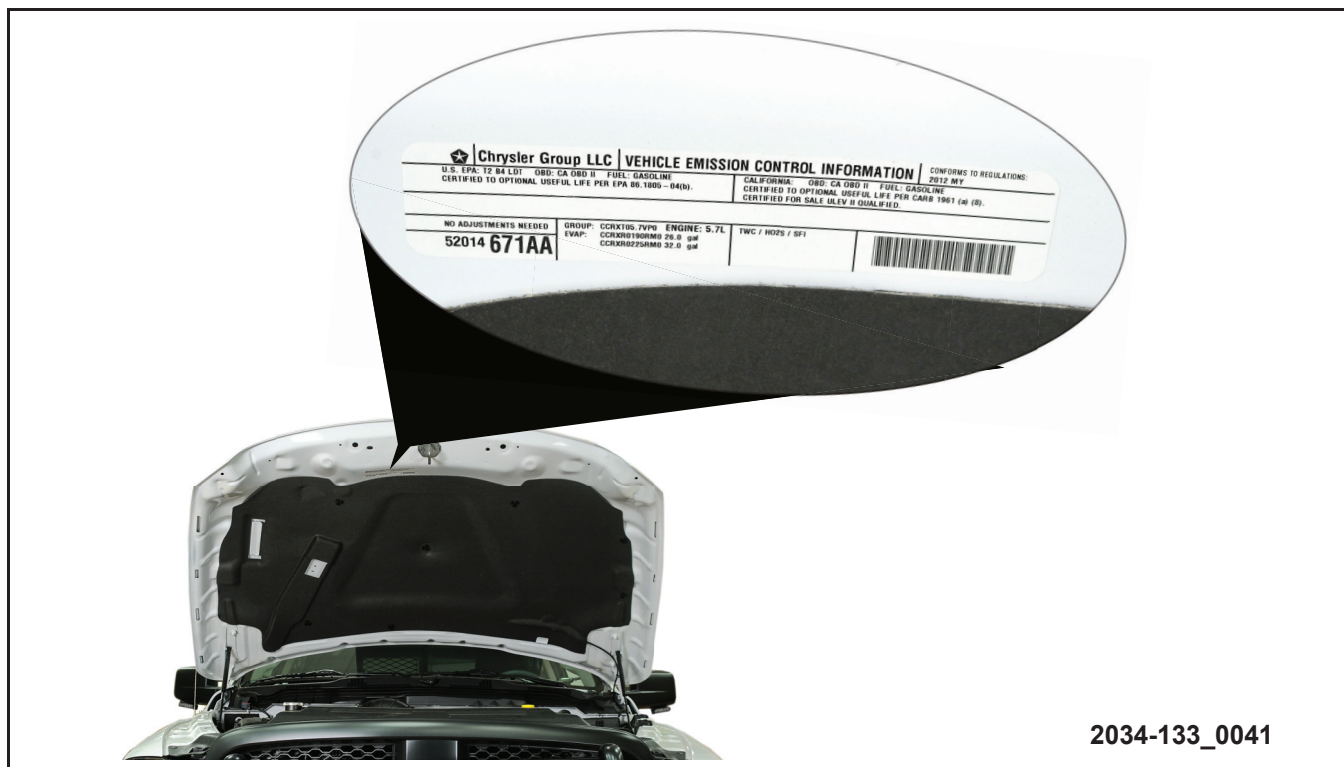


Figure 6 VECI Label

All models have a vehicle emissions control information (VECI) label in the engine compartment. This label is generally attached to the upper radiator core support or on the underside of the hood (on the front, leading edge). It cannot be removed without defacing information and destroying the label. There are unique labels for vehicles built for sale in the state of California and the country of Canada. Canadian labels are written in both English and French.

The label contains the vehicle model year and the regulations to which the vehicle conforms.

The VECI label may contain some or all of the following:

- Engine family and displacement
- Evaporative family
- Emissions control system schematic
- Engine timing specifications (if adjustable)
- Idle speeds
- Spark plug type and gap

The label may also contain an engine vacuum schematic.

NOTE: The vehicle emission control information (VECI) label must be in place for the life of the vehicle. When replacing the component in which the VECI label is adhered, a new VECI label must be adhered to the new component.

Tire and Loading Information Label

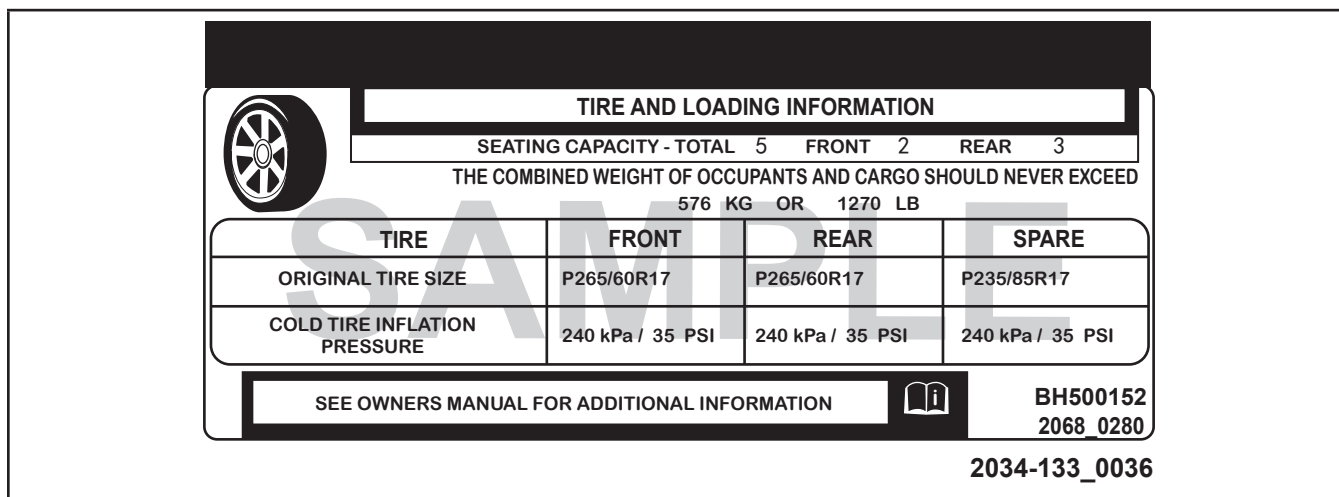


Figure 7 Tire and Loading Information Label

The tire and loading information label is located on the driver side B-pillar. The tire and loading label may contain:

- The number of people that can be carried in the vehicle
- The total weight the vehicle can carry
- The tire size designed for the vehicle
- The cold tire psi for the front, rear, and spare (depending on type)
- The last eight numbers of the VIN

Notes: _____

Vehicle Labels and Placards

Secondary Load Label

Vehicle Load Capacity:	577.3 kg (1270 lbs.)
Added Accessories:	90.9 kg (200 lbs.)
New Vehicle Load Capacity:	486.4 kg (1070 lbs.)

2034-133_0033

Figure 8 Secondary Load Label

After up-fitting is complete, the vehicle must have a secondary label added to certify the new weight capacity of the vehicle with the added equipment. This label is the responsibility of the up-fitter and may be hand written.

Notes: _____

Notes:

[illegible]

LESSON 3 VEHICLE MAINTENANCE

FUEL ECONOMY AND MAINTENANCE

04 - Vehicle Quick Reference/Capacities and Recommended Fluids/Specifications

FLUIDS, LUBRICANTS AND GENUINE PARTS

ENGINE

Description	Type	Part Number	Capacities	
			U.S.	Metric
Cooling System				
• Engine Coolant (3.7L and 4.7L Engines)	MOPAR® Antifreeze/Coolant 5 Year/100,000 Mile Formula HOAT (Hybrid Organic Additive Technology)	1 Gallon - 05066386AA	14 Quarts	13 Liters
• Engine Coolant (5.7L Engines)	MOPAR® Antifreeze/Coolant 5 Year/100,000 Mile Formula HOAT (Hybrid Organic Additive Technology)	1 Gallon - 05066386AA	16 Quarts	15 Liters
• Engine Coolant (6.7L HO Diesel Engines)	MOPAR® Antifreeze/Coolant 5 Year/100,000 Mile Formula HOAT (Hybrid Organic Additive Technology)	1 Gallon - 05066386AA	22.6 Quarts	21.4 Liters

2034-133_0411

Figure 9 TechCONNECT

A vehicle that is not properly tuned and maintained cannot be expected to perform at its maximum efficiency and can have an adverse effect on fuel economy. The following recommendations will ensure that the vehicle is performing at its maximum efficiency.

Use the recommended motor oil grade. Using the manufacturer's recommended grade of Mopar® motor oil or equivalent can improve fuel mileage. Motor oil labeled Energy Conserving contains friction-reducing additives.

Check and replace air filters. Replace a clogged air filter with a new Mopar® air filter or equivalent can improve fuel mileage.

Performing routine maintenance such as an engine tune up, properly inflating the tires, performing regular oil changes and prompt repairs (such as replacing a faulty oxygen sensor) can have a significant effect on vehicle performance and fuel economy.

The scheduled maintenance services listed in the owner's manual must be done at the times or mileages specified to protect the vehicle warranty and ensure the best vehicle performance and reliability. More frequent maintenance may be needed for vehicles in severe operating conditions, such as dusty areas and very short trip driving. Inspection and service should also be done anytime a malfunction is suspected.

Vehicle Maintenance

TECHCONNECT/TECH AUTHORITY

TechCONNECT and Tech Authority can be accessed to help locate service related information of the vehicle.

Service Bulletins

Frequently, the vehicle manufacturer will issue service bulletins. These publications contain information regarding updated parts, service procedures, or updated warranty administration. Service bulletins should always be checked when performing maintenance or repairs because they contain the latest information.

Service Information

The manufacturer provides service information to assist with the repair of the vehicle. Service information contains diagnostics, repair procedures, cautions, warnings, and diagrams of components and component locations.

Maintenance Schedules

Maintenance schedules provide a sound basis for those areas of the vehicle that require routine service. In certain situations, scheduled maintenance must be followed to keep the vehicle's warranties in place.

Notes: _____

New Vehicle Prep

eMail : eFiles : eSupport : My Dealership

DEALERCONNECT

HOME
SALES
SERVICE CONTRACTS
SERVICE
PARTS

DealerCONNECT > Service > Workshop > New Vehicle Prep

New Vehicle Prep

VIN: (Enter Last Eight of VIN)

Required field

Year/Model: 2012 DODGE RAM ST 4X4 1500 CREW CAB PICKUP
Build Date: September 27, 2011

WCC Code: 062

New Vehicle Prep Documents
New Vehicle Prep CheckList
New Vehicle Prep Instruction

Figure 10 New Vehicle Prep Form

Another feature available through TechCONNECT is a VIN-specific New Vehicle Preparation form. This form allows for the vehicle to be completely checked in by the receiving facility before the vehicle is placed into service.

Notes: _____

VEHICLE LIFTING



Figure 11 Vehicle Lifting Points

Floor Jack Lifting Points

When properly positioned, a floor jack can be used to lift a vehicle. Support the vehicle in the raised position with jack stands at the front and rear ends of the frame rails.

For emergency jacking, refer to the owner's manual for the procedure.

CAUTION Do not lift vehicle with a floor jack positioned under the axle tubes, a body side sill, a steering linkage component, a drive shaft, the engine or transmission oil pan, the fuel tank, or a front suspension arm.

Note: Use the correct rear frame rail lifting locations only

Hoist

A vehicle can be lifted with:

- A single-post, frame-contact hoist
- A twin-post, chassis hoist
- A ramp-type, drive-on hoist

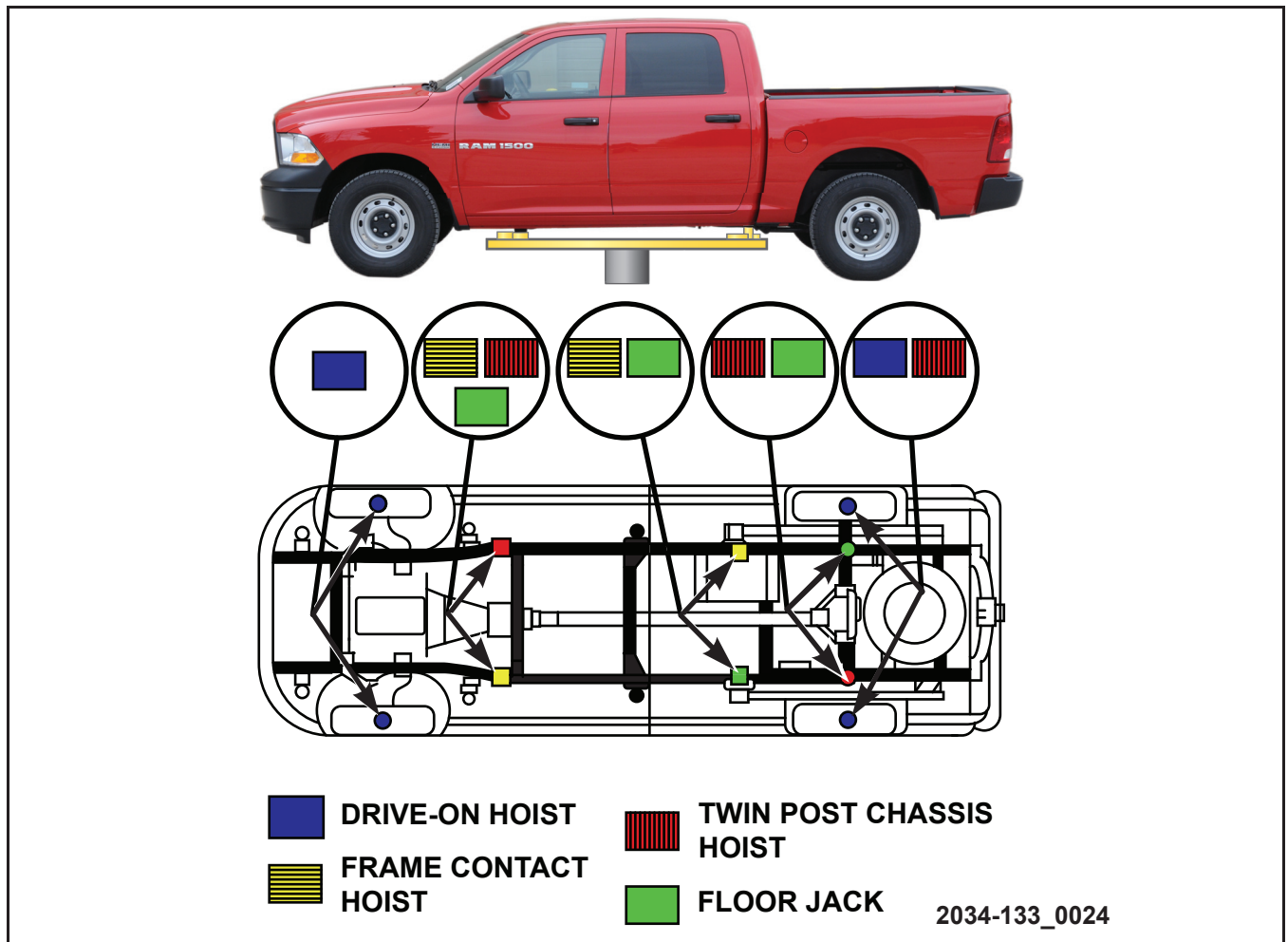


Figure 12 Jacking and Lifting Points

Notes: _____

Jack Stands

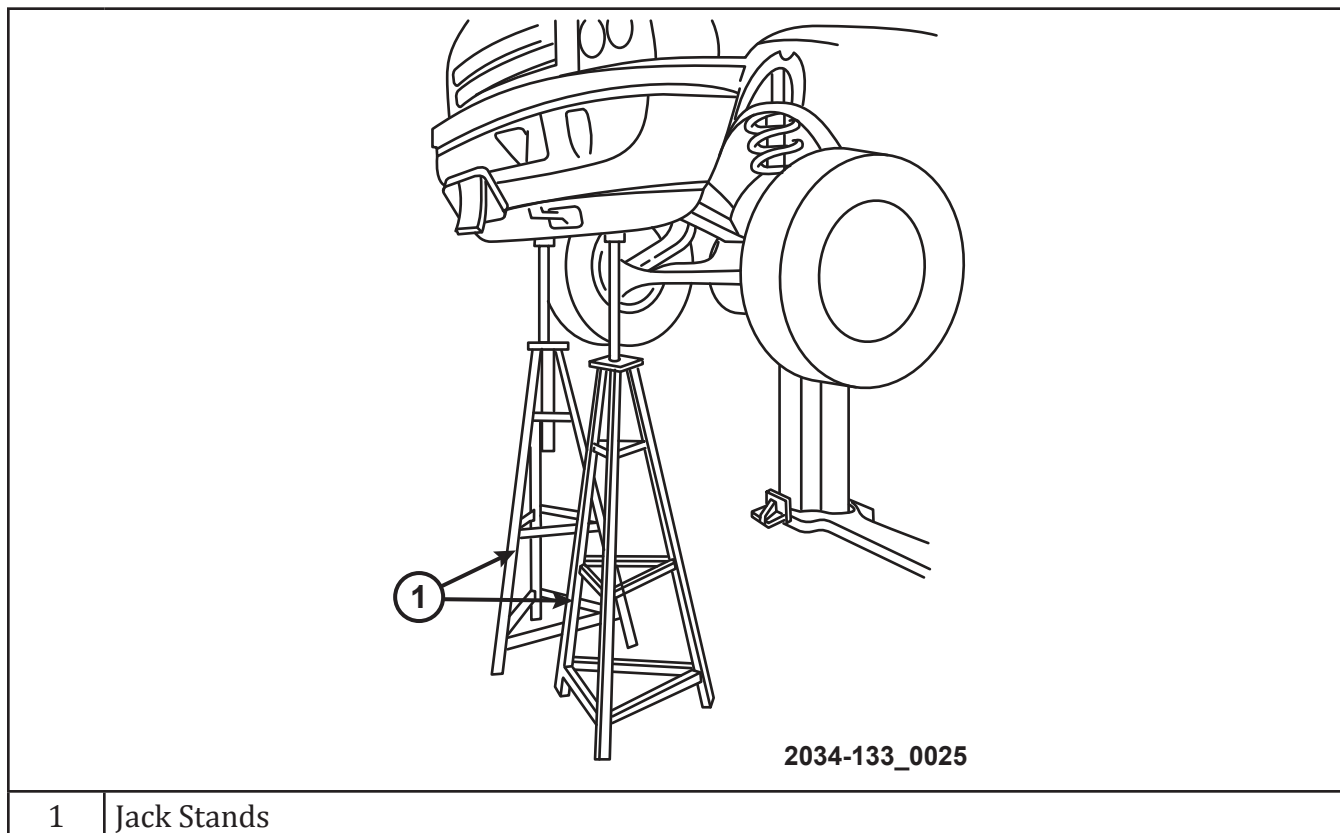


Figure 13 Lifting and Jacking Support Points

WARNING: THE HOISTING AND JACK LIFTING POINTS PROVIDED ARE FOR A COMPLETE VEHICLE. WHEN A CHASSIS OR DRIVETRAIN COMPONENT IS REMOVED FROM A VEHICLE, THE CENTER OF GRAVITY IS ALTERED, MAKING SOME HOISTING CONDITIONS UNSTABLE. PROPERLY SUPPORT OR SECURE THE VEHICLE TO THE HOISTING DEVICE WHEN THESE CONDITIONS EXIST.

Notes: _____

FLUIDS AND FILTERS

Engine Oil

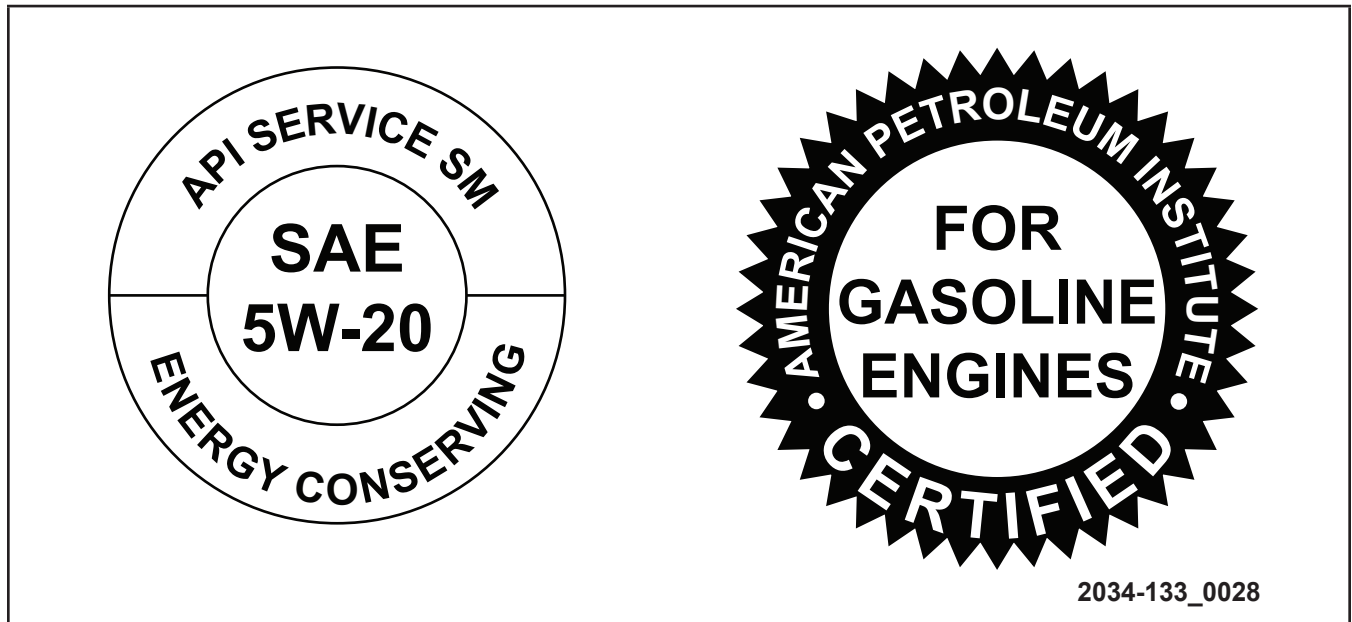


Figure 14 Proper Oil Identification

Chrysler recommends the use of 5W-20 motor oil for the 5.7L engine.

Note: Make sure all oil is American Petroleum Institute (API) certified and has a minimum rating of SL. Neither straight weight oil nor non-detergent oil is allowed to be used at any time in the engine.

Note: Synthetic engine oils may be used if the recommended oil quality requirements are met and the recommended maintenance intervals for oil and filter changes are followed.

Note: Do not add any supplemental materials, other than leak detection dyes, to the engine oil. Engine oil is an engineered product and its performance may be impaired by supplemental additives.

Notes: _____

Engine Oil Filter

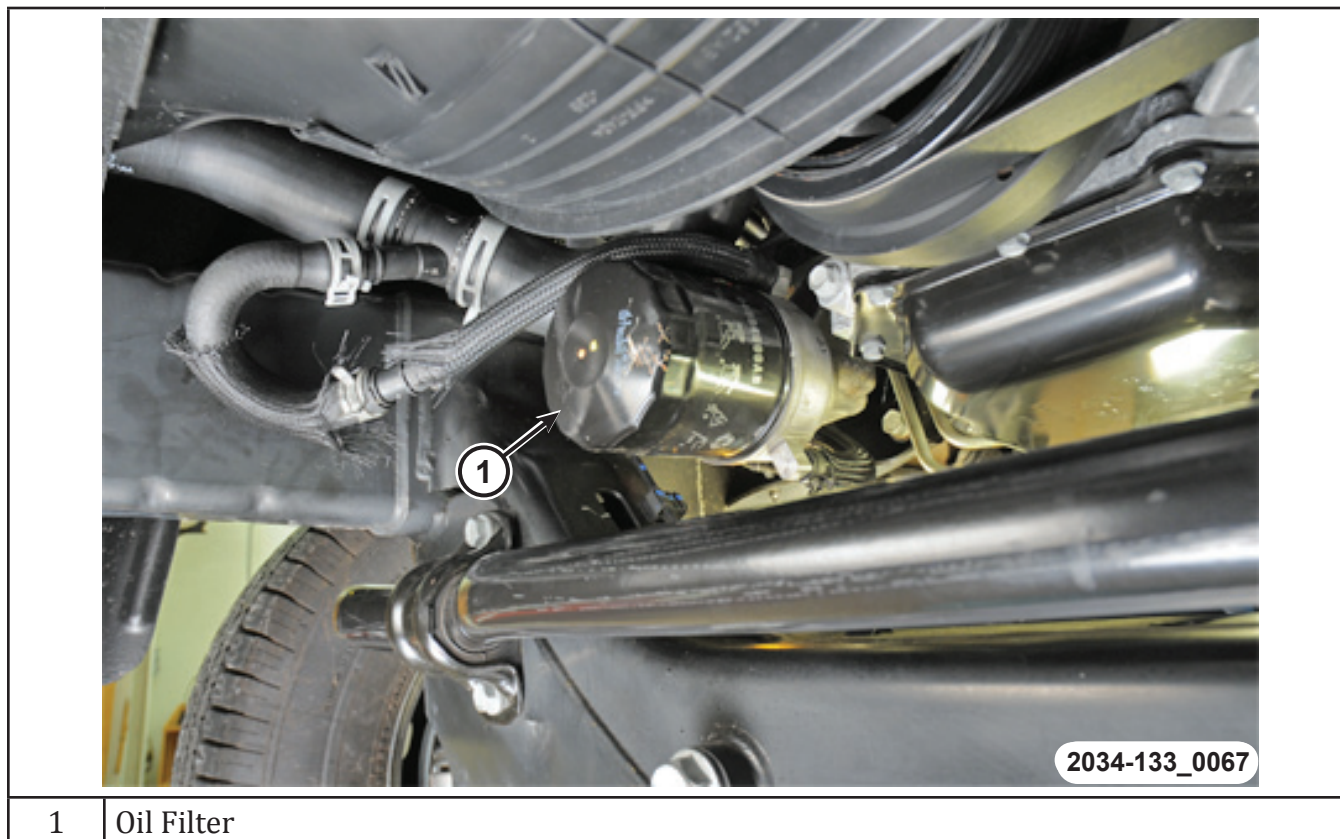


Figure 15 Oil Filter Location

The oil filter is located in the bottom side of the engine.

Note: The oil filter must be changed at every oil change interval. The filter should be replaced with a MOPAR filter or equivalent.

Notes: _____

Engine Oil Change Indicator



Figure 16 Oil Change Light

The RAM 1500 SSV package has an oil change minder that calculates oil change intervals based on:

- Engine start temperature
- Engine load
- Vehicle speed
- Idle time

The vehicle has software programmed into the PCM that is different from that of the civilian version. The package contains an algorithm that prompts the driver to change the oil after predetermined hours of engine operation based on the parameters listed above. This is not the same as passenger vehicles because it is based on a different algorithm and vehicle mileage is not a factor.

Oil Change Indicator Reset

Reset the oil change minder system and turn off the indicator light as follows:

1. With the engine off, press the START button until the vehicle is in the RUN position.
2. Fully depress the accelerator pedal three times within 10 seconds.
3. If the indicator was on before the reset procedure, it should now be off.

Notes: _____

HOUR METER AND IDLE HOUR METER ACCESS

Engine Hour Meter

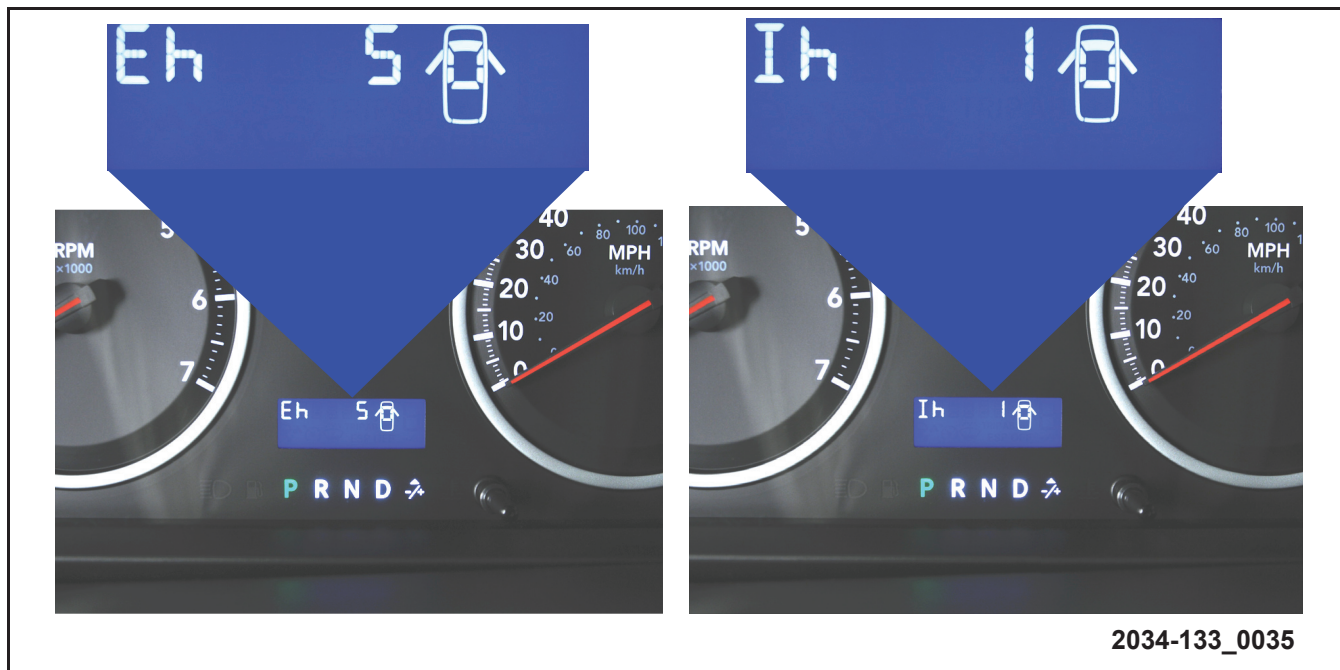


Figure 17 Engine Hour Meter

The RAM SSV has an engine hour meter and idle hour meter that can be viewed in the electronic vehicle information center EVIC. Hours are also shown on the EVIC display.

1. To access the engine hour meter, the odometer must first be showing, and the vehicle must be in RUN w/o rpm.
2. Next, press and hold the trip/reset button on the cluster for approximately 6 seconds.
3. The cluster will initiate a 30 second engine hour mode.
4. The first 15 seconds will show the engine run lifetime hours.
5. The last 15 seconds will show the idle lifetime hours.

TRANSMISSION FLUID

Mopar ATF+4 is being used as the factory fill for the RAM 1500 Special Services truck package. ATF+4 offers the following significant benefits:

- Fully synthetic (Chrysler engineered fluid)
- Anti-wear properties
- Rust/corrosion prevention
- Control of oxidation
- Elimination of deposits
- Control of friction
- Retention of anti-foaming properties
- Superior properties for low temperature operation
- Seal conditioner
- Meets material standard (MS-9602)

Note: The use of any other transmission fluid not produced by Chrysler Group LLC must meet MS-9602. This fluid is NOT compatible with transmissions that require either Dexron or Mercon fluids. Transmission fluids that claim to be universal in nature are NOT to be used in this transmission or any others that require ATF+4 MS-9602.

Note: Chrysler does NOT approve the addition of any type or kind of additives to the transmission. The exception to this is the use of special dyes to aid in detecting leaks.

Note: ATF+4 must always be used in vehicles that were originally filled with ATF+4.

Note: Use of Dexron transmission fluid may induce torque converter shudder. If this takes place, the transmission fluid will need to be flushed and the filter replaced.

Note: The transmission spin-on filter must be changed with each fluid service.

Note: If using a fluid exchanger to service the transmission, be sure to always remove non-ATF+4 fluids from the fluid exchanger before exchanging the fluid. Under no circumstances are the transmission cooler lines to be cut in order to service the transmission unless they are to be replaced.

Fluid Level Check

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with the fluid. As in any hydraulic system, air bubbles make the fluid spongy; therefore, pressures will be low and build up slowly.

Improper filling can also raise the fluid level too high. When the transmission has too much fluid, the geartrain churns up foam and cause the same conditions that occur with a low fluid level.

In either case, air bubbles can cause overheating, fluid oxidation, and varnishing. This can interfere with normal valve, clutch, and accumulator operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

The transmission has a dipstick to check the oil level. It is located on the right side of the engine. Be sure to wipe all dirt from the dipstick handle before removing.

The torque converter fills in both the park and neutral positions. Place the selector lever in P (park) to be sure that the fluid level check is accurate. The engine should be running at idle speed for at least one minute, with the vehicle on level ground. At normal operating temperature (approximately 82°C or 180°F), the fluid level is correct if it is in the HOT region (cross-hatched area) on the oil level indicator. The fluid level will be approximately at the upper COLD hole of the dipstick at 21°C (70°F) fluid temperature.

Note: Mopar ATF+4 is red in color when new. The ATF is dyed red so it can be identified from other fluids used in the vehicle such as engine oil or antifreeze. The red color is not permanent and is not an indicator of fluid condition. As the vehicle is driven, the ATF will begin to look darker in color and may eventually become brown. This is normal. ATF+4 also has a unique odor that may change with age. Consequently, odor and color cannot be used to indicate the fluid condition or the need for a fluid change.

Note: Various additives and supplements exist that claim to improve shift feel and/or quality. These additives and others also claim to improve converter clutch operation and inhibit overheating, oxidation, varnish, and sludge. These claims have not been supported to the satisfaction of Chrysler and these additives must not be used. The use of transmission sealers should also be avoided because they may adversely affect the integrity of transmission seals.

Oil Level Temperature Chart

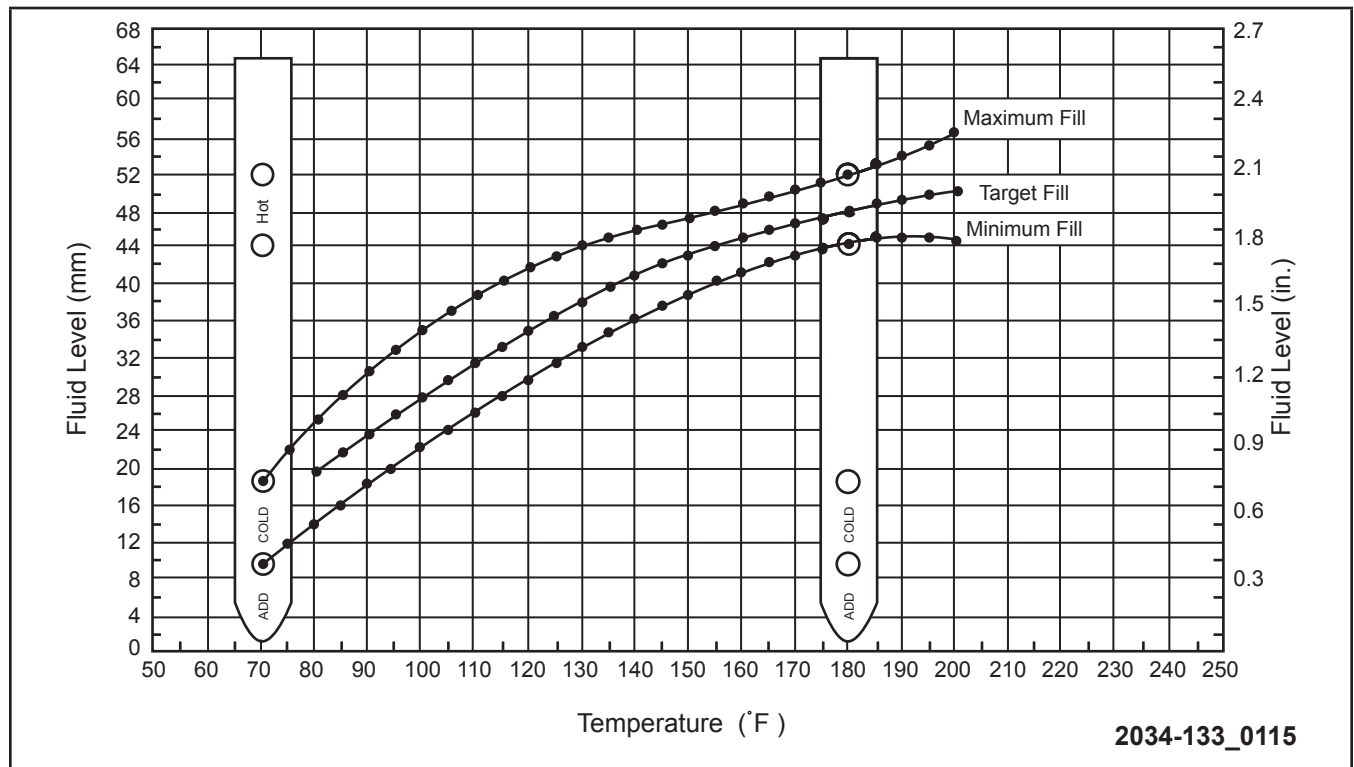


Figure 18 Transmission Fluid Temperature Chart

1. Start the engine and apply parking brake.
2. Shift the transmission into drive for approximately 2 seconds.
3. Shift the transmission into reverse for approximately 2 seconds.
4. Shift the transmission into park.
5. Hook up the scan tool and select transmission.
6. Select Sensors.
7. Read the transmission temperature value.
8. Compare the fluid temperature value with the chart.
9. Adjust the transmission fluid level shown on the dipstick according to the Transmission Fluid Temperature Chart.
10. Check the transmission for leaks

Note: After adding any fluid to the transmission, wait a minimum of 2 minutes for the oil to fully drain from the fill tube into the transmission before rechecking the fluid level.

Note: The engine and transmission should be at normal operating temperature before performing this procedure. After the fluid has been checked, seat the dipstick fully to seal out water and dirt.

Transmission Service Interval

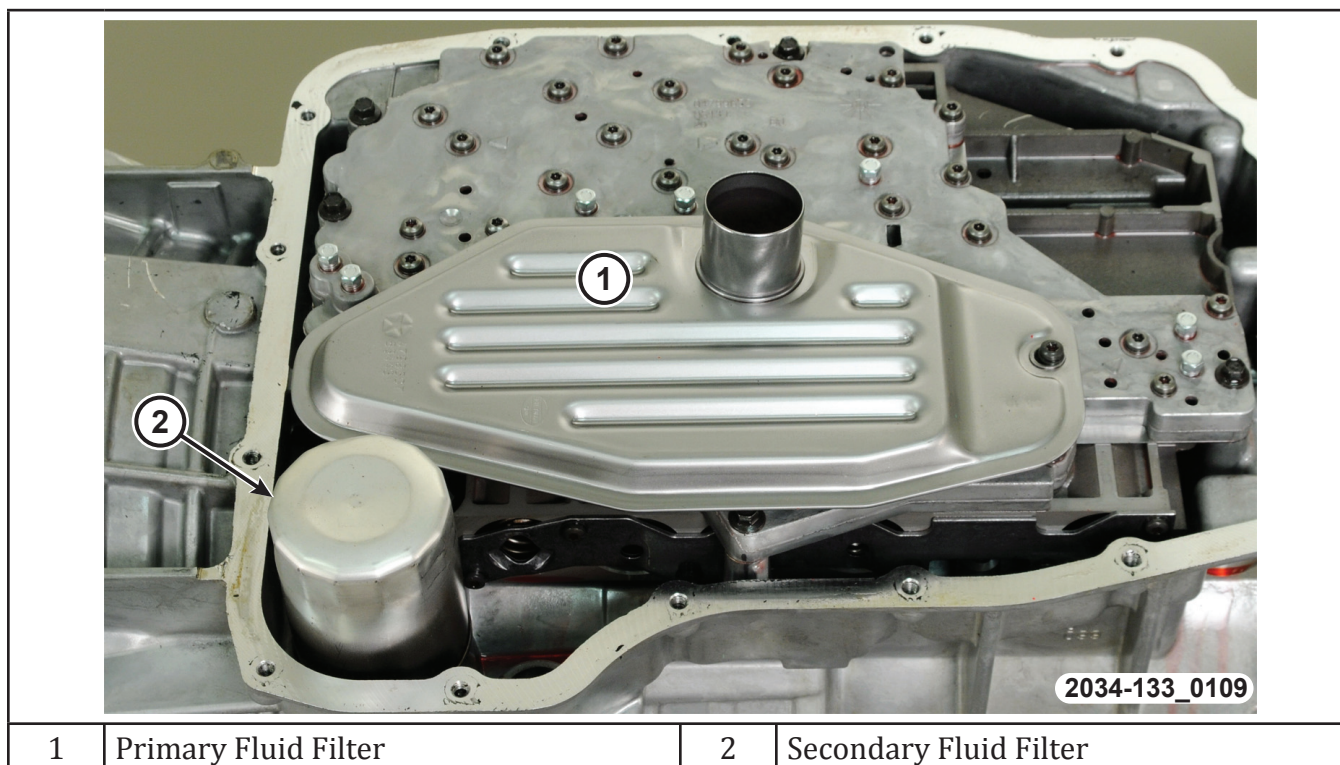


Figure 19 Transmission Fluid Filters

The transmission fluid and filters should be serviced at regular intervals based on the owner's manual guidelines for the police vehicle. There are two filters utilized on this vehicle. The primary filter is located in the transmission oil pan below the valve body and a second filter, which is a spin on, is located next to the primary filter inside the transmission oil pan.

Notes: _____

POWER STEERING FLUID

The RAM 1500 SSV uses Mopar ATF+4 automatic transmission fluid in it's hydraulic system.

CAUTION: MOPAR® ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage may result to the power steering pump and system if any other fluid is used. Do not overfill.

CAUTION: Mopar® Power Steering Fluid+4 or Mopar® ATF+4 Automatic Transmission Fluid is to be used in the power steering system. Both fluids have the same material standard specifications (MS-9602). No other power steering or automatic transmission fluid is to be used in the system. Damage to the power steering pump and system may result if another fluid is used. Do not overfill the system.

CAUTION: If the air is not purged from the power steering system correctly, pump failure could result.

WARNING: THE FLUID LEVEL SHOULD BE CHECKED WITH THE ENGINE OFF TO PREVENT INJURY FROM MOVING COMPONENTS.

Notes: _____

ENGINE COOLANT

The cooling system is designed around the coolant. The coolant accepts heat from the engine metal (in the cylinder head area near the exhaust valves and the engine block). Then coolant carries the heat to the radiator where the tube/fin radiator can transfer the heat to the air.

The use of aluminum cylinder blocks, cylinder heads, and water pumps requires special corrosion protection. The RAM 1500 Special Services truck uses MOPAR® Antifreeze/Coolant 5 Year/100,000 Mile Formula Hybrid Organic Additive Technology (HOAT) or equivalent ethylene-glycol base coolant with organic corrosion inhibitors. This coolant offers the best engine cooling without corrosion when mixed 50% ethylene-glycol and 50% distilled water to obtain a freeze point of -37°C (-35°F). If it loses color or becomes contaminated, drain, flush, and replace with fresh, properly mixed coolant solution.

The required ethylene-glycol and water mixture depends upon climate and vehicle operating conditions. The coolant performance of various mixtures follows:

- Pure Water - Water can absorb more heat than a mixture of water and ethylene-glycol. This is for the purpose of heat transfer only. Water also freezes at a higher temperature and allows corrosion.
- 100 % ethylene-glycol - The corrosion inhibiting additives in ethylene-glycol need the presence of water to dissolve. Without water, additives form deposits in the system. These act as insulation causing temperature to rise to as high as 149°C (300°F). This temperature is hot enough to melt plastic. The increased temperature can result in severe engine damage. In addition, 100% ethylene-glycol freezes at -22°C (-8°F).
- 50/50 ethylene-glycol and water - This is the recommended mixture; it provides protection against freezing to -37°C (-34°F). The antifreeze concentration must always be a minimum of 44%, year-round in all climates. If the percentage is lower, engine parts may be eroded by cavitation. Maximum protection against freezing is provided with a 68% antifreeze concentration, which prevents freezing down to -67.7°C (-90°F). A higher percentage will freeze at a warmer temperature. Also, a higher percentage of antifreeze can cause the engine to overheat because the specific heat of antifreeze is lower than water.

Notes: _____

Coolant Concentration Testing

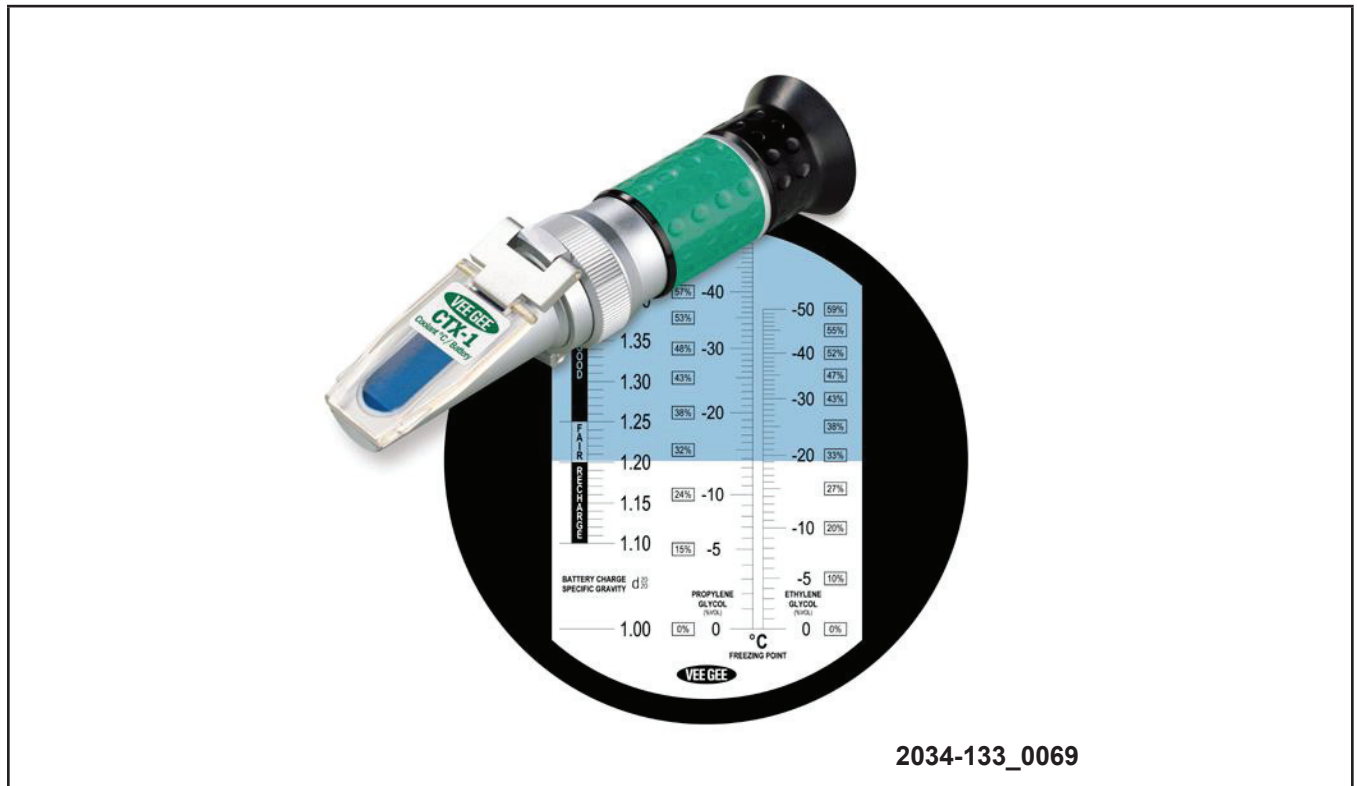


Figure 20 Refractometer

Coolant concentration should be checked when any additional coolant is added to the system or after a coolant drain, flush, and refill. The coolant mixture offers optimum engine cooling and protection against corrosion when mixed to a freeze point of -34°F (-37°C) to -50°F (-46°C). Use a hydrometer or a refractometer to test the coolant concentration.

A hydrometer tests the amount of glycol in a mixture by measuring the specific gravity of the mixture. The higher the concentration of ethylene-glycol, the larger the number of balls that will float, and the higher the freeze protection (up to a maximum of 60% by volume glycol). Coolant should be tested at room temperature.

A refractometer Special Tool 8286 tests the amount of glycol in a coolant mixture by measuring the amount a beam of light bends as it passes through the fluid.

Hydrometer



Figure 21 Typical Hydrometer

WARNING: ANTIFREEZE IS AN ETHYLENE-GLYCOL-BASED COOLANT AND IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO A FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE-GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL-BASED COOLANT PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR LOCATION OF COLLECTION CENTERS IN YOUR AREA.

WARNING: **DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE; PERSONAL INJURY CAN RESULT. AVOID THE RADIATOR COOLING FAN WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED; PERSONAL INJURY CAN RESULT.**

Caution: **Use of propylene-glycol based coolants is not recommended because they provide less freeze protection and less corrosion protection. Do not mix ethylene- and propylene-glycol based coolants. Through heat and pressure the two components will make sludge. Mopar Antifreeze/Coolant, 5 year/100,000 Mile Formula (MS-9769) may not be mixed with any other type of antifreeze. Mixing coolants other than specified (non-HOAT or other HOAT) may result in engine damage that may not be covered under the new vehicle warranty, and decreased corrosion protection.**

Notes: _____

Engine Coolant Fill

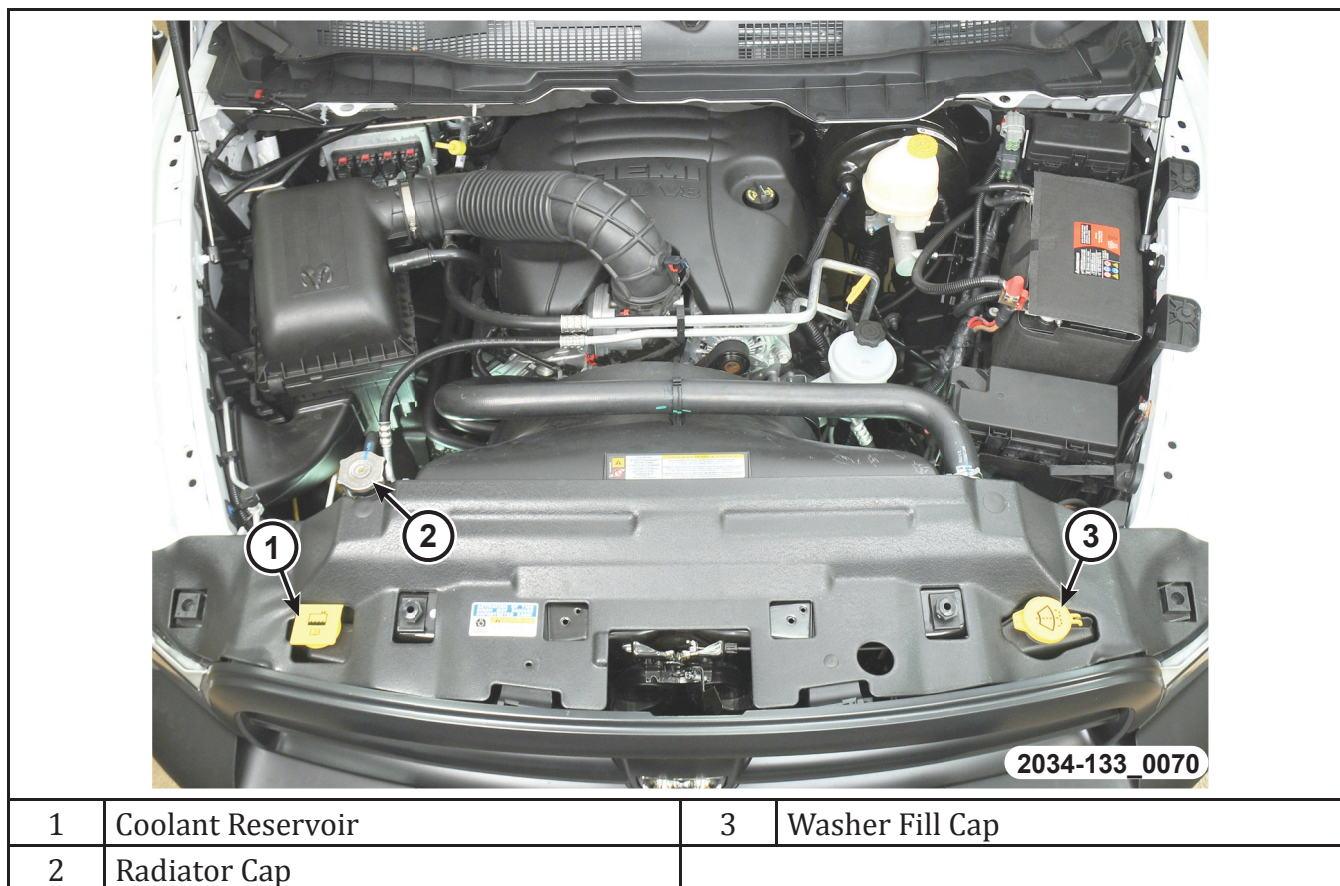


Figure 22 Front Under-hood

When topping off the coolant system, use caution when opening the system. Be sure to use the correct type and concentration of coolant for the vehicle. If it is necessary to replace the coolant or flush the cooling system, use the correct procedure listed in the service information.

Note: If the cooling system is opened for repair be sure to purge the air from the system.

WARNING: **ANTIFREEZE COOLANT IS HARMFUL IF SWALLOWED OR INHALED. IF SWALLOWED, DRINK TWO GLASSES OF WATER AND INDUCE VOMITING. IF INHALED, MOVE TO A FRESH AIR AREA. SEEK MEDICAL ATTENTION IMMEDIATELY. DO NOT STORE IN OPEN OR UNMARKED CONTAINERS. WASH SKIN AND CLOTHING THOROUGHLY AFTER COMING IN CONTACT WITH ETHYLENE-GLYCOL. KEEP OUT OF REACH OF CHILDREN. DISPOSE OF GLYCOL BASED COOLANT PROPERLY. CONTACT YOUR DEALER OR GOVERNMENT AGENCY FOR THE LOCATION OF COLLECTION CENTERS IN YOUR AREA.**

WARNING: **DO NOT OPEN A COOLING SYSTEM WHEN THE ENGINE IS AT OPERATING TEMPERATURE OR HOT UNDER PRESSURE; PERSONAL INJURY CAN RESULT. AVOID THE RADIATOR COOLING FAN AND OTHER MOVING COMPONENTS WHEN ENGINE COMPARTMENT RELATED SERVICE IS PERFORMED; PERSONAL INJURY CAN RESULT.**

WARNING: **WEAR APPROPRIATE EYE AND HAND PROTECTION WHEN PERFORMING THIS PROCEDURE.**

CAUTION: **Do not use well water or a suspect water supply in the cooling system. A 50/50 mixture of the recommended antifreeze coolant and distilled water is recommended.**

Note: **The cooling system fill procedure is critical to overall cooling system performance.**

Note: **Make sure all hoses are connected and the radiator drain is closed. The drain should be hand tightened only.**

Notes: _____

BRAKES

Base brake components consist of the brake pads, calipers, brake drum-in-hat rotor in the rear, rotors, brake lines, master cylinder, booster, and parking brake components.

The RAM 1500 SSV utilizes a four wheel disc brake system. The system also has an antilock brake module (ABS). Each wheel is on a separate channel. The ABS also provides brake proportioning.

If either the front or rear hydraulic system loses normal braking capability, the remaining system will still function with some loss of overall braking effectiveness. This will be evident by increased pedal travel during application, greater pedal force required to slow or stop, and activation of the brake warning light or the ABS warning light (if equipped) during brake use.

WARNING: CHRYSLER LLC DOES NOT MANUFACTURE ANY VEHICLES OR REPLACEMENT PARTS THAT CONTAIN ASBESTOS. AFTERMARKET PRODUCTS MAY OR MAY NOT CONTAIN ASBESTOS. REFER TO AFTERMARKET PRODUCT PACKAGING FOR PRODUCT INFORMATION. WHETHER THE PRODUCT CONTAINS ASBESTOS OR NOT, DUST AND DIRT CAN ACCUMULATE ON BRAKE PARTS DURING NORMAL USE. FOLLOW PRACTICES PRESCRIBED BY APPROPRIATE REGULATIONS FOR THE HANDLING, PROCESSING, AND DISPOSING OF DUST AND DEBRIS.

CAUTION: Never use gasoline, kerosene, alcohol, motor oil, transmission fluid, or any fluid containing mineral oil to clean the system components. These fluids damage rubber cups and seals. Use only fresh brake fluid or Mopar brake cleaner to clean or flush brake system components. These are the only cleaning materials recommended. If system contamination is suspected, check the fluid for dirt, discoloration, or separation into distinct layers. Also check the reservoir cap seal for distortion. Drain and flush the system with new brake fluid if contamination is suspected.

CAUTION: Use Mopar brake fluid or an equivalent quality fluid meeting SAE/DOT standards J1703 and DOT 3. Brake fluid must be clean and free of contaminants. Use fresh fluid from sealed containers only to ensure proper antilock component operation.

CAUTION: Use Mopar multi-mileage or high-temperature grease to lubricate caliper slide surfaces, drum brake pivot pins, and shoe contact points on the backing plates. Use multi-mileage grease or GE 661 or Dow 111 silicone grease on caliper slide pins to ensure proper operation.

Parking Brake System

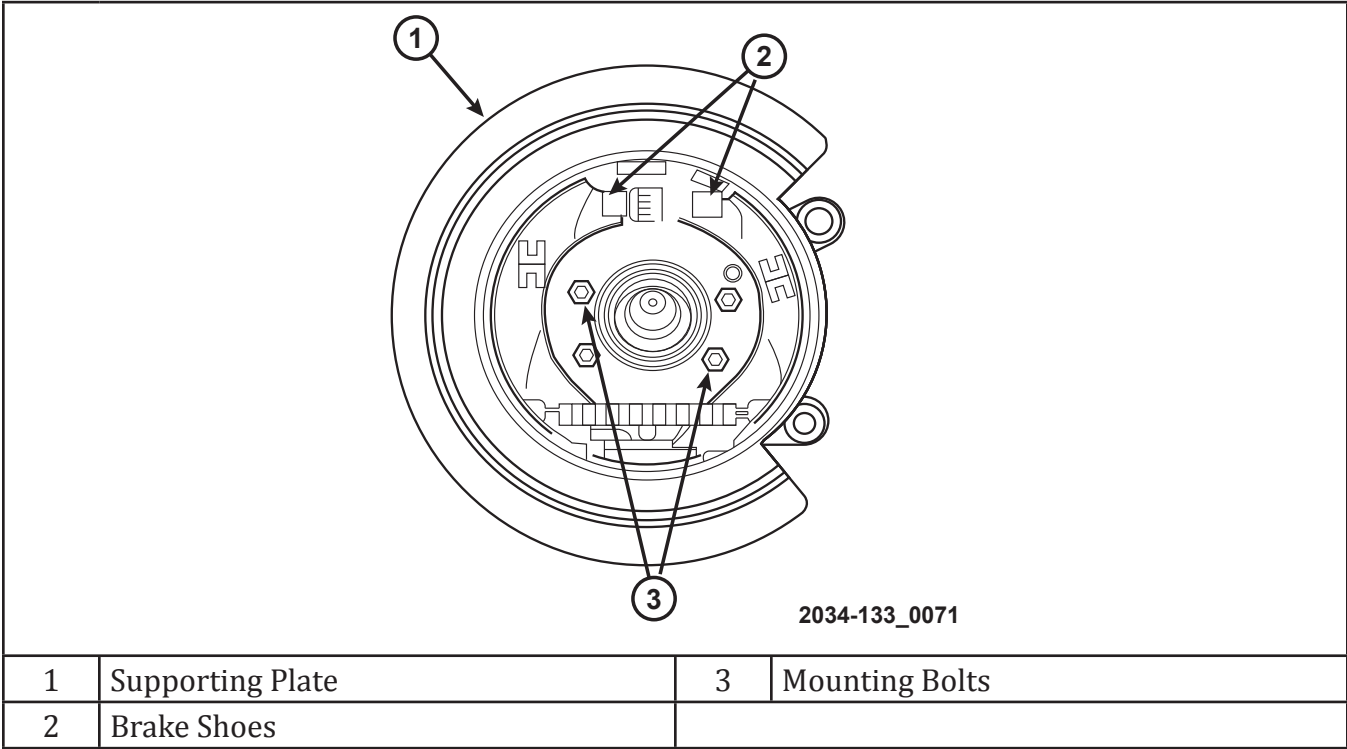


Figure 23 Parking Brakes

The parking brakes are secured to a support plate and operated by a system of cables and levers attached to a primary and secondary shoe positioned within the drum section of the rotor.

The drum-in-hat design utilizes an independent set of shoes to park the vehicle.

Notes: _____

Vehicle Maintenance

CHASSIS LUBRICATION POINTS

Front Suspension Lubrication

There are no grease fittings on the front suspension. If it becomes necessary to replace ball joints, the upper is replaceable. The lower ball joint requires the replacement of the entire control arm assembly.

Front Differential Fill

Fill the front axle so that fluid is level with the bottom of the fill hole.

Rear Differential Fill

To check axle fluid, park vehicle on a level surface. Take a piece of wire (or pipe cleaner) and make a 90 degree bend two inches from the end of the wire. Insert the wire into the fill plug hole and use it like a dipstick. Remove the wire and measure from the 90 degree bend to the oil level. Fluid should be 3 mm (1/8 in.) \pm 3 mm (1/8 in.) below the bottom of the fill hole.

Transfer Case Fill

The transfer case fill should be checked at the fill plug location. This plug is located in the center part of the transfer case housing. The transfer case should be filled to the bottom edge of the fill plug opening with Mopar® ATF +4.

Notes: _____

FLUID REQUIREMENTS

Capacities

Table 4 Capacities

Fuel	US	Metric
1500 Regular Cab Shortbed/Crew Quad Cab Models	26 Gallons	98 Liters
1500 Regular Cab Shortbed/Crew Quad Cab Models (Optional)	32 Gallons	121 Liters
Engine Oil with Filter		
5.7L (SAE 5W-20, API Certified)	7 Quarts	6.6 Liters
Cooling System		
5.7L Engine-1500 Models (MOPAR Antifreeze/Coolant 5 year/100,000 Mile Formula HOAT or Equivalent)	16 Quarts	15 Liters

Notes: _____

Vehicle Maintenance

FLUIDS, LUBRICANTS, AND GENUINE PARTS

Table 5 Fluids, Lubricants, and Genuine Parts

Component	Fluid, Lubricant, or Genuine Part
Engine	
Engine Coolant	MOPAR Antifreeze/Coolant 5 Year/100,000 Mile Formula HOAT (Hybrid Organic Additive Technology) or equivalent
Engine Oil	API Certified SAE 5W-20 Engine Oil, meeting Chrysler Material Standard MS-6395; refer to the engine oil cap for correct SAE grade
Engine Oil Filter	MOPAR Engine Oil Filter or Equivalent
Spark Plugs 5.7L Engine	LZFR5C-11 (Gap 0.043 in [1.1 mm])
Fuel Selection - 5.7L Engine	87 octane acceptable - 89 octane recommended
Automatic Transmission	MOPAR ATF+4 automatic transmission fluid or equivalent licenses ATF+4 product
Transfer Case	MOPAR ATF+4 automatic transmission fluid or equivalent licenses ATF+4 product
Front Axle - 1500 Four Wheel Drive Models	GL-5 SAE 75W-90 (MS-9763) or equivalent
Rear Axle - 1500 Models	MOPAR Synthetic Gear Lubricant SAE 75W-140 (MS-8985). Limited-Slip Rear Axles require the addition of 118 ml (4oz) MOPAR Limited Slip Additive or equivalent
Brake Master Cylinder	MOPAR DOT 3 and SAE J1703 or equivalent; if DOT 3 brake fluid is not available, then DOT 4 is acceptable; use only recommended brake fluids
Power Steering Reservoir	MOPAR ATF+4 automatic transmission fluid or equivalent licenses ATF+4 product

Notes: _____

Notes:

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LESSON 4 POWERTRAIN

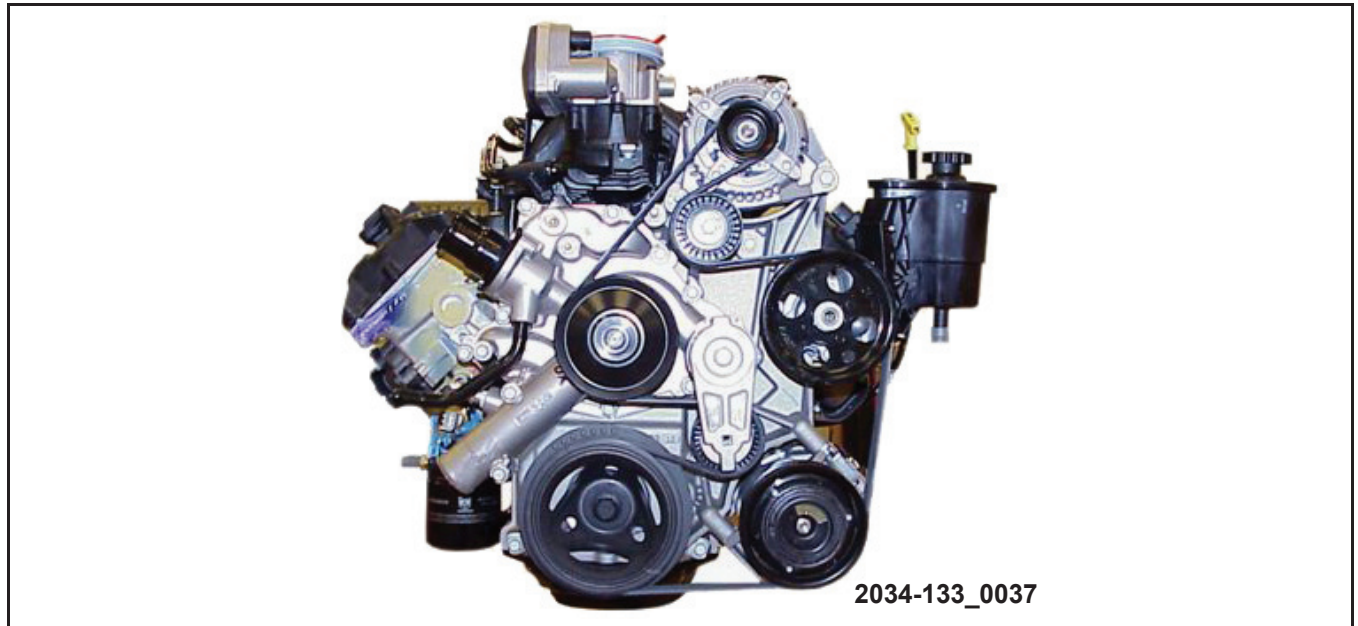


Figure 24 5.7L Hemi Engine

5.7 HEMI ENGINE OVERVIEW

The 5.7L HEMI engine shares the same architecture as the earlier 5.7L Hemi that was introduced in the 2003 MY DR Ram Pickup. Both 5.7L (345 CID) eight-cylinder engines are 90 degree, v-type, deep skirted cast iron block, single cam, overhead valve engines. Both 5.7L engines have aluminum heads and hydraulic roller lifters. The heads incorporate splayed valves with a hemispherical style combustion chamber and dual spark plugs. The cylinders are numbered from the front of the engine to the rear of the engine. Both versions of the 5.7L engine are non-freewheeling engines.

The current 5.7 engine is a performance upgrade from the previous version of the engine. There are new high flow ports and combustion chambers, a higher compression ratio, a variable camshaft timing (VCT) system, and new intake and exhaust valves.

Powertrain

Engine Specifications

Table 6 5.7 Hemi Engine Specifications

Bore	99.5 mm (3.92 in.)
Stroke	90.0 mm (3.58 in.)
Bore/Stroke	1.09
Displacement	5654 cc (348 CID)
Bore Spacing	113.3 mm (4.45 in.)
Rod Length	158.6 mm (6.24 in.)
Location of #1 Cylinder	Driver's side first cylinder
Right Bank Numbering	2, 4, 6, 8
Left Bank Numbering	1, 3, 5, 7
Intake Valve Diameter	50.8 mm (2.0 in.)
Exhaust Valve Diameter	39.4 mm (1.55 in.)
Intake Valve Lift	12.40 mm (0.49 in.)
Exhaust Valve Lift	12.00 mm (0.47 in.)
Compression Ratio	9.6:1
Combustion Chamber Volume	84.9 cc (5.18 CID)
Firing Order	1-8-4-3-6-5-7-2
Oil Specification	5W-20
Oil Capacity with Filter	7 qts.
Oil Capacity w/o Filter	6 qts.
Horsepower	390@5900 HP
Torque	407@3900 lbs./ft.

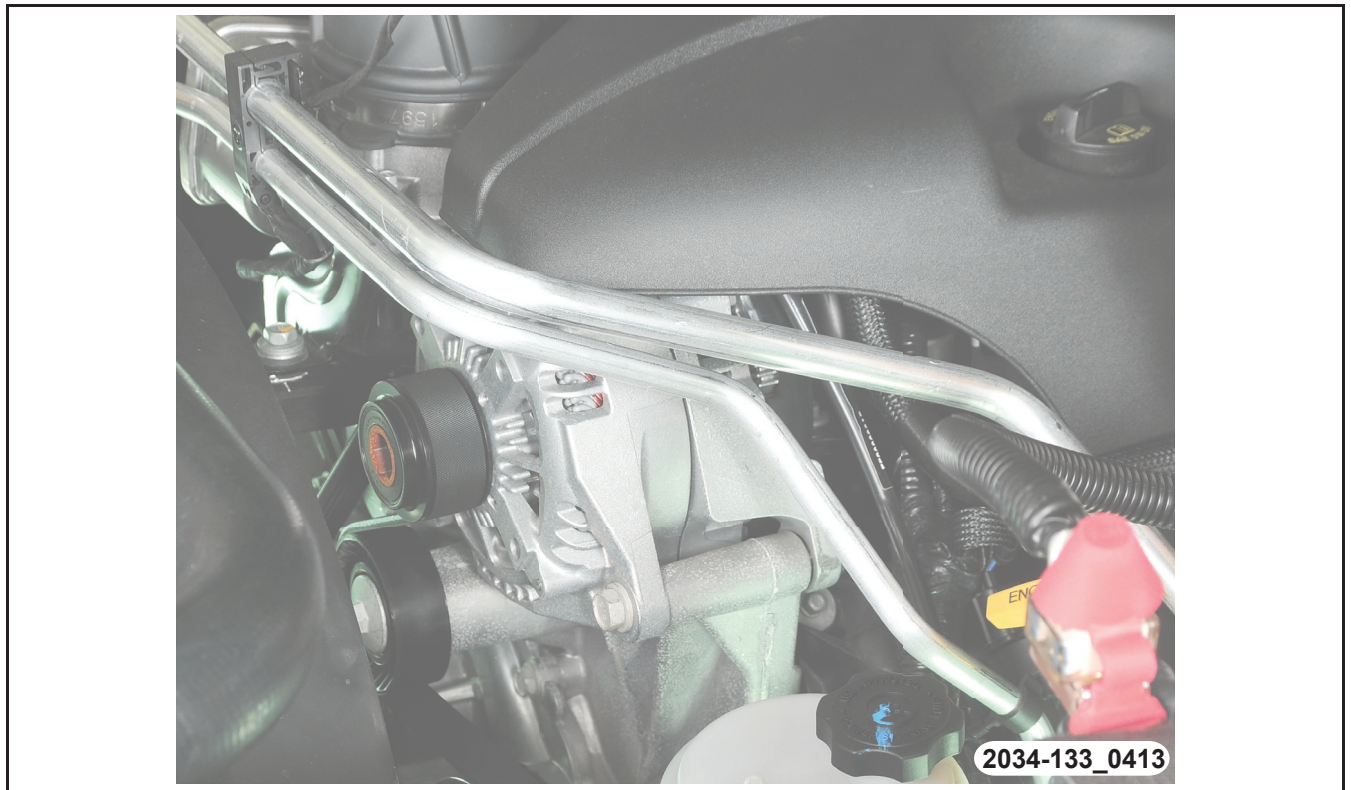
Front Engine Cover

Figure 25 Alternator and Cover

The RAM 1500 SSV equipped with the 5.7L engine has a unique engine cover. This cover is specifically designed to accommodate the larger output alternator.

Serpentine Belt Routing

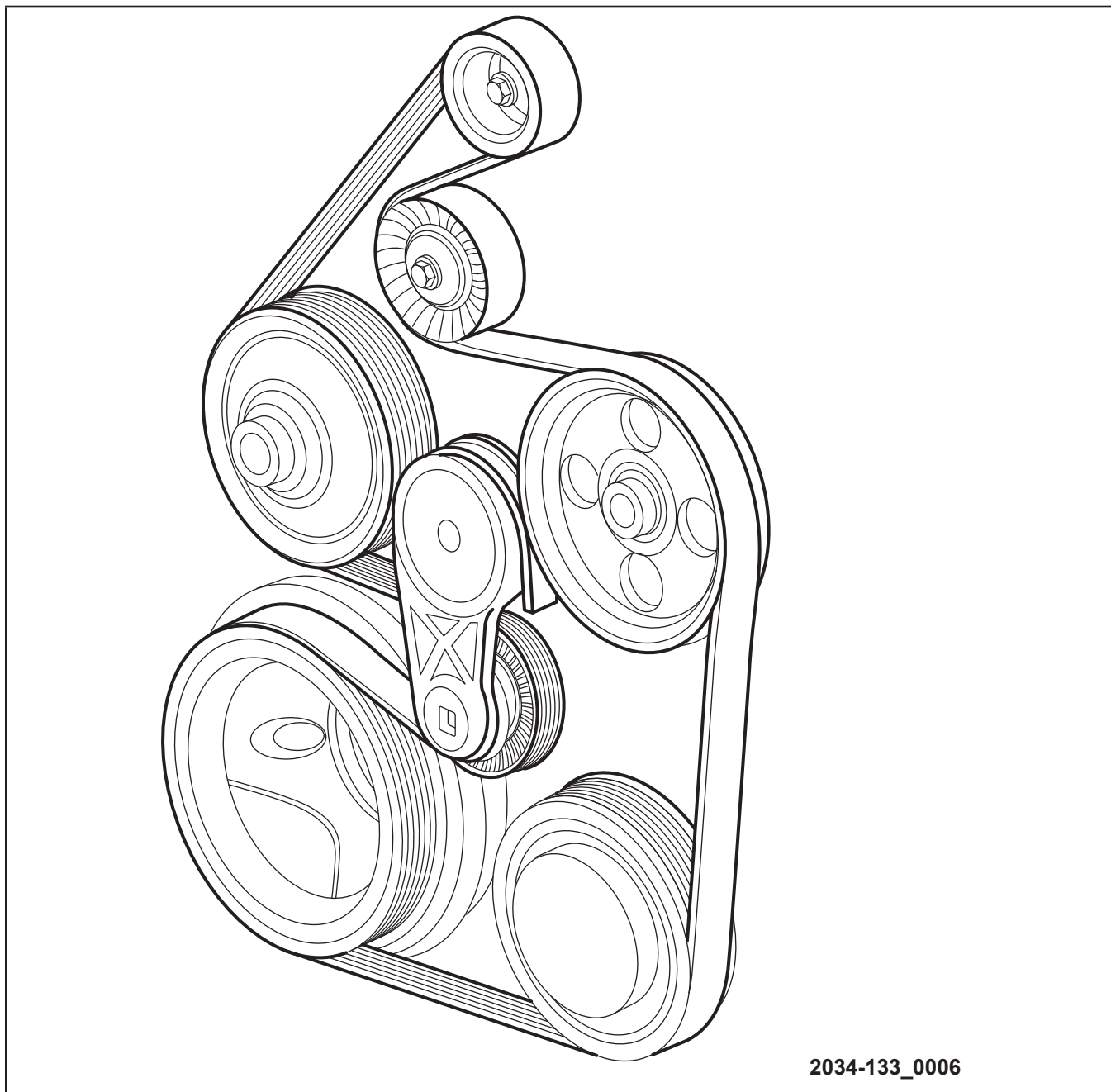


Figure 26 Serpentine Belt Routing

FUEL INJECTION

Fuel Injectors

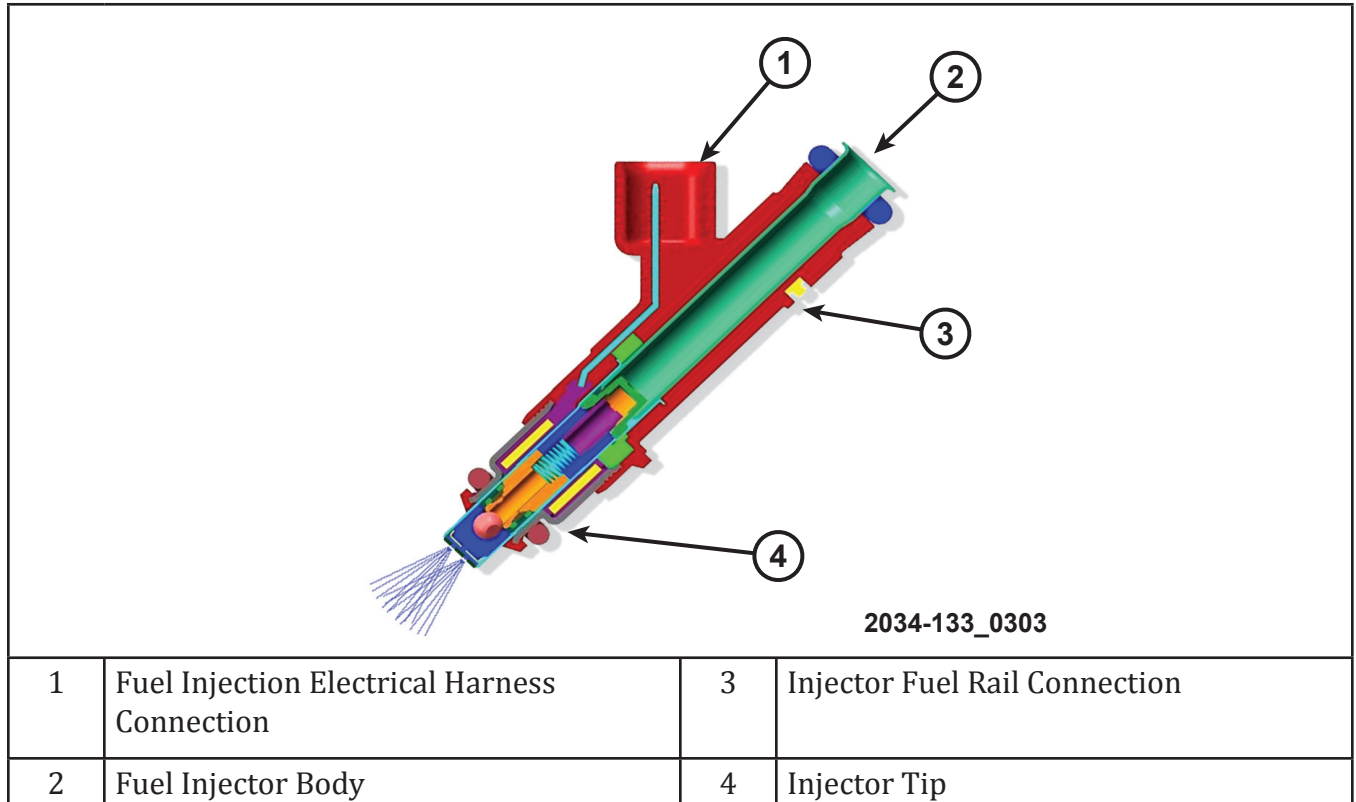


Figure 27 Fuel Injector

Fuel injectors are an output-operated device of the PCM. The PCM controls the “on” time of the injector. When the fuel injector is energized, fuel is sprayed into the engine. The fuel injectors are electrical solenoids. The injector contains a pintle that closes off an orifice at the nozzle end. When electric current is supplied to the injector, the armature and needle move a short distance against a spring, allowing fuel to flow out the orifice. Because the fuel is under high pressure, a fine spray is developed in the shape of a pencil stream. The spraying action atomizes the fuel, adding it to the air entering the combustion chamber.

The nozzle (outlet) ends of the injectors are positioned into openings in the intake manifold just above the intake valve ports of the cylinder head. The engine wiring harness connector for each fuel injector is equipped with an attached numerical tag (INJ 1, INJ 2, etc.). This is used to identify each fuel injector.

The injectors are energized individually in a sequential order by the powertrain control module (PCM). The PCM will adjust injector pulse width by switching the ground path to each individual injector on and off. Injector pulse width is the period of time that the injector is energized. The PCM will adjust injector pulse width based on various inputs it receives.

Battery voltage is supplied to the injectors through the ASD relay.

The PCM determines injector pulse width based on various inputs.

Multiple Displacement System

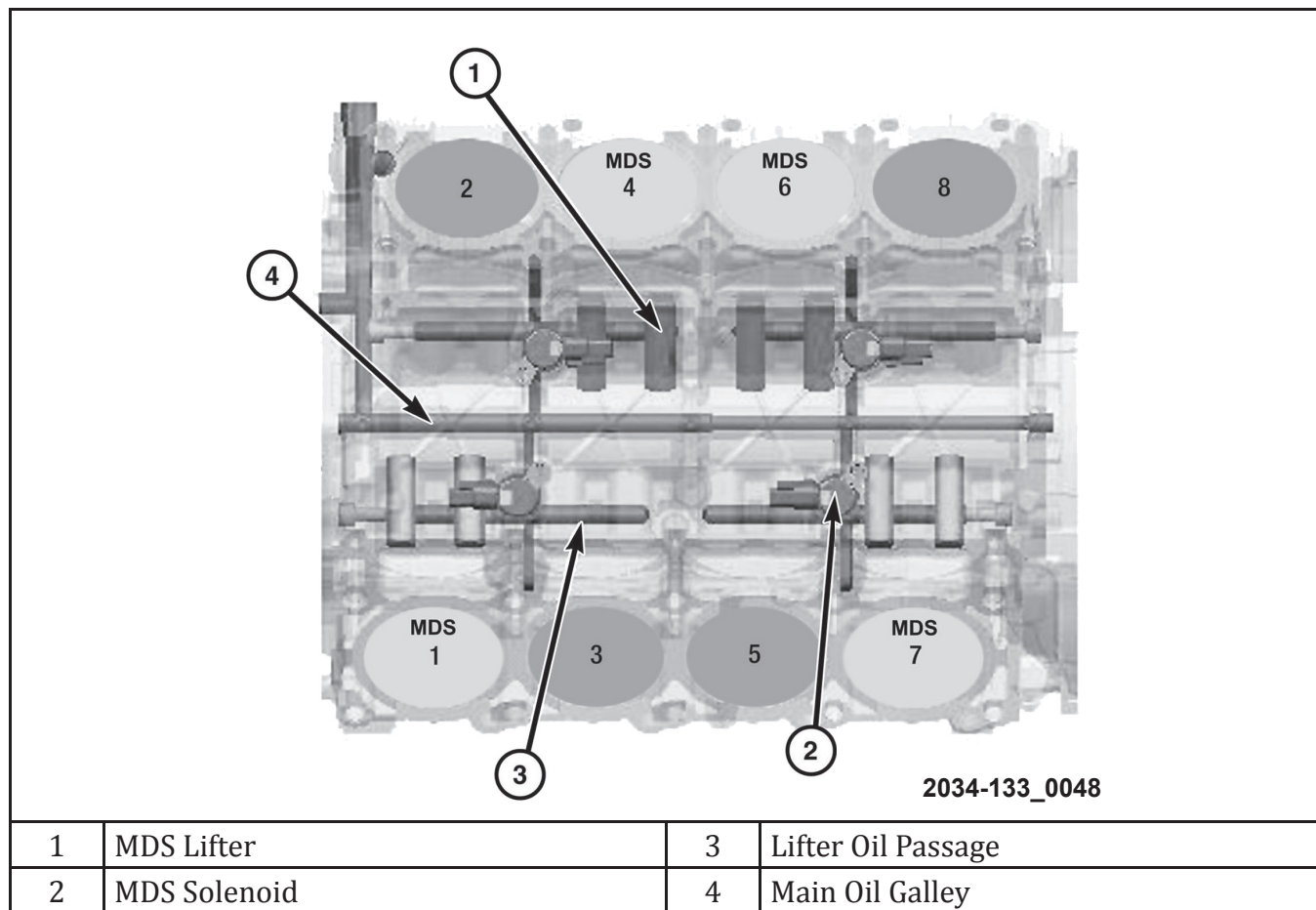


Figure 28 Multiple Displacement System (MDS)

The multiple displacement system (MDS) selectively deactivates cylinders 1, 4, 6, and 7 during steady speed, low acceleration, and shallow grade climbing conditions to increase fuel economy.

The MDS can provide a fuel economy benefit when operating in four-cylinder mode, depending on driving habits and vehicle usage. For EPA rating purposes, the fuel economy is 8 to 15% higher than if the engine was operating on eight-cylinders at all times.

The MDS deactivating lifter can be distinguished from the non-MDS lifter by the disconnecting pin on the side of the MDS lifter.

The MDS is integrated into the basic engine architecture, requiring these additional components:

- Unique MDS camshaft
- Deactivating roller lifters
- MDS control valve solenoids
- MDS control valve solenoid wiring harness
- Oil temperature sensor

Lifters

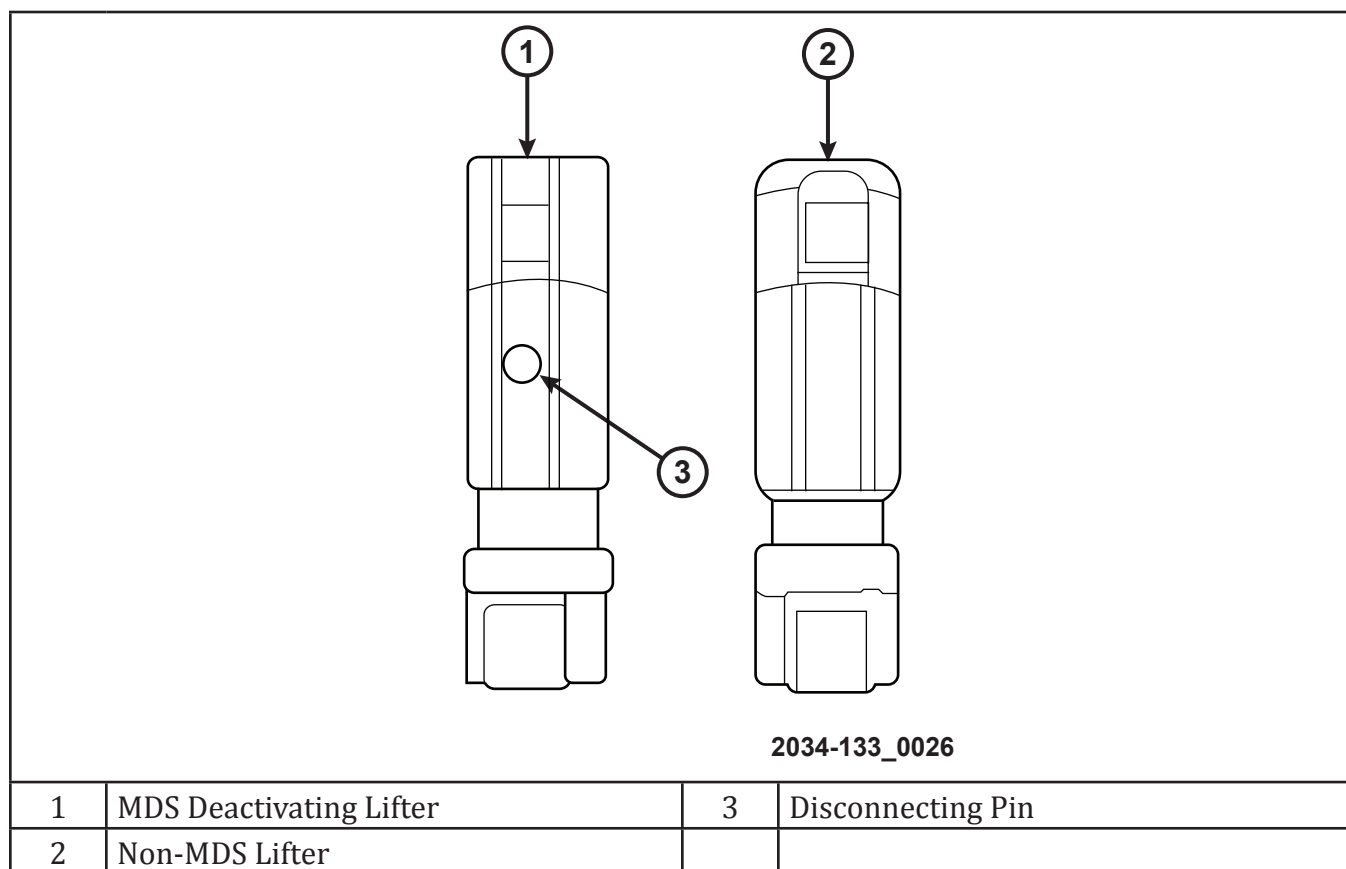


Figure 29 MDS and Non-MDS Lifter

Operation

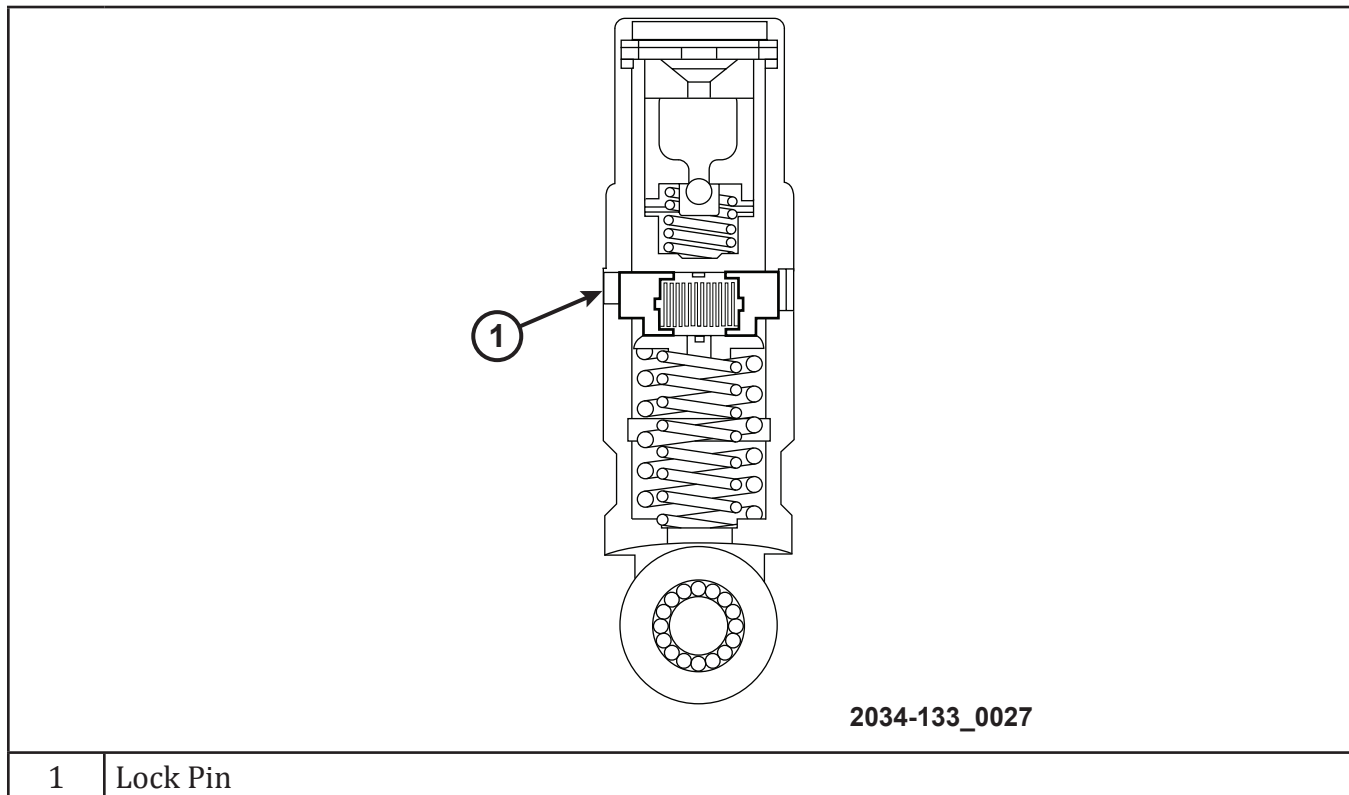


Figure 30 MDS Lifter Cross-section

The multiple displacement system (MDS) provides cylinder deactivation during steady speed, low acceleration and shallow grade climbing conditions to increase fuel economy. Both four-cylinder and eight-cylinder configurations have even firing intervals to provide smooth operation. The MDS selectively deactivates cylinders one, four, six, and seven to improve fuel economy. All deactivated cylinders have unique hydraulic lifters that collapse when deactivated to prevent the valves from opening. Engine oil pressure is used to activate and deactivate the valves. Oil is delivered through special oil passages drilled into the cylinder block. The MDS solenoid valves control the flow. When activated, pressurized oil pushes a latching pin on each MDS lifter, which becomes a lost motion link. The base of the MDS lifter follows the camshaft while the top remains stationary. The MDS lifter is held in place against the pushrod by light spring pressure but is unable to move because of the much higher force of the valve spring.

Deactivation occurs during the compression stroke of each cylinder, after air and fuel enter the cylinder. Ignition occurs, but the combustion products remain trapped in the cylinder under high pressure, because the valves no longer open. No fuel-air enters or leaves during subsequent piston strokes. This high-pressure gas is repeatedly compressed and expanded like an air spring.

Note: It is critical to use the recommended oil viscosity in engines that use MDS.

Notes: _____

CYLINDER HEAD SERVICE

The cylinder head service has unique features that need to be observed including the following:

- Head gaskets that are not interchangeable between sides and need to be installed with the correct side up
- Push rods that are different lengths for intake or exhaust
- Rocker arms that are marked for the correct valve

CAUTION: The cylinder head gaskets are not interchangeable between the left and right sides. They are marked with an “L” and “R” to indicate the left or right side and they are marked “TOP” to indicate which side goes up.

CAUTION: The head gaskets are marked “TOP” to indicate which side goes up.

CAUTION: The longer pushrods are for the exhaust side and the shorter pushrods are for the intake side.

CAUTION: The rocker shaft assemblies are not interchangeable between the intake and the exhaust, failure to install them in the correct location could result in engine damage. The intake rocker arms are marked with the letter “I”.

Notes: _____

VARIABLE CAM TIMING

VCT System

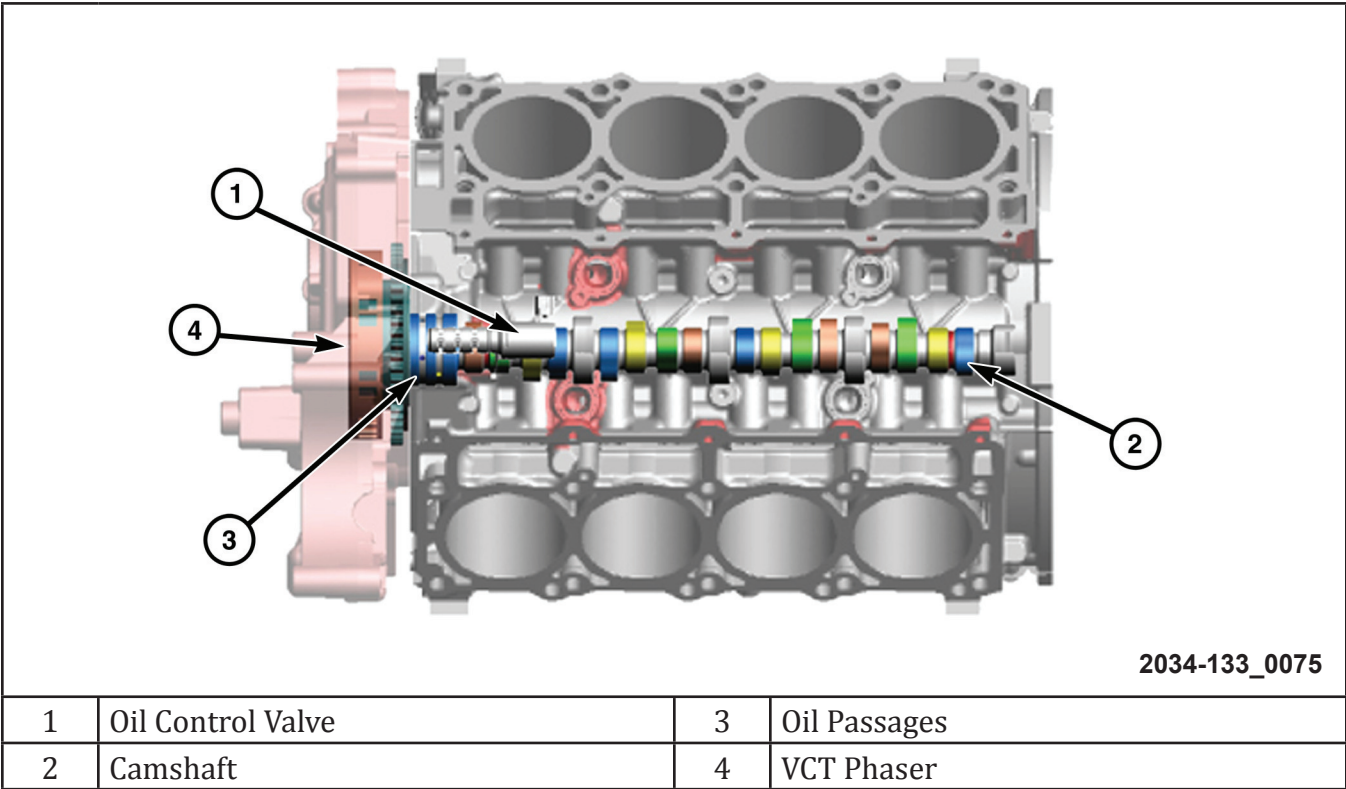


Figure 31 VCT System

The 5.7L HEMI utilizes a variable camshaft timing (VCT) system. This system is controlled by the powertrain control module (PCM). The PCM varies the timing of the valves, advancing or retarding the opening relative to piston motion. The lobes on the camshaft open the valves for a certain amount of time during the combustion cycle. The timing of the opening and closing of the valves is controlled by the VCT system. In a non-VCT system, the timing is fixed, and optimized for a certain engine speed, so there is a trade-off that limits power and torque, emissions reduction, and fuel economy. VCT allows the timing to change, which means the engine can achieve the best overall performance across the engine’s normal operating range.

The following components make up the VCT system:

- Camshaft phaser with tone wheel
- Oil control valve (OCV)
- Camshaft
- Unique oil passages
- Powertrain control module (PCM)

VCT Components

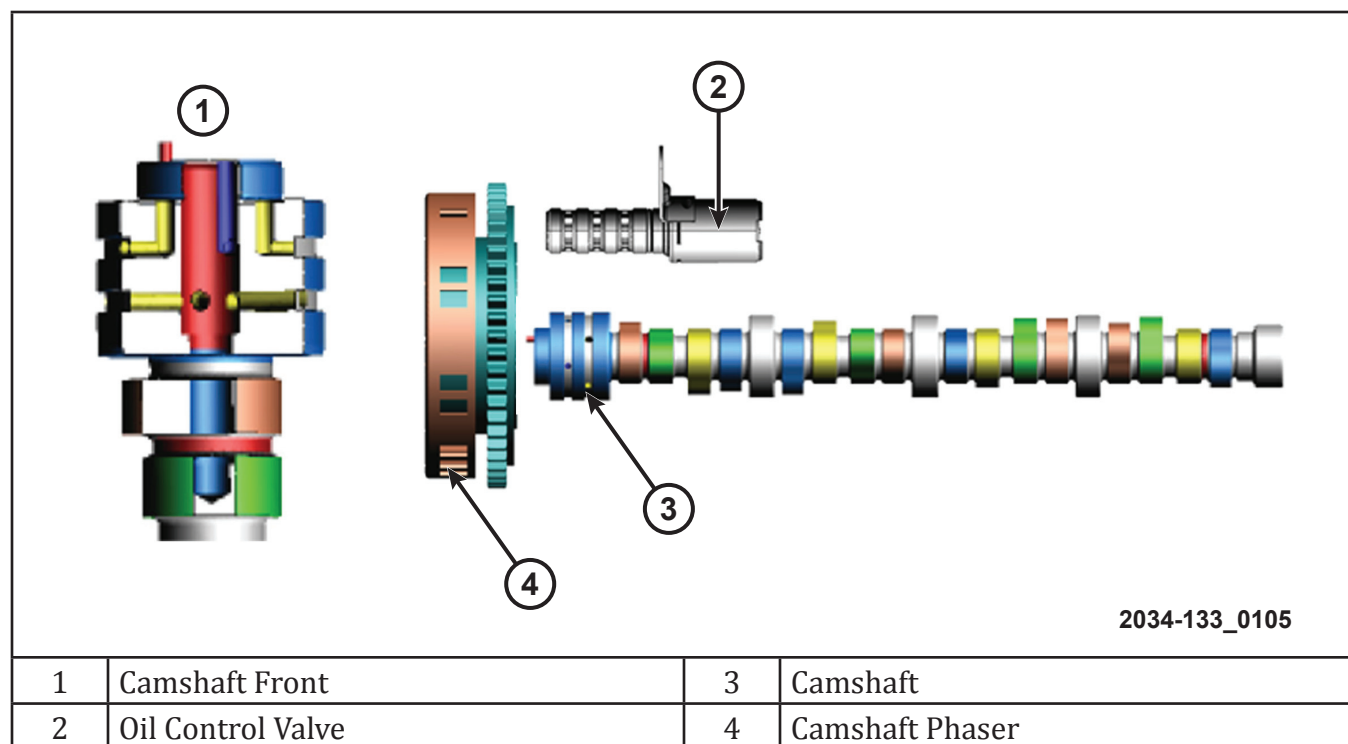


Figure 32 VCT Components

VCT Cam Drive

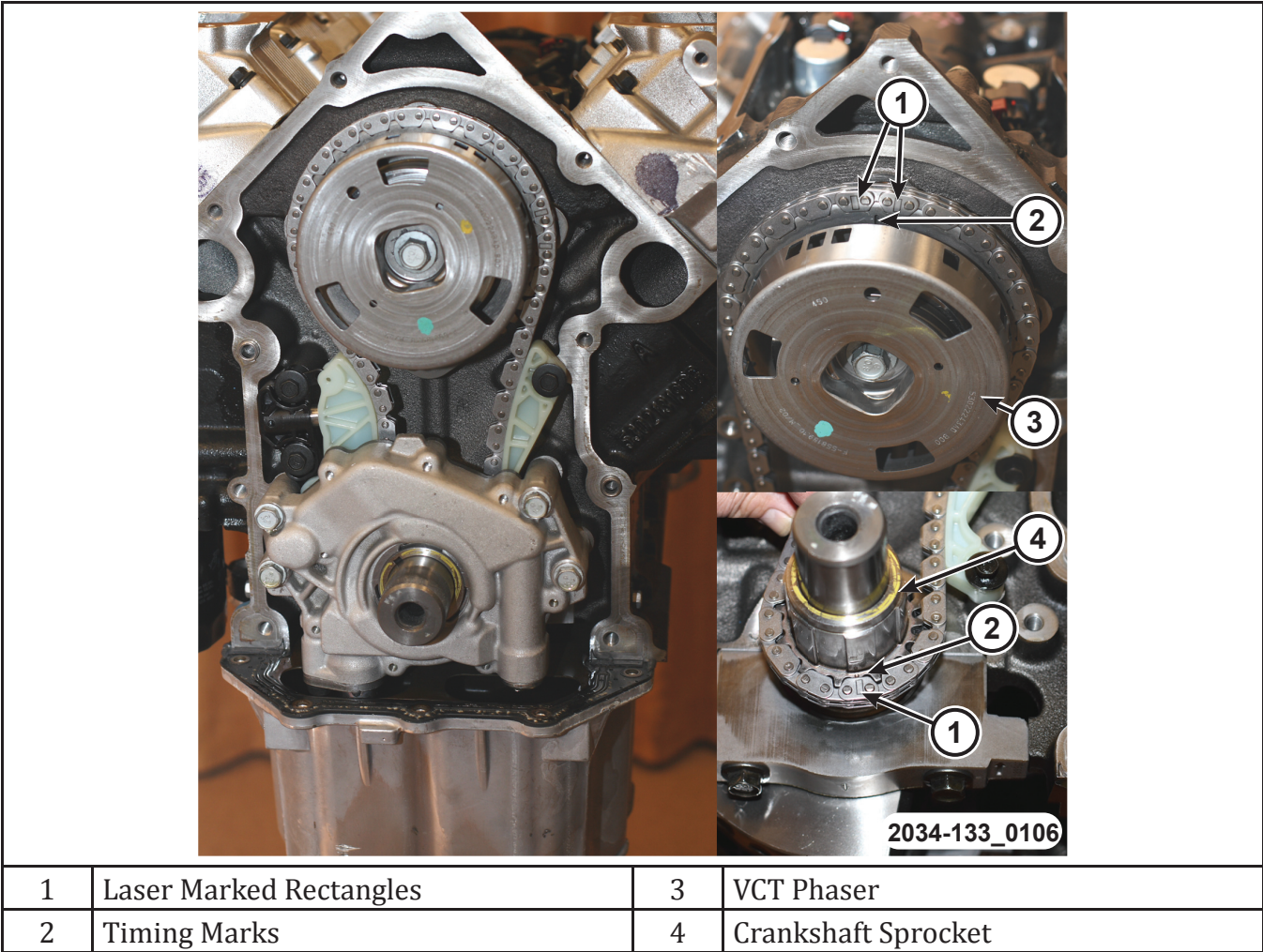


Figure 33 VCT Cam Drive

CAUTION: Never attempt to disassemble the camshaft phaser, severe engine damage could result.

VCT Reset

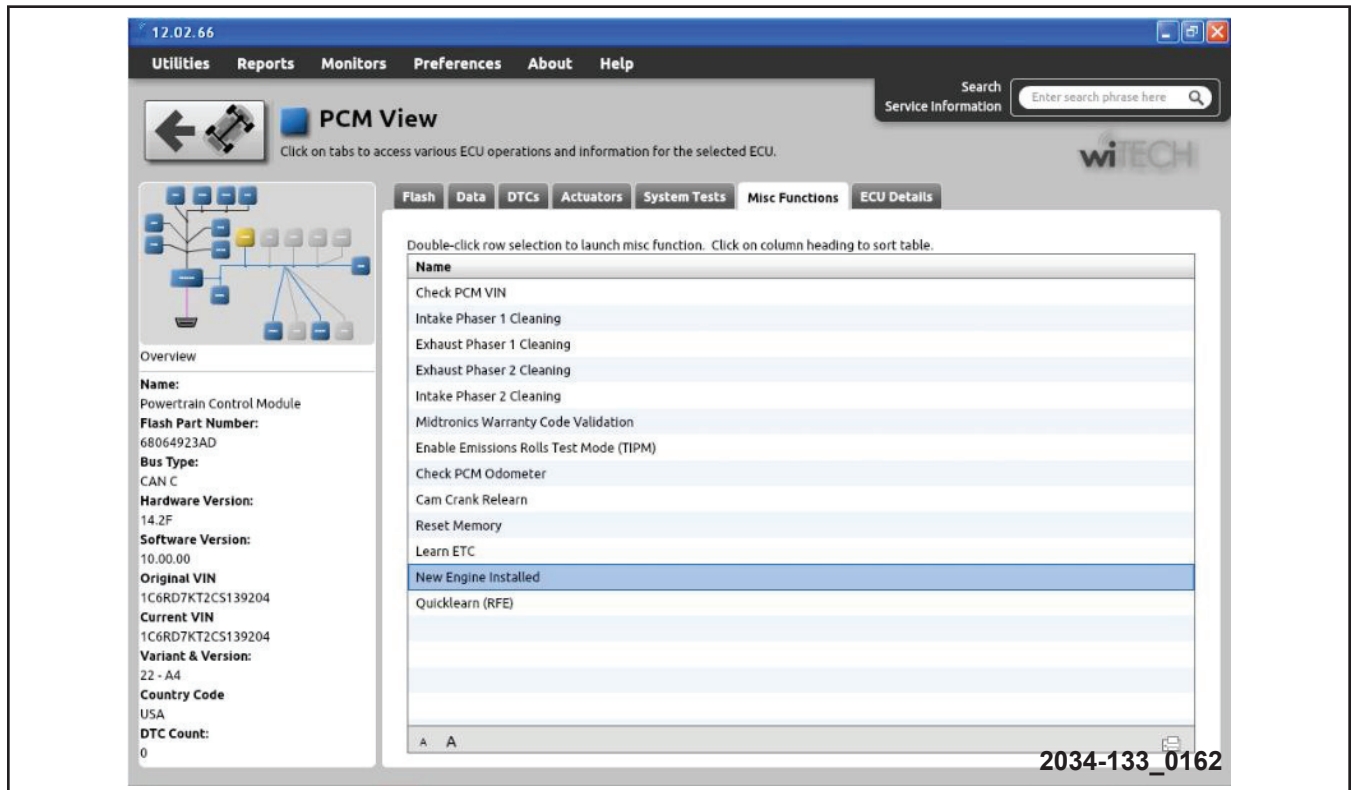


Figure 34 VCT Reset

If an engine is replaced (this includes short block replacement), it will be necessary to perform the New Engine Installed procedure using the scan tool. When working with the scan tool, select PCM, then select Miscellaneous, and then New Engine Installed.

The scan tool resets the oil pressure range that enables the VCT. On a new engine, lower engine oil pressure does not allow the VCT system to actuate quickly enough and could cause a performance fault. The scan tool changes the window for enabling VCT by changing the oil pressure specification. After 3750 miles, the oil pressure specification returns to normal.

Notes: _____

OIL

Viscosity DTC

Improper oil change intervals or incorrect oil viscosity can cause DTCs to be set. If the vehicle sets a P1521 Incorrect Engine Oil Type DTC check the following.

P1521 INCORRECT ENGINE OIL TYPE

When Monitored:

- Engine running

Set Condition:

Using oil pressure, oil temperature, and other engine inputs the powertrain control module (PCM) can determine the engine oil viscosity. Incorrect viscosity will affect the operation of the multi-displacement system (MDS) and/or the variable cam timing (VCT) system.

Possible Causes:

- Incorrect engine oil type
- Engine oil contamination
- Engine oil

Review the customer's oil change history. Make sure the customer is using the correct engine oil viscosity. If the incorrect oil is being used, change the oil, using the correct engine oil viscosity.

The following conditions must be checked:

- OEM recommended oil viscosity is being used
- Customer is following the oil change schedule
- Check the engine oil for contamination. (such as fuel and/or engine coolant)
- Internal engine conditions that may affect oil pressure

Engine Oiling System

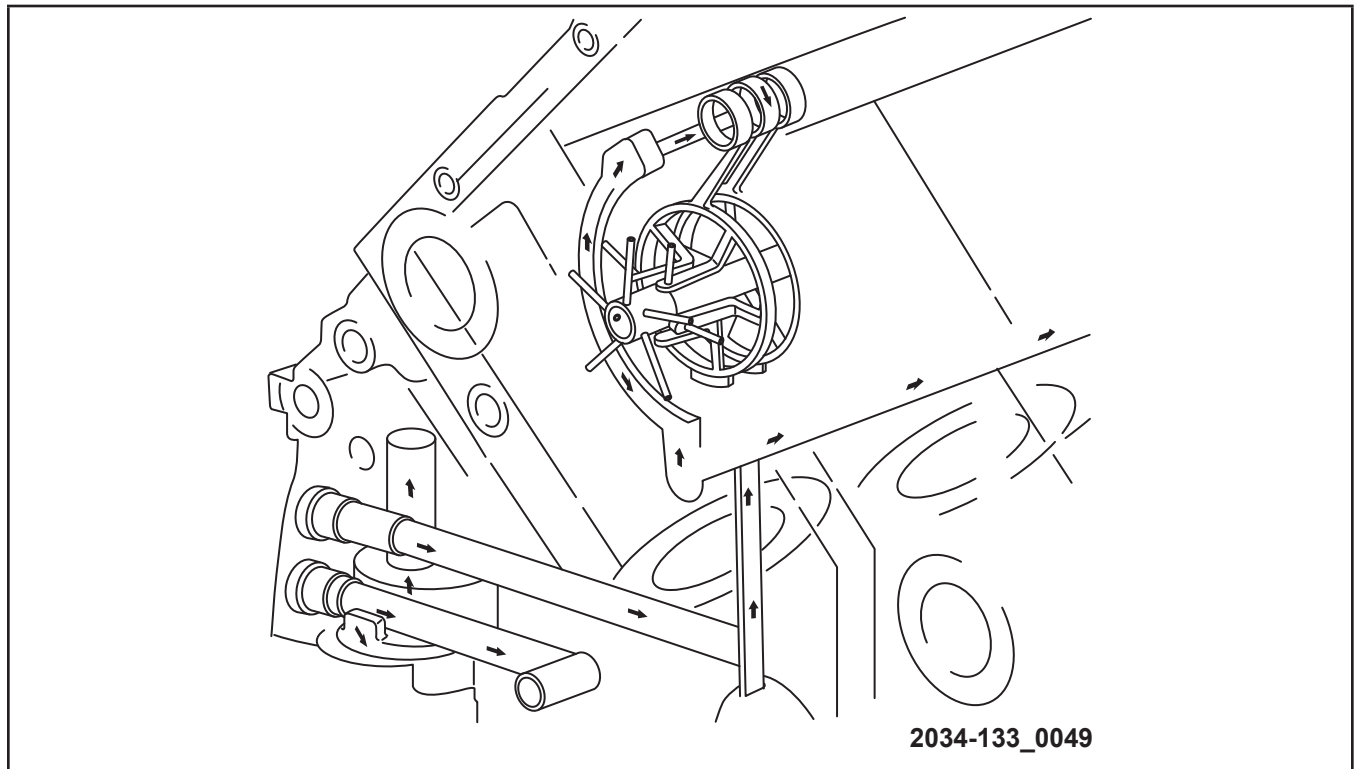


Figure 35 Engine Oiling System

Notes: _____

TRANSMISSION

The 65RFE automatic transmissions is a sophisticated, multi-range, electronically controlled transmission that combines optimized gear ratios for responsive performance, state of the art efficiency features, and low NVH. Other features include driver adaptive shifting and three planetary gear sets to provide wide ratio capability with precise ratio steps for optimum drivability. The three planetary gear sets also make a unique alternate second gear ratio available. The primary 2nd gear ratio fits between 1st and 3rd gears for normal through-gear accelerations. The alternate second gear ratio (2 prime) allows smoother 4-2 kickdowns at high speeds to provide 2nd gear passing performance over a wider highway cruising range.

The hydraulic portion of the transmission consists of the transmission fluid, fluid passages, hydraulic valves, and various line pressure control components.

The primary mechanical components of the transmission consist of the following:

- Three multiple disc input clutches
- Three multiple disc holding clutches
- Five hydraulic accumulators
- Three planetary gear sets
- Dual stage hydraulic oil pump
- Valve body
- Solenoid pack

65RFE Transmission

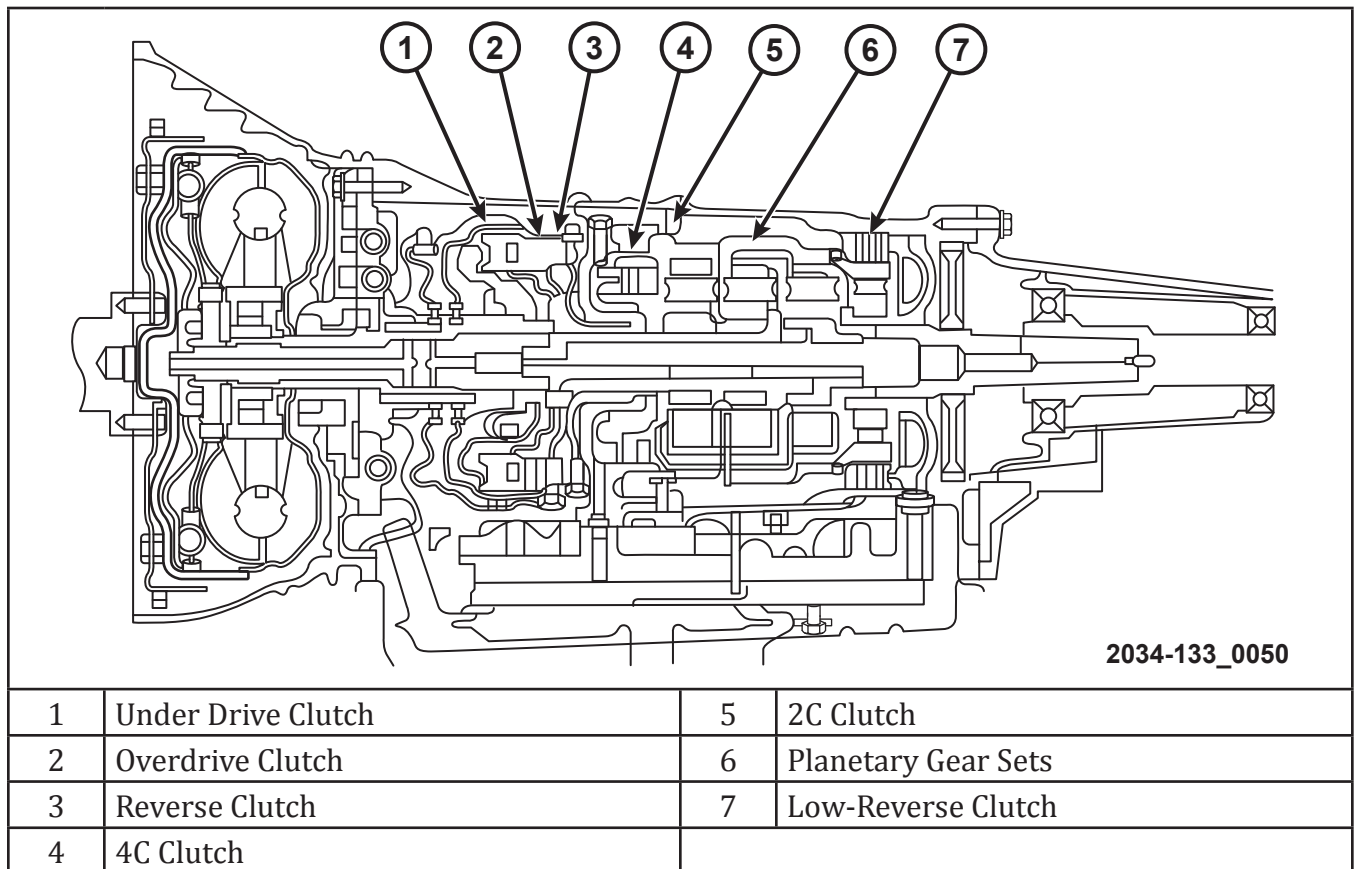


Figure 36 65RFE Transmission

The transmission control module (TCM) is the “heart” or “brain” of the electronic control system and relies on information from various direct and indirect inputs (sensors, switches, etc.) to determine driver demand and vehicle operating conditions. The TCM is housed along with the powertrain control module (PCM) in a single module. With this information, the TCM can calculate and perform shifts through various output or control devices (solenoid pack, transmission control relay, etc.).

Notes: _____

Transmission Identification

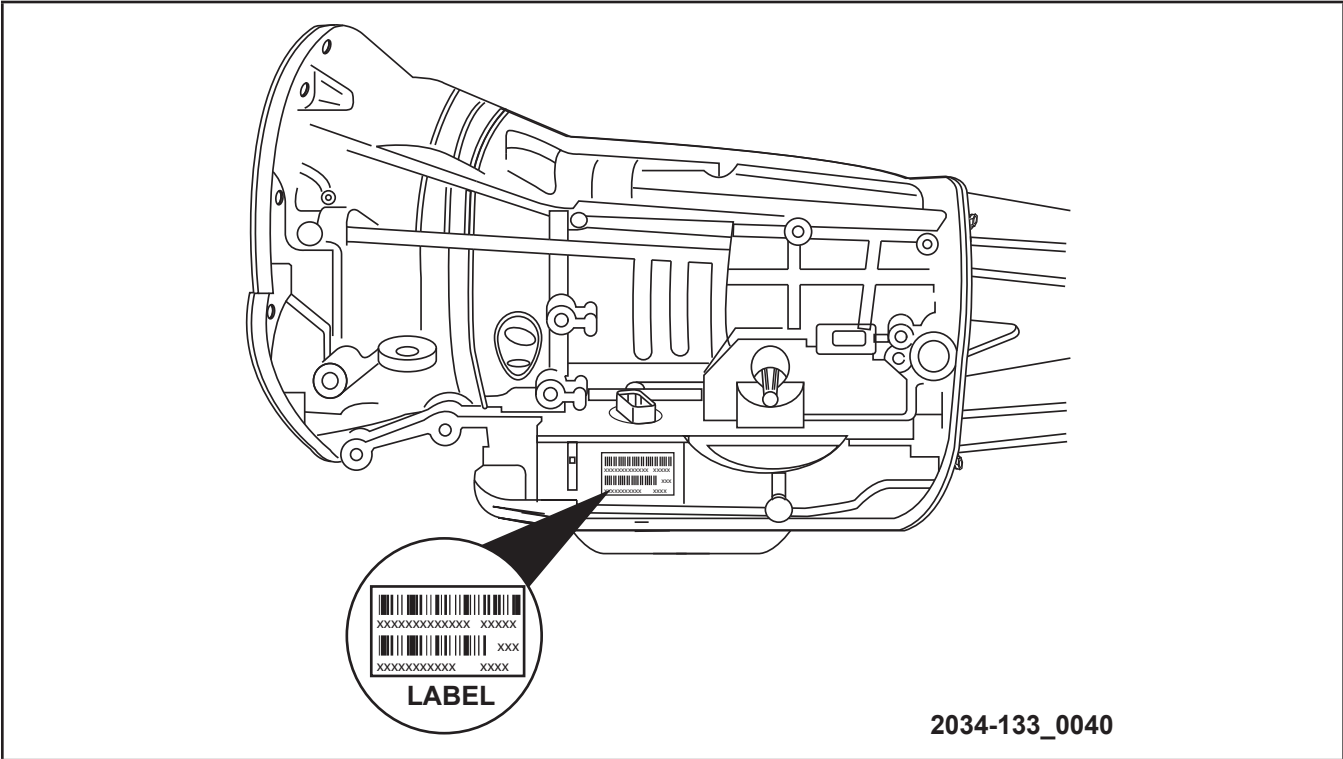


Figure 37 Transmission Identification Plate

Transmission identification numbers are stamped (1) on the left side of the case just above the oil pan sealing surface. Refer to this information when ordering replacement parts. A label is attached to the transmission case above the stamped numbers. The label gives additional information that may also be necessary for identification purposes.

Gear Ratio

Gear	Gear Ratio
1st	3.00:1
2nd	1.67:1
3rd	1.50:1
4th	1.00:1
5th	0.75:1
6th	0.67:1
Reverse	3.00:1

Table 7 Transmission Gear Ratios

Notes: _____

Transmission Operation

The 65RFE offers full electronic control of all automatic upshifts and downshifts. This transmission features real-time adaptive closed-loop shift and pressure control. Electronic shift and torque converter clutch controls help protect the transmission from damage due to high temperatures, which can occur under severe operating conditions. By altering shift schedules, line pressure, and converter clutch control, these controls reduce heat generation and increase transmission cooling.

To help reduce efficiency-robbing parasitic losses, the transmission includes a dual-stage transmission fluid pump with electronic output pressure control. Under most driving conditions, pump output capacity greatly exceeds that which is needed to keep the clutches applied. The 65RFE pump-pressure control system monitors input torque and adjusts the pump pressure accordingly. The primary stage of the pump works continuously; the second stage is bypassed when demand is low. The control system also monitors input and output speed and, if incipient clutch slip is observed, the pressure control solenoid duty cycle is varied, increasing pressure in proportion to demand.

A high-travel torque converter damper assembly allows earlier torque converter clutch engagement to reduce slippage. Needle-type thrust bearings reduce internal friction. The 65RFE is packaged in a one-piece, die-cast aluminum case. To reduce NVH, the case has high lateral, vertical, and torsional stiffness. Dual filters protect the pump and other components. A cooler return filter is added to the customary main sump filter. Independent lubrication and cooler circuits ensure ample pressure for normal transmission operation even if the cooler is obstructed or the fluid cannot flow due to extremely low temperatures.

Note: **Vehicles equipped with electronic range select (ERS) do not provide 2nd gear in limp-in, because the shift lever has no “2” or “1” position.**

The hydraulic control system design (without electronic assist) provides the transmission with park, reverse, neutral, second, and fourth gears, based solely on driver shift lever selection. This design allows the vehicle to be driven (in limp-in mode) in the event of an electronic control system failure, or a situation that the transmission control module (TCM) recognizes as potentially damaging to the transmission.

The TCM also performs certain self-diagnostic functions and provides comprehensive information (sensor data, DTCs, etc.) that is helpful in proper diagnosis and repair. This information can be viewed with the scan tool.

Notes: _____

Electronic Range Selection (ERS)



Screen Display	1	2	3	4	5*	D
Actual Gear(s) Allowed	1	1-2	1-3	1-4	1-5	1-6

Figure 38 Electronic Range Selection (ERS) Mode Switch

On vehicles equipped with 4.7L or 5.7L engines, use of ERS (or TOW/HAUL mode) also enables an additional underdrive gear that is not normally used during through-gear accelerations. This additional gear improves vehicle performance and cooling capability when towing a trailer on certain grades. In ERS mode, first through third gear are underdrive gears, and fourth gear is direct drive. ERS fifth gear (overdrive) is the same as the normal fourth gear.

When in the drive position in first through fourth gear, the first tap down (-), will display the ERS designation for the current gear (the transmission will not downshift). For example, if you are in drive and are in third (direct) gear, when you tap the shift lever/switch one time in the (-) direction, the display will show 4 (ERS 4 is direct gear). Another tap down (-) will shift the transmission down to ERS 3 (the added underdrive gear). When in the drive position in fifth gear, the first tap down (-) will downshift the transmission and display 5 (ERS 5 is the same as normal fourth gear). Another tap down (-) will shift the transmission down to ERS 4 (direct gear).

To exit ERS mode, press and hold the shift lever/switch in the (+) position until D is once again highlighted in the instrument cluster display.

WARNING: **DO NOT DOWNSHIFT FOR ADDITIONAL ENGINE BRAKING ON A SLIPPERY SURFACE. THE DRIVE WHEELS COULD LOSE THEIR GRIP AND THE VEHICLE COULD SKID.**

Note: **To select the proper gear position for maximum deceleration (engine braking), hold the shift lever/switch in the (-) position continuously while braking. The transmission will shift to the range from which the vehicle can best be slowed down.**

TOW/HAUL Mode

Figure 39 TOW/HAUL Switch

When driving in hilly areas, towing a trailer, carrying a heavy load, etc., and frequent transmission shifting occurs, press the TOW/HAUL switch. This will improve performance and reduce the potential for transmission overheating or failure due to excessive shifting. When operating in TOW/HAUL mode, the transmission will shift to third gear and fourth gear will be enabled under steady cruise conditions.

The TOW/HAUL Indicator Light will illuminate in the instrument cluster to indicate when the switch has been activated. Pressing the switch a second time restores normal operation. If the TOW/HAUL mode is desired, the switch must be pressed each time the engine is started.

Notes: _____

Transmission Cooler

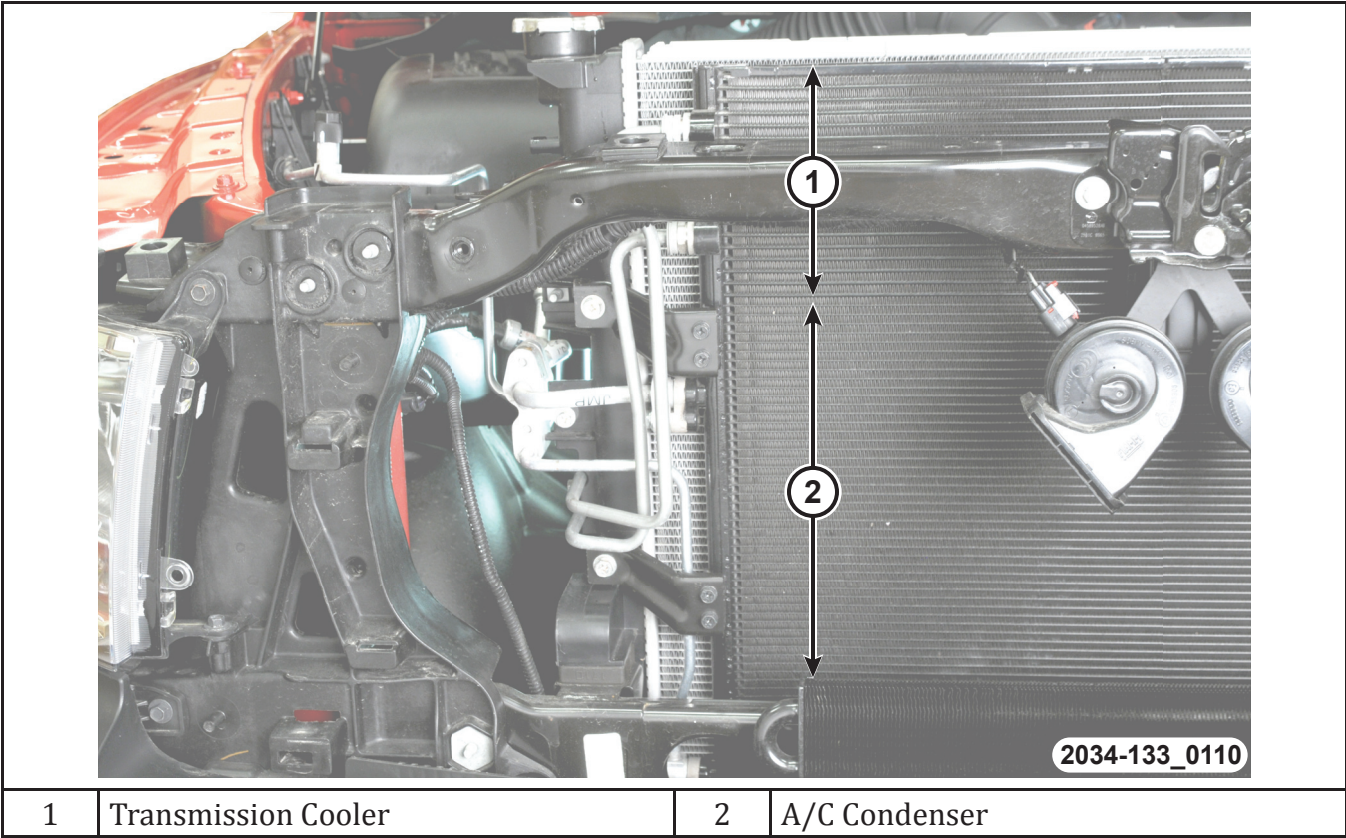


Figure 40 Transmission Cooler Location

An air-to-oil transmission oil cooler is standard on all engine packages. The transmission oil cooler is mounted to the front of the radiator above the power steering cooler.

Transmission Cooler Line Fittings

Similar to other lines in the engine compartment, the transmission cooler utilizes quick connect fittings. Special tools are required to service these fittings.

Notes: _____

TRANSFER CASE

Figure 41 4-Wheel Drive Selection

Description

The NVG243 is an electronically controlled, part-time transfer case with a low range gear reduction system. The NVG243 has three operating ranges plus a neutral position. The low range system provides a gear reduction ratio for increased torque capability at low speeds.

The geartrain is mounted in two aluminum case halves attached with bolts. The main-shaft front and rear bearings are mounted in aluminum retainer housings bolted to the case halves.

Transfer case operating ranges are:

- 2WD (2-wheel drive)
- 4HI (4-wheel drive)
- 4LO (4-wheel drive low range)
- Neutral

The 2WD range is for use on any road surface at any time.

The 4HI and 4LO ranges are for off road use only. They are not for use on hard surface roads except when the road surface is wet, slippery, or covered by ice and snow.

The low range reduction gear system is operative in 4LO range only. This range is for extra pulling power in off road situations. The low range reduction ratio is 2.72:1.

Note: The transfer case neutral position is selected by pressing the recessed button located on the lower left hand corner of the 4WD control switch. The transfer case neutral position is to be used for recreational towing only. Refer to “Recreational Towing” in “Starting and Operating” for further information.

Shift Mechanism

Operating ranges are selected with a dash-mounted shift selector switch. The shift selector switch provides an input to the drive train control module (DTCM) to indicate the driver's desire to change operating ranges. The DTCM uses this input, along with input from the transfer-case-mounted mode sensor and information from the vehicle's bus, to determine if a shift is permitted. If the DTCM decides the shift is permitted, the DTCM controls the shift motor, which is mounted to the exterior of the transfer case, to perform the shift.

Transfer Case Position Indicator Lights

The transfer case position indicator lights (4WD and 4LOW) are located in the instrument cluster and indicate the current and desired transfer case selection. When you select a different transfer case position, the indicator lights will do the following:

If all shift conditions are met:

- The current position indicator light will turn off.
- The selected position indicator light will flash until the transfer case completes the shift.
- When the shift is complete, the indicator light for the selected position will stop flashing and remain ON.

If one or more shift conditions are not met:

- The indicator light for the current position will remain on.
- The newly selected position indicator light will continue to flash.
- The transfer case will not shift.

Note: Before retrying a selection, make certain that all the necessary requirements for selecting a new transfer case position have been met. To retry the selection, turn the control knob back to the current position, wait 5 seconds, and retry selection. To find the shift requirements, refer to the "Shifting Procedure" for your transfer case, located in this section.

The SVC 4WD warning light monitors the electronic shift four-wheel drive system. If this light remains on after engine start up or illuminates during driving, it means that the four-wheel drive system is not functioning properly and that service is required.

WARNING: ALWAYS ENGAGE THE PARKING BRAKE WHEN POWERING DOWN THE VEHICLE IF THE "SVC 4WD WARNING LIGHT" IS ILLUMINATED. NOT ENGAGING THE PARKING BRAKE MAY ALLOW THE VEHICLE TO ROLL, WHICH MAY CAUSE PERSONAL INJURY.

Note: Do not attempt to make a shift while only the front or rear wheels are spinning, as this can cause damage to driveline components.

When operating the vehicle in 4WD LOW, the engine speed is approximately three times that of the 2WD or 4WD LOCK positions at a given road speed. Take care not to overspeed the engine and do not exceed 40 km/h (25 mph).

Proper operation of four-wheel drive vehicles depends on tires of equal size, type, and circumference on each wheel. Any difference in tire size can cause damage to the drivetrain.

Because four-wheel drive provides improved traction, there is a tendency to exceed safe turning and stopping speeds. Do not go faster than road conditions permit.

WARNING: YOU OR OTHERS COULD BE INJURED IF YOU LEAVE THE VEHICLE UNATTENDED WITH THE TRANSFER CASE IN THE NEUTRAL POSITION WITHOUT FIRST FULLY ENGAGING THE PARKING BRAKE. THE TRANSFER CASE NEUTRAL POSITION DISENGAGES BOTH THE FRONT AND REAR DRIVESHAFTS FROM THE POWERTRAIN AND WILL ALLOW THE VEHICLE TO MOVE REGARDLESS OF THE TRANSMISSION POSITION. THE PARKING BRAKE SHOULD ALWAYS BE APPLIED WHEN THE DRIVER IS NOT IN THE VEHICLE.

Notes: _____

Identification

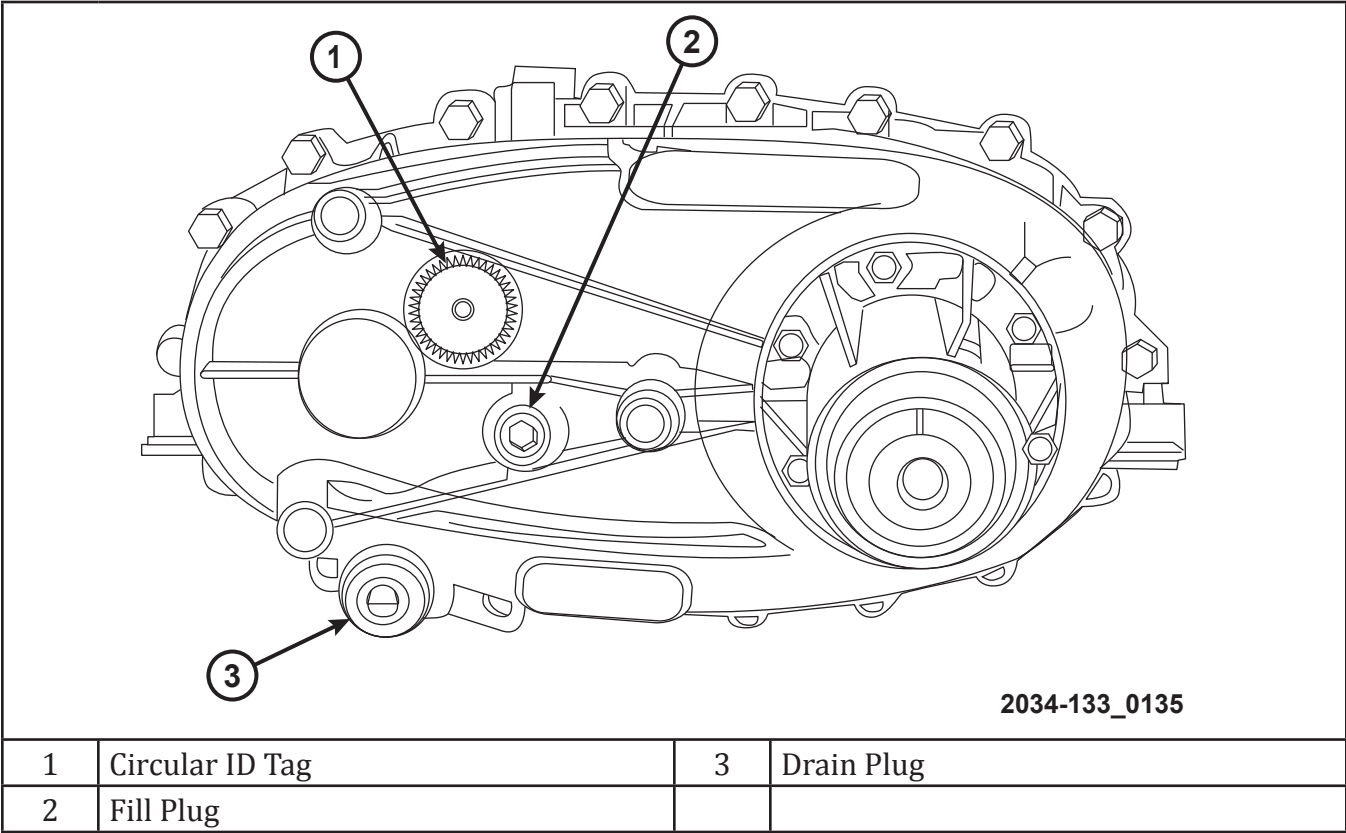


Figure 42 Transfer Case Identification

A circular ID tag (1) is attached to the rear case of each transfer case. The ID tag provides the transfer case model number, assembly number, serial number, and low range ratio.

The transfer case serial number also represents the date of build.

Operation

The input gear is splined to the transmission output shaft. The input gear drives the mainshaft through the planetary assembly and range sleeve. The front output shaft is operated by a drive chain that connects the shaft to a drive sprocket on the mainshaft. The drive sprocket is engaged/disengaged by the mode fork, which operates the mode sleeve and hub. The sleeve and hub are not equipped with a synchronizer mechanism for shifting.

Service and Fluid Type

Refer to the maintenance information section of the Student Guide.

Notes: _____

Towing the Vehicle

TYPE OF TOW	AXLE on GROUND	ALLOWED
Wheel Lift and Dolly Tow	Front	Not Allowed
Wheel Lift and Dolly Tow	Rear	Not Allowed
Flatbed or Rollback	None	Best Method

Table 8 Towing

Proper towing or lifting equipment is required to prevent damage to your vehicle. Use only tow bars and other equipment designed for the purpose. Follow the equipment manufacturer's instructions. Use of safety chains is mandatory. Attach a tow bar or other towing device to main structural members of the vehicle, not to bumpers or associated brackets. State and local laws applying to vehicles under tow must be observed.

If the accessories must be used while being towed, the ignition must be in the ON/RUN position, not the ACC position.

If the vehicle's battery is discharged, see "Brake/Transmission Interlock Manual Override under Starting and Operating, Automatic Transmission" for instructions on shifting the automatic transmission out of the park position for towing.

Caution: Do not attempt to use sling type equipment when towing. When securing the vehicle to a flat bed truck, do not attach to the front or rear suspension components. Damage to the vehicle may result from improper towing.

If the vehicle being towed requires steering, the ignition must be in the ON/RUN or ACC position, not in the LOCK position.

Notes: _____

Notes:

LESSON 5 CHASSIS

CHASSIS



Figure 43 Chassis View

Towing Requirements

To promote proper break-in of the new vehicle drivetrain components observe all cautions and warnings.

Caution: Do not tow a trailer at all during the first 805 km (500 miles) the new vehicle is driven. The engine, axle or other parts could be damaged.

Then, during the first 805 km (500 miles) that a trailer is towed, do not drive over 80 km/h (50 mph) and do not make starts at full throttle. This helps the engine and other parts of the vehicle wear in at the heavier loads.

Notes: _____

WARNING: IMPROPER TOWING CAN LEAD TO A COLLISION. FOLLOW THESE GUIDELINES TO MAKE YOUR TRAILER TOWING AS SAFE AS POSSIBLE:

MAKE CERTAIN THAT THE LOAD IS SECURED IN THE TRAILER AND WILL NOT SHIFT DURING TRAVEL. WHEN TRAILERING CARGO THAT IS NOT FULLY SECURED, DYNAMIC LOAD SHIFTS CAN OCCUR THAT MAY BE DIFFICULT FOR THE DRIVER TO CONTROL. YOU COULD LOSE CONTROL OF THE VEHICLE AND HAVE A COLLISION.

WHEN HAULING CARGO OR TOWING A TRAILER, DO NOT OVERLOAD THE VEHICLE OR TRAILER. OVERLOADING CAN CAUSE A LOSS OF CONTROL, POOR PERFORMANCE OR DAMAGE TO BRAKES, AXLE, ENGINE, TRANSMISSION, STEERING, SUSPENSION, CHASSIS STRUCTURE, OR TIRES.

SAFETY CHAINS MUST ALWAYS BE USED BETWEEN THE VEHICLE AND TRAILER. ALWAYS CONNECT THE CHAINS TO THE HOOK RETAINERS OF THE VEHICLE HITCH. CROSS THE CHAINS UNDER THE TRAILER TONGUE AND ALLOW ENOUGH SLACK FOR TURNING CORNERS.

VEHICLES WITH TRAILERS SHOULD NOT BE PARKED ON A GRADE. WHEN PARKING, APPLY THE PARKING BRAKE ON THE TOW VEHICLE. PUT THE TOW VEHICLE TRANSMISSION IN PARK. FOR FOUR-WHEEL DRIVE VEHICLES, MAKE SURE THE TRANSFER CASE IS NOT IN NEUTRAL. ALWAYS BLOCK OR "CHOCK" THE TRAILER WHEELS.

TOTAL WEIGHT MUST BE DISTRIBUTED BETWEEN THE TOW VEHICLE AND THE TRAILER SUCH THAT THE FOLLOWING FOUR RATINGS ARE NOT EXCEEDED:

- GVWR
- GTW
- GAWR
- GCWR MUST NOT BE EXCEEDED

Notes: _____

WARNING: TRAILER TONGUE WEIGHT RATING FOR THE TRAILER HITCH UTILIZED (THIS REQUIREMENT MAY LIMIT THE ABILITY TO ALWAYS ACHIEVE THE 10% TO 15% RANGE OF TONGUE WEIGHT AS A PERCENTAGE OF TOTAL TRAILER WEIGHT).

TOWING REQUIREMENTS – TRAILER BRAKES

DO NOT INTERCONNECT THE HYDRAULIC BRAKE SYSTEM OR VACUUM SYSTEM OF YOUR VEHICLE WITH THAT OF THE TRAILER. THIS COULD CAUSE INADEQUATE BRAKING AND POSSIBLE PERSONAL INJURY.

AN ELECTRONICALLY ACTUATED TRAILER BRAKE CONTROLLER IS REQUIRED WHEN TOWING A TRAILER WITH ELECTRONICALLY ACTUATED BRAKES. WHEN TOWING A TRAILER EQUIPPED WITH A HYDRAULIC SURGE ACTUATED BRAKE SYSTEM, AN ELECTRONIC BRAKE CONTROLLER IS NOT REQUIRED.

TRAILER BRAKES ARE RECOMMENDED FOR TRAILERS OVER 454 KG (1,000 LBS) AND REQUIRED FOR TRAILERS IN EXCESS OF 907 KG (2,000 LBS.).

Caution: If the trailer weighs more than 454 kg (1,000 lbs) loaded, it should have its own brakes and they should be of adequate capacity. Failure to do this could lead to accelerated brake lining wear, higher brake pedal effort, and longer stopping distances.

WARNING: TOWING ANY TRAILER WILL INCREASE YOUR STOPPING DISTANCE. WHEN TOWING YOU SHOULD ALLOW FOR ADDITIONAL SPACE BETWEEN YOUR VEHICLE AND THE VEHICLE IN FRONT OF YOU. FAILURE TO DO SO COULD RESULT IN A COLLISION.

Notes: _____

TRAILER BRAKE CONTROLLER (ITBM)

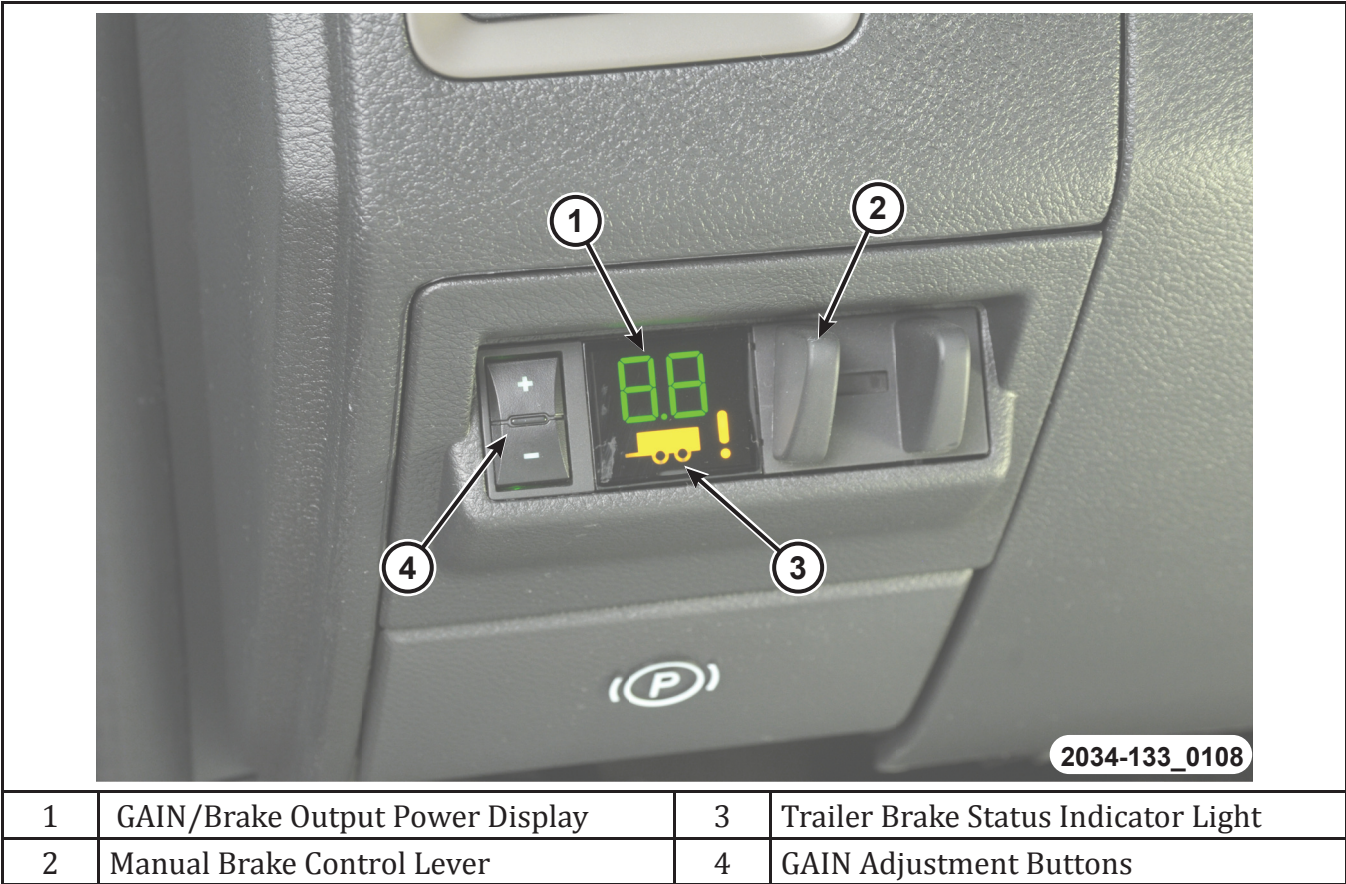


Figure 44 Integrated Trailer Brake Control

The vehicle is equipped with an integrated trailer brake module for electric trailer brakes.

Note: This module has been designed and verified for electric trailer brakes. To determine the type of brakes on your trailer, check with your trailer manufacturer or dealer.

The user interface consists of the following:

- GAIN/ brake output power display
- Shows the current GAIN setting

This display may also display diagnostic information symbols:

- SC — Short circuit to ground
- SB — Short to battery
- CF — Controller Fault (if this message appears on the display, see your authorized dealer)

When the vehicle brakes are applied, the display will no longer show GAIN and will change the output to the trailer brakes.

Manual Brake Control Lever

Slide the manual brake control lever to the right to activate power to the trailer's electric brakes independent of the tow vehicle's brakes. If the manual brake control lever is activated while the brake is also applied, the greater of the two inputs determines the power sent to the trailer brakes.

The trailer and the vehicle's brake lamps will come on when the vehicle brakes or the manual trailer brakes are applied.

Trailer Brake Status Indicator Light

This light indicates the trailer electrical connection status.

If no electrical connection is detected after the ignition is turned ON, pressing the GAIN adjustment button or sliding the manual brake control lever will display the GAIN setting for 10 seconds and the trailer brake status indicator light will not be displayed.

If a fault is detected in the trailer wiring or the integrated trailer brake module (ITBM), the trailer brake status indicator light will flash.

GAIN Adjustment Buttons

Pressing these buttons will adjust the brake control power output to the trailer brakes in 0.5 increments. The GAIN setting can be increased to a maximum of 10 or decreased to a minimum of 0 (no trailer braking).

GAIN

The GAIN setting is used to set the trailer brake control for the specific towing condition and should be changed as towing conditions change. Changes to towing conditions include trailer load, vehicle load, road conditions, and weather.

Adjusting GAIN

Make sure the trailer brakes are in good working condition, functioning normally, and properly adjusted. See your trailer dealer if necessary.

Hook up the trailer and make the electrical connections according to the trailer manufacturer's instructions.

When a trailer with electric brakes is plugged in, the GAIN setting will illuminate.

Use the GAIN adjustment (+/-) buttons to increase or decrease the GAIN setting to the desired starting point. A GAIN setting of 6 is a good starting point for heavier loads.

In a traffic-free environment, tow the trailer on a dry, level surface at a speed of 30–40 km/h (20–25 mph) and squeeze the manual brake control lever completely.

Note: This should only be performed in a traffic-free environment at speeds of approximately 30–40 km/h (20–25 mph).

If the trailer wheels lockup (indicated by squealing tires), reduce the GAIN setting; if the trailer wheels turn freely, increase the GAIN setting.

Repeat Steps 5 and 6 until the GAIN setting is at a point just below trailer wheel lockup. If towing a heavier trailer, trailer wheel lockup may not be attainable even with the maximum GAIN setting of 10.

Caution: The ITBM module has been designed and verified for electric trailer brakes. Connecting a trailer that is not compatible with the ITBM system may result in reduced or complete loss of trailer braking. There may be an increase in stopping distance or trailer instability that could result in damage to your vehicle, trailer, or other property.

WARNING: **THE ITBM MODULE HAS BEEN DESIGNED AND VERIFIED FOR ELECTRIC TRAILER BRAKES. CONNECTING A TRAILER THAT IS NOT COMPATIBLE WITH THE ITBM SYSTEM MAY RESULT IN REDUCED OR COMPLETE LOSS OF TRAILER BRAKING. THERE MAY BE AN INCREASE IN STOPPING DISTANCE OR TRAILER INSTABILITY THAT COULD RESULT IN PERSONAL INJURY.**

Note: **An aftermarket controller may be available for use with trailers with air or electric-over-hydraulic trailer brake systems. To determine the type of brakes on the trailer and the availability of controllers, check with the trailer manufacturer or dealer.**

Removal of the ITBM will cause errors and it may cause damage to the electrical system and electronic modules of the vehicle. See an authorized dealer if an aftermarket module is to be installed.

Notes: _____

TIRES AND WHEELS

Tires

Tires are designed and engineered for each specific vehicle. They provide the best overall performance for normal operation. The ride and handling characteristics match the vehicle's requirements. With proper care, they give excellent reliability, traction, skid resistance, and tread life.

Driving habits have more effect on tire life than any other factor. Careful drivers will obtain, in most cases, much greater mileage than severe use or careless drivers. A few of the driving habits which will shorten the life of any tire are:

- Rapid acceleration
- Severe brake applications
- High-speed driving
- Excessive speeds on turns
- Striking curbs and other obstacles

Radial-ply tires are more prone to irregular tread wear. It is important to follow the tire rotation interval. This will help to achieve a greater tread life.

Tire Identification

Tire type, size, aspect ratio, and speed rating are encoded in the letters and numbers imprinted on the side wall of the tire. Performance tires have a speed rating letter after the aspect ratio number. The speed rating is not always printed on the tire sidewall. These ratings are:

- Q up to 99 mph
- S up to 112 mph
- T up to 118 mph
- U up to 124 mph
- H up to 130 mph
- V up to 149 mph
- W (consult the tire manufacturer for the specific speed rating)
- Z more than 149 mph (consult the tire manufacturer for the specific speed rating)

An all season tire will have either M + S, M AND S, or M-S (indicating mud and snow traction) imprinted on the side wall

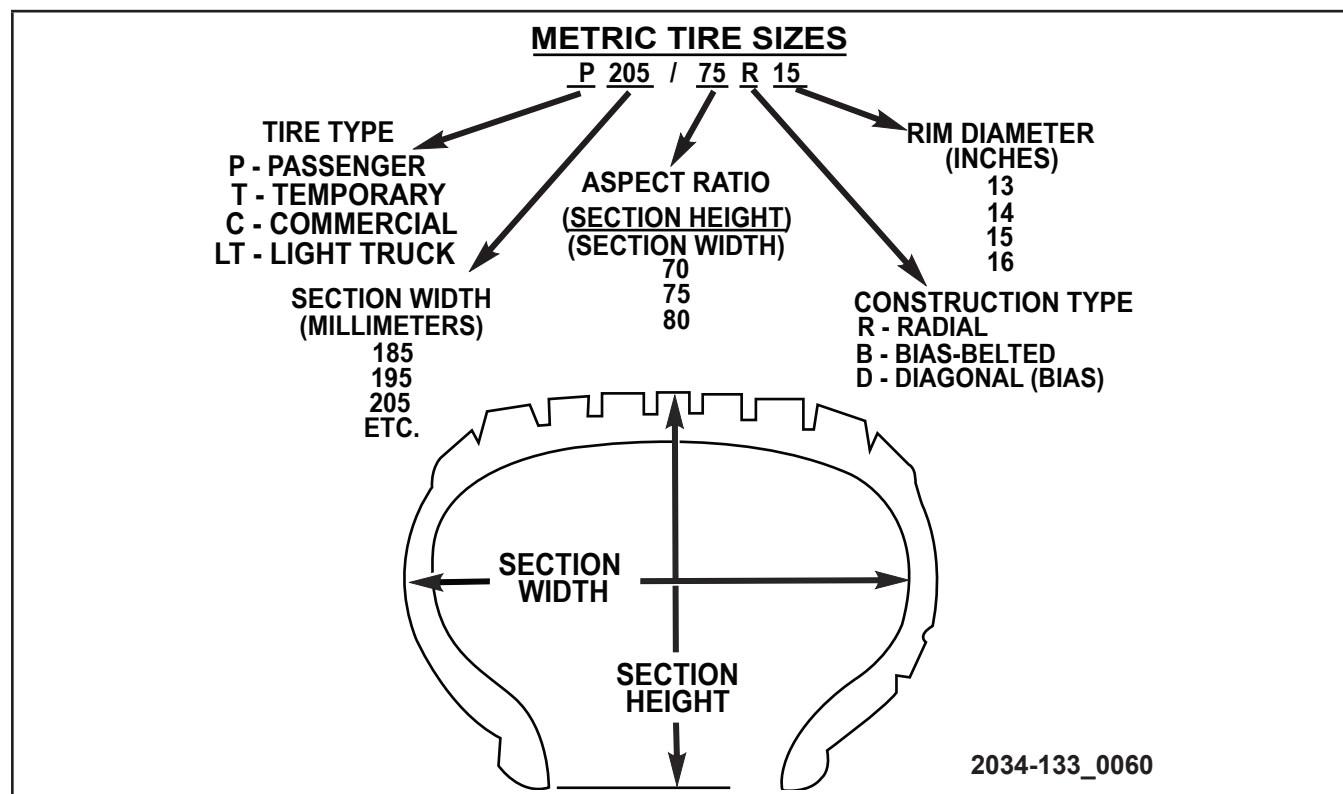


Figure 45 Tire Cross-section

Replacement Tires

The original equipment tires provide a proper balance of many characteristics such as:

- Ride
- Noise
- Handling
- Durability
- Tread life
- Traction
- Rolling resistance
- Speed capability

Speedometer Certification

It is recommended that tires equivalent to the original equipment tires be used when replacement is needed.

Note: **The RAM 1500 Special Services Vehicle is equipped with a certified speedometer. The vehicle is delivered with a letter of certification for the speedometer. This certification is valid based on the vehicle maintaining original equipment tires. Modifying or changing the tires to non-original equipment will take the vehicle speedometer out of certification.**

Failure to use equivalent replacement tires may adversely affect the safety and handling of the vehicle.

The use of oversize tires may cause interference with vehicle components. Under extremes of suspension and steering travel, interference with vehicle components may cause tire damage.

WARNING: **FAILURE TO EQUIP THE VEHICLE WITH TIRES HAVING ADEQUATE SPEED CAPABILITY CAN RESULT IN SUDDEN TIRE FAILURE.**

Tire Chains

Use Class S chains, or other traction aids that meet SAE Type S specifications. Use Class U chains on 2500/3500 model trucks, or other traction aids that meet SAE Type U specifications.

Note: Chains must be the proper size for the vehicle as recommended by the chain manufacturer.

Caution: To avoid damage to your vehicle, tires, or chains, observe the following precautions:

Because of limited chain clearance between tires and other suspension components, it is important that only chains in good condition are used. Broken chains can cause serious vehicle damage. Stop the vehicle immediately if noise occurs that could suggest chain breakage. Remove the damaged parts of the chain before further use.

Install chains as tightly as possible and then retighten after driving about 0.8 km (0.5 mile).

Do not exceed 72 km/h (45 mph).

Drive cautiously and avoid severe turns and large bumps, especially with a loaded vehicle.

Do not install tire chains on the front wheels of 4x2 vehicles.

Do not drive for a prolonged periods on dry pavement.

Observe the tire chain manufacturer's instructions on method of installation, operating speed, and conditions for usage. Always use the lower suggested operating speed of the chain manufacturer if different than the speed recommended by the manufacturer.

These cautions apply to all chain traction devices, including link and cable (radial) chains.

Chassis

Note: On 4x2 and 4x4 1500 model trucks, the use of Class S snow chains is permitted on the rear wheels only of trucks equipped with P265/70R17 tires.

On 4x2 2500 model trucks, the use of Class U snow chains is permitted on the rear wheels only of trucks equipped with LT245/70R17E or LT265/70R17E tires.

On 4x4 2500 model trucks, the use of Class U snow chains is permitted on the rear wheels only of trucks equipped with LT245/70R17E, LT265/70R17E, or LT285/70R17D tires.

On 4x2 and 4x4 3500 single rear wheel (SRW) model trucks, the use of Class U snow chains is permitted on the rear wheels only of trucks equipped with LT265/70R17E tires.

On 4x2 and 4x4 3500 dual rear wheel (DRW) model trucks, the use of Class U snow chains is permitted on the front and rear wheels of trucks equipped with LT235/80R17E tires.

Caution: Do not use tire chains on the front wheels of any model except for 3500 dual rear wheel (DRW) trucks equipped with LT235/80R17E tires. There may not be adequate clearance for the chains and you are risking structural or body damage to your vehicle. Do not use tire chains on the rear wheels of 1500 model trucks equipped with LT275/70R17, P275/60R20, or 285/45R22 tires. There may not be adequate clearance for the chains and you are risking structural or body damage to your vehicle.

Notes: _____

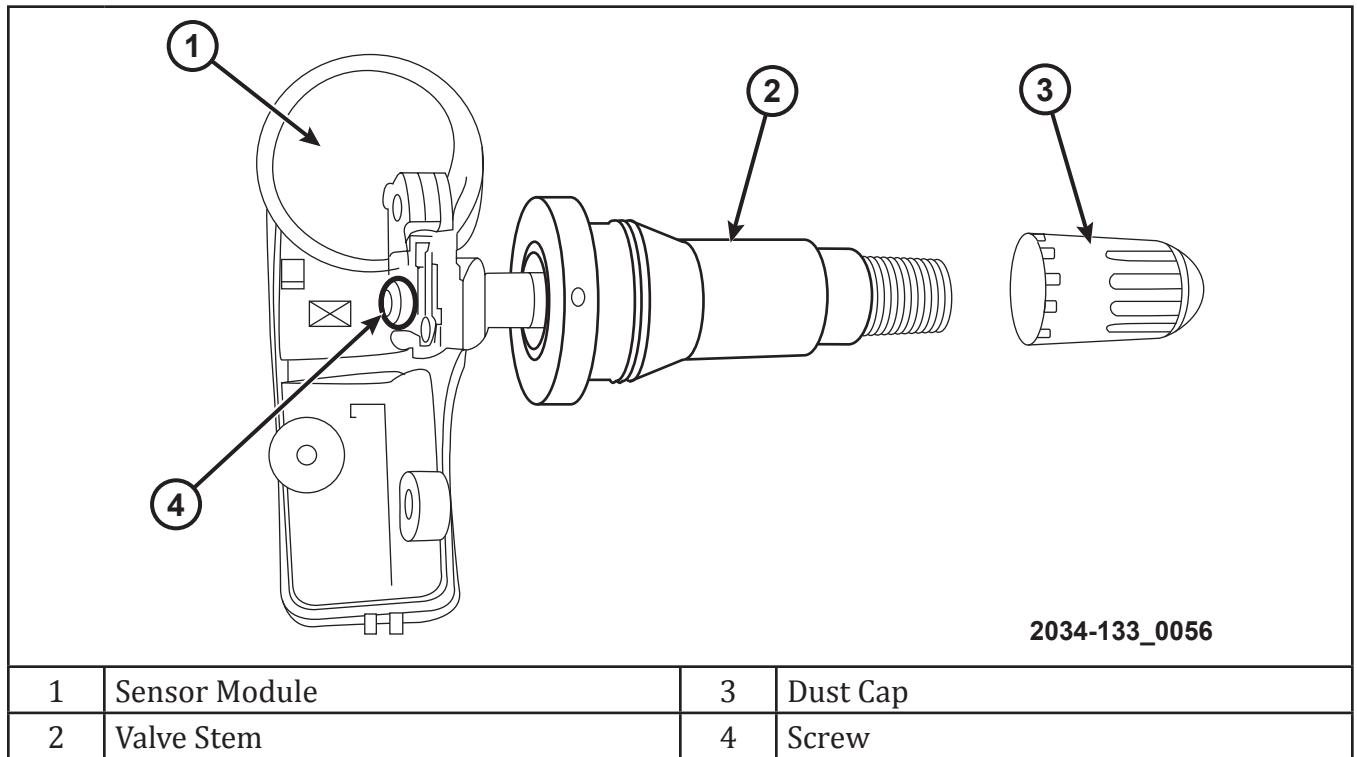
Tire Pressure Monitor System

Figure 46 Tire Pressure Sensor

The RAM 1500 SSV uses a tire pressure monitor system.

The TPM system consists of tire pressure monitoring sensors attached to each road wheel (and spare if equipped with a sensor) valve stem, a central receiver module, an indicator lamp, and (on some applications) a light load switch located on the instrument panel center stack. The valve stem used on this system is redesigned to look similar to a standard valve stem. The RAM SSV uses the wireless ignition node (WIN) as the central receiver module.

Snow Tires

Some areas of the country require the use of snow tires during the winter. All season tires can be identified by the M+S designation on the tire sidewall.

If you need snow tires, select tires equivalent in size and type to the original equipment tires. Use snow tires only in sets of four; failure to do so may adversely affect the safety and handling of your vehicle.

Snow tires generally have lower speed ratings than what was originally equipped with your vehicle and should not be operated at sustained speeds over 120 km/h (75 mph). For speeds above 120 km/h (75 mph) refer to original equipment or an authorized tire dealer for recommended safe operating speeds and loading and cold tire inflation pressures.

While studded tires improve performance on ice, skid and traction capability on wet or dry surfaces may be poorer than that of non-studded tires. Some states prohibit studded tires; therefore, local laws should be checked before using these tire types.

Tire Rotation Recommendations

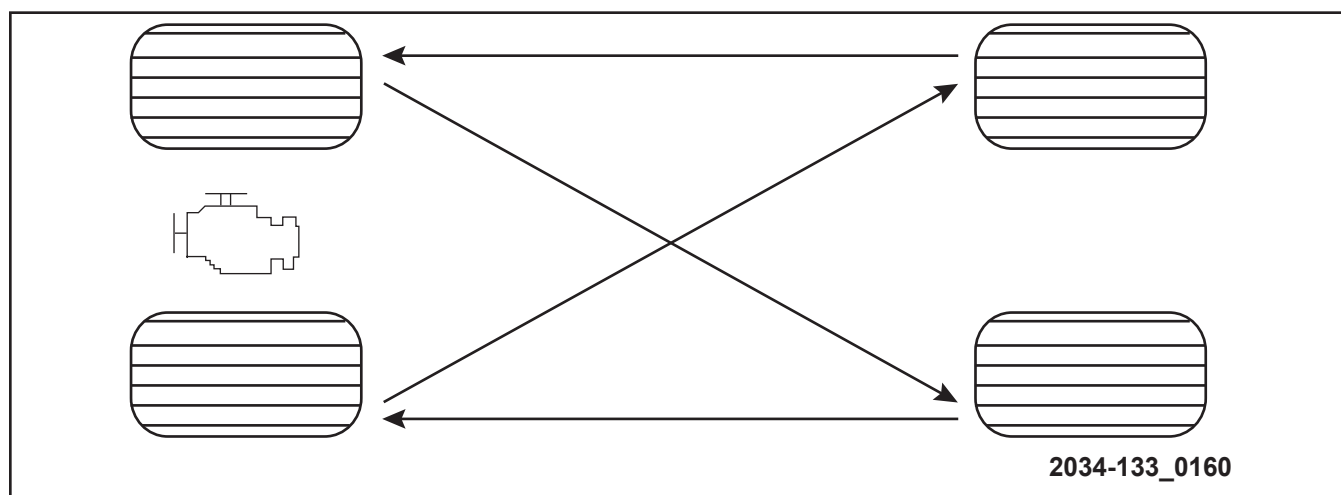


Figure 47 Tire Rotation

Tires on the front and rear axles of vehicles operate at different loads and perform different steering, driving, and braking functions. For these reasons, they wear at unequal rates.

These effects can be reduced by timely rotation of tires. The benefits of rotation are especially worthwhile with aggressive tread designs such as those on all season type tires. Rotation will increase tread life, help to maintain mud, snow, and wet traction levels and contribute to a smooth, quiet ride.

Refer to the maintenance schedule for the proper maintenance intervals. More frequent rotation is permissible if desired. The reasons for any rapid or unusual wear should be corrected prior to rotation being performed.

The suggested rotation method is the forward cross shown in the following diagram. This rotation pattern does not apply to some directional tires that must not be reversed.

Notes: _____

Chassis

AXLES

Rear Axle and 4x4 Front Driving Axle Fluid Level

For normal service, periodic fluid level checks are not required. When the vehicle is serviced for other reasons, the exterior surfaces of the axle assembly should be inspected. If gear oil leakage is suspected, inspect the fluid level. Refer to “Fluids, Lubricants, And Genuine Parts in Maintaining Your Vehicle” for further information.

This inspection should be made with the vehicle in a level position. The fluid level should be 3 mm (1/8 in.) below the fill hole on 9 1/4 in. manufacturer’s rear axles. Filling a front axle to the bottom of the fill hole will result in an overfill condition.

To check axle fluid, park the vehicle on a level surface. Take a piece of wire (or pipe cleaner) and make a 90 degree bend two inches from the end of the wire. Insert the wire into the fill plug hole and use it like a dipstick. Remove the wire and measure from the 90 degree bend to the oil level.

Drain and Refill

Refer to the “Maintenance Schedule” for the proper maintenance intervals.

Lubricant Selection

Refer to “Fluids, Lubricants, and Genuine Parts in Maintaining Your Vehicle” for further information.

Note: **The presence of water in the gear lubricant will result in corrosion and possible failure of differential components. Operation of the vehicle in water, as may be encountered in some off-highway types of service, will require draining and refilling the axle to avoid damage.**

Limited-slip Differential

This vehicle requires that 118 ml (4 oz.) MOPAR® Limited Slip Additive or equivalent be added to the gear lubricant. Refer to Fluids, Lubricants, and Genuine Parts in “Maintaining Your Vehicle” for further information. The MOPAR® Limited Slip Additive or equivalent should be added to the gear lubricant whenever a fluid change is made.

Notes: _____

SUSPENSION

Front Suspension

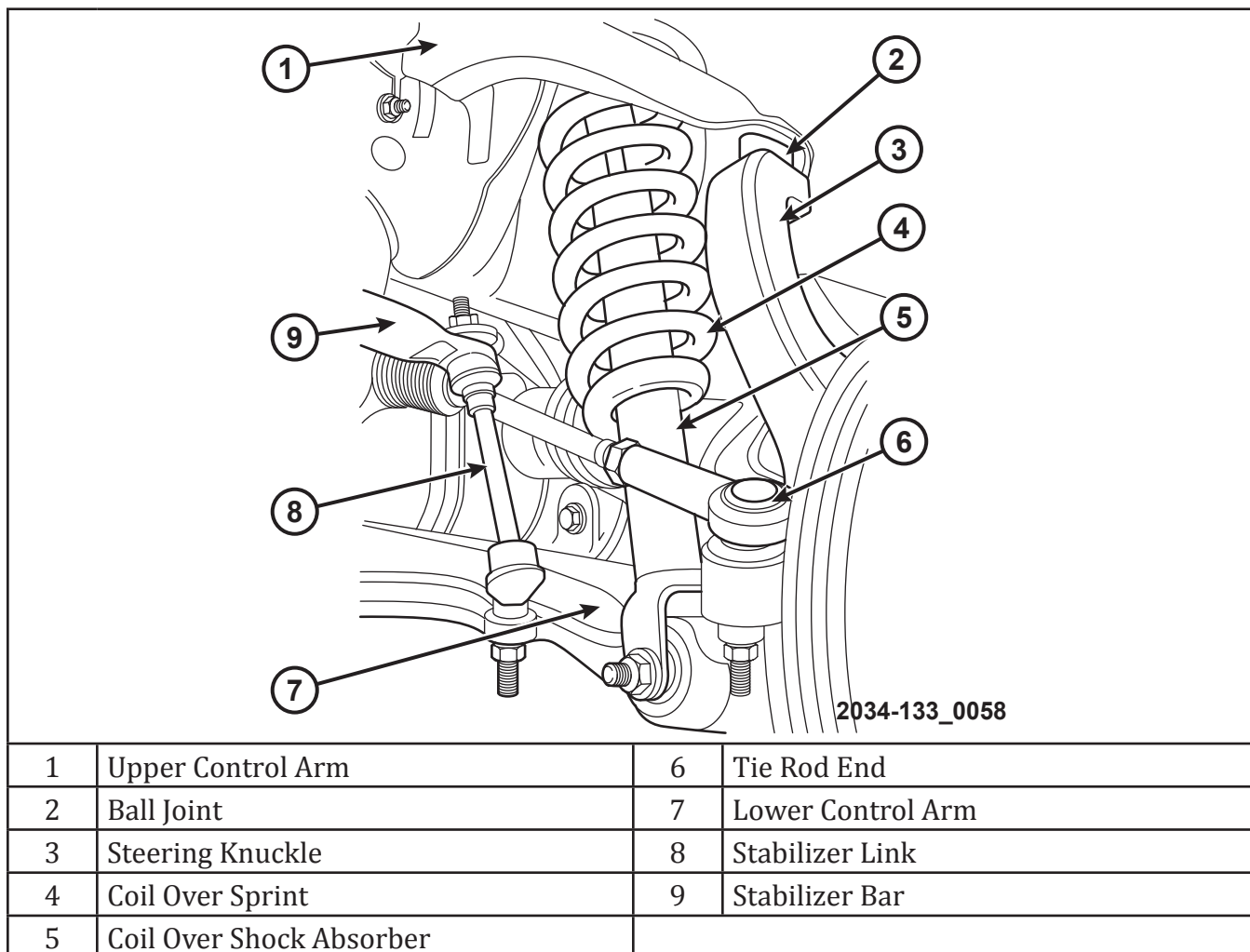


Figure 48 Front Suspension

The front suspension is designed to allow each wheel to adapt to different road surfaces independently. The wheels are mounted to hub/bearings units bolted to the steering knuckle. The double-row hub bearings are sealed and lubricated for life. The steering knuckles turn (pivot) on ball joints. The front suspension also includes the following parts:

- Hub/bearing
- Rack and pinion

Chassis

Note: Do not use lubricant on tapered studs in aluminum.

Note: Components attached with a nut must be torqued to specification.

Note: Suspension components with rubber/urethane bushings should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

Rear Suspension

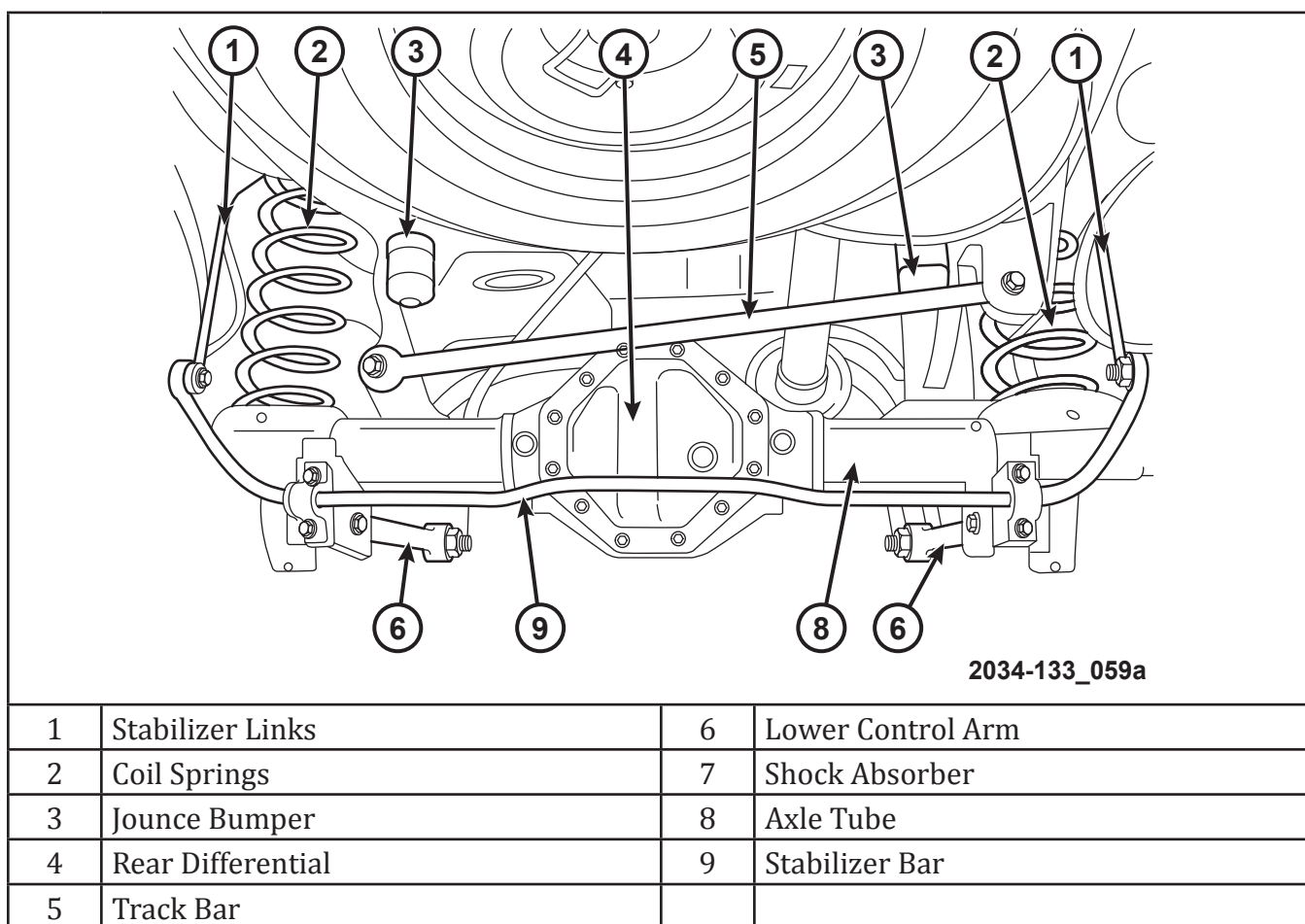


Figure 49 Rear Suspension

The rear suspension system on the 1500 series is a coil spring system, while the 2500 and 3500 series is a leaf spring system.

Note: In addition to the listed components, the rear suspension also has upper control arms.

CAUTION: A vehicle should always be loaded so the vehicle weight center-line is located immediately forward of the rear axle. Correct vehicle loading provides proper front-tire-to-road contact. This results in maximum vehicle handling stability and safety. Incorrect vehicle weight distribution can cause excessive tire tread wear, spring fatigue or failure, and erratic steering.

CAUTION: Suspension components with rubber/urethane bushings (except the stabilizer bar) should be tightened with the vehicle at normal ride height. It is important to have the springs supporting the weight of the vehicle when the fasteners are torqued. If springs are not at their normal ride position, vehicle ride comfort could be affected and premature bushing wear may occur.

STEERING

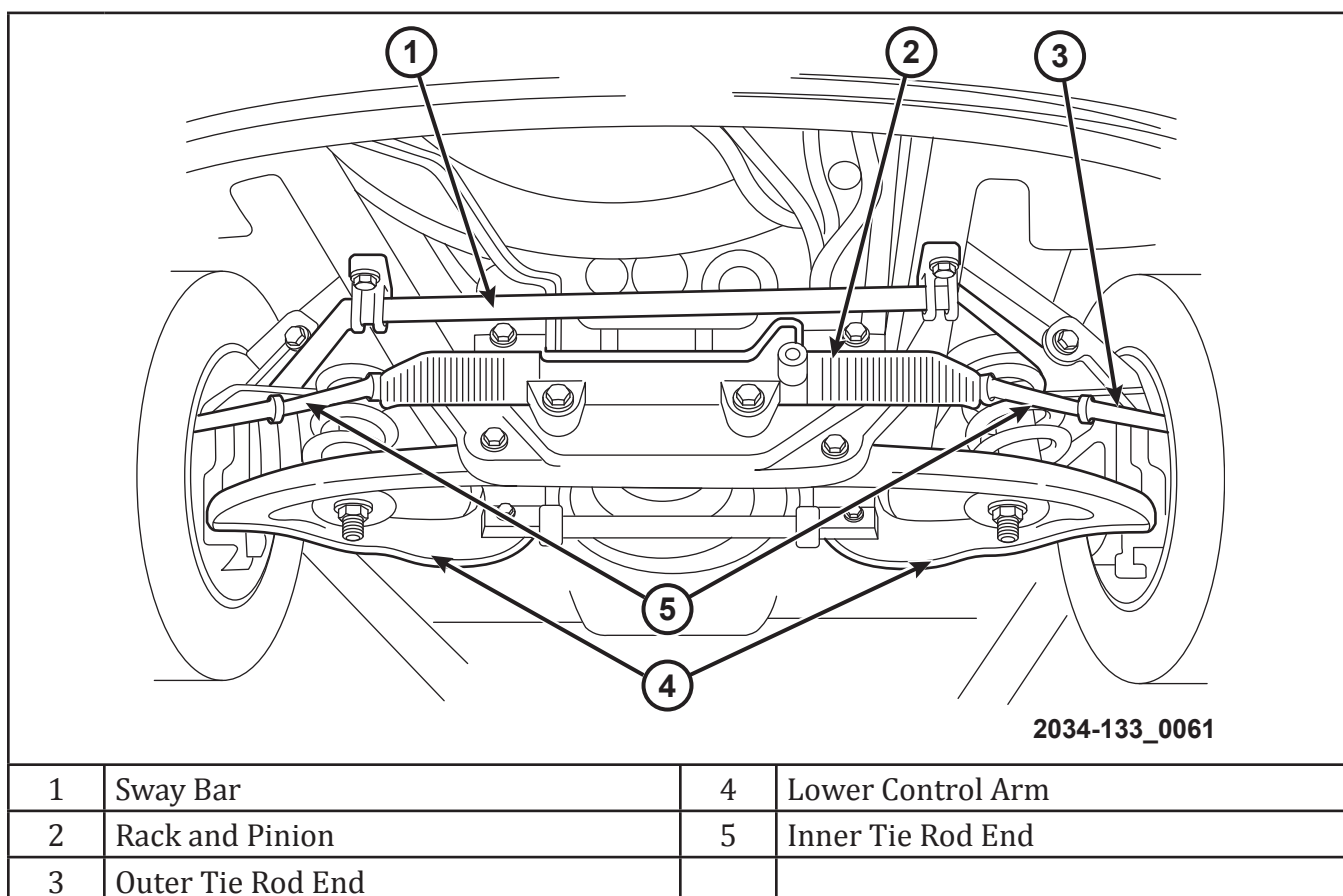


Figure 50 Steering System

The rack and pinion power steering systems consist of:

- Steering column
- Steering gear (rack and pinion or recirculating ball)
- Belt driven hydraulic steering pump
- Pump pressure and return hoses
- Oil cooler

CAUTION: MOPAR® ATF+4 is to be used in the power steering system. No other power steering or automatic transmission fluid is to be used in the system. Damage to the power steering pump and system may result if any other fluid is used, and do not overfill.

Fuel System

The lines, tubes, and hoses used on fuel injected vehicles are of a special construction. This is due to the higher fuel pressures and the possibility of contaminated fuel in this system. If it is necessary to replace these lines, tubes, and hoses, only those marked EFM/EFI may be used.

If equipped: The hose clamps used to secure rubber hoses on fuel injected vehicles are of a special rolled edge construction. This construction is used to prevent the edge of the clamp from cutting into the hose. Only these rolled edge type clamps may be used in this system. All other types of clamps may cut into the hoses and cause high-pressure fuel leaks.

Use new original equipment type hose clamps.

WARNING: THE FUEL SYSTEM MAY BE UNDER A CONSTANT PRESSURE (EVEN WITH THE ENGINE OFF). BEFORE SERVICING ANY FUEL SYSTEM HOSES, FITTINGS, LINES, OR MOST COMPONENTS, FUEL SYSTEM PRESSURE MUST BE RELEASED. REFER TO THE FUEL SYSTEM PRESSURE RELEASE PROCEDURE.

Notes:_____

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Notes:

LESSON 6 ELECTRICAL

BATTERY

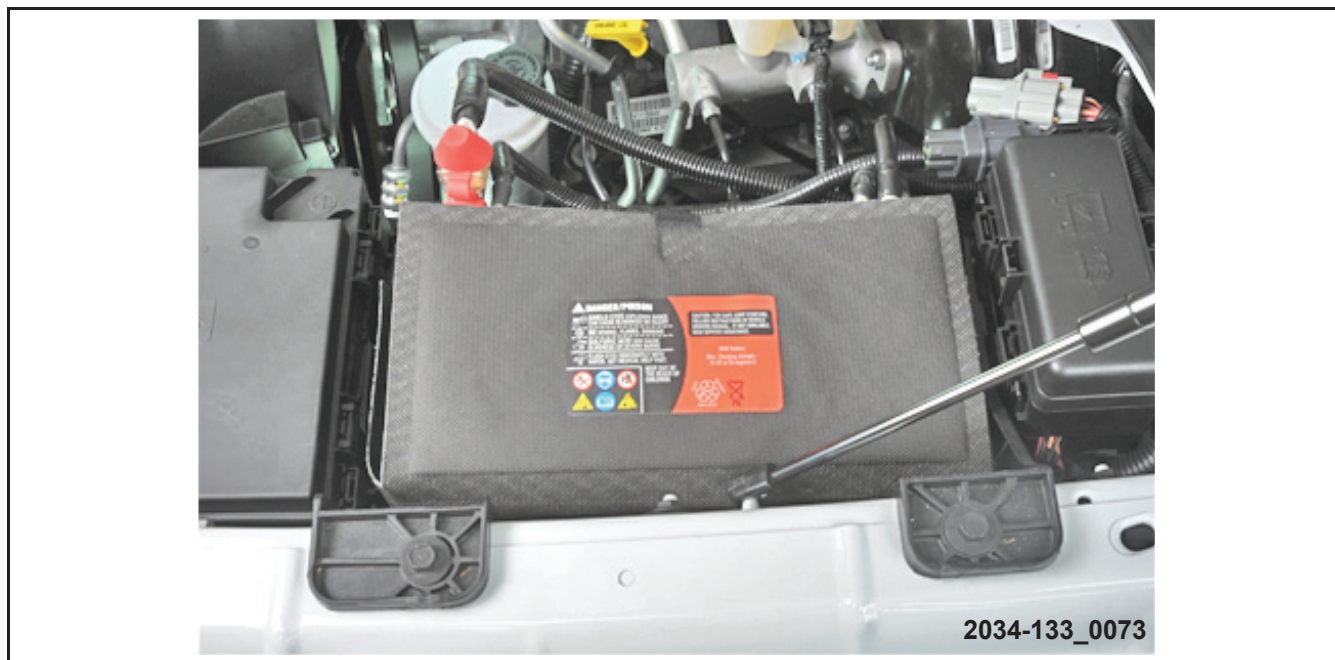


Figure 51 Battery

Specifications

The battery group size number, the cold cranking amperage (CCA) rating, and the reserve capacity (RC) rating or ampere-hours (AH) rating can be found on the original equipment battery label. Be certain that a replacement battery has the correct group size number, as well as CCA, and RC or AH ratings that equal or exceed the original equipment specification for the vehicle being serviced. Battery sizes and ratings are discussed in more detail below.

Group Size

The outside dimensions and terminal placement of the battery conform to standards established by the Battery Council International (BCI). Each battery is assigned a BCI Group Size number to help identify a correctly-sized replacement.

Cold Cranking Amperage

The cold cranking amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for thirty seconds at -18°C (0°F). Terminal voltage must not fall below 7.2 volts during or after the thirty second discharge period. The CCA required is generally higher as engine displacement increases, depending also upon the starter current draw requirements.

Reserve Capacity

The reserve capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes. RC is determined with the battery fully-charged at 26.7°C (80°F). This rating estimates how long the battery might last after a charging system failure, under minimum electrical load.

Ampere-Hours

The ampere-hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for 20 hours, with the voltage in the battery not falling below 10.5 volts. This rating is also sometimes identified as the 20-hour discharge rating.

Notes: _____

Load Test Amperage

The load test amperage rating specifies the current (in amperes) that a battery should be tested at with the battery load test equipment. This value should always be 50% of the CCA. For example: if the CCA for this battery is 600 amps, the load test amperage is 50% of that or 300 amps.

Table 9 Battery Classification and Rating

Battery Classification and Rating				
BCI Group Classification	Cold Cranking Amperage	Reserve Capacity	Ampere Hours	Load Test Amperage
H7	730	140 Minutes	80	365

WARNING: IF THE BATTERY SHOWS SIGNS OF FREEZING, OR LEAKING OR LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.

WARNING: THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.

A battery that will not accept a charge is inoperative, and must be replaced. Further testing is not required. A fully-charged battery must be load tested to determine its cranking capacity. A battery that is fully-charged, but does not pass the load test, is inoperative and must be replaced.

Note: Completely discharged batteries may take several hours to accept a charge. Refer to Standard Procedures for the proper battery charging procedures.

Notes: _____

Battery Charging



Figure 52 Charging Battery

Battery charging is the means by which the battery can be restored to its full voltage potential. A battery is fully-charged when:

- All of the battery cells are gassing freely during battery charging.
- Open-circuit voltage of the battery is 12.65 volts or above.

After the battery has been charged to 12.65 volts or greater, perform a load test to determine the battery cranking capacity, for the proper battery load test procedures. If the battery will endure a load test, return the battery to service. If the battery will not endure a load test, it is inoperative and must be replaced.

Clean and inspect the battery hold down, tray, terminals, posts, and top before completing battery service.

Notes: _____

- WARNING:** NEVER EXCEED TWENTY AMPERES WHEN CHARGING A COLD (-1°C [30°F] OR LOWER) BATTERY. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.
- WARNING:** IF THE BATTERY SHOWS SIGNS OF FREEZING, OR LEAKING, LOOSE POSTS, DO NOT TEST, ASSIST-BOOST, OR CHARGE. THE BATTERY MAY ARC INTERNALLY AND EXPLODE. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.
- WARNING:** EXPLOSIVE HYDROGEN GAS FORMS IN AND AROUND THE BATTERY. DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR THE BATTERY. PERSONAL INJURY AND/OR VEHICLE DAMAGE MAY RESULT.
- WARNING:** THE BATTERY CONTAINS SULFURIC ACID, WHICH IS POISONOUS AND CAUSTIC. AVOID CONTACT WITH THE SKIN, EYES, OR CLOTHING. IN THE EVENT OF CONTACT, FLUSH WITH WATER AND CALL A PHYSICIAN IMMEDIATELY. KEEP OUT OF THE REACH OF CHILDREN.
- WARNING:** IF THE BATTERY IS EQUIPPED WITH REMOVABLE CELL CAPS, BE CERTAIN THAT EACH OF THE CELL CAPS IS IN PLACE AND TIGHT BEFORE THE BATTERY IS RETURNED TO SERVICE. PERSONAL INJURY AND POSSIBLE VEHICLE DAMAGE MAY RESULT FROM LOOSE OR MISSING CELL CAPS.
- CAUTION:** Always disconnect and isolate the battery negative cable before charging a battery. Do not exceed 16 volts while charging a battery. Damage to the vehicle electrical system components may result.
- CAUTION:** Battery electrolyte will bubble inside the battery case during normal battery charging. Electrolyte boiling or being discharged from the battery vents indicates a battery overcharging condition. Immediately reduce the charging rate or turn off the charger to evaluate the battery condition. Damage to the battery may result from overcharging.
- CAUTION:** The battery should not be hot to the touch. If the battery feels hot to the touch, turn off the charger and let the battery cool before continuing the charging operation. Damage to the battery may result.

ALTERNATOR/GENERATOR

Description

The charging system consists of:

- Generator
- Electronic voltage regulator (EVR) circuitry within the powertrain control module (PCM)
- Ignition switch
- Battery
- Battery temperature sensor
- Check gauges lamp (if equipped)
- Voltmeter
- Wiring harness and connections

Operation

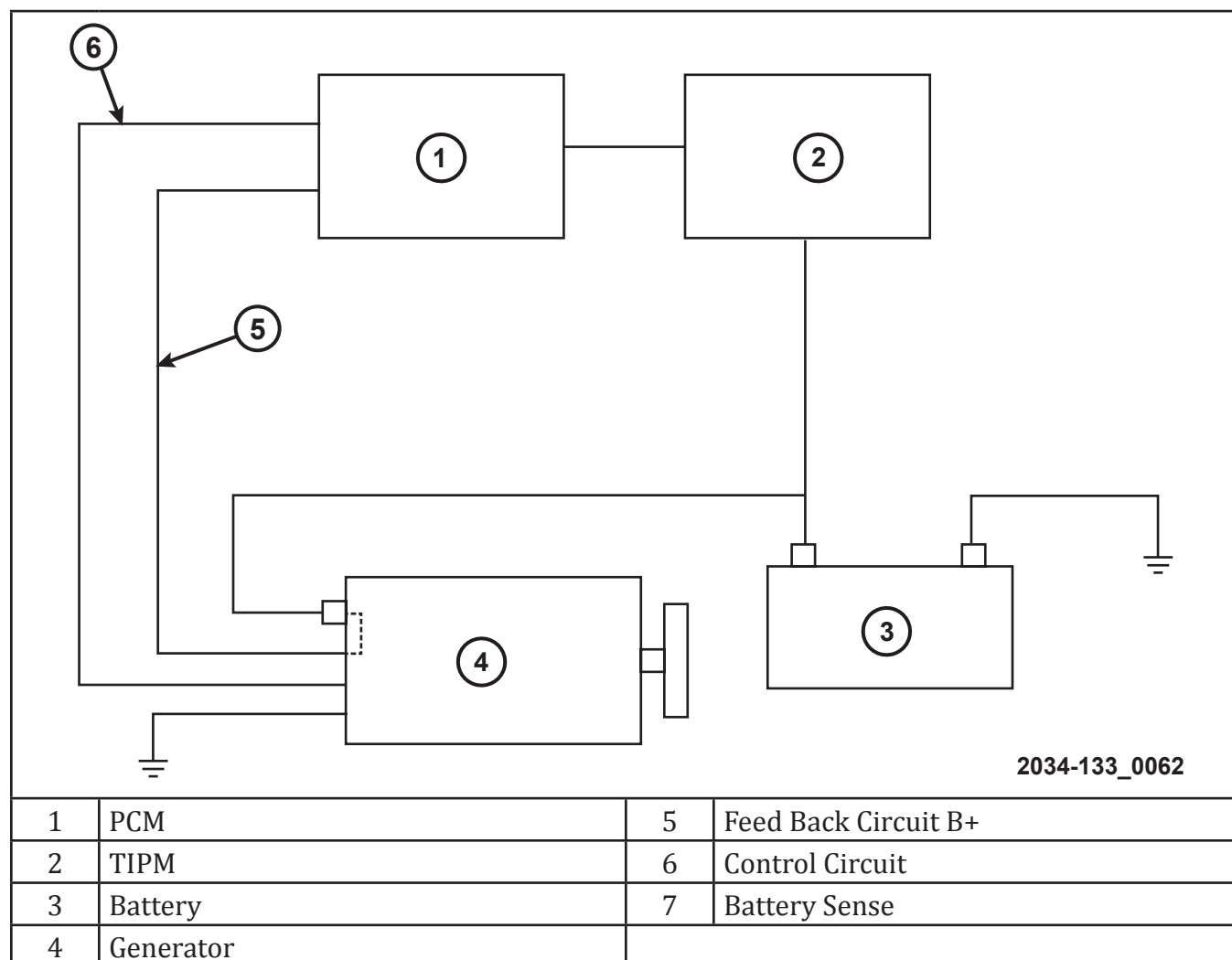


Figure 53 Charging Circuit

The charging system is turned on and off with the powertrain control module (PCM) and ignition switch with the engine running. The generator is driven by the engine through a serpentine belt and pulley, or a decoupler pulley arrangement. The field circuit will not be energized until the engine is running and the ignition switch is ON. This voltage is connected through the PCM and supplied to one of the generator field terminals (Gen. Source B+) at the back of the generator. The generator is internally grounded. The generator regulates the field using pin-1 of the field connector (high-side driver).

Electrical

The PCM receives a voltage input from the generator and also a battery voltage input from the totally integrated power module (TIPM), it then compares the voltages to the desired voltage programmed in the electronic voltage regulator (EVR) software and, if there is a difference, it sends a signal to the generator EVR circuit to increase or decrease output. It uses pulse-width modulation (PWM) to send signals to the generator circuitry to control the amount of output from the generator. The amount of DC current produced by the generator is controlled by the EVR circuitry contained within the generator.

All OBD-sensed systems, including EVR circuitry, are monitored by the PCM. Each monitored circuit is assigned a diagnostic trouble code (DTC). The PCM will store a DTC in electronic memory for certain failures it detects.

The check gauges lamp (if equipped) monitors charging system voltage, engine coolant temperature, and engine oil pressure. If an extreme condition is indicated, the lamp will be illuminated. This is done as reminder to check the three gauges. The lamp is located on the instrument panel.

Voltage is monitored at the B+ terminal stud to ensure it is connected. If the B+ cable is loose, the PCM will shut down the generator field. Because of this new feature, pin-2 of the field connector is internally connected to the B+ terminal.

Notes; _____

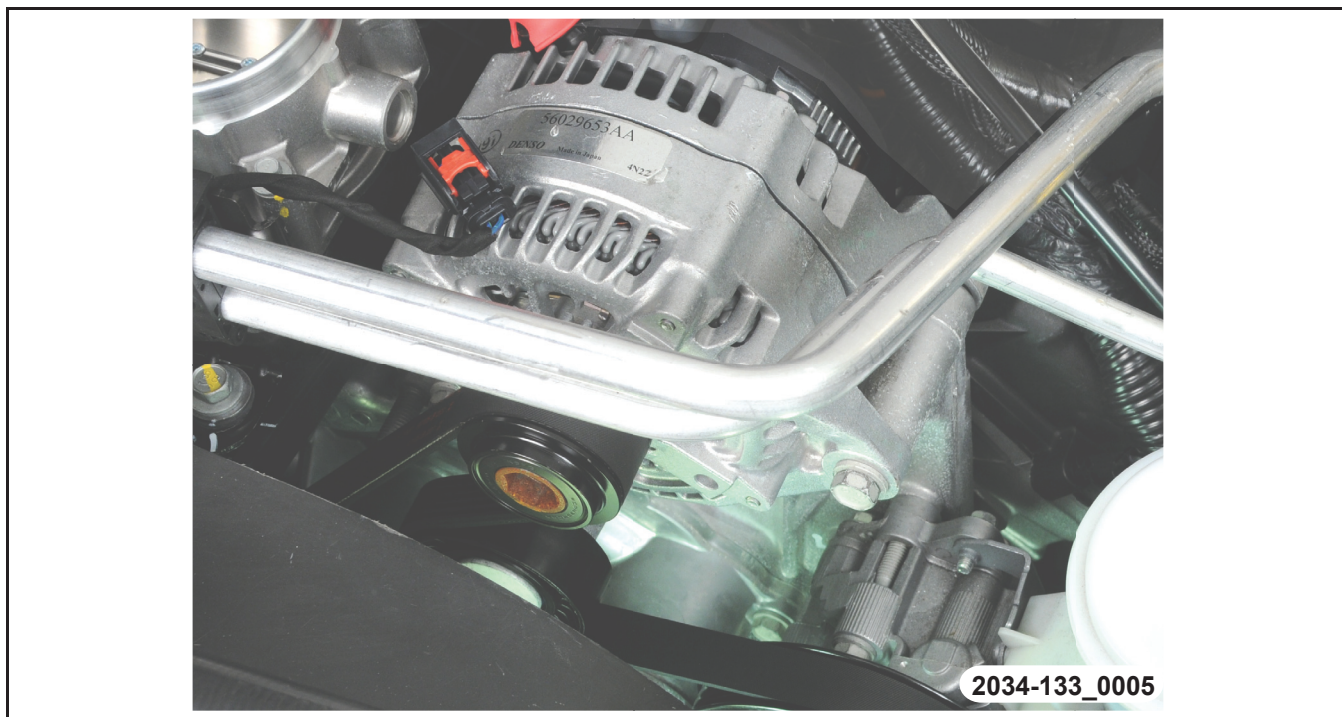
RAM 1500 SSV Alternator

Figure 54 Optional 220-Amp Alternator

The RAM 1500 SSV is available with either the standard 160-amp alternator or with the optional 220-amp alternator (option code BAJ). While both alternators are available, the 220-amp alternator requires a different mount on the engine cover.

Note: **The 160-amp alternator and the 220-amp alternator are not interchangeable due to each having a unique mounting bracket.**

Notes: _____

NETWORK

Data Link Connector (DLC)

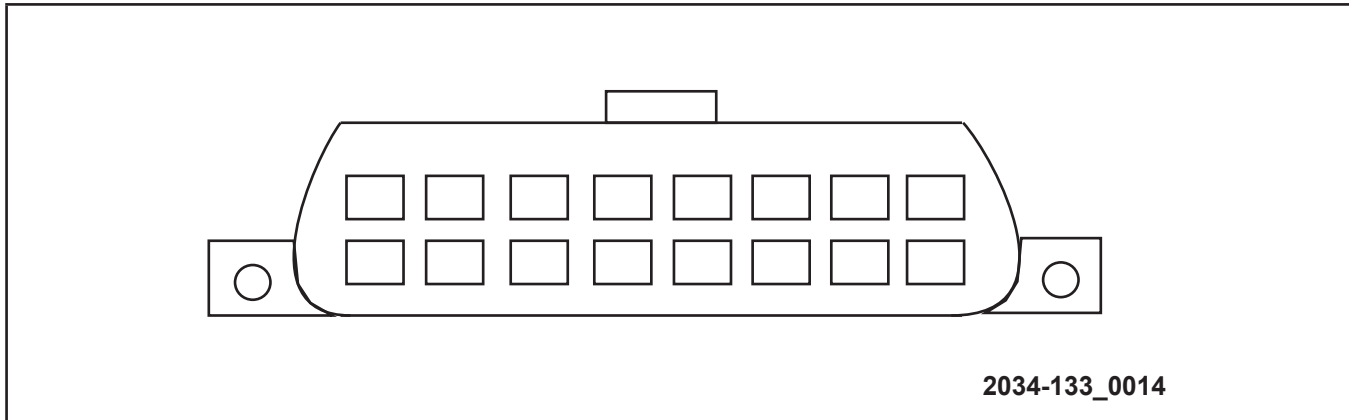


Figure 55 Data Link Connector

The PCM maintains communication with the scan tools through the vehicle data link connector (DLC). The DLC is located under the instrument panel, near the steering column.

Communications System

Network communication is a way to send multiple messages over a single wire or a pair of twisted wires. Modules share information between each other across these common wires. Locating modules close to the components they control reduces the amount and number of wires. This network is referred to as a bus.

Most networks are composed of a twisted pair of wires. Electronic control modules (ECMs) can both transmit and receive data on the bus. Data placed on the bus includes input data, output data, and configuration data. Modules also monitor the input sensors, output actuators, communications, and other modules for faults. If a fault occurs with a particular input or output, the module that is hard-wired to that particular device may be designed to detect it and send a diagnostic trouble code (DTC) on the bus.

Notes: _____

Table 10 Terminal Assignment and Function

	J1962 Data Link Connector Pin Location	Configuration A (1994 MY-2002 MY)	Configuration B* (2002 MY +)	TIPM Based	PowerNet
1	Mfr. Discretionary	RKE Program Input	Not Used/Empty	Not Used/Empty	Not Used/Empty
2	SAE J1850 (+)	SAE J1850 (+)	SAE J1850 (+)	Not Used/Empty	Not Used/Empty
3	Mfr. Discretionary	CCD (+)	Not Used/Empty	Not Used/Empty	CAN-IHS (+)
4	Chassis Ground	Power Ground	Power Ground	Power Ground	Power Ground
5	Signal Ground	Signal Ground	Signal Ground	Signal Ground	Signal Ground
6	ISO 15765, CAN-C (+)	SCI A Rx	ISO 15765-4 CAN-C (+)	Diagnostic CAN-C (+)	CAN-C (+)
7	K-Line	ISO 9141-2, K-Line/SCI Tx	SCI Tx (engine)	Not Used/Empty	Not Used/Empty
8	Mfr. Discretionary	A/D Signal Output/ Switched Ign.	Switched Ignition	Not Used/Empty	Not Used/Empty
9	Mfr. Discretionary	SCI B Rx/J1850 Flash Enable	SCI Rx (trans)/ J1850 Flash Enable	Not Used/Empty	Not Used/Empty
10	SAE J1850 (-)	SAE J1850 (-)	SAE J1850 (-)	Not Used/Empty	Not Used/Empty
11	Mfr. Discretionary	CCD (-)	Not Used/Empty	Not Used/Empty	CAN-IHS (-)
12	Mfr. Discretionary	SCI C Rx	SCI Rx (engine)	Not Used/Empty	Not Used/Empty
13	Mfr. Discretionary	Low Side Driver/SCI Tx	Not Used/Empty	Not Used/Empty	Not Used/Empty
14	ISO 15765, CAN-C (-)	SCI D Rx	ISO 15765-4 CAN-C (-)	Diagnostic CAN-C (-)	CAN-C (-)
15	L Line	Inverted SCI Tx	SCI Tx (trans)	Not Used/Empty	Not Used/Empty
16	Permanent Positive Voltage	Battery Voltage	Battery Voltage	Battery Voltage	Battery Voltage
*Configuration B was used for CS (Pacifica), KJ (Liberty), and ZB (Viper) where powertrain (engine & trans controllers) went on a CAN network (CAN-C) and remaining ECUs stayed on J1850.					

CAN Bus

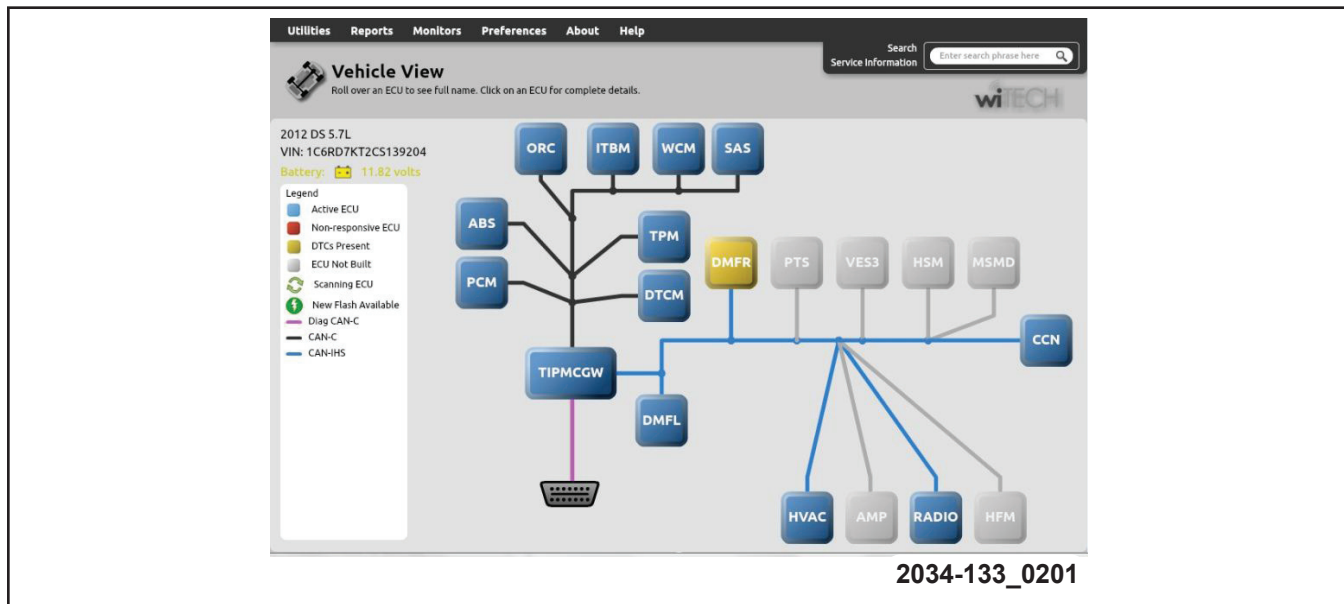


Figure 56 Network Topology

Description

The primary on-board communication network between microprocessor-based electronic control modules in this vehicle is the controller area network (CAN) data bus system. A data bus network minimizes redundant wiring connections; and, at the same time, reduces wire harness complexity. By allowing each sensing device to be connected to only one module or node, it reduces the sensor current loads and the need for more controller hardware. Each node reads, then broadcasts its sensor data over the bus for use by all other nodes requiring that data. Each node ignores the messages on the bus that it cannot use.

The CAN bus is a two-wire multiplex system. Multiplexing is any system that enables the transmission of multiple messages over a single channel or circuit. The CAN bus is used for communication between most vehicle nodes. However, in addition to the CAN bus network, certain nodes may also be equipped with a LIN data bus. The LIN data bus is a single-wire low-speed (9.6 Kbps) serial link bus used to provide direct communication between a LIN master module and certain switch or sensor inputs.

There are actually three separate CAN bus systems used in the vehicle. They are the CAN IHS, the CAN-C, and the Diagnostic CAN-C. The CAN-IHS and CAN-C systems provide on-board communication between all nodes in the vehicle. The CAN-C is the faster of the two systems providing near real-time communication (500 Kbps). The CAN-C is used typically for communications between more critical nodes, while the slower (125 Kbps) CAN-IHS is used for communications between less critical nodes.

Operation

CAN Bus Voltages (Normal Operation)								
CAN-C Bus Circuits	Sleep	Recessive (Bus Idle)	Dominant (Bus Active)	CAN-L Short to Ground	CAN-H Short to Ground	CAN-L Short to Battery	CAN-H Short to Battery	CAN-H Short to CAN-L
CAN-L (-)	0 V	2.4 - 2.5 V	1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0 V	2.4 - 2.5 V	2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V
CAN-Interior Bus Circuits	Key-Off (Bus Asleep)		Key-On (Bus Active)	CAN-L Short to Ground	CAN-H Short to Ground	CAN-L Short to Battery	CAN-H Short to Battery	CAN-H Short to CAN-L
CAN-L (-)	0.0 V		1.3 - 2.3 V	0 V	0.3 - 0.5 V	Battery Voltage	Battery Voltage Less 0.75 V	2.45 V
CAN-H (+)	0.0 V		2.6 - 3.5 V	0.02 V	0 V	Battery Voltage Less 0.75 V	Battery Voltage	2.45 V

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Figure 57 CAN Bus Voltages

The communication protocol being used for the CAN data bus is a non-proprietary, open standard adopted from the Bosch CAN Specification 2.0b. The CAN-C is the faster of the two primary buses in the CAN bus system, providing near real-time communication (500 Kbps).

The CAN bus nodes are connected in parallel to the two-wire bus using a twisted pair. The wires are wrapped around each other to provide shielding from unwanted electromagnetic induction, preventing interference with the relatively low voltage signals being carried through them. The twisted pairs have between 33 and 50 twists per meter (yard). While the CAN bus is operating (active), one of the bus wires will carry a higher voltage and is referred to as the CAN High or CAN bus (+) wire, while the other bus wire will carry a lower voltage and is referred to as the CAN Low or CAN bus (-) wire.

Note: All measurement of termination resistance is done with the vehicle battery disconnected.

Notes: _____

TOTALLY INTEGRATED POWER MODULE (TIPM)

The totally integrated power module and the PCM share the responsibility to power many devices.

The TIPM performs multiple functions including:

- Acts as the gateway of the communication network
- Processes bused messages from the PCM and other controllers
- Provides power and logic control for various systems
- Processes inputs
 - A/C pressure transducer
 - Ambient air temp
 - Ignition RUN/START relay
- Controls outputs
 - ASD relay
 - A/C compressor
 - Clutch
 - Fuel pump
 - Starter solenoid
 - Cooling fans

The TIPM contains solid-state, high-side and low-side drivers, as well as fuses. The high-side driver or a relay for the starter is located inside the TIPM. The PCM buses starter information to the TIPM. The TIPM then supplies voltage directly to the starter assembly.

The high-side driver for the fuel pump is also located inside the TIPM.

Description

The totally integrated power module (TIPM) is a combination unit that performs the functions of the power distribution center (PDC) and the front control module. The TIPM is a printed circuit board based module that contains fuses, internal relays and a microprocessor that performs the functions previously executed by the FCM. The TIPM is located in the engine compartment, next to the battery, and connects directly to the B+ cable via a stud located on top of the unit. The ground connection is via electrical connectors. The TIPM provides the primary means of voltage distribution and protection for the entire vehicle.

The molded plastic TIPM housing includes a base and cover. The TIPM cover is easily opened or removed for service and has a fuse and relay layout map integral to the inside surface of the cover. The TIPM housing base and cover are secured in place via mounting tabs. The mounting tabs secure the TIPM to the TIPM mounting bracket.

Operation



Figure 58 TIPM

All of the current from the battery and the generator output enters the totally integrated power module (TIPM) via a stud on the top of the module. The TIPM cover is removed to access the fuses or relays. Internal connections of all of the power distribution center circuits are accomplished by a combination of bus bars and a printed circuit board.

For complete circuit diagrams, refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information, and location views for the various wire harness connectors, splices, and grounds.

Notes: _____

POWERTRAIN CONTROL MODULE (PCM)

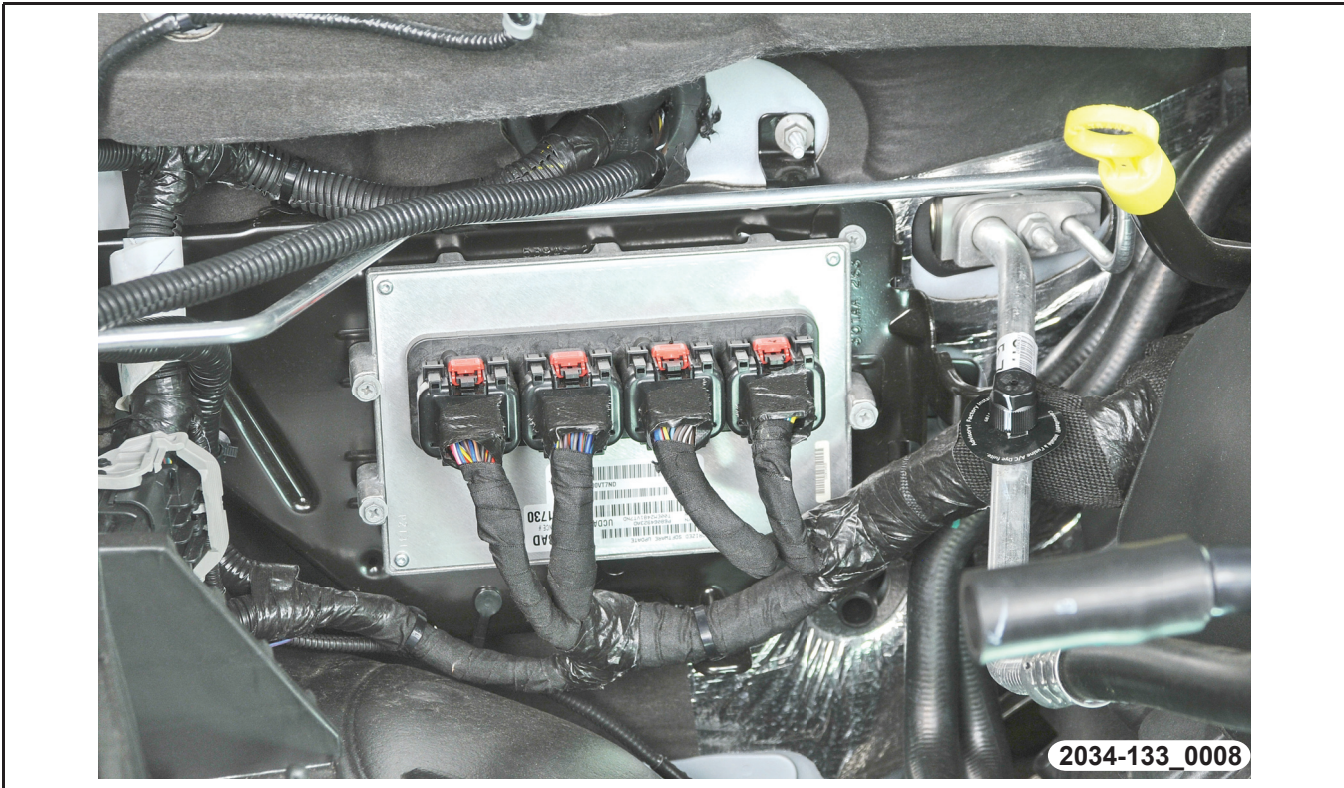


Figure 59 PCM

The powertrain control module (PCM) is located in the right-rear section of the engine compartment under the cowl.

The PCM operates the fuel system. The PCM is a pre-programmed, triple microprocessor digital computer. It regulates ignition timing, air-fuel ratio, emission control devices, charging system, certain transmission features, speed control, air conditioning compressor clutch engagement, and idle speed. The PCM can adapt its programming to meet changing operating conditions.

The PCM receives input signals from various switches and sensors. Based on these inputs, the PCM regulates various engine and vehicle operations through different system components. These components are referred to as powertrain control module (PCM) outputs. The sensors and switches that provide inputs to the PCM are considered powertrain control module (PCM) inputs.

The PCM adjusts ignition timing based upon inputs it receives from sensors that react to engine rpm, manifold absolute pressure, engine coolant temperature, throttle position, transmission gear selection (automatic transmission), vehicle speed, power steering pump pressure, and the brake switch.

The PCM adjusts idle speed based on inputs it receives from sensors that react to:

- Throttle position
- Vehicle speed
- Transmission gear selection
- Engine coolant temperature
- Inputs from the air conditioning clutch switch
- Brake switch

Based on inputs that it receives, the PCM adjusts ignition coil dwell. The PCM also adjusts the generator charge rate through control of the generator field and provides speed control operation.

Notes: _____

PCM Inputs

- ABS module (if equipped)
- A/C request (if equipped with factory A/C)
- A/C select (if equipped with factory A/C)
- A/C pressure transducer
- Auto shutdown (ASD) sense
- Battery temperature sensor
- Battery voltage
- Brake switch
- CAN-C bus (+) circuits
- CAN-C bus (-) circuits
- Camshaft position sensor signal
- Crankshaft position sensor
- Data link connection for a scan tool
- EATX module (if equipped)
- Engine coolant temperature sensor
- Fuel level
- Generator (battery voltage) output
- Ignition circuit sense (ignition switch in ON/OFF/CRANK/RUN position)
- Intake manifold air temperature sensor
- Knock sensors (two on the 3.7L engine)
- Leak detection pump (switch) sense (if equipped)
- Manifold absolute pressure (MAP) sensor
- Oil pressure
- Oxygen sensors
- Park/neutral switch (automatic transmission only)
- Power ground
- Power steering pressure switch (if equipped)
- Sensor return
- Signal ground
- Speed control multiplexed single-wire input
- Throttle position sensor
- Transfer case switch (4WD range position)

- Vehicle speed signal

PCM Outputs

- A/C clutch relay
- Auto shutdown (ASD) relay
- CAN-C BUS (+/-) circuits for:
 - Speedometer
 - Voltmeter
 - Fuel gauge
 - Oil pressure gauge/lamp
 - Engine temperature gauge
 - Speed control warning lamp
- Data link connection for diagnostic scan tool
- EGR valve control solenoid (if equipped)
- EVAP canister purge solenoid
- Five-volt sensor supply (primary)
- Five-volt sensor supply (secondary)
- Fuel injectors
- Fuel pump relay
- Generator field driver (-)
- Generator field driver (+)
- Idle air control (IAC) motor
- Ignition coil(s)
- Leak detection pump (if equipped)
- Malfunction indicator lamp (Check engine lamp)
- Oxygen sensor heater relays
- Oxygen sensors (pulse width modulated)
- Radiator cooling fan relay (pulse width modulated)
- Speed control vacuum solenoid
- Speed control vent solenoid
- Tachometer (if equipped)
- Transmission convertor clutch circuit

Modes of Operation

As input signals to the powertrain control module (PCM) change, the PCM adjusts its response to the output devices. For example, the PCM must calculate different injector pulse width and ignition timing for idle than it does for wide open throttle (WOT).

The PCM will operate in two different modes: open loop and closed loop.

During open loop modes, the PCM receives input signals and responds only according to preset PCM programming. Input from the oxygen sensors (O2S) is not monitored during open loop modes.

During closed loop modes, the PCM will monitor the oxygen sensors (O2S) input. This input indicates to the PCM whether or not the calculated injector pulse width results in the ideal air-fuel ratio. This ratio is 14.7 parts air to 1 part fuel. By monitoring the exhaust oxygen content through the O2S sensor, the PCM can fine tune the injector pulse width. This is done to achieve optimum fuel economy combined with low emission engine performance.

The fuel injection system has the following modes of operation:

- Ignition switch ON
- Engine start-up (crank)
- Engine warm-up
- Idle
- Cruise
- Acceleration
- Deceleration
- Wide open throttle (WOT)
- Ignition switch OFF

The ignition switch ON, engine start-up (crank), engine warm-up, acceleration, deceleration, and wide open throttle modes are open loop modes. The idle and cruise modes (with the engine at operating temperature) are closed loop modes.

Notes: _____

PCM Replacement

Removal

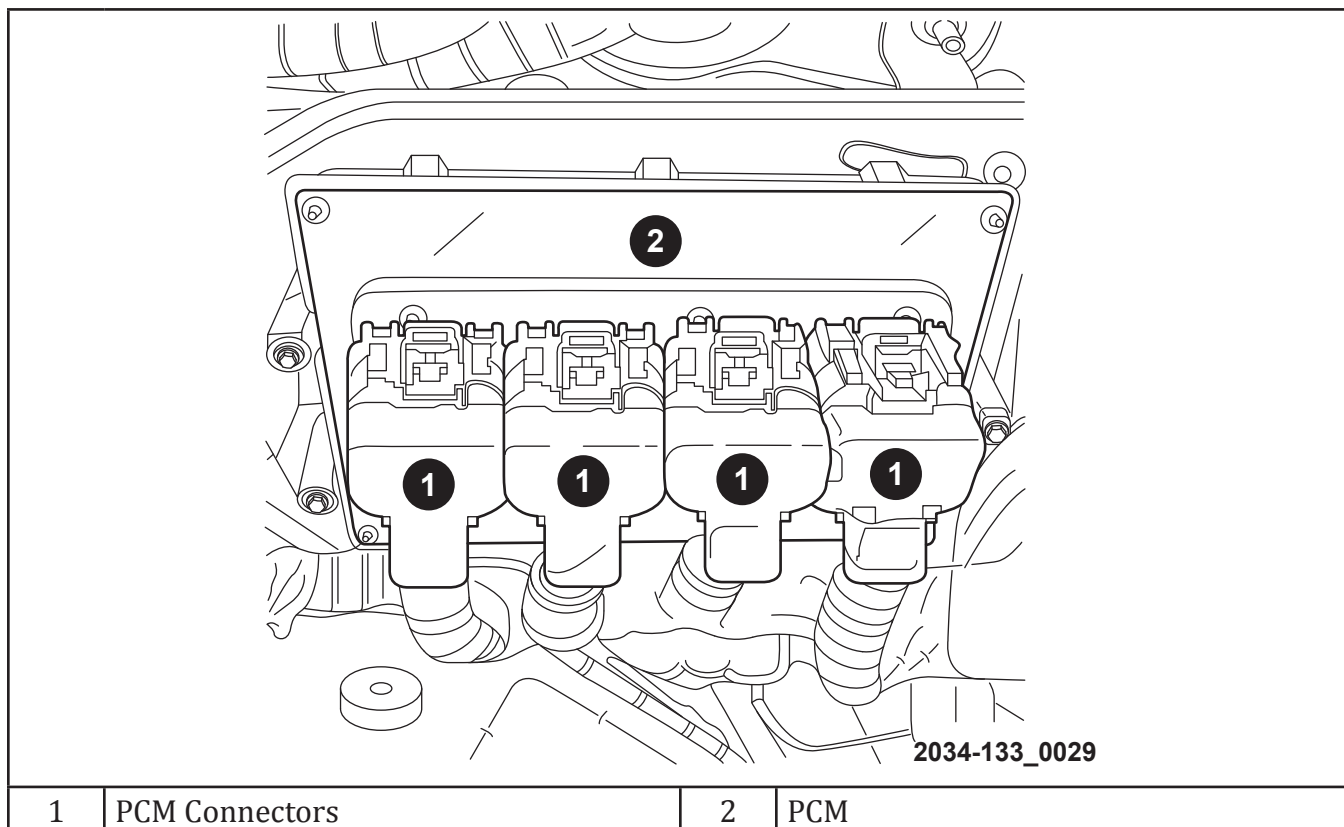


Figure 60 PCM Removal

In certain situations it may be necessary to replace the PCM. The following procedures should be observed to prevent possible damage to the replacement PCM, connectors, terminals, harnesses, and related components.

The PCM is located in the engine compartment attached to the passenger side dash panel.

To avoid possible voltage spike damage to the PCM, ignition key must be OFF, and negative battery cable must be disconnected before unplugging PCM connectors.

1. Disconnect and isolate the negative battery cable.
2. Carefully unplug the four 38-way connectors from the PCM.
3. Remove the four PCM mounting bolts and remove the PCM from the vehicle.

Installation

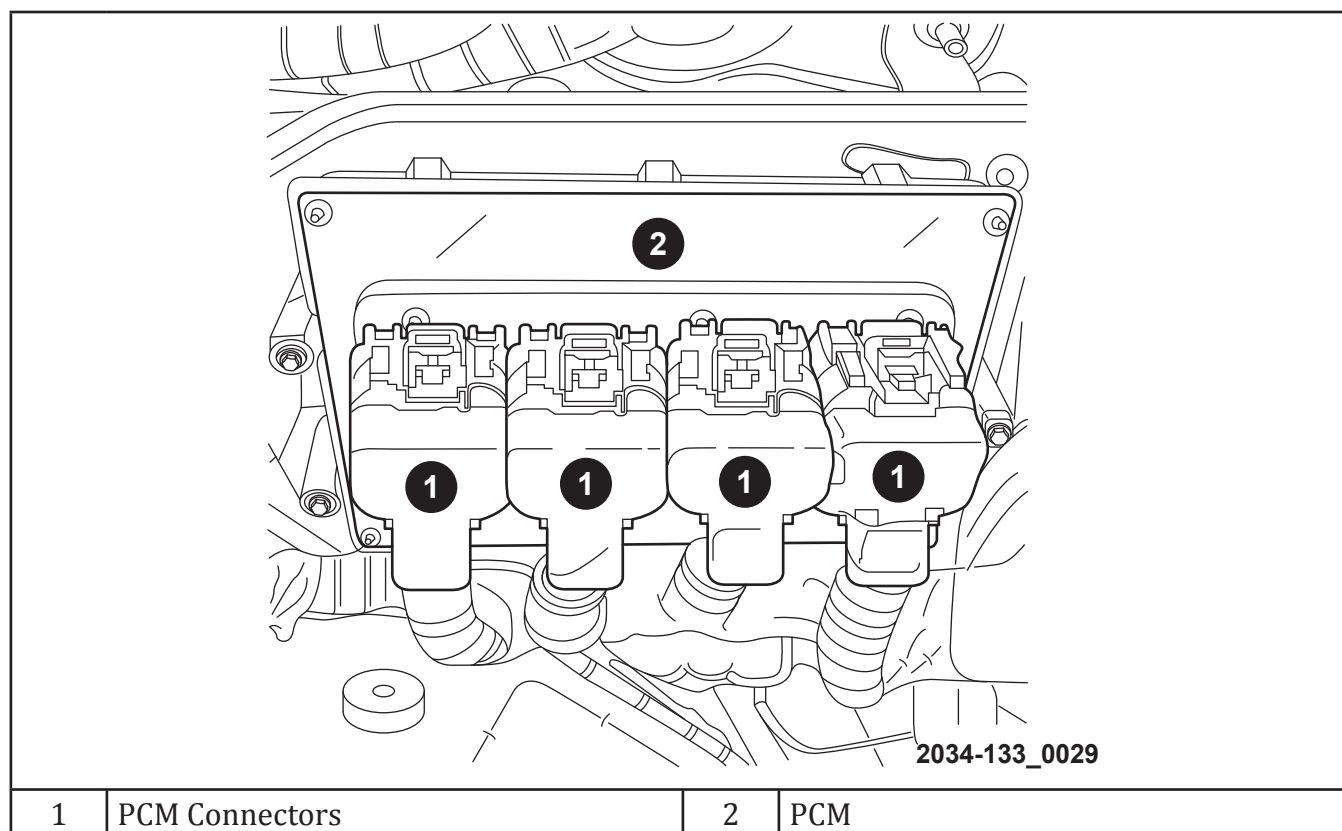


Figure 61 PCM Installation

1. Install the PCM and four mounting bolts to vehicle.
2. Check pin connectors in the PCM and the four 38-way connectors for corrosion or damage. Also, the pin heights in connectors should all be same. Repair as necessary before installing connectors.
3. Install the four 38-way connectors.
4. The 5.7L V-8 engine is equipped with a fully electronic accelerator pedal position sensor. If equipped with a 5.7L, also perform the following three steps:
 - Connect the negative battery cable.
 - Turn the ignition switch ON, but do not crank the engine.
 - Leave the ignition switch ON for a minimum of 10 seconds. This will allow the PCM to learn the electrical parameters.
 - The scan tool may also be used to learn electrical parameters. Go to the Miscellaneous menu, and then select ETC Learn.
5. If the previous step is not performed, a diagnostic trouble code (DTC) will be set.
6. If necessary, use a scan tool to erase any diagnostic trouble codes (DTCs) from the PCM. Also use the scan tool to reprogram the new PCM with the vehicle's original vehicle identification number (VIN) and the original vehicle mileage.

CAUTION: Certain ABS systems rely on having the powertrain control module (PCM) broadcast the vehicle identification number (VIN) over the bus network. To prevent problems of DTCs and other items related to the VIN broadcast, it is recommended that you disconnect the ABS CAB (controller) temporarily when replacing the PCM. After the PCM is replaced, write the VIN to the PCM using a scan tool. This is done from the engine main menu. Arrow over to the second page to Miscellaneous. Select Check VIN from the choices. Make sure it has the correct VIN entered before continuing. When the VIN is complete, turn OFF the ignition key and reconnect the ABS module connector. This will prevent the setting of DTCs and other items associated with the lack of a VIN detected when you turn the key ON after replacing the PCM.

CAUTION: Use the scan tool to reprogram the new PCM with the vehicle's original identification number (VIN) and the vehicle's original mileage. If this step is not done, a diagnostic trouble code (DTC) may be set.

PCM/TCM Flash Programing

This procedure will need to be done when one or more of the following situations are true:

1. A vehicle's powertrain control module (PCM) has been replaced
2. A diagnostic trouble code (DTC) is set, P1602 - PCM Not Programmed
3. An updated calibration or software release is available for either the PCM or TCM ECUs

This procedure assumes that the wiTECH™ vehicle connection interface (VCI) pod, StarSCAN® and StarMOBILE® devices are configured to your dealership's network with either a wired or wireless connection. The wiTECH VCI Pod, StarSCAN and StarMOBILE must also be running at the latest operating system and software release level. For more help on networking your StarSCAN or StarMOBILE reference the StarSCAN/StarMOBILE Quick Start Networking Guide available on DealerCONNECT > Service > StarSCAN and StarMOBILE Tools > Online Documentation or at www.dcctools.com, under the Download Center. For the wiTECH VCI Pod use the HELP tab in the wiTECH™ Diagnostic Application.

Notes: _____

TRANSMISSION CONTROL FUNCTIONS OF THE PCM

The transmission control module is integrated into the PCM on the RAM 1500 SSV truck.

The powertrain control module (PCM) controls all electronic operations of the transmission. The PCM receives information regarding vehicle operation from both direct and indirect inputs, and selects the operational mode of the transmission. Direct inputs are hard wired to, and used specifically by, the PCM. Indirect inputs are shared with the PCM via the vehicle communication bus.

Some examples of direct inputs to the PCM are:

- Battery (B+) voltage
- Ignition ON voltage
- Transmission control relay (Switched B+) (if equipped)
- Throttle position sensor
- Crankshaft position sensor
- Transmission range sensor
- Pressure switches
- Transmission temperature sensor
- Input shaft speed sensor
- Output shaft speed sensor
- Line pressure sensor

Some examples of indirect inputs to the PCM are:

- Target idle
- Torque reduction confirmation
- Engine coolant temperature
- Ambient/battery temperature
- Scan tool communication

Based on the information received from these various inputs, the PCM determines the appropriate shift schedule and shift points, depending on the present operating conditions and driver demand. This is possible through the control of various direct and indirect outputs.

Some examples of PCM direct outputs are:

- Transmission control relay
- Solenoids
- Torque reduction requests
- PRNDL position (to cluster CCN)

In addition to monitoring inputs and controlling outputs, the PCM has other important responsibilities and functions:

- Storing and maintaining clutch volume indexes (CVI)
- Storing and selecting appropriate shift schedules
- System self diagnosis
- Diagnostic capabilities (with the scan tool)

Notes: _____

Transmission Limp-in Mode

Loss of power causes the solenoids to revert to their default, power off state, causing the transmission to enter limp-in mode. If power is restored to the PCM, the transmission resumes normal operation. A DTC may be set if there is vehicle speed.

When the transmission enters into a condition that causes a limp-in mode to occur, the PCM will turn on the check engine light. The PCM will set default gears available of:

- Park
- Neutral
- Reverse
- 4th gear

Notes: _____

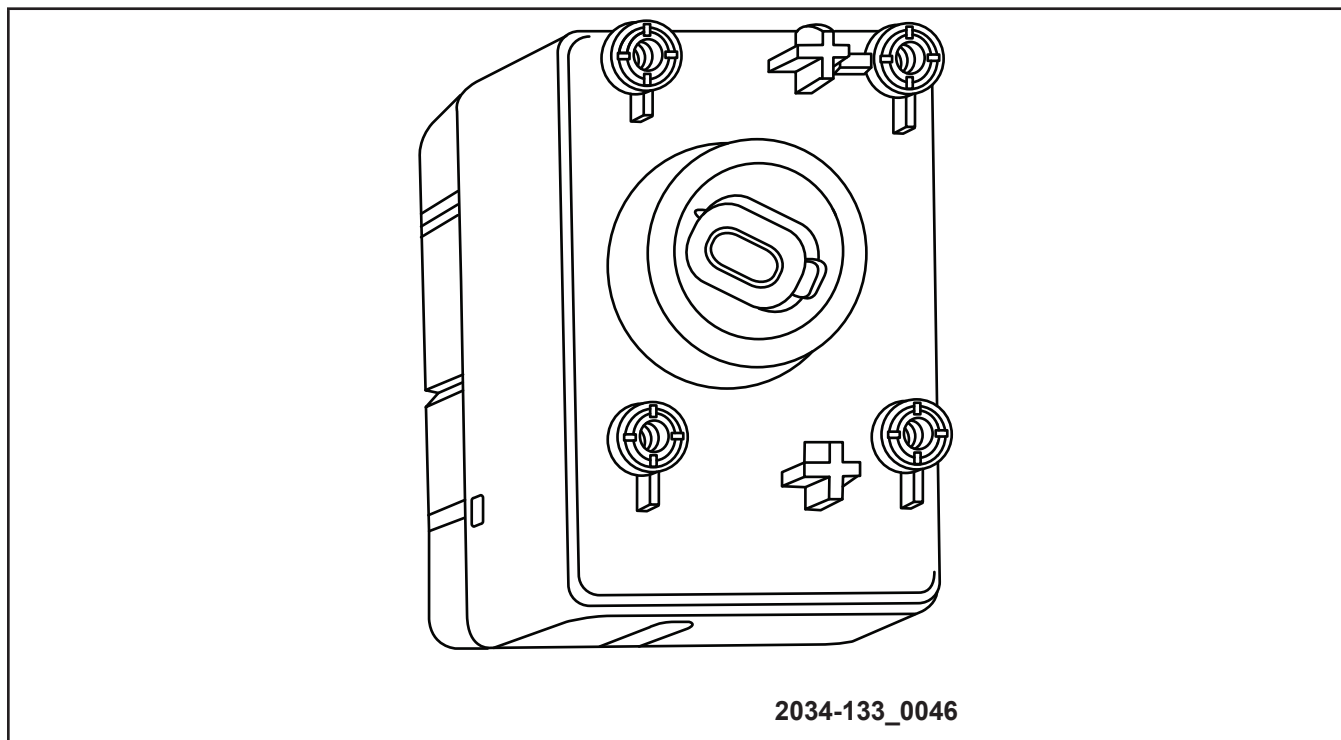
WIRELESS IGNITION NODE (WIN)**Description**

Figure 62 Wireless Ignition Node

This RAM 1500 SSV is equipped with a wireless ignition node (WIN). The WIN and the remote key-less entry (RKE) device or (FOB), with the integrated key (FOBIK) are the primary components of the keyless ignition system. The only visible component of the WIN is the ignition switch located on the face of the instrument panel just to the inboard side of the steering column.

The WIN housing is constructed of molded black plastic and it includes four integral mounting bosses, which are secured to the instrument panel structure with screws. Two connector receptacles are integral to the back of the switch housing. One connects the WIN to the vehicle electrical system through a dedicated takeout and connector of the instrument panel wire harness.

The WIN is an integrated electronic receiver that replaces the ignition switch. The WIN communicates with other electronic modules in the vehicle over the controller area network (CAN) data bus.

The WIN interfaces with the RKE FOBIK and the tire pressure monitor (TPM) sensors (if equipped) using radio frequency (RF) communication. It also communicates with the TPM trigger transponders using a LIN data bus connection.

The WIN cannot be adjusted or repaired, but is flash update capable. If ineffective or damaged, the entire WIN must be replaced. When replacing the WIN, you must also replace the steering column lock module (if equipped).

Functions of the WIN Module

Ignition Switch

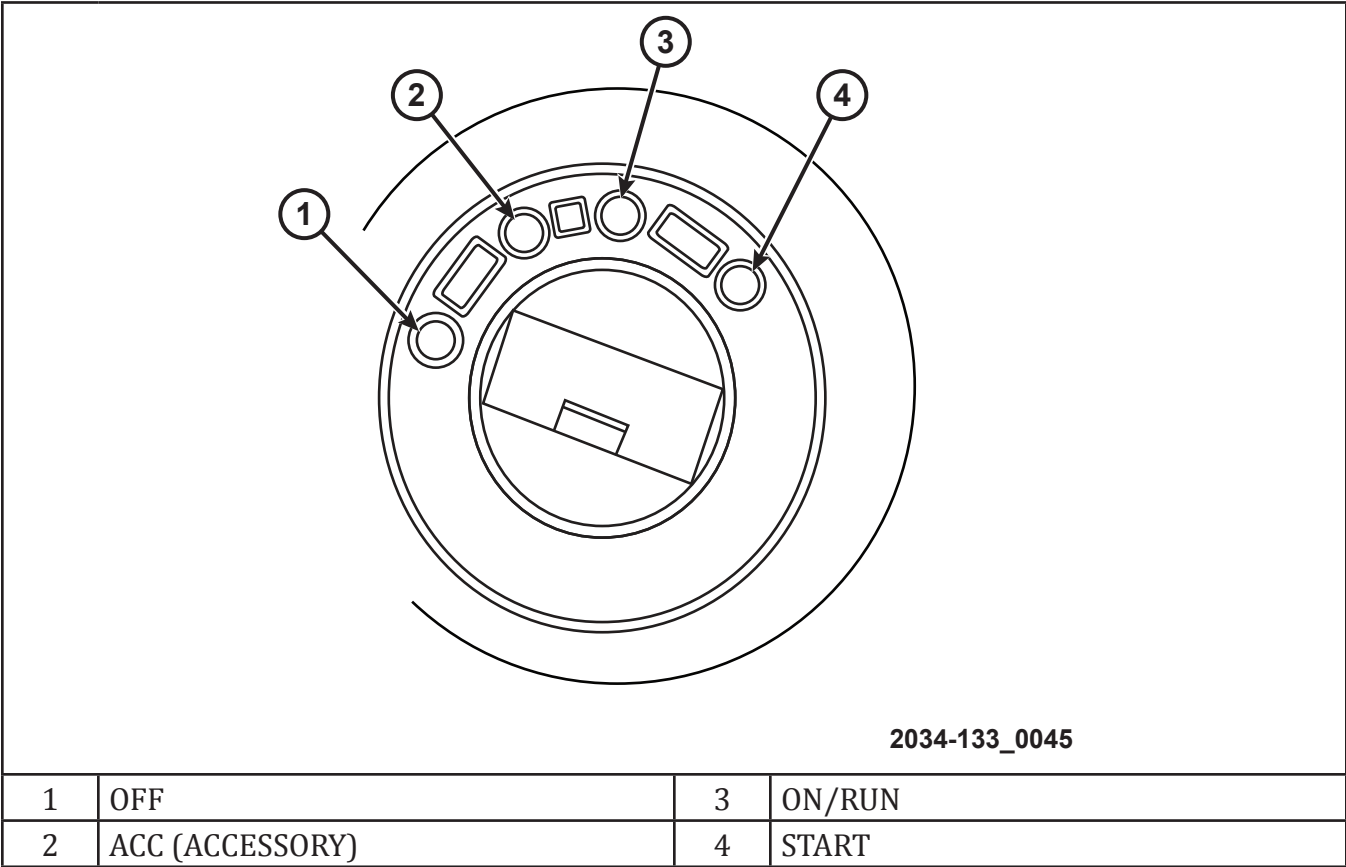


Figure 63 Ignition Switch

The wireless ignition node (WIN) incorporates an integral ignition switch that consists of four rotary positions with three detent positions and one spring-loaded position. The one extreme clockwise position is a spring-loaded momentary contact START position. When released from the START position, the switch will automatically return to the detent ON position. The other position includes a detent ACCESSORY position and a detent LOCK position.

The WIN reads the position of the ignition switch and transmits the data via the CAN data bus. These positions include LOCK with ignition key-out, LOCK with ignition key-in, ACCESSORY, RUN, and START.

Sentry Key Immobilizer System (SKIS)

Upon failure of proper sentry key immobilizer (SKIS) communication to the powertrain control module (PCM), the PCM will not allow the vehicle to crank. The engine will not re-crank on the key cycle that the failure occurred, a full key down sequence must be performed for the engine to crank again.

Remote Keyless Entry (RKE)

The RKE transmitter uses RF signals to communicate with the WIN, and the WIN relays the RKE requests to other modules in the vehicle over the CAN data bus.

Tire Pressure Monitor (TPM)

The TPM system consists of tire pressure monitoring sensors attached to each road wheel (and spare if equipped with a sensor) valve stem, a central receiver module, an indicator lamp, and (on some applications) a light load switch located on the instrument panel center stack. The valve stem used on this system is redesigned to look similar to a standard valve stem. The RAM SSV uses the wireless ignition node (WIN) as the central receiver module.

Brake Transmission Shifter Interlock (BTSI)

The brake transmission shifter/ignition interlock (BTSI) is controlled by the WIN. The BTSI prevents the transmission gear shifter from being moved out of park without a driver in place. For more information view the brake transmission shift interlock mechanism for the related transmission.

Park Shift Interlock

The key removal inhibit solenoid internal to the WIN prevents the FOB/IK from being rotated in the ignition switch to the LOCK position for all vehicles with an automatic transmission unless the transmission shift lever is in the park position. The WIN module monitors a hard-wired input from a switch integral to the automatic transmission shifter module to control this feature. The key removal inhibit solenoid is electronically disabled internally by the WIN on vehicles with a manual transmission.

IGNITION KEYS

Key FOB with Integrated Key

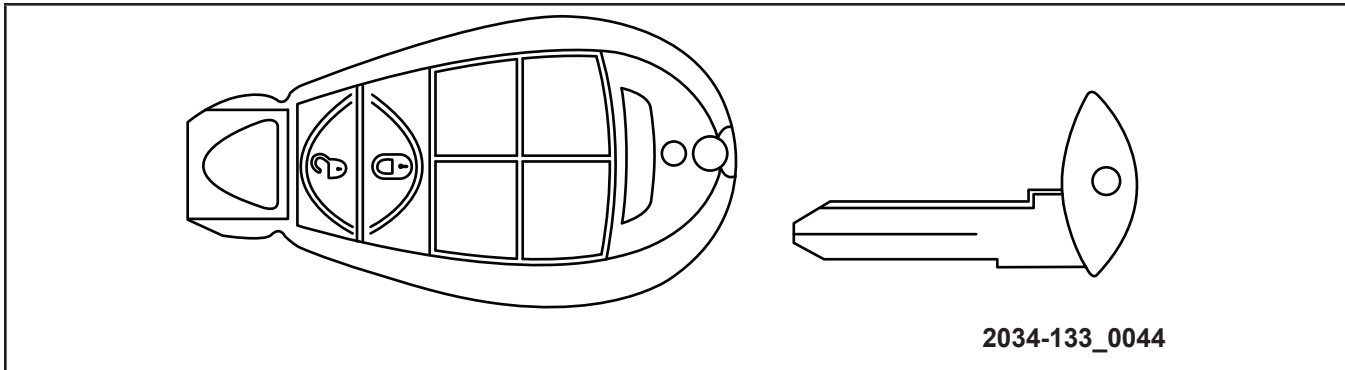


Figure 64 FOBIK

The key FOBIK operates the ignition switch. Insert the square end of the key FOBIK into the ignition switch located on the instrument panel and rotate to the desired position. The key FOB also contains the RKE transmitter and an emergency key, which stores in the rear of the key FOBIK.

Removing the Key FOBIK from the Ignition

Place the shift lever in park (if equipped with an automatic transmission). Turn the key FOBIK to the OFF position and then remove the key FOBIK.

Emergency Key Removal

The emergency key allows for entry into the vehicle should the battery in the vehicle or the RKE transmitter go dead. You can keep the emergency key with you when valet parking.

To remove the emergency key, slide the mechanical latch at the top of the Key FOB sideways with your thumb and then pull the key out with your other hand.

Note: Insert the double-sided emergency key into the lock cylinder with either side up.

Note: For vehicles not equipped with the electronic vehicle information center (EVIC), the power window switches, radio, power sunroof (if equipped), and power outlets will remain active for 10 minutes after the ignition switch is turned to the OFF position. Opening either front door will cancel this feature.

For vehicles equipped with the EVIC, the power window switches, radio, power sunroof (if equipped), and power outlets will remain active for up to 10 minutes after the ignition switch is turned to the OFF position. Opening either front door will cancel this feature. The time for this feature is programmable. Refer to “Electronic Vehicle Information Center (EVIC)/Personal Settings (Customer-Programmable Features)” in “Understanding Your Instrument Panel” for further information.

Key-in-ignition Reminder

Opening the driver’s door when the key FOB is in the ignition and the ignition switch position is OFF or ACC, sounds a signal to remind you to remove the key FOB.

Note: The key-in-ignition reminder only sounds when the key FOB is placed in the OFF or ACC ignition position.

If equipped with electronic vehicle information center (EVIC) the EVIC will display “Key In Ignition”.

SENTRY KEY®

The Sentry Key® immobilizer system prevents unauthorized vehicle operation by disabling the engine. The system does not need to be armed or activated. Operation is automatic, regardless of whether the vehicle is locked or unlocked.

The system uses a key FOB with a factory-mated RKE transmitter and WIN to prevent unauthorized vehicle operation. Therefore, only key FOBs that are programmed to the vehicle can be used to start and operate the vehicle. The system will not allow the engine to crank if an invalid key FOB is used to start and operate the vehicle.

Note: A key FOB that has not been programmed is also considered an invalid key.

During normal operation, after turning the ignition switch ON, the vehicle security light will turn on for 3 seconds for a bulb check. If the light remains on after the bulb check, it indicates that there is a problem with the electronics. In addition, if the light begins to flash after the bulb check, it indicates that someone used an invalid key FOB to try to start the engine. Either of these conditions will result in the engine being shut off after 2 seconds.

If the vehicle security light turns on during normal vehicle operation (vehicle running for longer than 10 seconds), it indicates that there is a fault in the electronics. Should this occur, have the vehicle serviced as soon as possible by an authorized dealer.

Caution: The Sentry Key® immobilizer system is not compatible with some after-market remote starting systems. Use of these systems may result in vehicle starting problems and loss of security protection.

Replacement Keys

At the time of purchase, the original owner is provided with a four-digit personal identification number (PIN). The owner should keep the PIN in a secure location. This number is required for authorized dealer replacement of key FOBs. Duplication of key FOBs may be performed at an authorized dealer; this procedure consists of programming a blank key FOB to the vehicle electronics. A blank key FOB is one that has never been programmed.

Note: Only key FOBs that are programmed to the vehicle electronics can be used to start and operate the vehicle. Once a key FOB is programmed to a vehicle, it cannot be programmed to any other vehicle.

Caution: Always remove the Sentry Keys® from the vehicle and lock all doors when leaving the vehicle unattended.

Note: When having the Sentry Key® Immobilizer System serviced, bring all vehicle keys with you to an authorized dealer.

If a programmed key FOB is lost, see your authorized dealer to have all remaining key FOBs erased from the system's memory. This will prevent the lost key FOBs from starting your vehicle. The remaining keys FOBs must then be reprogrammed.

Notes: _____

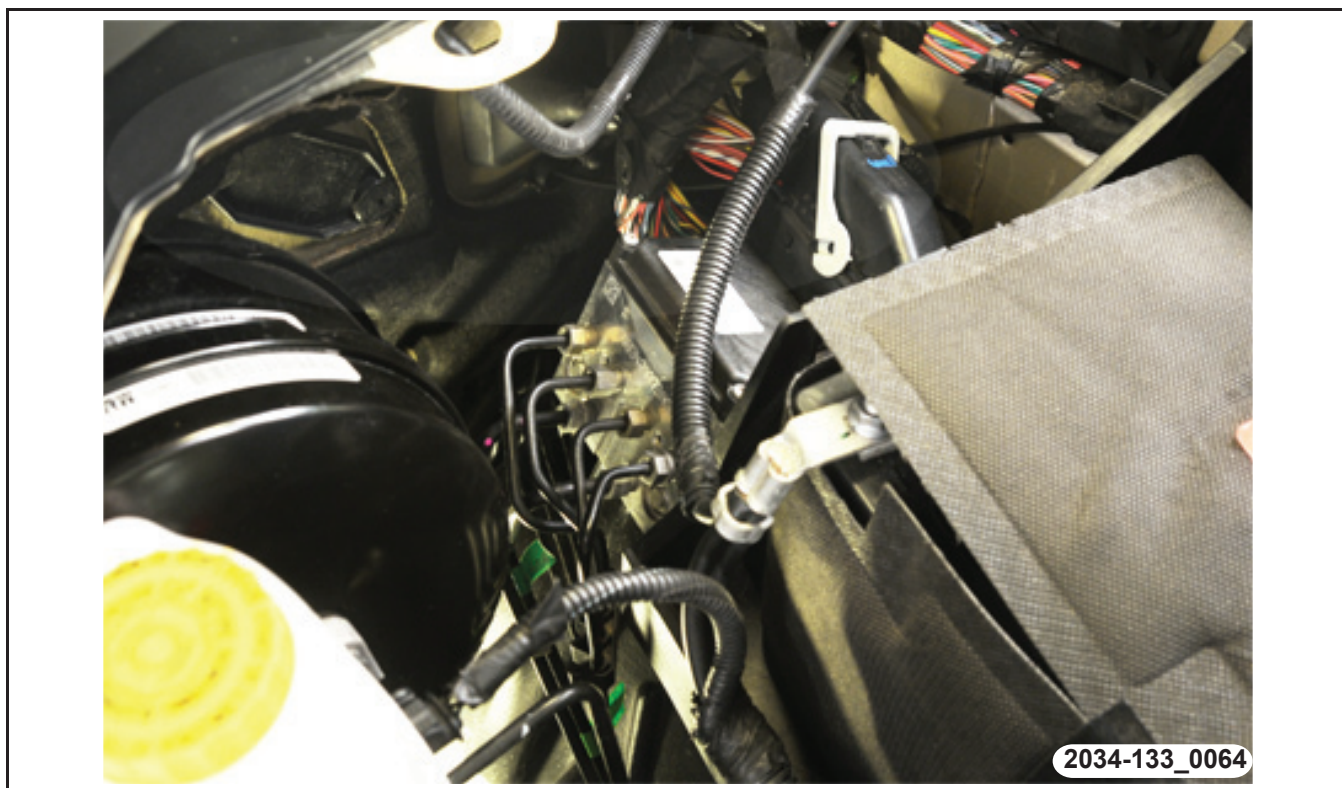
ANTILOCK BRAKE SYSTEM (ABS)

Figure 65 ABS Module

The antilock brake system (ABS) is an electronically operated, four channel brake control system that is part of electronic stability control (ESC). The vehicle also has electronic variable brake proportioning (EVBP) designed into the system which eliminates the combination/proportioning valve.

The system is designed to prevent wheel lockup and maintain steering control during braking. Preventing lockup is accomplished by modulating fluid pressure to the wheel brake units.

The hydraulic system is a four channel design. All wheel brakes are controlled individually. The ABS electrical system is separate from other electrical circuits in the vehicle. A specially programmed controller antilock brake unit operates the system components.

ABS system major components include:

- Antilock brake module (ABM)
- Hydraulic control unit (HCU)
- Wheel speed sensors (WSS)
- ABS warning light

Operation

Battery voltage is supplied to the ABM. The ABM performs a system initialization procedure at start up along with an ABS motor check. Initialization consists of a static and dynamic self check of system electrical components.

The static and dynamic checks occurs at ignition start up. During the dynamic check, the ABM briefly cycles solenoids to verify operation. An audible noise may be heard during this self check. This noise should be considered normal.

If an ABS component exhibits a fault during initialization, the ABM illuminates the amber warning light and registers a fault code in the microprocessor memory.

The ABM monitors wheel speed sensor inputs continuously while the vehicle is in motion. However, the ABM will not activate any ABS components as long as sensor inputs indicate normal braking.

During normal braking, the master cylinder, power booster, and wheel brake units all function as they would in a vehicle without ABS. The HCU components are not activated.

The purpose of the antilock system is to prevent wheel lockup. Preventing lockup helps maintain vehicle braking action and steering control.

The antilock ABM activates the system whenever sensor signals indicate periods of wheel slip.

The antilock system prevents lockup during a wheel slip condition by modulating fluid apply pressure to the wheel brake units.

Brake fluid apply pressure is modulated according to wheel speed, degree of slip, and rate of deceleration. Sensors at each wheel convert wheel speed into electrical signals. These signals are transmitted to the ABM for processing and determination of wheel slip and deceleration rate.

The ABS system has four fluid pressure control channels. Each wheel brake is controlled separately. A speed sensor input signal indicating a wheel slip condition activates the ABM antilock program.

There are two solenoid valves (isolation and dump valve) that are used in each antilock control channel. The valves are all located within the HCU valve body and work in pairs to either increase, hold, or decrease apply pressure as needed in the individual control channels.

During an ABS stop, the ISO valve is energized, which acts to prevent further pressure build-up to the calipers. Then the dump valve dumps off pressure until the wheel unlocks. This will continue until the wheels quit slipping altogether.

Notes: _____

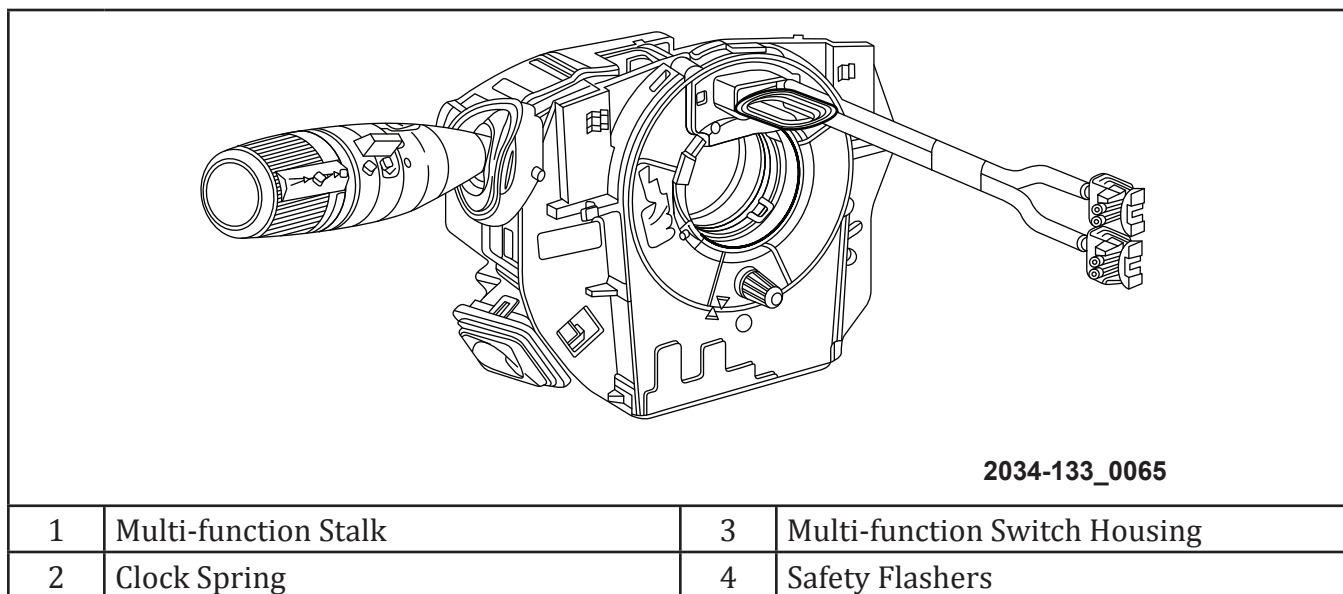
STEERING COLUMN MODULE

Figure 66 Steering Column Module

This vehicle is equipped with a steering column module (SCM), which is an electronic circuit board with a microprocessor that is internal to the multi-function switch housing. The SCM is a LIN slave and communicates over a dedicated LIN bus circuit. The CCN is the LIN master and also provides a gateway to the CAN data bus.

The multi-function switch is located on the left side of the steering column, just below the steering wheel. The multi-function switch provides the primary controls for the front wiper and washer systems, the turn signals, and headlamp beam selection. The only visible component of the switch is the control stalk, which includes a control knob that extends through the shrouds on the left side of the steering column. The remainder of the switch including its mounting provisions, its electrical connection, and a turn signal cancel actuator are concealed beneath the shrouds.

The switch housing and controls are constructed of molded black plastic. A single integral latch feature and slide tabs on the switch housing engage channels and a striker that are integral to the left side of the mounting bracket that is integral to the clock spring to secure the switch to the steering column. Each of the switches within the multi-function switch is internally connected to the SCM. A single connector receptacle integral to the back of the switch housing connects the SCM to the vehicle electrical system through a dedicated takeout and connector of the instrument panel wire harness.

The SCM cannot be adjusted or repaired, and is not flash update capable. If ineffective or damaged, the entire multi-function switch must be replaced. The clock spring (with the multi-function switch mounting bracket) and the multi-function switch (with the SCM) are each available for separate service replacement.

Operation

The microprocessor-based steering column module (SCM) utilizes integrated circuitry to monitor hard-wired analog and multiplexed inputs from the individual switches within the multi-function switch. In response to those inputs, the internal circuitry of the SCM allows it to transmit electronic message outputs to the CCN over the LIN data bus.

The SCM is connected to both a fused B (+) circuit and a fused ignition switch output (run-start) circuit. It receives a path to ground at all times. These connections allow it to remain functional regardless of the ignition switch position. Any input to the SCM that controls a vehicle system function that does not require that the ignition switch be in the ON position (such as flashing the high beam headlamps), prompts the SCM to wake up and transmit on the LIN data bus.

Diagnosis and Testing SCM

The hard-wired circuits between components related to the steering column module (SCM) may be diagnosed using conventional diagnostic tools and procedures.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the SCM or the electronic controls or communication between modules and other devices that provide some features of the SCM. The most reliable, efficient, and accurate means to diagnose the SCM or the electronic controls and communication related to SCM operation requires the use of a diagnostic scan tool.

WARNING: TO AVOID SERIOUS OR FATAL INJURY ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, SEAT BELT TENSIONER, IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SRS. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

CABIN COMPARTMENT NODE (CCN)**Description**

Figure 67 Cabin Compartment Node

The instrument cluster is located in the instrument panel above the steering column opening and includes the hardware and software necessary to serve as the electronic body control module. The remainder of the instrument cluster, including the mounts and the electrical connections, are concealed within the instrument panel behind the cluster bezel. Besides analog gauges and indicators, the CCN module incorporates a single unit for displaying odometer/trip odometer information, engine hours, several warning or reminder indications, and certain diagnostic information.

The instrument cluster gauges and indicators are visible through a dedicated opening in the cluster bezel on the instrument panel and are protected by a clear plastic cluster lens that is integral to a cluster lens and hood unit. Just behind the cluster lens is the cluster hood. The cluster hood serves as a visor and shields the face of the cluster from ambient light and reflections to reduce glare. A black plastic odometer/trip odometer switch button protrudes through dedicated holes in the cluster lens, located near the lower edge of the cluster just to the left of the speedometer. The molded plastic lens and hood unit has three integral mounting tabs, one each on the lower outboard corners and one on the upper center of the unit. These mounting tabs are used to secure the CCN to the molded plastic instrument panel cluster carrier with three screws.

The rear of the cluster housing and the CCN electronic circuitry are protected by a molded plastic rear cover, which is secured to the cluster housing with molded plastic clips. The connector receptacles on the back of the cluster electronic circuit board connect the CCN to the vehicle electrical system through three take outs with connectors from the instrument panel wire harness.

Sandwiched between the rear cover and the lens and hood unit is the cluster housing. The molded plastic cluster housing serves as the carrier for the cluster circuit board and circuitry, the cluster connector receptacles, the gauges, a light-emitting diode (LED) for each cluster indicator, an audible tone transducer, the cluster overlay, the gauge pointers and the odometer/trip odometer switch.

The cluster overlay is a laminated plastic unit. The dark, visible, outer surface of the overlay is marked with all of the gauge dial faces and graduations, but this layer is also translucent. The darkness of this outer layer prevents the cluster from appearing cluttered or busy by concealing the cluster indicators that are not illuminated, while the translucence of this layer allows those indicators and icons that are illuminated to be readily visible. The underlying layer of the overlay is opaque and allows light from the LED for each of the various indicators and the LED general illumination behind it to be visible through the outer layer of the overlay only through predetermined stencil-like cutouts. A rectangular opening in the overlay between the tachometer and the speedometer through which the liquid crystal display (LCD) unit can be viewed.

Notes: _____

Functions of the Cabin Compartment Node (CCN)

Besides typical instrument cluster gauge and indicator support, the CCN supports or controls the following electronic functions and features.

Audible Warnings

The CCN electronic circuit board is equipped with an audible tone transducer and programming that allows it to provide various audible alerts to the vehicle operator, including chime tones and beep tones, and emulates the sound of a conventional turn signal or hazard warning flasher.

Brake Lamp Control

The CCN provides electronic brake lamp request messages to the totally integrated power module (TIPM) located in the engine compartment near the battery for brake lamp control, excluding control of the center high mounted stop lamp (CHMSL), which remains controlled by a direct hard-wired output of the brake lamp switch.

Cargo Lamp Control

The CCN provides direct control of cargo lamp operation with a load shedding (battery saver) feature which will automatically turn off the cargo lamp if it remains on after a timed interval.

Electronic Transfer Case Interface

On vehicles equipped with an electronic four-wheel drive transfer case, the CCN monitors a hard-wired multiplex input from the transfer case mode switch and then provides the appropriate electronic data bus messages to the TIPM for transfer case control. After the transfer case shift is completed, the TIPM provides an electronic message back to the CCN and the CCN responds by activating the appropriate 4WD indicators within the cluster or in the transfer case switch.

Enhanced Accident Response Support

The CCN monitors an input from the occupant restraint controller (ORC) and, following an airbag deployment. The CCN monitors an input from the powertrain control module (PCM) to automatically turn on the interior lighting after an airbag deployment event, 10 seconds after the vehicle speed is zero. The interior lighting remains illuminated until the ignition switch is turned to the off position, at which time the interior lighting returns to normal operation and control. These enhanced accident response system (EARS) features are each dependent upon a functional vehicle electrical system following the vehicle impact event.

Exterior Lighting Control

The CCN provides electronic head lamp and park lamp request messages to the TIPM for the appropriate exterior lamp control of standard head and park lamps, as well as optional front fog lamps. This includes support for headlamp beam selection and the optical horn feature, also known as flash-to-pass.

Exterior Lighting Fail-Safe

In the absence of a headlamp switch input, the CCN will turn on the cluster general illumination lamps and provide electronic headlamp low beam and park lamp request messages to the TIPM for default exterior lamp operation. The TIPM will also provide default park lamp and headlamp low beam operation and the CCN will turn on the cluster general illumination lighting at full intensity if there is a failure of the electronic data bus communication between the CCN and the TIPM.

Fuel Level Data Support

The TIPM provides a current source for and receives a bus message input from the fuel level sending unit located on the fuel pump module in the fuel tank. The TIPM then sends electronic messages to the CCN over the can data bus to calculate the proper fuel gauge needle position and low fuel indicator operation. Based upon this input, the CCN also calculates fuel level, average fuel economy, and distance to empty data, then uses electronic messaging to transmit this data over the CAN data bus for use by other electronic modules in the vehicle.

Horn Control

The CCN monitors an input from the horn switch and provides electronic horn request messages to the TIPM for horn control.

Instrument Panel Synchronization

The CCN monitors hard-wired multiplexed inputs from the headlamp switch on the instrument panel, then transmits electronic panel lamp dimming level messages that allows all other electronic modules on the CAN data bus to coordinate their illumination intensity with that of the CCN. This includes a PARADE mode (also known as funeral mode) that allows all LCD units in the vehicle to be illuminated at full (daytime) intensity while driving during daylight hours with the exterior lamps turned on.

Interior Lamp Load Shedding

The CCN provides a battery saver feature which will automatically turn off all interior lamps and the cargo lamps if they remain on after a timed interval of about five minutes.

Interior Lighting Control

The CCN monitors inputs from the interior lighting switch, the door ajar switches, the cargo lamp switch, the reading lamp switches, and the WIN to provide courtesy lamp control. This includes support for timed illuminated entry with theater-style fade-to-off and courtesy illumination defeat features.

Panel Lamps Dimming Control

The CCN monitors hard-wired multiplexed inputs from the headlamp switch on the instrument panel, then provides a hard-wired, 12-volt, pulse-width-modulated (PWM) output that synchronizes the dimming level of all panel lamps dimmer controlled lamps with that of the cluster illumination lamps.

Remote Keyless Entry

The CCN supports the optional remote keyless entry (RKE) system features, including support for the RKE LOCK, UNLOCK (with optional driver-door-only unlock, and unlock-all-doors), PANIC, audible chirp, optical chirp, illuminated entry modes, an RKE programming mode. CCN also supports the optional vehicle theft security system (VTSS) arming (when the proper VTSS arming conditions are met) and disarming.

Remote Radio Switch Interface

The CCN monitors inputs from the optional remote radio switches and then provides the appropriate electronic data bus messages to the radio to select the radio or optional hands-free cellular system operating mode, volume control, preset station scan and station seek features.

Turn Signal and Hazard Warning Lamp Control

The CCN monitors hard-wired multiplexed inputs from the multi-function switch on the steering column, then provides electronic turn and hazard lamp request messages to the TIPM for turn and hazard lamp control. The CCN also provides an audible click at one of two rates to emulate normal and bulb out turn or hazard flasher operation based upon electronic lamp outage messages from the TIPM, and provides an audible turn signal ON chime warning if a turn is signalled continuously for more than about 1.6 kilometers (one mile) and the vehicle speed remains greater than about 24 km/h (15 mph).

Vehicle Theft Security System Control

The CCN monitors inputs from the door ajar switches, the ignition switch, and the WIN, then provides electronic horn and lighting request messages to the TIPM for the appropriate VTSS alarm output features.

Wiper and Washer System Control

The CCN monitors LIN bus inputs from the wiper and washer switches in the multi-function switch on the steering column, then provides electronic wiper and washer request messages to the TIPM for the appropriate wiper and washer system features.

Notes: _____

LIQUID CRYSTAL DISPLAY



Figure 68 Liquid Crystal Display

The instrument cluster includes an odometer/trip odometer display that is a liquid crystal display (LCD).

The odometer, trip odometer, and engine hours information are not displayed simultaneously. The trip odometer reset switch on the instrument cluster circuit board toggles the display between odometer and trip odometer modes by depressing the odometer/trip odometer switch button that extends through the lower edge of the cluster lens, just left of the tachometer. When the trip odometer information is displayed, the word TRIP is also illuminated in the lower right corner of the LCD in a blue-green color and at the same lighting level as the trip odometer information. The engine hours information replaces the selected odometer or trip odometer information whenever the ignition switch is in the ON position and the engine is not running.

The odometer, trip odometer, and engine hours information is stored in the instrument cluster memory. This information can be increased when the proper inputs are provided to the instrument cluster, but the information cannot be decreased. The odometer can display values up to 999,999 kilometers (621,369.3 miles). The odometer latches at these values, and will not roll over to zero. The trip odometer can display values up to 999.9 kilometers (621 miles) before it rolls over to zero. Engine hours are displayed in the format, hr 9999. The cluster will accumulate values up to 65,000 hours before the display rolls over to zero. The engine hours are displayed within the LCD odometer display on low line models and in the EVIC display on high-line models.

The odometer display does not have a decimal point and will not show values less than a full unit (kilometer or mile), while the trip odometer display does have a decimal point and will show tenths of a unit (kilometer or mile). The unit of measure (kilometers or miles) for the odometer and trip odometer display is not shown in the LCD. The unit of measure for the instrument cluster odometer/trip odometer is selected at the time that it is manufactured, and cannot be changed. The odometer also has a RENTAL CAR mode, which will illuminate the odometer information in the LCD whenever the driver side front door is opened with the ignition switch in the OFF or ACCESSORY positions.

During daylight hours (exterior lamps are off) the odometer LCD is illuminated at full brightness for clear visibility. At night (exterior lamps are on), the LCD lighting level is adjusted with the other cluster general illumination lamps using the panel lamps dimmer thumb wheel on the headlamp switch. However, a PARADE mode position of the panel lamps dimmer thumb wheel allows the LCD to be illuminated at full brightness if the exterior lamps are turned on during daylight hours.

The odometer/trip odometer LCD, the trip odometer switch, and the trip odometer switch button are serviced as a unit with the instrument cluster.

The CCN module for this vehicle is serviced only as a complete unit. The CCN module cannot be adjusted or repaired. If a gauge, an LED indicator, the LCD unit, the electronic circuit board, the circuit board hardware, the cluster overlay, or the CCN housing are damaged or ineffective, the entire CCN module must be replaced. The cluster lens, hood and mask unit are available for separate service replacement.

Operation

The instrument cluster includes the hardware and software necessary to serve as the electronic body control module and is sometimes referred to as the cab compartment node or (CCN).

The following information deals primarily with the instrument cluster functions of this unit. Additional details of the electronic body control functions of this unit may be found within the service information for the system or component that the CCN controls. For example, additional details of the audible warning functions of the CCN are found within the Chime/Buzzer service information.

The CCN also has a self-diagnostic test capability, which will test each of the CAN bus message-controlled functions of the cluster by lighting the appropriate indicators, positioning the gauge needles at several predetermined calibration points across the gauge faces, and illuminating all segments of the odometer/trip odometer/gear selector indicator liquid crystal display (LCD) unit.

Diagnosis and Testing Instrument Cluster

If all of the instrument cluster gauges and indicators are inoperative, be certain to check the instrument cluster fused B (+) fuse and the instrument cluster fused B (+) and ground circuits for shorts or opens. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information, and location views for the various wire harness connectors, splices, and grounds.

If an individual hard-wired gauge or indicator is inoperative, refer to the diagnosis and testing service information for that specific gauge or indicator. If an individual CAN data bus message-controlled gauge or indicator is inoperative, perform the Self Test.

WARNING: TO AVOID SERIOUS OR FATAL INJURY ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, SEAT BELT TENSIONER, IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SRS. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

CAUTION: Instrument clusters used in this vehicle automatically configure themselves for compatibility with the features and optional equipment in the vehicle in which they are initially installed. The instrument cluster is programmed to do this by embedding the vehicle identification number (VIN) and other information critical to proper cluster operation into electronic memory. This embedded information is learned through electronic messages received from other electronic modules in the vehicle over the controller area network (CAN) data bus, and through certain hard-wired inputs received when the cluster is connected to the vehicle electrically. When configured, the instrument cluster memory may be irreparably damaged and certain irreversible configuration errors may occur if the cluster is connected electrically to another vehicle; or, if an electronic module from another vehicle is connected that provides data to the instrument cluster (including odometer values) that conflicts with that which was previously learned and stored. Therefore, the practice of exchanging (swapping) instrument clusters and other electronic modules in this vehicle with those removed from another vehicle must always be avoided. Failure to observe this caution may result in instrument cluster damage, which is not reimbursable under the terms of the product warranty. Service replacement instrument clusters are provided with the correct VIN, and the certified odometer and engine hours values embedded into cluster memory, but will otherwise be automatically configured for compatibility with the features and optional equipment in the vehicle in which they are initially installed.

Note: Certain indicators in this instrument cluster are automatically configured. This feature allows those indicators to be activated or deactivated for compatibility with certain optional equipment. If the problem being diagnosed involves improper illumination of the cruise indicator, the electronic throttle control indicator, the fog lamp indicator, any of the four-wheel drive indicators, the overdrive off indicator, the tow/haul indicator, the transmission over temperature indicator, the security indicator or the gear selector indicator, disconnect and isolate the battery negative cable. After about five minutes, reconnect the battery negative cable and turn the ignition switch to the ON position. The instrument cluster should automatically relearn the equipment in the vehicle and properly configure the configurative indicators accordingly.

Self Test

The instrument cluster self test will put the instrument cluster into its self-diagnostic mode. In this mode, the instrument cluster can perform a self-diagnostic test that will confirm that the instrument cluster circuitry, the gauges, and the indicators are capable of operating as designed. During the self test, the instrument cluster circuitry will position each of the gauge needles at various calibration points, illuminate all of the segments or portions in the liquid crystal display (LCD) unit, and turn all of the indicators on and off again.

Successful completion of the self test will confirm that the instrument cluster is operational. However, there may still be a problem with the CAN data bus, the powertrain control module (PCM), the totally integrated power module (TIPM), the transmission control module (TCM), the occupant restraint controller (ORC), the controller antilock brake (CAB), the wireless ignition node (WIN), or the hard-wired inputs to one of these electronic control modules. Use a diagnostic scan tool to diagnose these components. Refer to the appropriate diagnostic information.

1. Begin the test with the ignition switch in the OFF position.
2. Depress the odometer/trip odometer switch button.
3. While still holding the odometer/trip odometer switch button depressed, turn the ignition switch to the ON position, but do not start the engine.
4. Release the odometer/trip odometer switch button.
5. The instrument cluster will simultaneously begin to illuminate all of the operational segments in the LCD unit and perform a bulb check of each operational light emitting diode (LED) indicator. The LCD segments and LED indicators remain illuminated as each gauge needle is swept to several calibration points and back. If a VFD segment or an LED indicator fails to illuminate, or if a gauge needle fails to sweep through the calibration points and back during this test, the instrument cluster must be replaced.
6. The self test is now completed. The instrument cluster will automatically exit the self-diagnostic mode and return to normal operation at the completion of the test. The self test will be aborted if the ignition switch is turned to the OFF position, or if a vehicle speed message indicating that the vehicle is moving is received from the PCM over the CAN data bus during the test.
7. Go back to Step #1 to repeat the test, if necessary.

Notes: _____

RESTRAINTS

WARNING: TO AVOID SERIOUS OR FATAL INJURY ON VEHICLES EQUIPPED WITH THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS), NEVER ATTEMPT TO REPAIR THE ELECTRICALLY CONDUCTIVE CIRCUITS OR WIRING COMPONENTS RELATED TO THE SRS FOR WHICH THERE IS NO MOPAR WIRING REPAIR KIT. IT IS IMPORTANT TO USE ONLY THE RECOMMENDED SPLICING KIT AND PROCEDURE. FOR APPLICABLE AND AVAILABLE MOPAR WIRING REPAIR KITS, PLEASE VISIT THE MOPAR CONNECTOR WEB SITE AT THE FOLLOWING ADDRESS ON THE INTERNET: ([HTTP://DTO.VFTIS.COM/MOPAR/DISCLAIMER.ASP](http://dto.vftis.com/mopar/disclaimer.asp)). INAPPROPRIATE REPAIRS CAN COMPROMISE THE CONDUCTIVITY AND CURRENT CARRYING CAPACITY OF THOSE CRITICAL ELECTRICAL CIRCUITS, WHICH MAY CAUSE SRS COMPONENTS NOT TO DEPLOY WHEN REQUIRED, OR TO DEPLOY WHEN NOT REQUIRED. ONLY MINOR CUTS OR ABRASIONS OF WIRE AND TERMINAL INSULATION WHERE THE CONDUCTIVE MATERIAL HAS NOT BEEN DAMAGED, OR CONNECTOR INSULATORS WHERE THE INTEGRITY OF THE LATCHING AND LOCKING MECHANISMS HAVE NOT BEEN COMPROMISED MAY BE REPAIRED USING APPROPRIATE METHODS.

WARNING: TO AVOID SERIOUS OR FATAL INJURY DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INEFFECTIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR INEFFECTIVE SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW, AND UNUSED REPLACEMENT PARTS LISTED IN THE CHRYSLER MOPAR® PARTS CATALOG. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.

WARNING: TO AVOID SERIOUS OR FATAL INJURY ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, SEAT BELT TENSIONER, IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SRS. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

- WARNING:** TO AVOID POTENTIAL PHYSICAL INJURY OR DAMAGE TO SENSITIVE ELECTRONIC CIRCUITS AND SYSTEMS, ALWAYS DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE AND THE POSITIVE CABLE, THEN GROUND THE POSITIVE CABLE TO DISCHARGE THE OCCUPANT RESTRAINT CONTROLLER (ORC) CAPACITOR BEFORE PERFORMING ANY WELDING OPERATIONS ON THE VEHICLE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT, POSSIBLE DAMAGE TO THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) CIRCUITS AND COMPONENTS, AND POSSIBLE DAMAGE TO OTHER ELECTRONIC CIRCUITS AND COMPONENTS. WHENEVER A WELDING PROCESS IS BEING PERFORMED WITHIN 12 INCHES (30 CENTIMETERS) OF AN ELECTRONIC MODULE OR WIRING HARNESS, THEN THAT MODULE OR HARNESS SHOULD BE RELOCATED OUT OF THE WAY, OR DISCONNECTED. ALWAYS PROTECT AGAINST COMPONENT OR VEHICLE DAMAGE FROM WELD SPATTER BY USING WELD BLANKETS AND SCREENS.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY, DO NOT ATTEMPT TO DISMANTLE AN AIRBAG UNIT OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURES EXCEEDING 93°C (200°F). AN AIRBAG INFLATOR UNIT MAY CONTAIN SODIUM AZIDE AND POTASSIUM NITRATE. THESE MATERIALS ARE POISONOUS AND EXTREMELY FLAMMABLE. CONTACT WITH ACID, WATER, OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES (SODIUM HYDROXIDE IS FORMED IN THE PRESENCE OF MOISTURE) OR COMBUSTIBLE COMPOUNDS. AN AIRBAG INFLATOR UNIT MAY ALSO CONTAIN A GAS CANISTER PRESSURIZED TO OVER 17.24 KPA (2500 PSI). FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY WHEN HANDLING A SEAT BELT TENSIONER RETRACTOR. EXERCISE PROPER CARE TO KEEP FINGERS OUT FROM UNDER THE RETRACTOR COVER AND AWAY FROM THE SEAT BELT WEBBING WHERE IT EXITS FROM THE RETRACTOR COVER. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY, REPLACE ALL SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS ONLY WITH PARTS SPECIFIED IN THE CHRYSLER MOPAR® PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.

WARNING: TO AVOID SERIOUS OR FATAL INJURY, THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. THESE FASTENERS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE SRS. ANYTIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE CHRYSLER MOPAR® PARTS CATALOG.

WARNING: TO AVOID SERIOUS OR FATAL INJURY WHEN A STEERING COLUMN HAS AN AIRBAG UNIT ATTACHED, NEVER PLACE THE COLUMN ON THE FLOOR OR ANY OTHER SURFACE WITH THE STEERING WHEEL OR AIRBAG UNIT FACE DOWN. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.

Description

An occupant restraint system is standard factory-installed safety equipment on this vehicle. Available occupant restraints for this vehicle include both active and passive types. Active restraints are those which require the vehicle occupants to take some action to employ, such as fastening and adjusting a seat belt; while passive restraints require no action by the vehicle occupants to be employed.

ACTIVE RESTRAINTS

Child Restraint Anchors

All standard cab vehicles are equipped with two, fixed-position, child seat upper tether anchors that are integral to the upper cab back panel reinforcement and concealed behind individual trim cover and bezel units that are integral to the cab back trim panel. All vehicles with rear seats are equipped with three child seat upper tether anchor straps that are secured to the upper cab back panel reinforcement, behind the upright rear seat back. Two lower anchors are also provided for each rear outboard seating position on quad or crew cabs. Mega cabs have lower anchors provided for all three rear seating positions. These lower anchors are accessed from the front of the seat where the seat back meets the seat cushion. Child seat upper tether and lower anchors for the front seat are unavailable on quad or crew cab and mega cab vehicles. Likewise, lower anchors for the front seat are not available on standard cab vehicles.

Front Seat Belts

Both outboard front seating positions are equipped with three-point seat belt systems employing a lower B-pillar-mounted inertia latch-type emergency locking retractor (ELR), a height-adjustable upper B-pillar-mounted turning loop, a fixed lower seat belt anchor secured to the lower B-pillar (standard cab) or floor panel adjacent to the B-pillar (quad or crew cab), and a traveling end-release seat belt buckle secured to the inboard seat track. Except for the driver side front seat, the retractors for all vehicles are also switchable from an ELR to an automatic locking retractor (ALR) for compatibility with child seats. The front seat belt buckle for the driver side of all vehicles includes an integral seat belt switch that detects whether its seat belt has been fastened. The center front seating position for standard cabs is also equipped with a three-point seat belt employing a floor panel mounted inertia latch-type ELR, a routing bracket and bezel near the top of the cab back panel, and two fixed end-release buckles secured to the center seat cushion frame. One of the center buckles is specially keyed to serve as the center seat belt lower anchor. The center front seating position for quad or crew cab vehicles with a split bench front seat is equipped with a fixed lap belt and an end-release buckle secured to the center seat cushion frame.

Rear Seat Belts

On all vehicles equipped with rear seats, each rear seating position is equipped with a three-point seat belt system. Each outboard rear seating position seat belt employs a lower C-pillar-mounted inertia latch-type emergency locking retractor (ELR), a fixed position upper C-pillar-mounted turning loop, and a fixed lower seat belt anchor secured to the lower C-pillar. The quad or crew cab rear seat center seating position has a rear floor-panel-mounted inertia latch-type ELR and a routing bracket and bezel on the top of the cab back panel, while the mega cab rear seat center position retractor and a routing bracket and bezel are mounted to the rear seat back panel. A fixed end-release buckle unit for the quad or crew cab right outboard seating position is integral to the right side of the center retractor mounting bracket on the rear floor panel. The end-release buckle units for the quad or crew cab center and left outboard seating positions are individually secured to the rear floor panel on vehicles with the standard equipment rear bench seat, or secured with the rear seat mounting hardware on vehicles with the optional split rear bench seat. The fixed end-release buckle units for all mega cab rear seating positions are secured to the seat cushion frame mounting hardware. The rear seat retractors for all vehicles are also switchable from an ELR to an ALR for compatibility with child seats.

PASSIVE RESTRAINTS

Figure 69 Restraint Label

Dual Front Airbags

Multistage driver and front passenger airbags are used in this vehicle. This airbag system consists of passive, inflatable, supplemental restraint system (SRS) components and vehicles with this equipment can be readily identified by the SRS - AIRBAG logo molded into the driver airbag trim cover in the center of the steering wheel and also into the passenger airbag door on the top of the instrument panel trim cover above the upper glove box or storage bin opening. Vehicles with the airbag system can also be identified by the airbag indicator, which will illuminate in the CCN from 4 to 6 seconds as a bulb test each time the ignition switch is turned to the ON position. A pyrotechnic-type seat belt tensioner is also integral to the front outboard seat belt retractors to work in conjunction with the dual front airbags.

Side Curtain Airbags

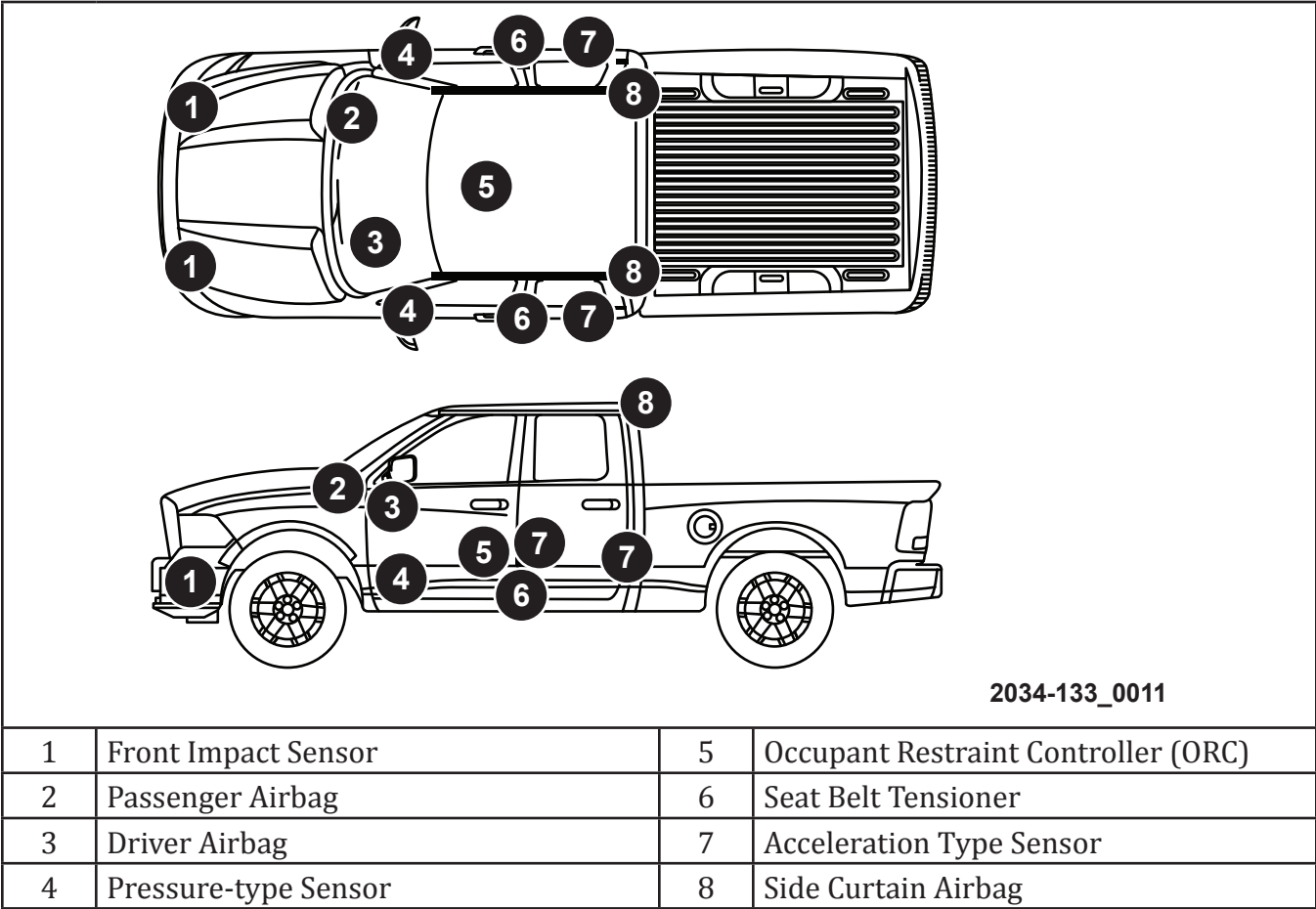


Figure 70 SRS Component Locations

Side curtain airbags are standard equipment for this vehicle when it is also equipped with dual front airbags. This airbag system consists of passive, inflatable, SRS components and vehicles with this equipment can be readily identified by a molded identification trim button with the SRS-AIRBAG logo located at the top of each B-pillar trim (all models) and C-pillar trim (quad or crew cab and mega cab only) near the headliner.

The SRS includes the following major components:

Airbag Indicator

The airbag indicator is integral to the CCN, which is located on the instrument panel in front of the driver.

Clock Spring

The clock spring is located near the top of the steering column, directly beneath the steering wheel.

Driver Airbag

The driver airbag is located in the center of the steering wheel horn pad, beneath the driver airbag trim cover.

Front Impact Sensor

Two front impact sensors are used, one left side and one right side. One sensor is located on the back side of each end of the lower radiator support cross member on each side of the cooling module and below the inboard side of each front lamp unit.

Occupant Restraint Controller

The occupant restraint controller (ORC) is located on a mounting bracket on the floor panel transmission tunnel below the center section of the front seat, or under the center floor console, as the vehicle is equipped.

Passenger Airbag

The passenger airbag is located in the instrument panel, beneath the passenger airbag door integral to the top of the instrument panel trim cover just forward of the upper glove box or storage bin on the passenger side of the vehicle.

Passenger Knee Blocker

The passenger knee blocker is a structural reinforcement that is integral to and concealed within the lower glove box door.

Seat Belt Tensioner

A seat belt tensioner is integral to both front outboard seat belt retractor units. The seat belt retractor tensioner units are secured to the right and left inner B-pillars and concealed beneath the lower B-pillar trim.

Side Curtain Airbag

A side curtain airbag is secured to each inside roof side rail above the headliner, and extends from the A-pillar to near the cab back.

Side Impact Sensor

Up to six side impact sensors are used on vehicles with side curtain airbags, up to three on each side of the vehicle. One pressure sensor is located on each right and left front door module carrier behind the front door trim panel on some vehicles. In addition, an acceleration sensor is located on each inner B-pillar behind the lower B-pillar trim on all models, while quad or crew cab and mega cab models also have one acceleration sensor on each inner C-pillar behind the lower C-pillar trim.

The ORC and the CCN each contain a microprocessor and programming that allow them to communicate with each other using the CAN data bus. This method of communication is used by the ORC for control of the airbag indicator in the CCN.

Hard-wired circuitry connects the SRS components to each other through the electrical system of the vehicle. These hard-wired circuits are integral to several wire harnesses, which are routed throughout the vehicle and retained by many different methods. These circuits may be connected to each other, to the vehicle electrical system, and to the SRS components through the use of a combination of soldered splices, splice block connectors, and many different types of wire harness terminal connectors and insulators. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, further details on wire harness routing and retention, as well as pin-out and location views for the various wire harness connectors, splices, and grounds.

Operation

Active Restraints

The primary passenger restraints in this or any other vehicle are the standard equipment factory-installed seat belts and child restraint anchors. Seat belts and child restraint anchors are referred to as an active restraint because the vehicle occupants are required to physically fasten and properly adjust these restraints in order to benefit from them.

Passive Restraints

The passive restraints are referred to as a supplemental restraint system (SRS) because they were designed and are intended to enhance the protection for the occupants of the vehicle only when used in conjunction with the seat belts. They are referred to as passive restraints because the vehicle occupants are not required to do anything to make them operate; however, the vehicle occupants must be wearing their seat belts in order to obtain the maximum safety benefit from the factory-installed SRS components.

The SRS electrical circuits are continuously monitored and controlled by a microprocessor and software contained within the occupant restraint controller (ORC). An airbag indicator in the CCN illuminates from 4 to 6 seconds as a bulb test each time the ignition switch is turned to the ON or START positions. Following the bulb test, the airbag indicator is turned on or off by the ORC to indicate the status of the SRS. If the airbag indicator comes on at any time other than during the bulb test, it indicates that there is a problem in the SRS electrical circuits. Such a problem may cause airbags not to deploy when required, or to deploy when not required.

Deployment of the SRS components depends upon the angle and severity of an impact. Deployment is not based upon vehicle speed; rather, deployment is based upon the rate of

deceleration as measured by the forces of gravity (G force) upon the acceleration impact sensors, or by a pressure wave within a front door as measured by the pressure impact sensor. When an impact is severe enough, the microprocessor in the ORC signals the inflator of the appropriate airbag units to deploy their airbag cushions. The outboard front seat belt retractor tensioners are provided with a deployment signal by the ORC in conjunction with the front airbags. The side curtain airbags are provided with a deployment signal individually by the ORC based upon a side impact sensor input for the same side of the vehicle.

During a frontal vehicle impact, the knee blockers work in concert with properly fastened and adjusted seat belts to restrain both the driver and the right front seat passenger in the proper position for an airbag deployment. The knee blockers also absorb and distribute the crash energy from the driver and the right front seat passenger to the structure of the instrument panel. The seat belt tensioners remove the slack from the outboard front seat belts to provide further assurance that the driver and right front seat passenger are properly positioned and restrained for an airbag deployment.

When the ORC monitors a problem in any of the SRS circuits or components, including the seat belt tensioners, it stores a fault code or DTC in its memory circuit and sends an electronic message to the CCN to turn on the airbag indicator. The hard-wired circuits between components related to the SRS may be diagnosed using conventional diagnostic tools and procedures. Refer to the appropriate wiring information. The wiring information includes wiring diagrams, proper wire and connector repair procedures, details of wire harness routing and retention, connector pin-out information and location views for the various wire harness connectors, splices, and grounds.

However, conventional diagnostic methods will not prove conclusive in the diagnosis of the SRS or the electronic controls or communication between other modules and devices that provide features of the SRS. The most reliable, efficient, and accurate means to diagnose the SRS or the electronic controls and communication related to SRS operation, as well as the retrieval or erasure of a DTC requires the use of a diagnostic scan tool. Refer to the appropriate diagnostic information.

Notes: _____

SEATBELT RETRACTOR

Description

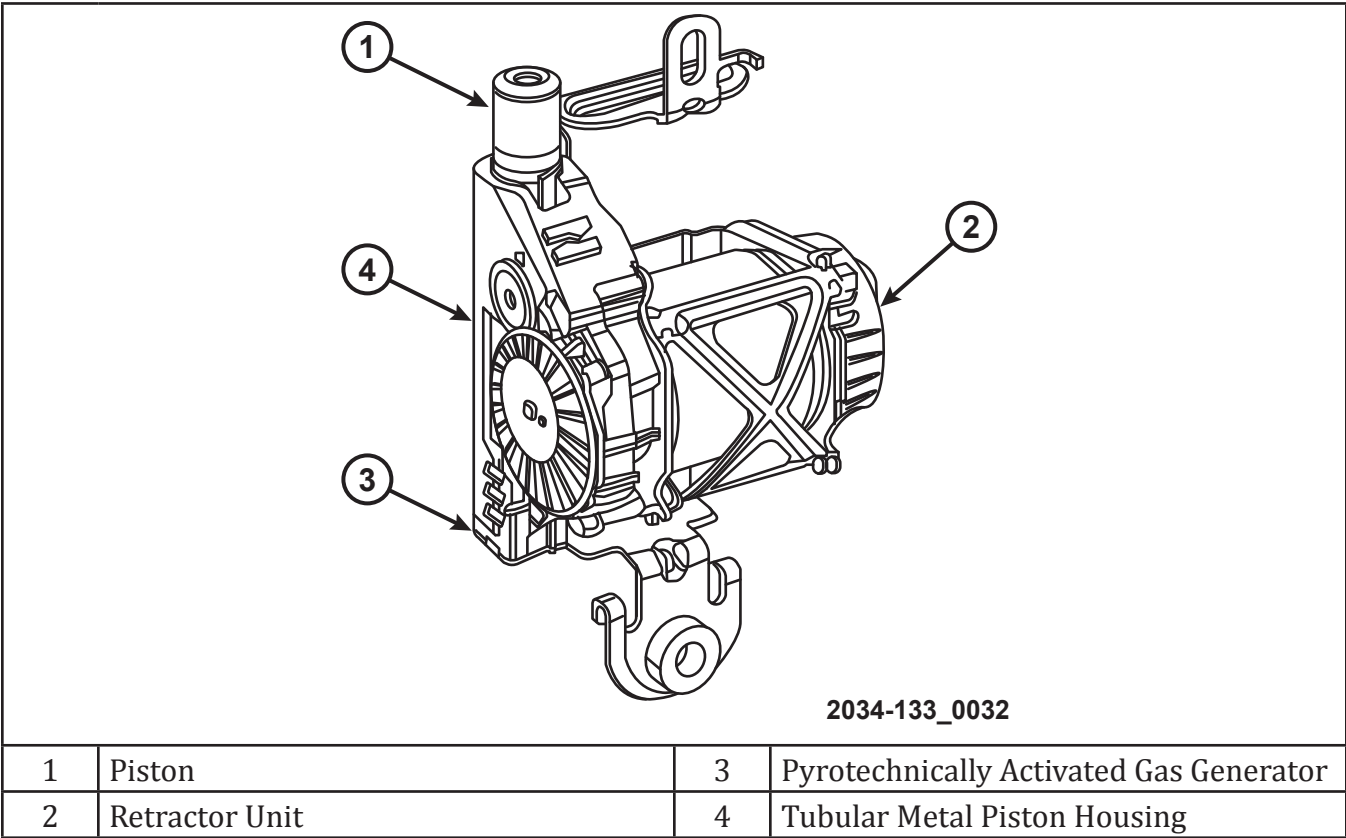


Figure 71 Seatbelt Tensioner

Seat belt retractor tensioners supplement the dual front airbag system for all versions of this vehicle. These tensioners are integral to the front seat belt and retractor units, which are secured to the B-pillars on the right and left sides of the vehicle. The retractors are concealed beneath the molded plastic B-pillar trim. The seat belt tensioner consists primarily of a molded plastic tensioner housing, a tubular metal piston housing, a piston, a short rack gear, a set of pinion gears, and a pyrotechnically activated gas generator.

All of these components are located on one side of the retractor spool on the outside of the retractor housing. The seat belt tensioners are controlled by the occupant restraint controller (ORC) and are connected to the vehicle electrical system through dedicated takeouts of the body wire harness by keyed and latching molded plastic connector insulators to ensure a secure connection.

The retractor tensioners cannot be repaired and, if ineffective or damaged, the entire front seat belt and retractor unit must be replaced. The retractor tensioners are not intended for reuse and must be replaced following any front airbag deployment. A locked retractor that will not allow the seat belt webbing to be retracted or extracted is a sure indication that the seat belt tensioner has been deployed and requires replacement.

ROLL OVER PROTECTION

Rollover Sensing

Rollover sensing is the ability to sense the conditions leading up to a vehicle rollover event. Rollover sensing is used for enhanced restraint systems on some vehicles. These enhanced systems provide additional protection for the vehicle occupants in the event the vehicle rolls over. When the ACM of a rollover sensing equipped vehicle determines a rollover event is occurring, the ACM deploys both pretensioners for slow developing events or both pretensioners and both side curtain airbags for faster developing events to protect the occupants.

Rollover Events

A ramp rollover event occurs when one side of the vehicle suddenly drives up on an object similar to a ramp lifting one side of the vehicle causing it to rollover.

A ditch rollover event occurs when the vehicle leaves the road and the wheels on one side of the vehicle encounter significantly lower ground causing the vehicle to rollover.

A trip rollover event occurs when the vehicle enters a sideways skid and then encounters an object causing the vehicle to tip. A trip rollover can be further defined as a curb trip or a soil trip.

A curb trip occurs when a sideways skidding vehicle encounters a rigid object such as a curb causing it to tip.

A soil trip occurs when a sideways skidding vehicle digs into the soil causing the vehicle to tip.

To provide protection, the rollover sensing system must be able to detect the conditions leading to a rollover regardless of the cause of the rollover.

TEMPERATURE CONTROL

Description

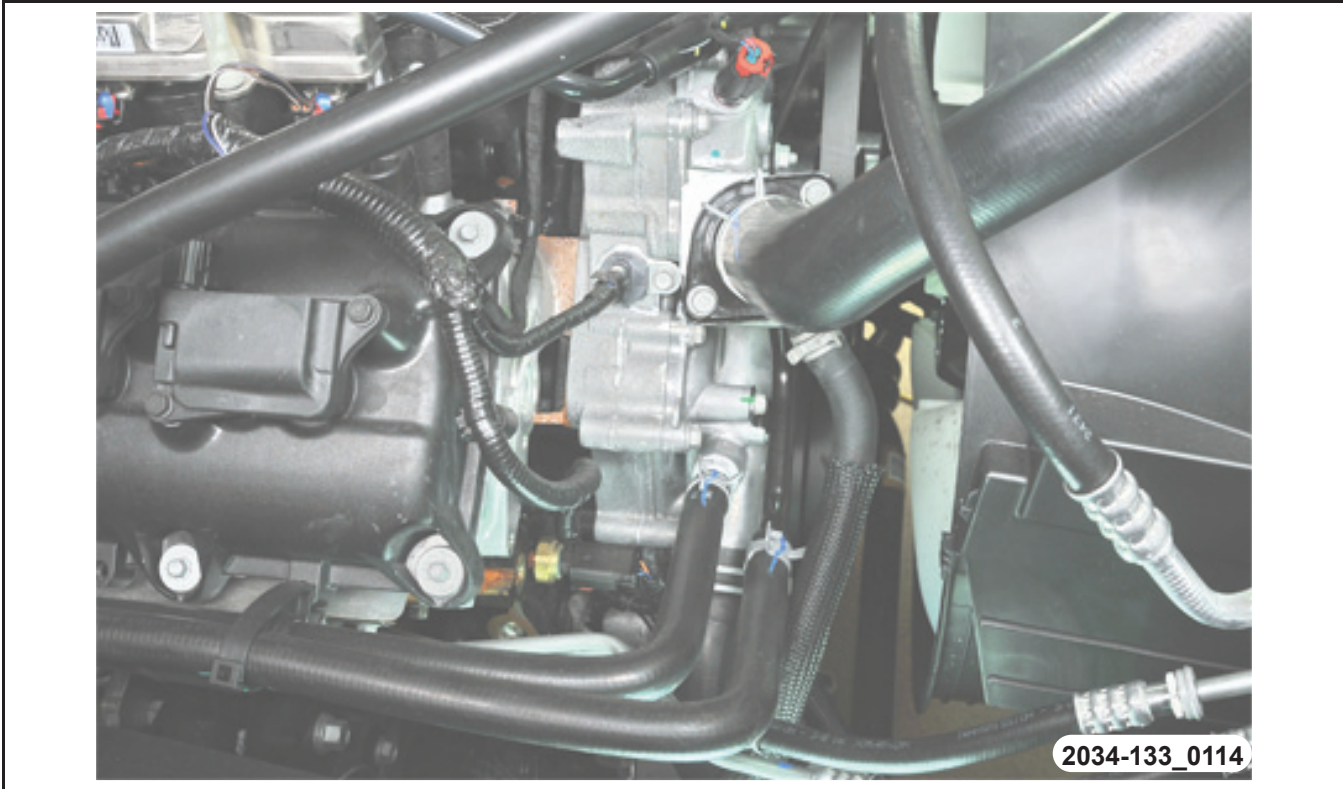


Figure 72 Cooling System

The RAM 1500S SVV is equipped with manual temperature control (MTC).

To maintain the performance level of the heating, ventilation, and air conditioning (HVAC) system, the engine cooling system must be properly maintained. The use of a bug screen is not recommended. Any obstructions in front of the radiator or A/C condenser will reduce the performance of the A/C and engine cooling systems.

The engine cooling system includes the following:

- Radiator
- Thermostat
- Radiator hoses
- Engine coolant pump

HVAC Module

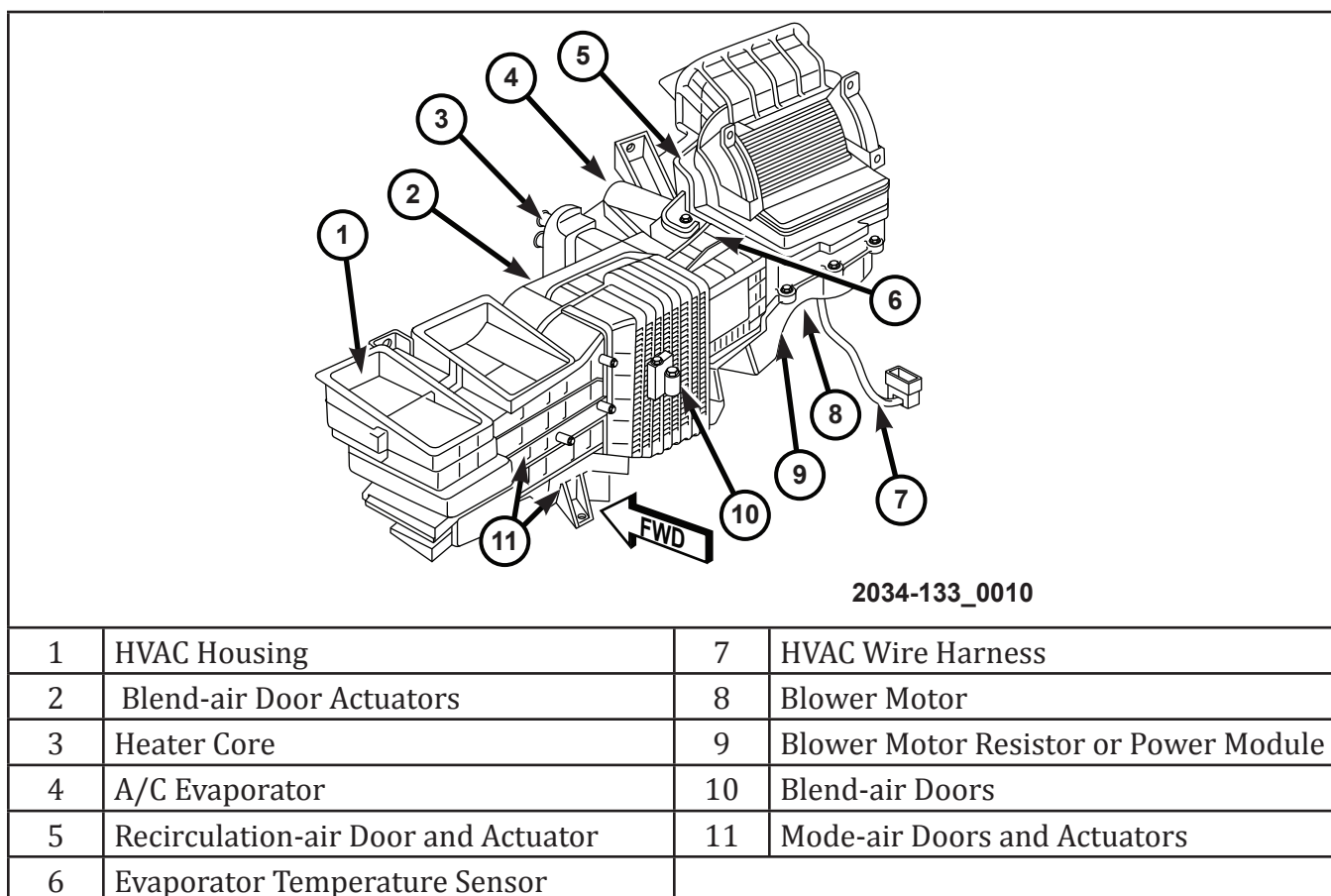


Figure 73 A/C Box

All vehicles are equipped with a common HVAC housing. The system combines air conditioning, heating, and ventilating capabilities in a single unit housing mounted within the passenger compartment under the instrument panel.

Based upon the system and mode selected, conditioned air can exit the HVAC housing through a combination of the three main housing outlets: defrost, panel, or floor. The defrost and the panel outlets are located on the top of the housing, and the floor outlet is located on the bottom of the housing. When the conditioned air exits the HVAC housing, it is further directed through molded plastic ducts to the various outlets within the vehicle interior.

Defroster Outlet

Four defroster outlets are located in the instrument panel top cover, near the base of the windshield.

Side Window De-mister Outlets

There are two side window de-mister outlets, one is located at each outboard end of the instrument panel top cover, near the belt line at the A-pillars.

Panel Outlets

There are four panel outlets in the instrument panel, one located near each outboard end of the instrument panel facing the rear of the vehicle and two located near the top of the instrument panel center bezel.

Front Floor Outlets

There are two front floor outlets, one located above each side of the floor panel center tunnel, near the dash panel.

Operation

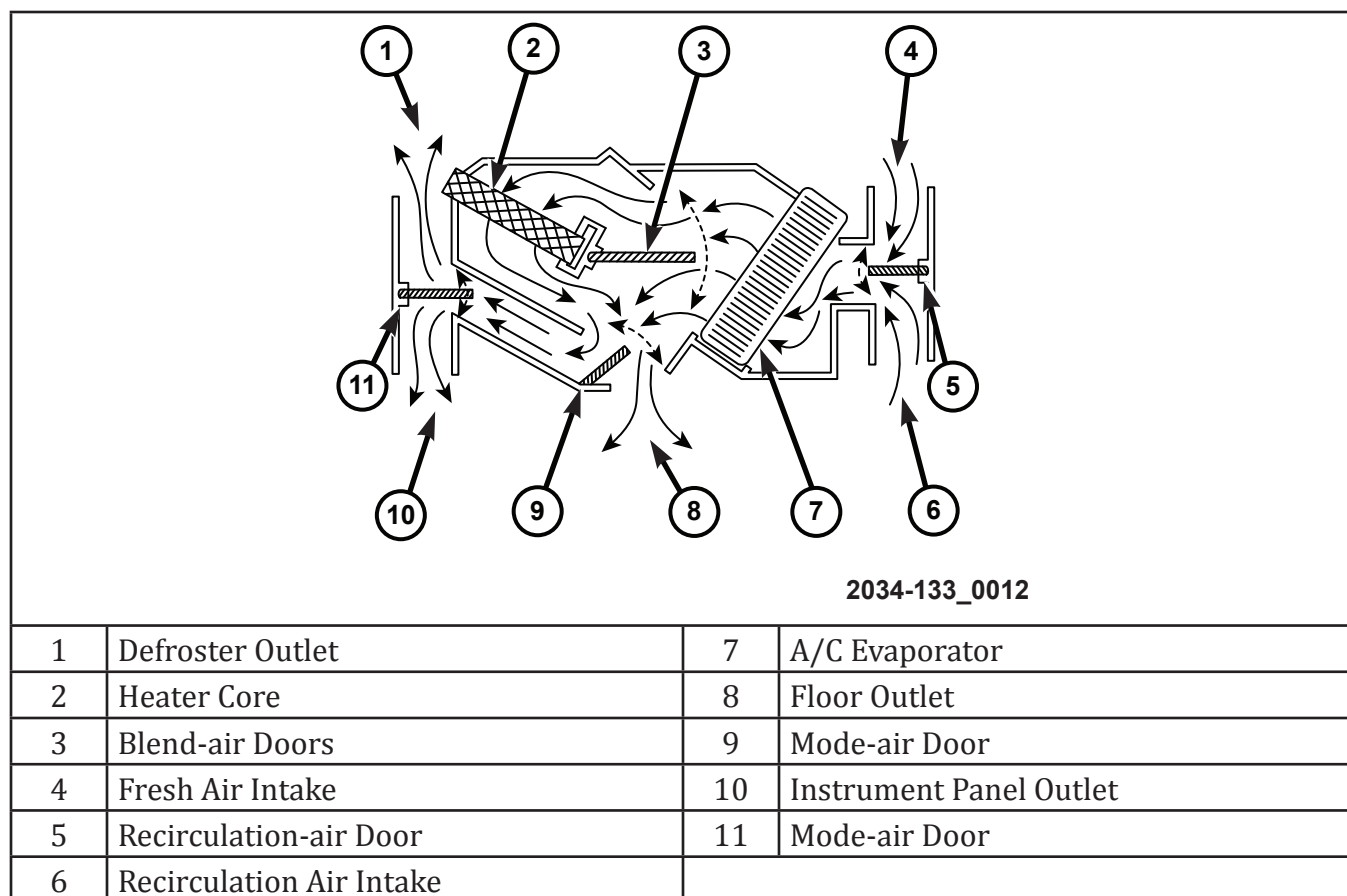


Figure 74 Blend-air HVAC

Both the manual temperature control (MTC), single zone heating-A/C system and the automatic temperature control (ATC), dual zone heating-A/C system are blend-air type systems. In a blend-air heating-A/C system, a blend-air door controls the amount of conditioned air that is allowed to flow through or around the heater core. The temperature controls determine the discharge air temperatures by operating the blend door actuators, that move the blend-air doors. This design allows almost immediate control of output air temperatures.

The heating-A/C system pulls outside (ambient) air through the fresh air intake located at the cowl panel at the base of the windshield. Air in the air inlet housing passes through the A/C evaporator. Air flow is then directed either through or around the heater core. This is done by adjusting the position of the blend-air doors with the temperature controls located on the A/C-heater control in the instrument panel. Air flow is then directed out the floor outlet, instrument panel outlet, or the defroster outlet in various combinations by adjusting the position of the mode-air doors and using the mode control located on the A/C-heater control. The temperature and mode control uses electrical actuators to operate the air doors.

The velocity of the air flow out of the outlets can be adjusted with the blower speed control located on the A/C-heater control.

Note: Typical blend-air type HVAC system shown.

The fresh air intake can be shut off by pressing the recirculation button on the A/C-heater control. This will operate the electrically actuated recirculation-air door, which closes off the fresh air intake. With the fresh air intake closed, the conditioned air within the vehicle is pulled back into the HVAC housing through the recirculation air intake located within the passenger compartment.

The A/C compressor can be engaged by pressing the A/C (snowflake) button on the A/C-heater control. It will automatically engage when the mode control is set in any mix to defrost position. This will remove heat and humidity from the air before it is directed through or around the heater core. The mode control on the A/C-heater control is used to direct the conditioned air to the selected system outlets.

The defroster outlet receives airflow from the HVAC housing through the molded plastic defroster duct, which connects to the HVAC housing defroster outlet. The airflow from the defroster outlets is directed by fixed vanes in the defroster outlet grilles and cannot be adjusted. The defroster outlet grilles are integral to the instrument panel top cover.

The side window de-mister outlets receive airflow from the HVAC housing through the molded plastic defroster duct and two molded plastic de-mister ducts. The airflow from the side window de-mister outlets is directed by fixed vanes in the de-mister outlet grilles and cannot be adjusted. The side window de-mister outlet grilles are integral to the instrument panel. The de-misters direct air from the HVAC housing through the outlets located on the top corners of the instrument panel. The de-misters operate when the mode control knob is positioned in the floor-defrost and defrost-only settings. Some air may be noticeable from the de-mister outlets when the mode control is in the bi-level to floor positions.

The panel outlets receive airflow from the HVAC housing through a molded plastic main panel duct, center panel duct, and two end panel ducts. The two end panel ducts direct airflow to the left and right instrument panel outlets, while the center panel duct directs airflow to the two center panel outlets. Each of these outlets can be individually adjusted to direct the flow of air.

The floor outlets receive airflow from the HVAC housing through the floor distribution duct. The front floor outlets are integral to the molded plastic floor distribution duct, which is secured to the bottom of the housing. The floor outlets cannot be adjusted.

Note: It is important to keep the air intake opening clear of debris. Leaf particles and other debris that are small enough to pass through the cowl opening screen can accumulate within the HVAC housing. The closed, warm, damp, and dark environment created within the housing is ideal for the growth of certain molds, mildews, and fungi. Any accumulation of decaying plant matter provides an additional food source for fungal spores, that enter the housing with the fresh intake-air. Excess debris, as well as objectionable odors created by decaying plant matter and growing fungi can be discharged into the passenger compartment during heater-A/C operation if the air intake opening is not kept clear of debris.

The A/C system is designed for non-CFC, R-134a refrigerant and uses an A/C expansion valve to meter the flow of refrigerant through the A/C evaporator. The A/C evaporator cools and dehumidifies the incoming air prior to blending it with the heated air. An evaporator temperature sensor is used to supply evaporator temperature input to the A/C-heater control to maintain minimum evaporator temperature and prevent evaporator freezing. The powertrain control module (PCM) or engine control module (ECM), depending on engine application, cycles the A/C clutch off and on as necessary to protect the A/C system from evaporator freezing and optimize A/C system performance.

Note: _____

[illegible]

LESSON 7 UP-FITTER

The information in this supplement is intended to be used with the current RAM 1500 SSV. This section provides dimensions for the truck and electrical upgrades provided for the benefit of the fleet installer. Passive restraint warnings, cautions, and component locations are shown.

VEHICLE DIMENSIONS

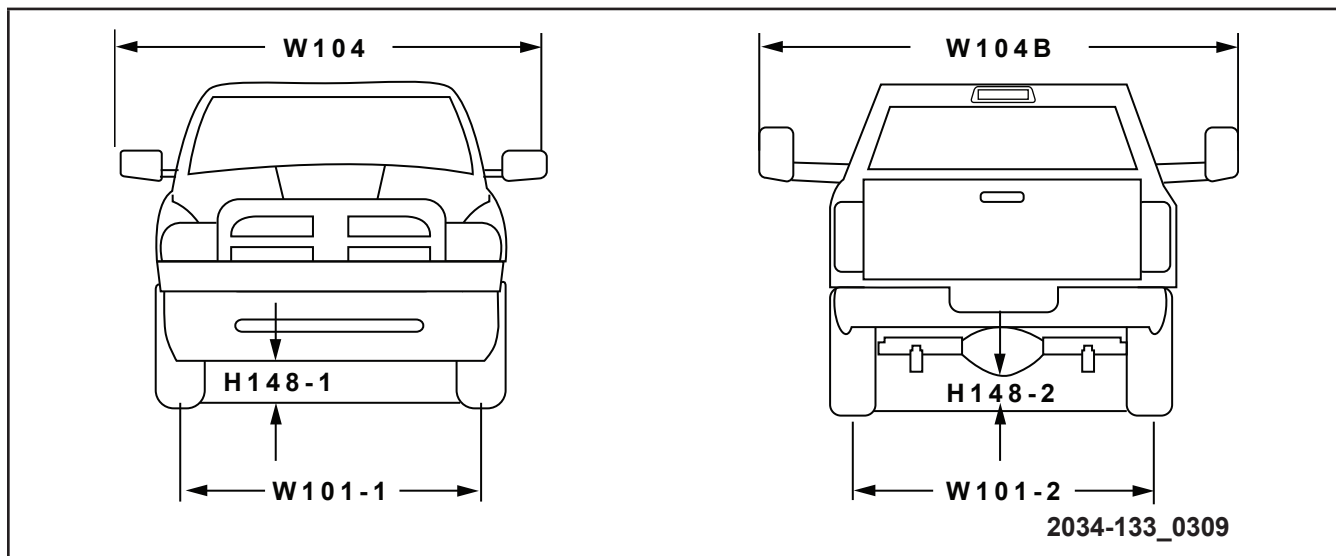


Figure 75 Front and Rear View

Vehicle dimensions are provided in three graphics. Front and rear, top, and side images. There is a table provided that corresponds with each of the given measurements. To use the images and table, locate the measurement in the graphic, then locate the measurement in the table. The measurements are provided in both English and the metric equivalence.

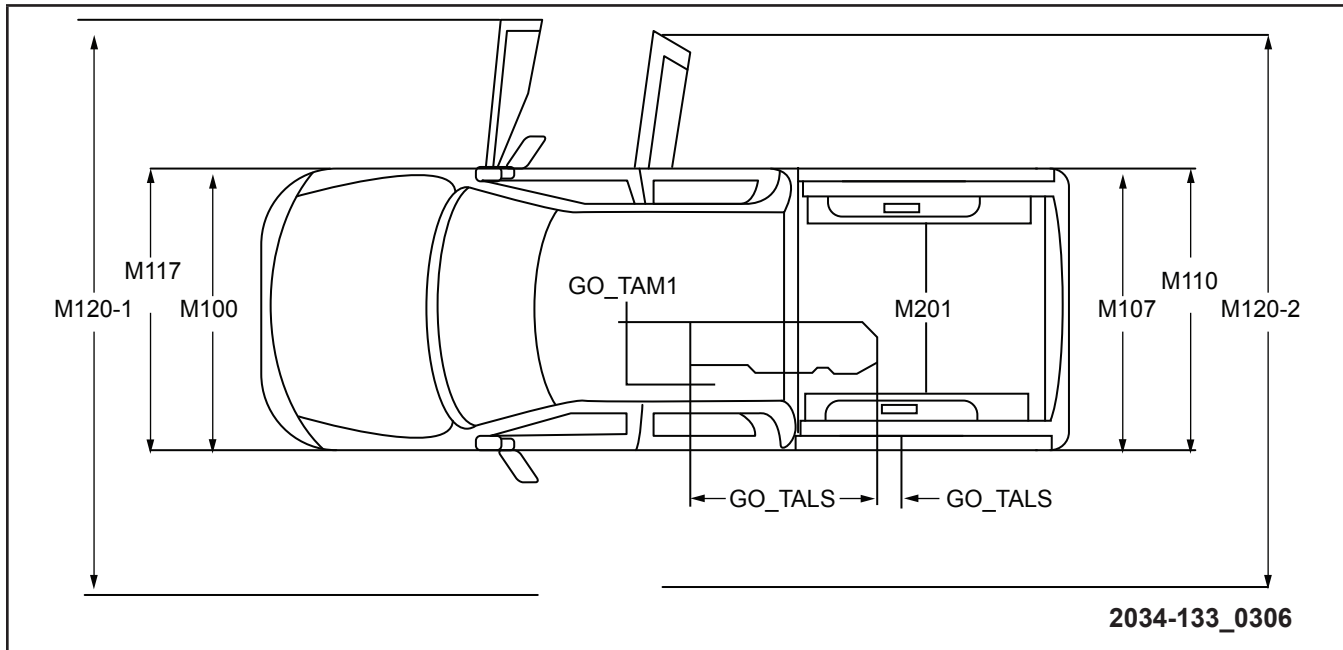


Figure 76 Top View



Figure 77 Side View

Table 11 Frame Dimensions

Location Number	Description	Metric	English
A106-1	Angle of Approach	19.2 deg	19.2 deg
A106-2	Angle of Departure	25.4 deg	25.4 deg
A147	Ramp Breakover Angle	16.6 deg	16.6 deg
CG H511	Bottom of Open Hood to Ground	2134.0 mm	84.0 in.
CG L513	Rear Axle to Inside Box at Rear	1016.1 mm	40.0 in.
CG TRL3	Rear Wheel Center Line to Fuel Tank	170.6 mm	6.7 in.
CG TT18	Turn Circle Diameter	13.8 m	45.4 ft.
H5-1	SgRP to Ground - First	948.4 mm	37.3 in.
H5-2	SgRP to Ground - Second	981.3 mm	36.6 in.
H101	Vehicle Height (Curb Load)	1923.0 mm	75.7 in.
H103-1	Fascia (Bumper) to Ground - Front	236.5 mm	9.3 in.
H103-2	Fascia (Bumper) to Ground - Rear	487.6 mm	19.2 in.
H108-1	Static Load Radius - Front Tire	378.5 mm	14.9 in.
H108-2	Static Load Radius - Rear Tire	386.1 mm	15.2 in.
H115-1	Step Height - Front	597.9 mm	23.5 in.
H115-2	Step Height - Second	602.0 mm	23.7 in.
H148-1	Suspension or Axle to Ground - Front	228.0 mm	9.0 in.
H148-2	Suspension or Axle to Ground - Rear	219.5 mm	8.6 in.
H195	Liftover Height	1398.8 mm	55.1 in.
H250	Open Tailgate to Ground	885.3 mm	34.9 in.
L101	Wheelbase	3570.5 mm	140.6 in.
L104	Overhang - Front	1016.0 mm	40.0 in.
L105	Overhang - Rear	1230 mm	48.4 in.
L114	Front Wheel Centerline to SgRP - Front	1475.8 mm	58.1 in.
L404	Cab to Rear Axle (CA)	710.4 mm	28.0 in.
W101-1	Tread Width - Front Tires	1732.3 mm	68.2 in.
W101-2	Tread Width - Rear Tires	1714.7 mm	67.5 in.

Table 12 Body Dimensions

Code	RAM Crew Cab - 5.5 Box -140.5 WB	Metric	English
CG TRL1	Rear Bumper to Back of Cab	1940.6 mm	78.4 in.
CG TRL2	Fuel Tank Length	1317.5 mm	51.9 in.
L50-2	SgRP Couple Distance, Front to Second	939.8 mm	37.0 in.
L403	Front Bumper to Back of Cab (BBC)	3876.0 mm	152.6 in.
L410	Cab Length	2573.6 mm	101.3
L504	Cab to Pickup Body	16.0 mm	0.6 in.
A121-1	Win.dow Slope Angle-Windshield	55.1 deg	55.1 deg
CG A18	Steering Wheel Angle	23.4 deg	23.4 deg
CH16	Top of Box to Cab Roof	585.5 mm	23.1 in.
CH17	Box Floor to Cab Roof	1105.8 mm	43.5 in.
CH18	Steering Column Angle	22.9 deg	22.9 deg
CH514	Box Floor to Top of Fuel Tank	108.5 mm	4.3 in.
H6	SgRP - Front to Windshield Lower DLO	405.8 mm	16.0 in.
H61-1	Effective Head Room - Front	1041.4 mm	41.0 in.
H61-2	Effective Head Room - Second	1012.8 mm	39.9 in.
CG TRW1	Outside Rail to Fuel Tank (inside)	442.4 mm	17.4 in.
W104	Vehicle Width-Mirrors (std)	2464.4 mm	97.0 in.
W104B	Vehicle Width-Mirrors (trailer)	2776.1 mm	109.3 in.
W106	Fender Width - Front	2003.7 mm	78.9 in.
W107	Fender Width - Rear	2014.4 mm	79.3 in.
W116	Body Width - Maximum	2017.4 mm	79.4 in.
W117	Body Width at SgRP - Front	2008.7 mm	79.1 in.
W120-1	Vehicle Width, Doors Open - Front	4076.6 mm	160.5 in.
W120-2	Vehicle Width, Doors Open - Rear Row	3883.7 mm	152.9 in.
W201	Cargo Width-Wheelhouse	1295.4 mm	51.0 in.

Table 13 Acronyms Used in the Measurement Table

Acronym	Definition
SgRP	Seating Reference Point (H-point typically measured at the center of the occupants hip joint with the occupant in the seated position)
DLO	Day Light Opening

ELECTRICAL COMPONENT LOCATIONS

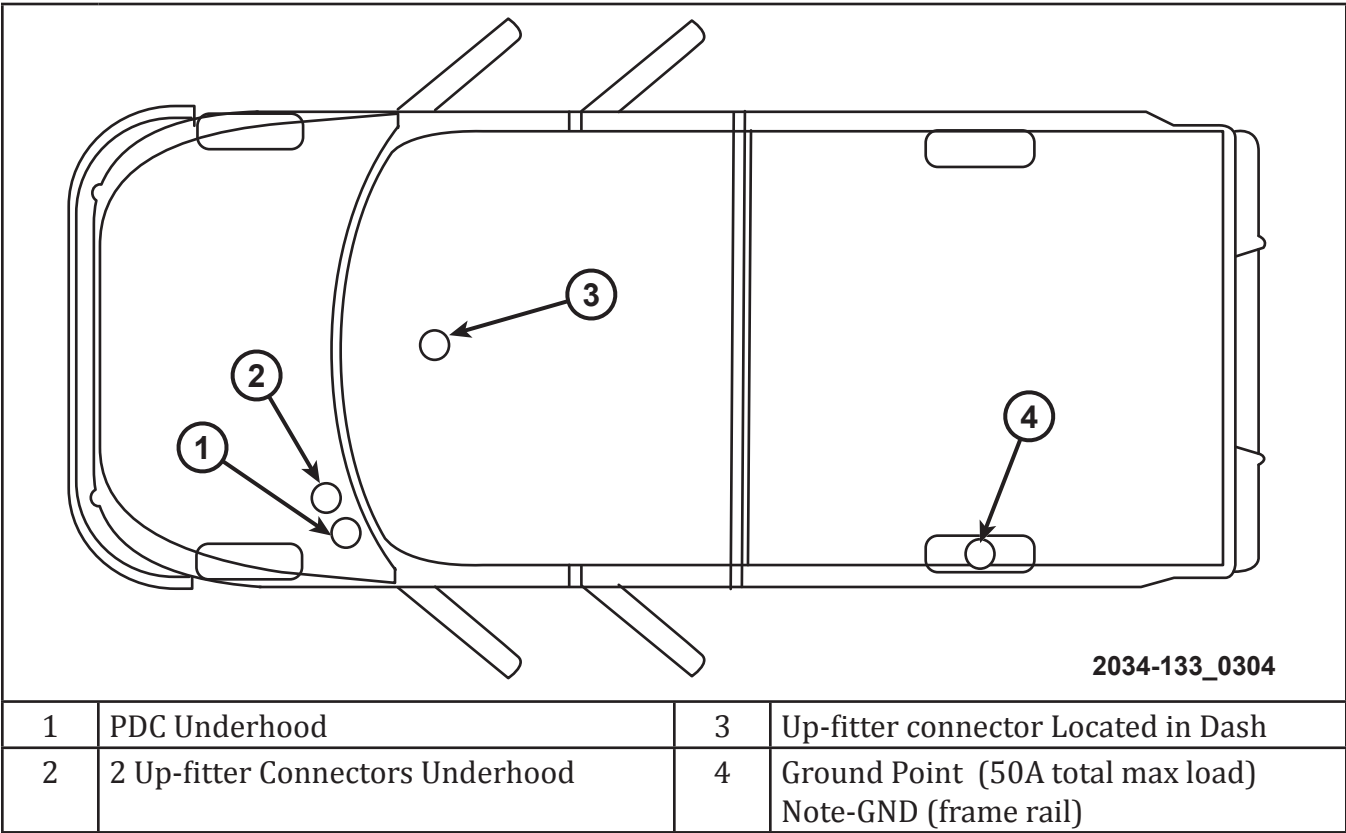


Figure 78 Component Locations

There are four major components provided to assist the fleet up-fitter in adding equipment. The power distribution center (PDC) that is located underhood, two connectors also located underhood for connecting to power from the PDC, an up-fitter connector located in the center stack of the dash to connect switches that operate the relays in the PDC and a ground terminal located in the rear of the frame.

Auxiliary Power Distribution Center (PDC)

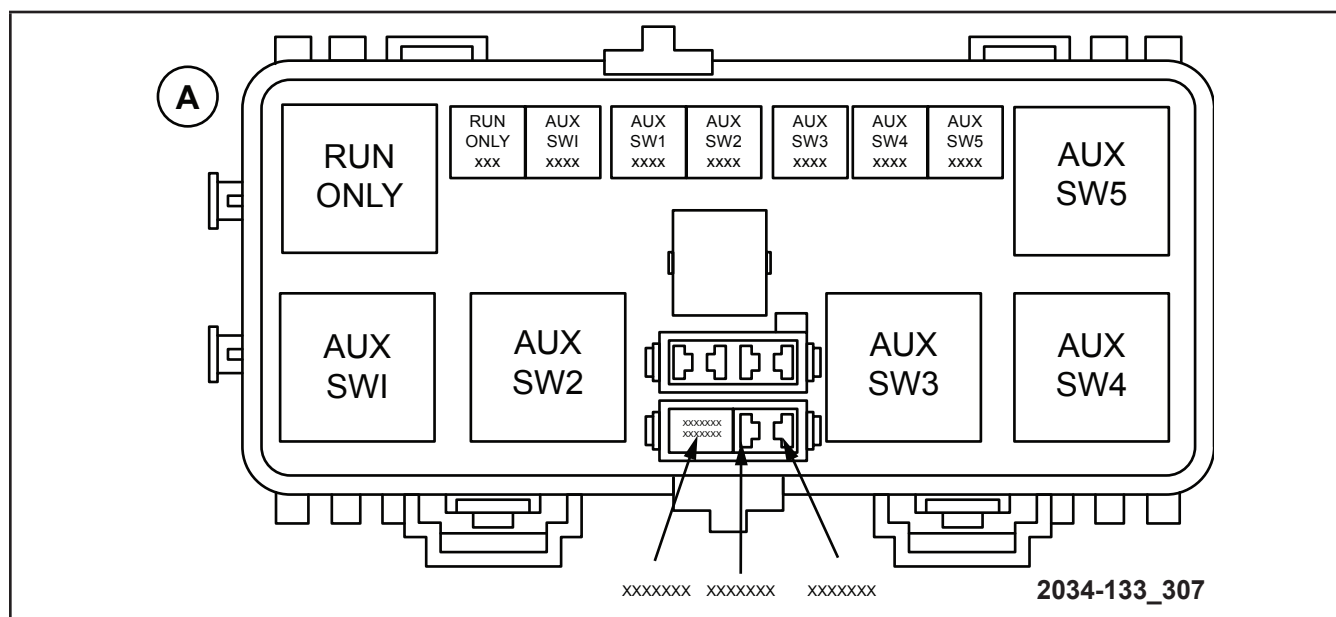


Figure 79 Up-fitter PDC

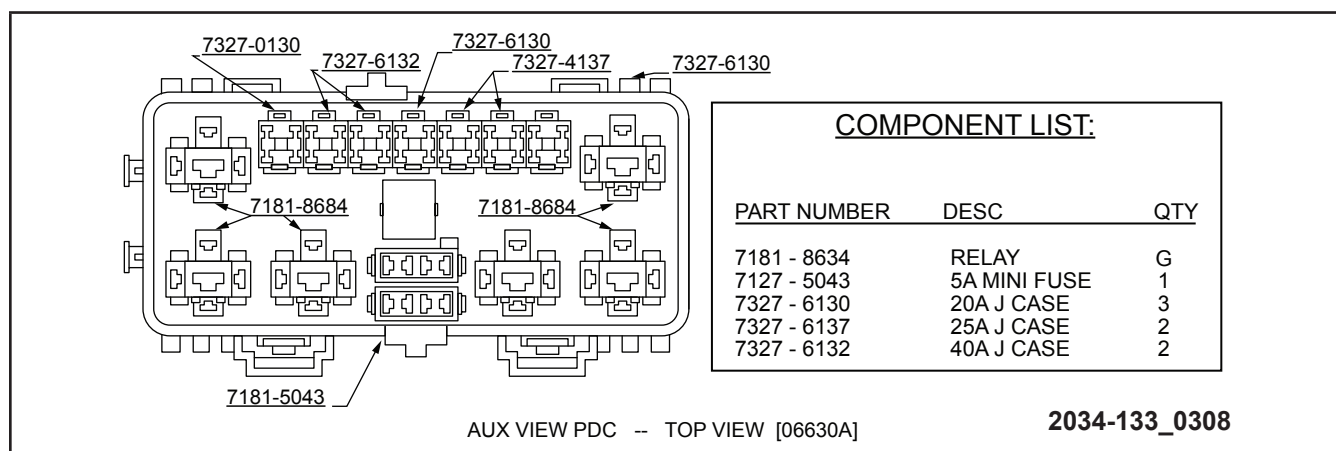


Figure 80 Up-fitter PDC Connector View

An auxiliary power distribution center (PDC) for up-fitters is located under the hood. The PDC contains fuses and relays that provide power to the dash-mounted auxiliary switches. Attached to the PDC bracket are two four-way connectors. The upper dark gray connector contains the four 12-volt outputs for the dash-mounted switches. The lower, light gray connector contains circuits for an add-on PTO system. An available up-fitter wiring kit contains wires with crimped on blades that fit into the connector sockets to allow for factory-sealed connections.

Table 14 Schematic Legend

A	PDC Located Underhood	D	Heat Shrunk Wires Located in the Right A Pillar
B	Up-fitter Connector	E	Open connector Located in the I/P Center Stack
C	Underhood Heat Shrunk Wires Located in the Left A Pillar		

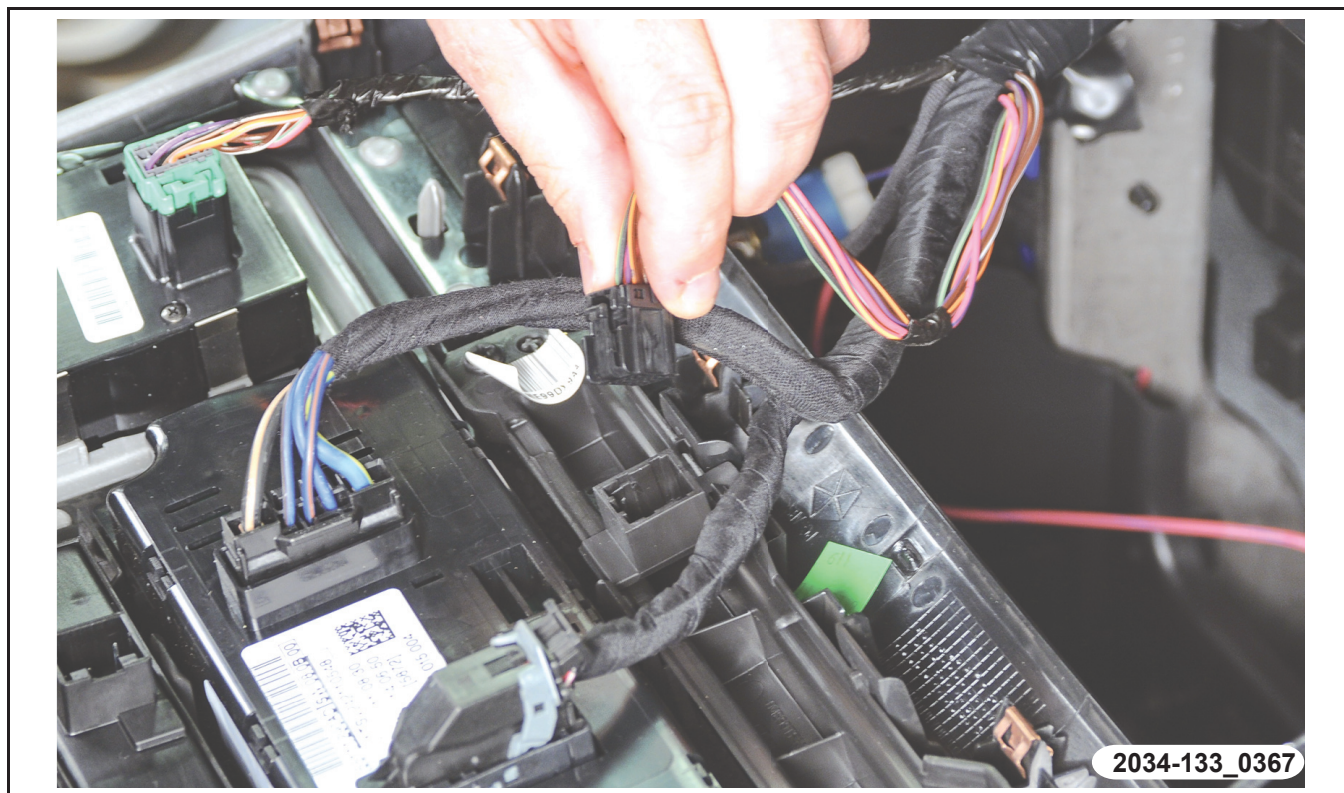


Figure 82 Interior PDC Up-fitter Connector

There are two possible locations for the auxiliary PDC relay control connection point. Some vehicles have the wires terminate in a connector body attached to the rear of the center stack. The connector plugs into an empty port on the back of the cover.

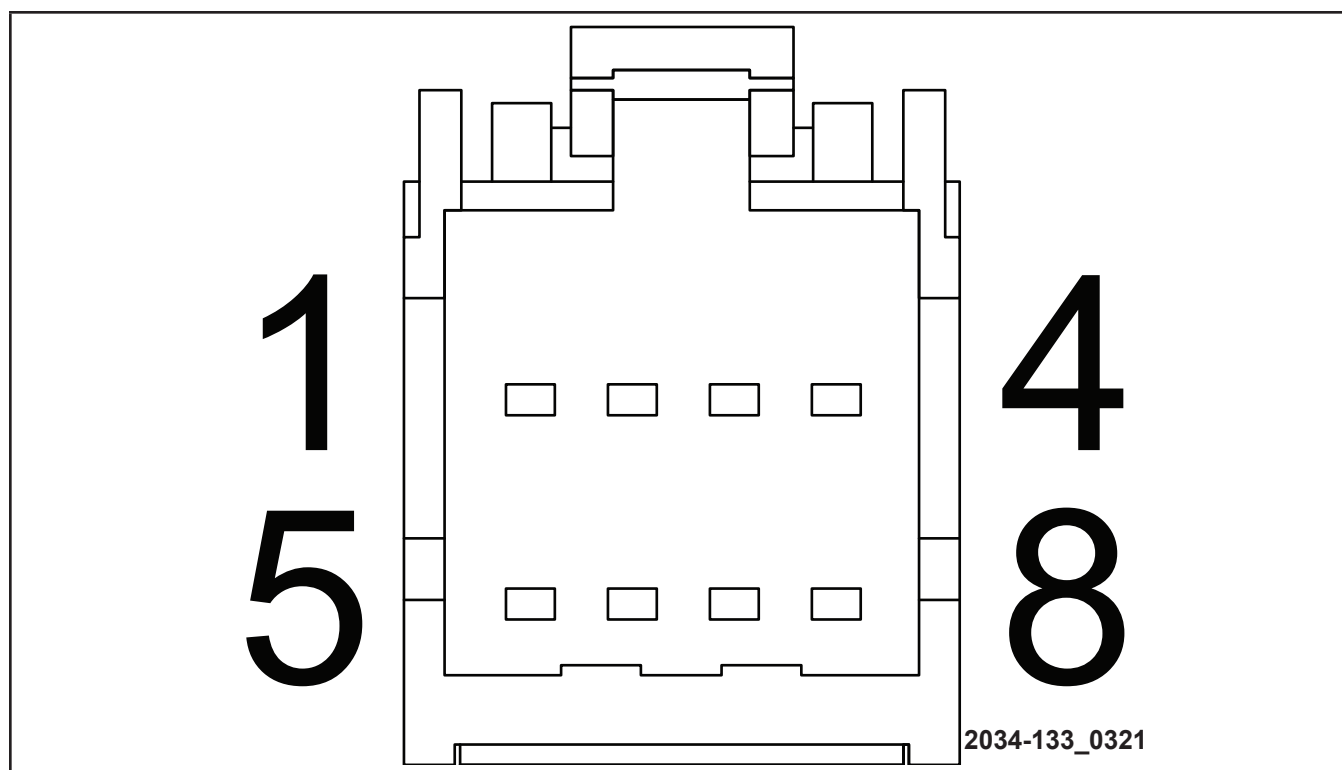


Figure 83 PDC Auxiliary Connector

Table 15 PDC I/P Auxiliary Connector Pin-out

Pin	Circuit	Wire Color	Gauge/Size	Function
A1	F921	Pink/Yellow	22	Fused Ignition Run Control Output
A2	Z911	Black/Light Green	22	Ground
A3	P821	Brown/Violet	22	Auxiliary 2 Relay Control Signal
A4	P820	Brown/Orange	22	Auxiliary 1 Relay Control Signal
A5	P923	Pink/Dark Brown	22	Run Relay Control
A6				No Connection
A7	P823	Brown/Gray	22	Auxiliary 4 Relay Control Signal
A8	P822	Brown/White	22	Auxiliary 3 Relay Control Signal

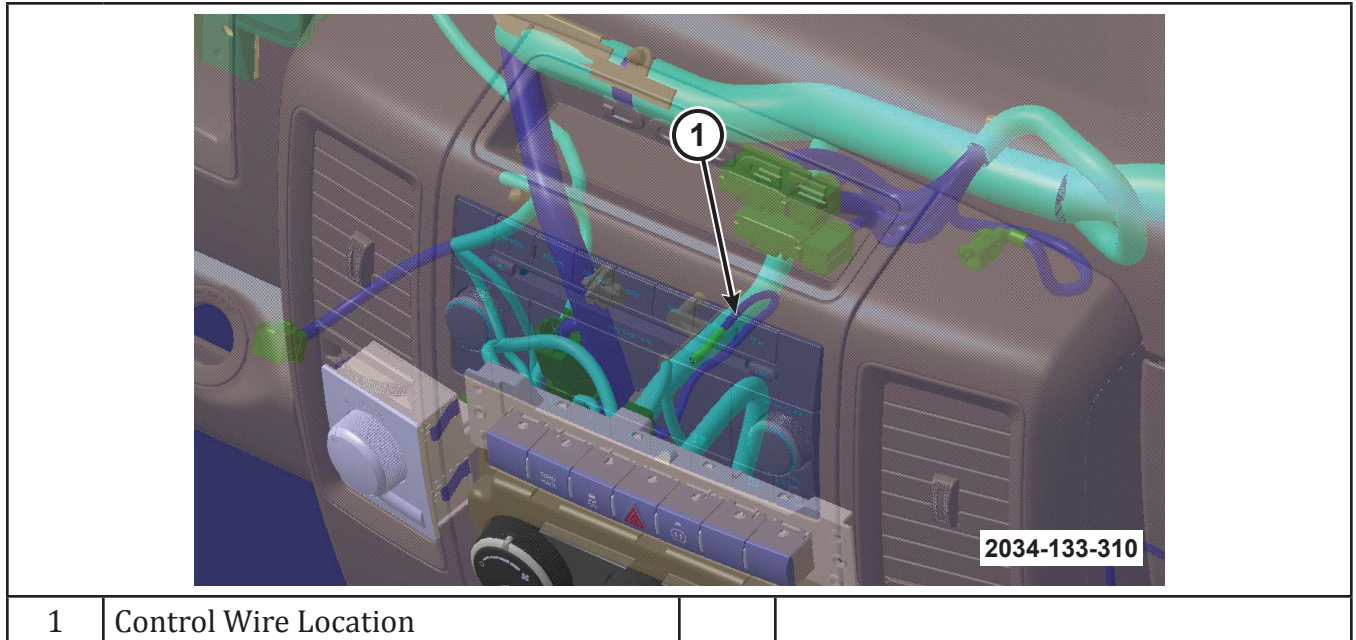


Figure 84 Alternative Auxiliary Wire Connection

Some early vehicles have the control circuits for the relays terminated and taped to the air conditioning control head harness behind the center stack.

Spot Lamp Connections

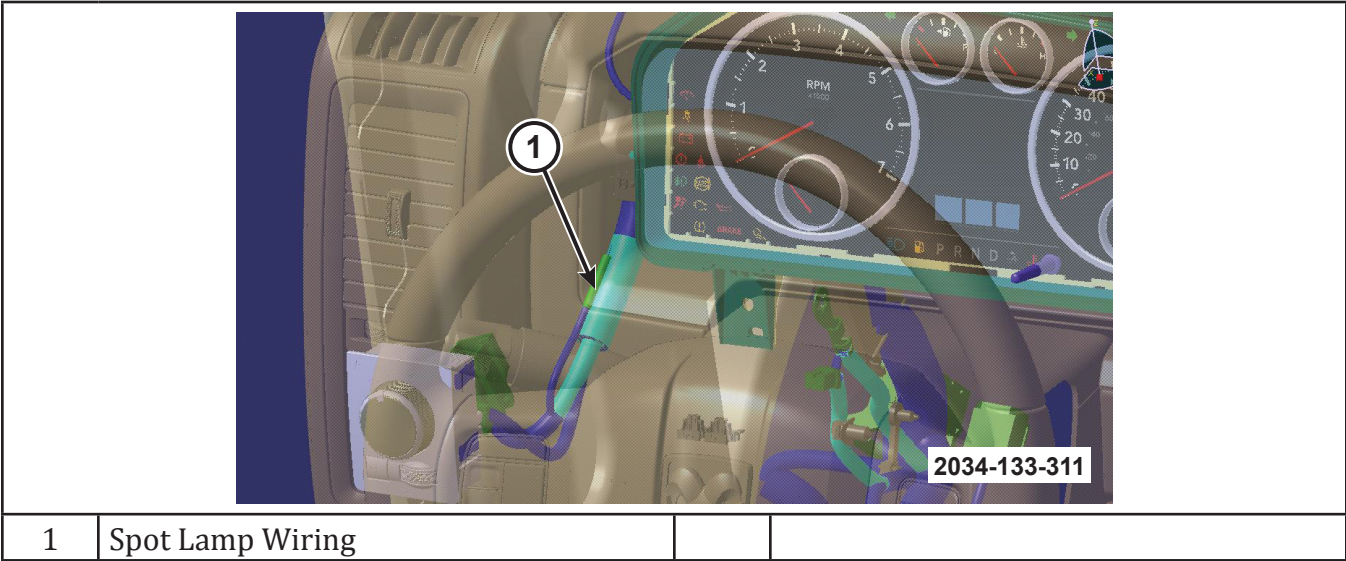


Figure 85 Left Side Spot Lamp Connector

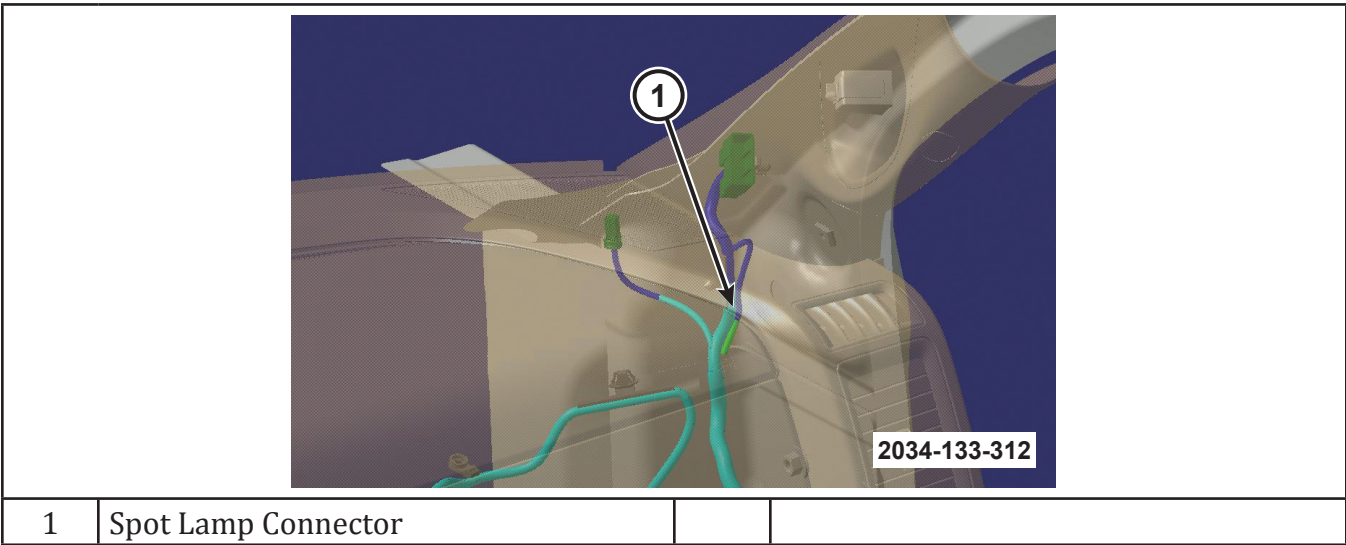


Figure 86 Right Hand Spot Lamp Connector

The spot lamp connection points for the left and right side spot lamps are located at the base of the A-pillar for both sides, taped to the harness.

POWER/GROUND RECOMMENDATIONS

Figure 87 Underhood PDC

In the engine compartment there are two up-fitter connectors (light grey and dark grey) that allow easy access to the fuse box relay outputs. Mating terminated circuits are included in the kit as needed.

WARNING: **AN AUXILIARY BATTERY MAY BE USED, HOWEVER A BATTERY ISOLATION UNIT IS NOT SUPPLIED. USE CAUTION IF ADDING A SECONDARY BATTERY BECAUSE THE AUXILIARY BATTERY MAY DISCHARGE THE TRUCK BATTERY WHEN THE ENGINE IS NOT RUNNING.**

GROUND LOCATIONS

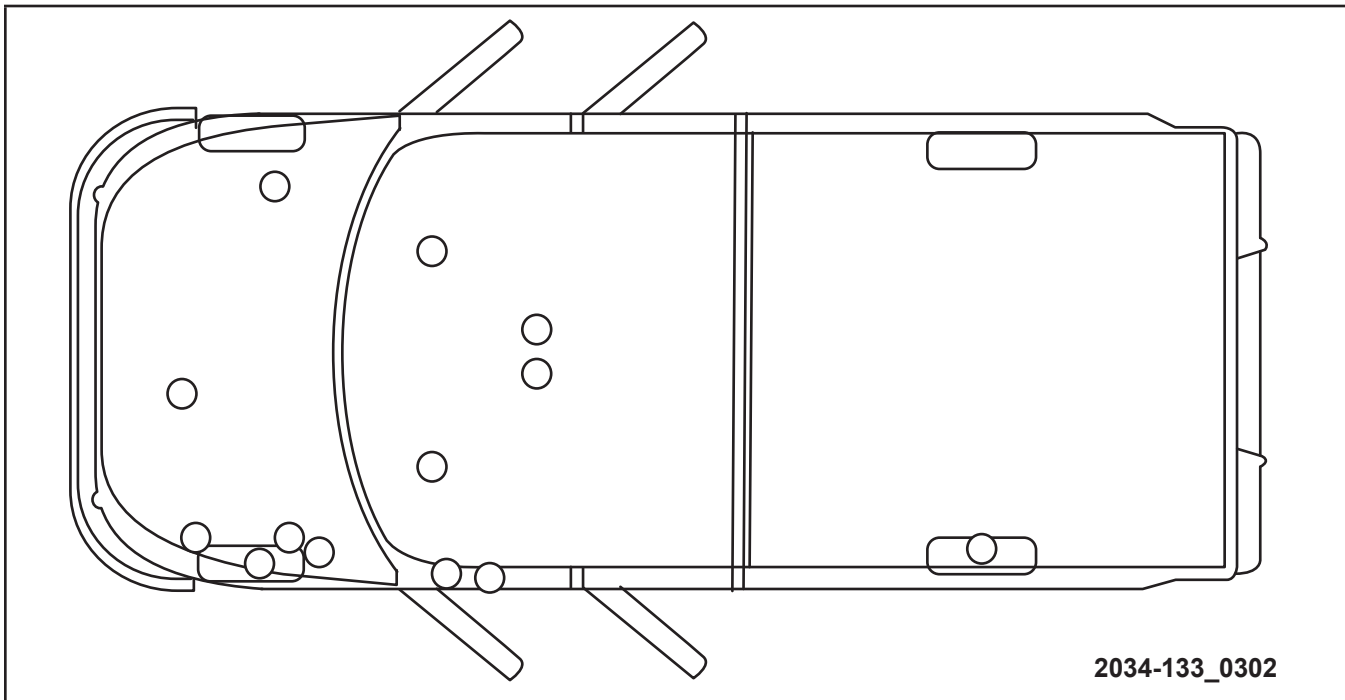


Figure 88 Ground Locations

There are multiple ground locations throughout the vehicle. Six grounds are located underhood, seven grounds are located within the interior and one designated up-fitter ground located on the rear frame. The ground stud at the rear of frame may be utilized as a grounding point with a 50A maximum total load.

Note: When adding a component ground to vehicle ground, care should be taken not to interrupt the integrity of the manufacturer's installation. It is possible to create electronic malfunctions as a result if improper handling of the ground attachment.

Caution: Before opening or adding a ground consult the service information. Certain components have dedicated grounds that should not have additional components added to them (such as PCM and passive restraint circuits).

PASSIVE RESTRAINTS

WARNING: TO AVOID SERIOUS OR FATAL INJURY ON VEHICLES EQUIPPED WITH THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS), NEVER ATTEMPT TO REPAIR THE ELECTRICALLY CONDUCTIVE CIRCUITS OR WIRING COMPONENTS RELATED TO THE SRS FOR WHICH THERE IS NO MOPAR WIRING REPAIR KIT. IT IS IMPORTANT TO USE ONLY THE RECOMMENDED SPLICING KIT AND PROCEDURE. FOR APPLICABLE AND AVAILABLE MOPAR WIRING REPAIR KITS, PLEASE VISIT THE MOPAR CONNECTOR WEB SITE AT THE FOLLOWING ADDRESS ON THE INTERNET: ([HTTP://DTO.VFTIS.COM/MOPAR/DISCLAIMER.ASP](http://dto.vftis.com/mopar/disclaimer.asp)). INAPPROPRIATE REPAIRS CAN COMPROMISE THE CONDUCTIVITY AND CURRENT CARRYING CAPACITY OF THOSE CRITICAL ELECTRICAL CIRCUITS, WHICH MAY CAUSE SRS COMPONENTS NOT TO DEPLOY WHEN REQUIRED, OR TO DEPLOY WHEN NOT REQUIRED. ONLY MINOR CUTS OR ABRASIONS OF WIRE AND TERMINAL INSULATION WHERE THE CONDUCTIVE MATERIAL HAS NOT BEEN DAMAGED, OR CONNECTOR INSULATORS WHERE THE INTEGRITY OF THE LATCHING AND LOCKING MECHANISMS HAVE NOT BEEN COMPROMISED MAY BE REPAIRED USING APPROPRIATE METHODS.

WARNING: TO AVOID SERIOUS OR FATAL INJURY DURING AND FOLLOWING ANY SEAT BELT OR CHILD RESTRAINT ANCHOR SERVICE, CAREFULLY INSPECT ALL SEAT BELTS, BUCKLES, MOUNTING HARDWARE, RETRACTORS, TETHER STRAPS, AND ANCHORS FOR PROPER INSTALLATION, OPERATION, OR DAMAGE. REPLACE ANY BELT THAT IS CUT, FRAYED, OR TORN. STRAIGHTEN ANY BELT THAT IS TWISTED. TIGHTEN ANY LOOSE FASTENERS. REPLACE ANY BELT THAT HAS A DAMAGED OR INEFFECTIVE BUCKLE OR RETRACTOR. REPLACE ANY BELT THAT HAS A BENT OR DAMAGED LATCH PLATE OR ANCHOR PLATE. REPLACE ANY CHILD RESTRAINT ANCHOR OR THE UNIT TO WHICH THE ANCHOR IS INTEGRAL THAT HAS BEEN BENT OR DAMAGED. NEVER ATTEMPT TO REPAIR A SEAT BELT OR CHILD RESTRAINT COMPONENT. ALWAYS REPLACE DAMAGED OR INEFFECTIVE SEAT BELT AND CHILD RESTRAINT COMPONENTS WITH THE CORRECT, NEW, AND UNUSED REPLACEMENT PARTS LISTED IN THE CHRYSLER MOPAR® PARTS CATALOG. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.

WARNING: TO AVOID SERIOUS OR FATAL INJURY ON VEHICLES EQUIPPED WITH AIRBAGS, DISABLE THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) BEFORE ATTEMPTING ANY STEERING WHEEL, STEERING COLUMN, AIRBAG, SEAT BELT TENSIONER, IMPACT SENSOR, OR INSTRUMENT PANEL COMPONENT DIAGNOSIS OR SERVICE. DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE, THEN WAIT TWO MINUTES FOR THE SYSTEM CAPACITOR TO DISCHARGE BEFORE PERFORMING FURTHER DIAGNOSIS OR SERVICE. THIS IS THE ONLY SURE WAY TO DISABLE THE SRS. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT.

- WARNING:** TO AVOID POTENTIAL PHYSICAL INJURY OR DAMAGE TO SENSITIVE ELECTRONIC CIRCUITS AND SYSTEMS, ALWAYS DISCONNECT AND ISOLATE THE BATTERY NEGATIVE (GROUND) CABLE AND THE POSITIVE CABLE, THEN GROUND THE POSITIVE CABLE TO DISCHARGE THE OCCUPANT RESTRAINT CONTROLLER (ORC) CAPACITOR BEFORE PERFORMING ANY WELDING OPERATIONS ON THE VEHICLE. FAILURE TO TAKE THE PROPER PRECAUTIONS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT, POSSIBLE DAMAGE TO THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) CIRCUITS AND COMPONENTS, AND POSSIBLE DAMAGE TO OTHER ELECTRONIC CIRCUITS AND COMPONENTS. WHENEVER A WELDING PROCESS IS BEING PERFORMED WITHIN 12 INCHES (30 CENTIMETERS) OF AN ELECTRONIC MODULE OR WIRING HARNESS, THEN THAT MODULE OR HARNESS SHOULD BE RELOCATED OUT OF THE WAY, OR DISCONNECTED. ALWAYS PROTECT AGAINST COMPONENT OR VEHICLE DAMAGE FROM WELD SPATTER BY USING WELD BLANKETS AND SCREENS.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY, DO NOT ATTEMPT TO DISMANTLE AN AIRBAG UNIT OR TAMPER WITH ITS INFLATOR. DO NOT PUNCTURE, INCINERATE OR BRING INTO CONTACT WITH ELECTRICITY. DO NOT STORE AT TEMPERATURES EXCEEDING 93° C (200° F). AN AIRBAG INFLATOR UNIT MAY CONTAIN SODIUM AZIDE AND POTASSIUM NITRATE. THESE MATERIALS ARE POISONOUS AND EXTREMELY FLAMMABLE. CONTACT WITH ACID, WATER, OR HEAVY METALS MAY PRODUCE HARMFUL AND IRRITATING GASES (SODIUM HYDROXIDE IS FORMED IN THE PRESENCE OF MOISTURE) OR COMBUSTIBLE COMPOUNDS. AN AIRBAG INFLATOR UNIT MAY ALSO CONTAIN A GAS CANISTER PRESSURIZED TO OVER 17.24 KPA (2500 PSI). FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY WHEN HANDLING A SEAT BELT TENSIONER RETRACTOR. EXERCISE PROPER CARE TO KEEP FINGERS OUT FROM UNDER THE RETRACTOR COVER AND AWAY FROM THE SEAT BELT WEBBING WHERE IT EXITS FROM THE RETRACTOR COVER. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY, REPLACE ALL SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS ONLY WITH PARTS SPECIFIED IN THE CHRYSLER MOPAR® PARTS CATALOG. SUBSTITUTE PARTS MAY APPEAR INTERCHANGEABLE, BUT INTERNAL DIFFERENCES MAY RESULT IN INFERIOR OCCUPANT PROTECTION.
- WARNING:** TO AVOID SERIOUS OR FATAL INJURY WHEN A STEERING COLUMN HAS AN AIRBAG UNIT ATTACHED, NEVER PLACE THE COLUMN ON THE FLOOR OR ANY OTHER SURFACE WITH THE STEERING WHEEL OR AIRBAG UNIT FACE DOWN. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN POSSIBLE SERIOUS OR FATAL INJURY.

WARNING: TO AVOID SERIOUS OR FATAL INJURY, THE FASTENERS, SCREWS, AND BOLTS ORIGINALLY USED FOR THE SUPPLEMENTAL RESTRAINT SYSTEM (SRS) COMPONENTS MUST NEVER BE REPLACED WITH ANY SUBSTITUTES. THESE FASTENERS HAVE SPECIAL COATINGS AND ARE SPECIFICALLY DESIGNED FOR THE SRS. ANYTIME A NEW FASTENER IS NEEDED, REPLACE IT WITH THE CORRECT FASTENERS PROVIDED IN THE SERVICE PACKAGE OR SPECIFIED IN THE CHRYSLER MOPAR® PARTS CATALOG.

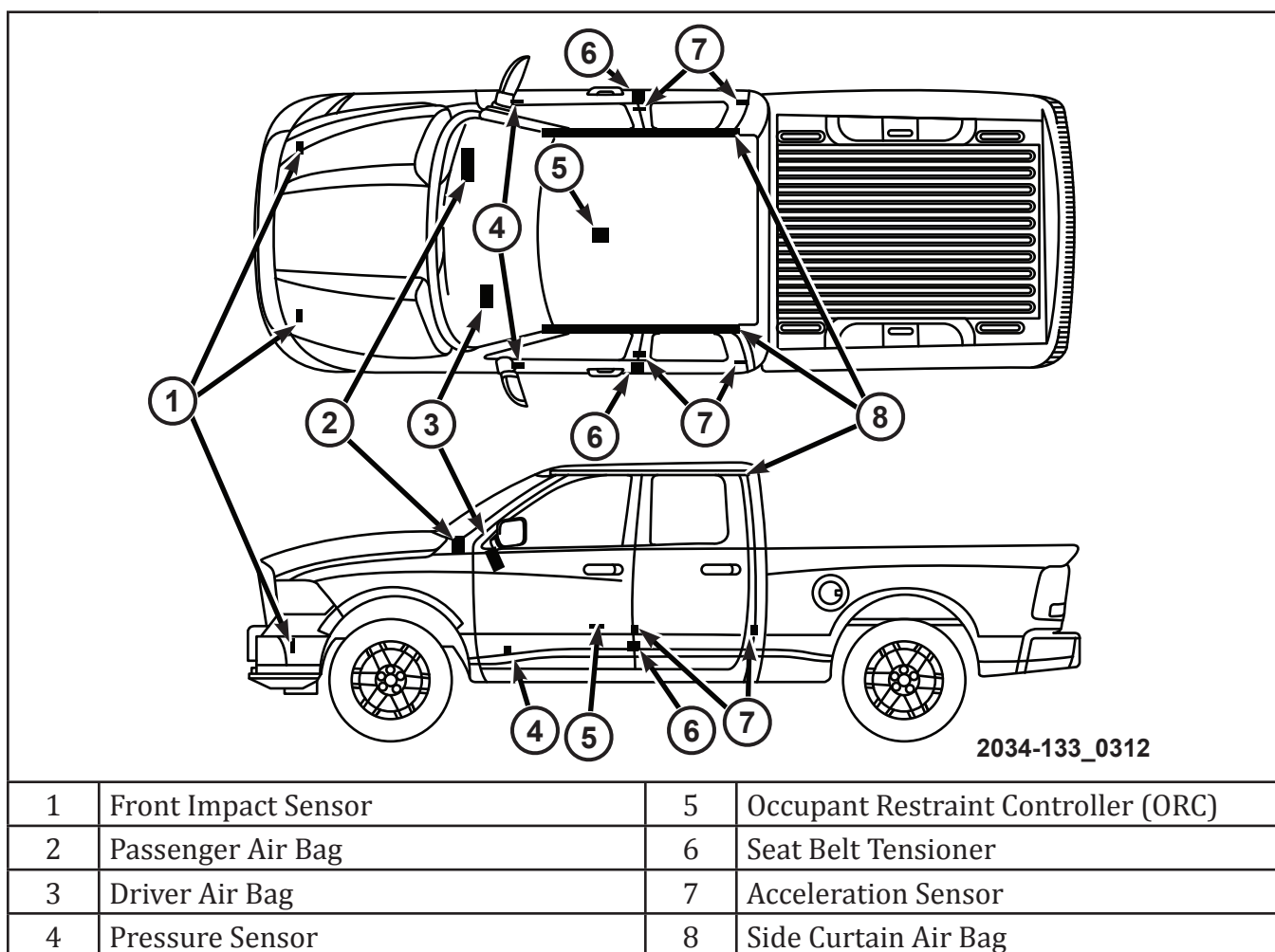


Figure 89 SRS Component Locations

Airbag Dimensions

Steering Wheel

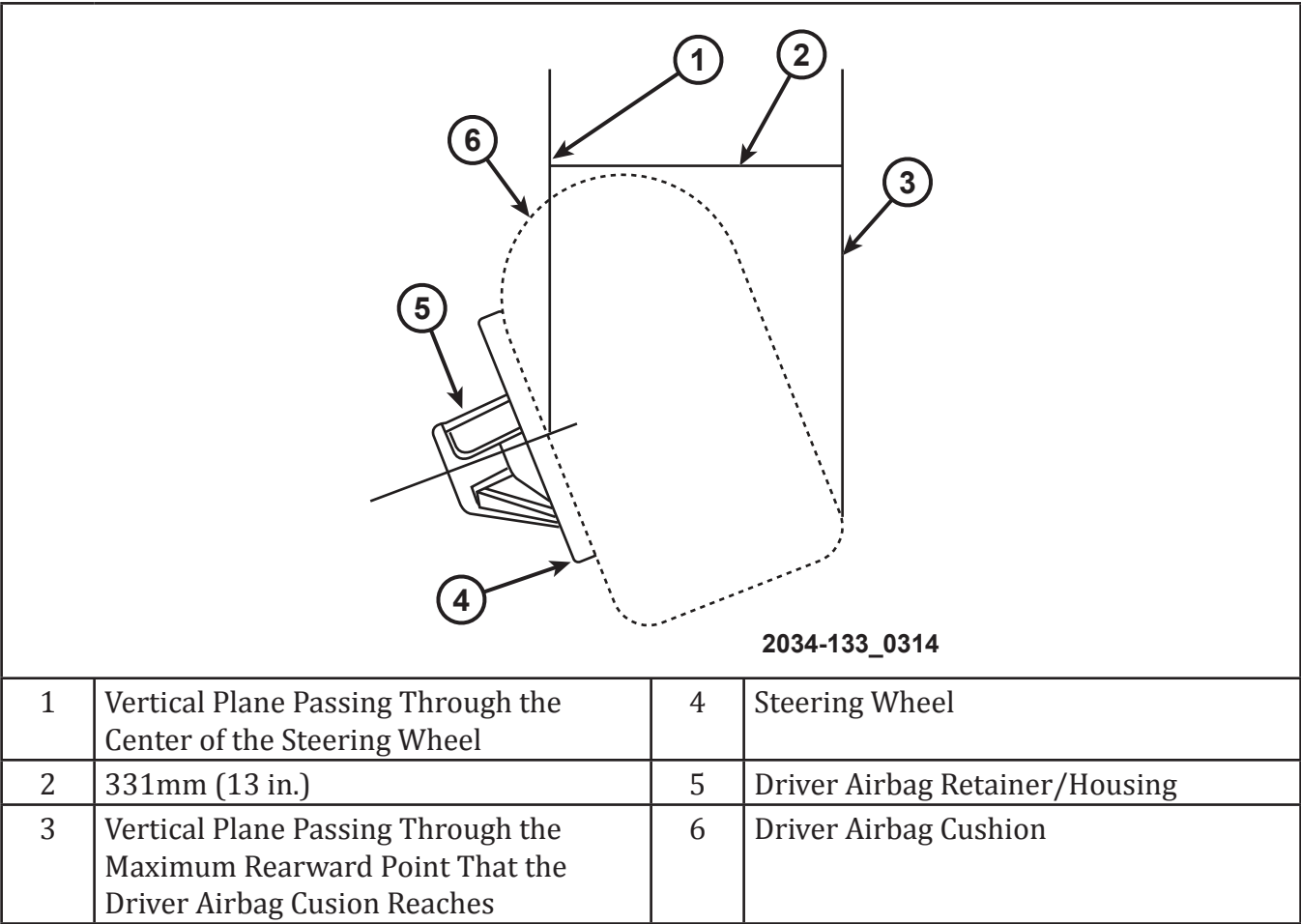


Figure 90 Drivers Airbag Dimensions

Note: Illustration represents the maximum dynamic deployment shape

Description	Dimension
Driver Airbag (DAB) Diameter when Full	661 mm (26 in.)
Driver Airbag (DAB) Depth when Full	305 mm (12 in.)
Maximum Rearward Displacment During Fill	407mm (16 in.)

Table 16 Driver Airbag Cushion Position

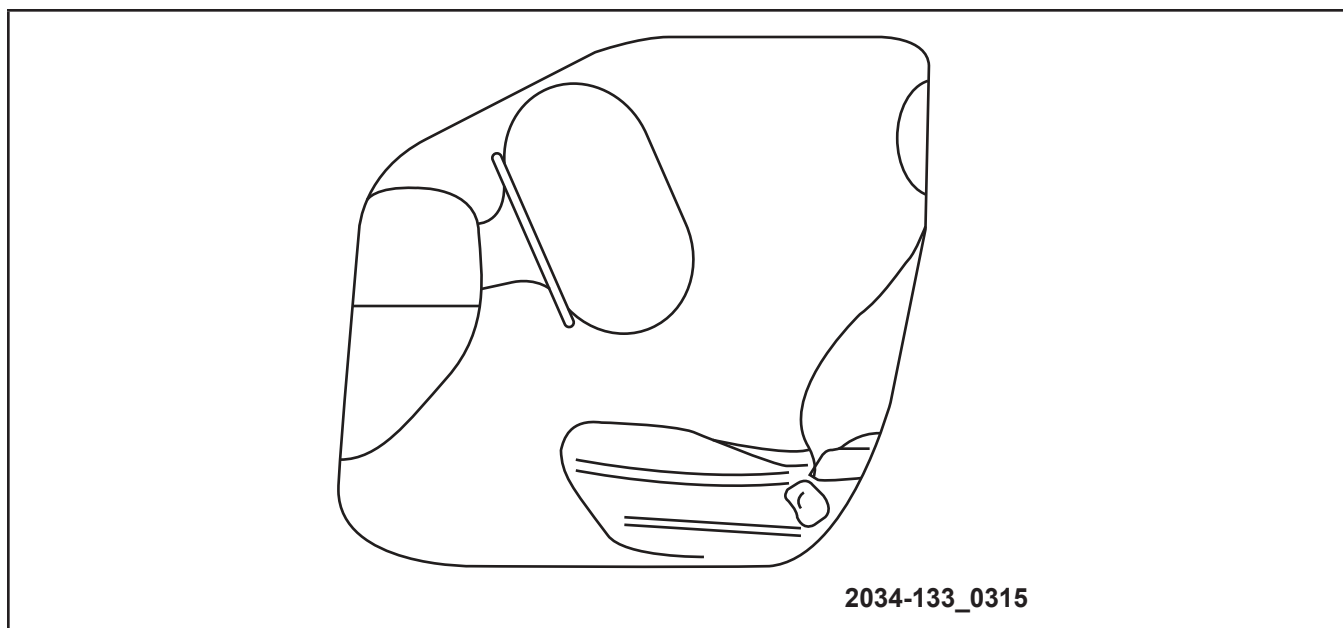
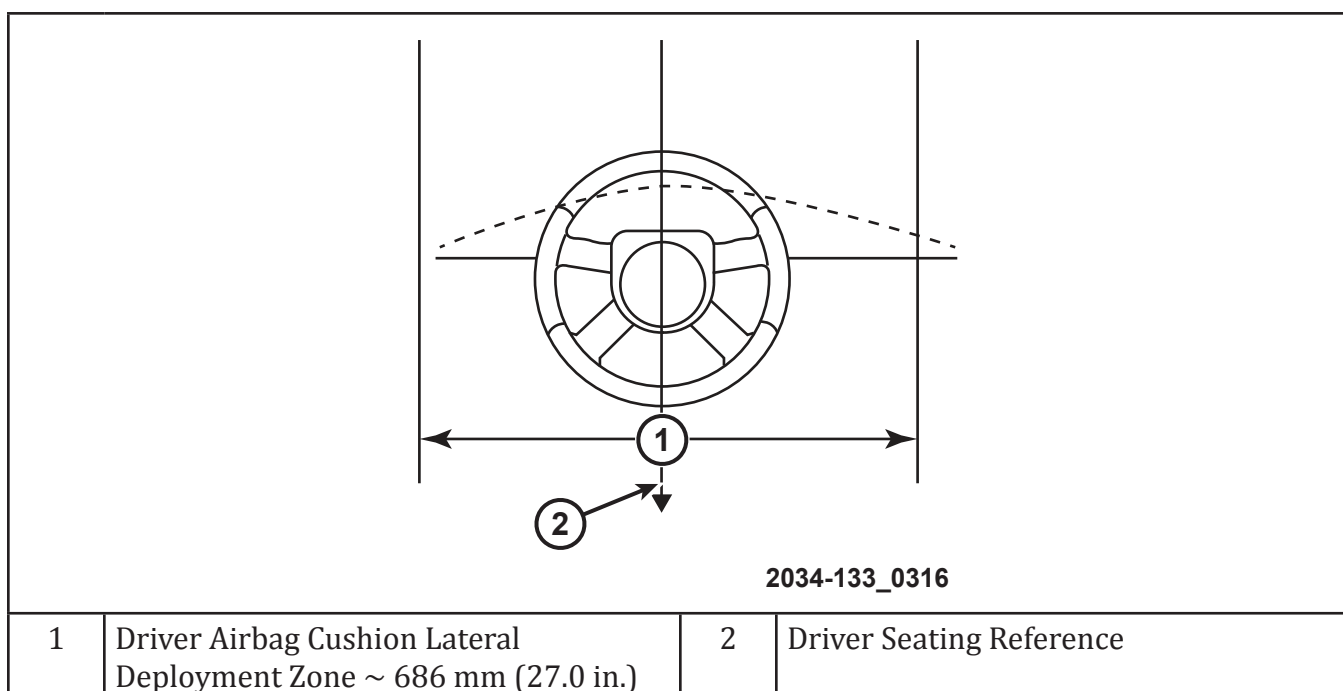


Figure 91 Driver Airbag Deployed Shape

Table 17 Steering Column Tilt Position Range

± 2 degrees from steering column tilt pivot point
~ 22.0 degrees from verticle is the normal position



1	Driver Airbag Cushion Lateral Deployment Zone ~ 686 mm (27.0 in.)	2	Driver Seating Reference
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Figure 92 Deployment Zone

Side Curtain

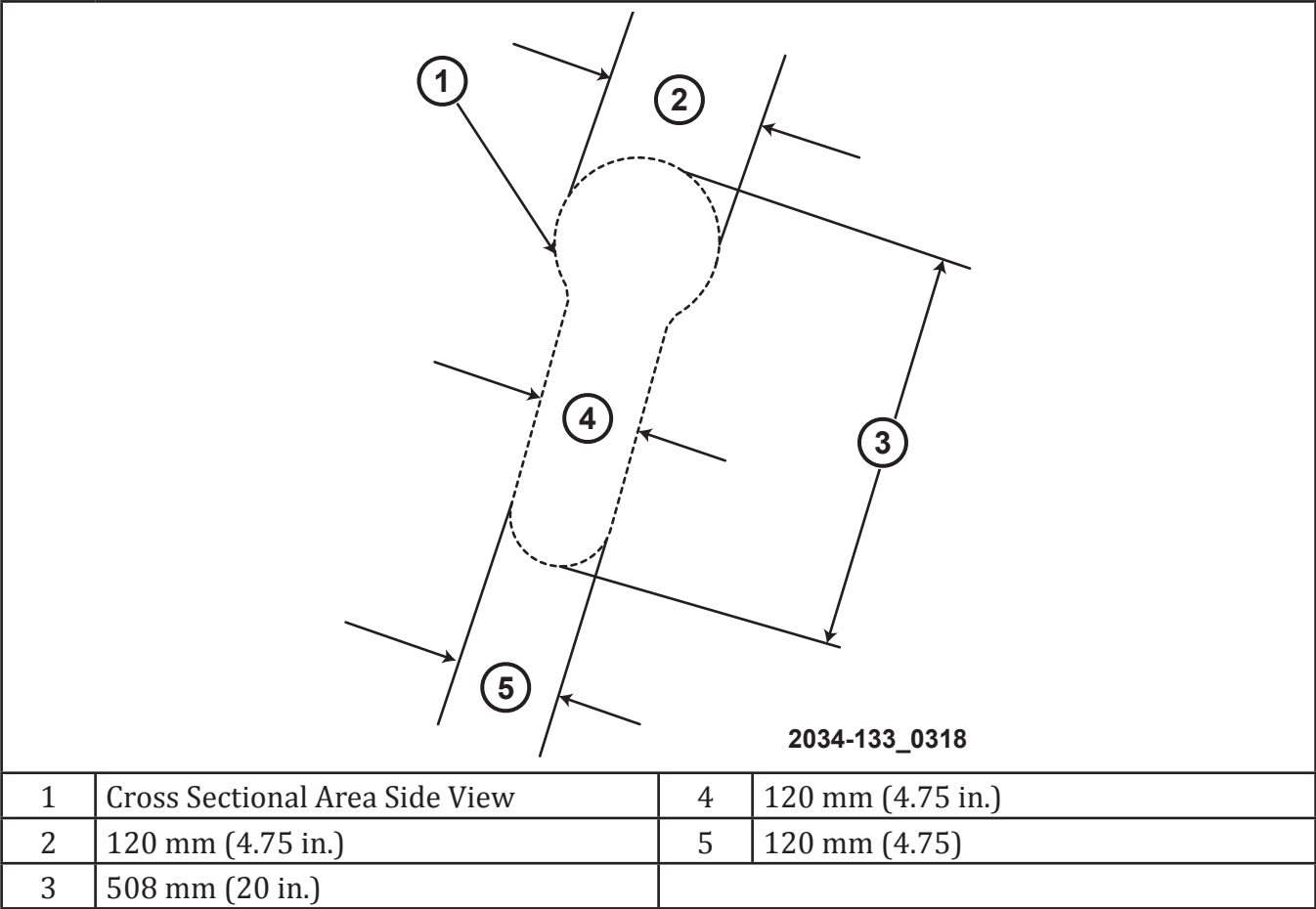


Figure 93 Side Curtain

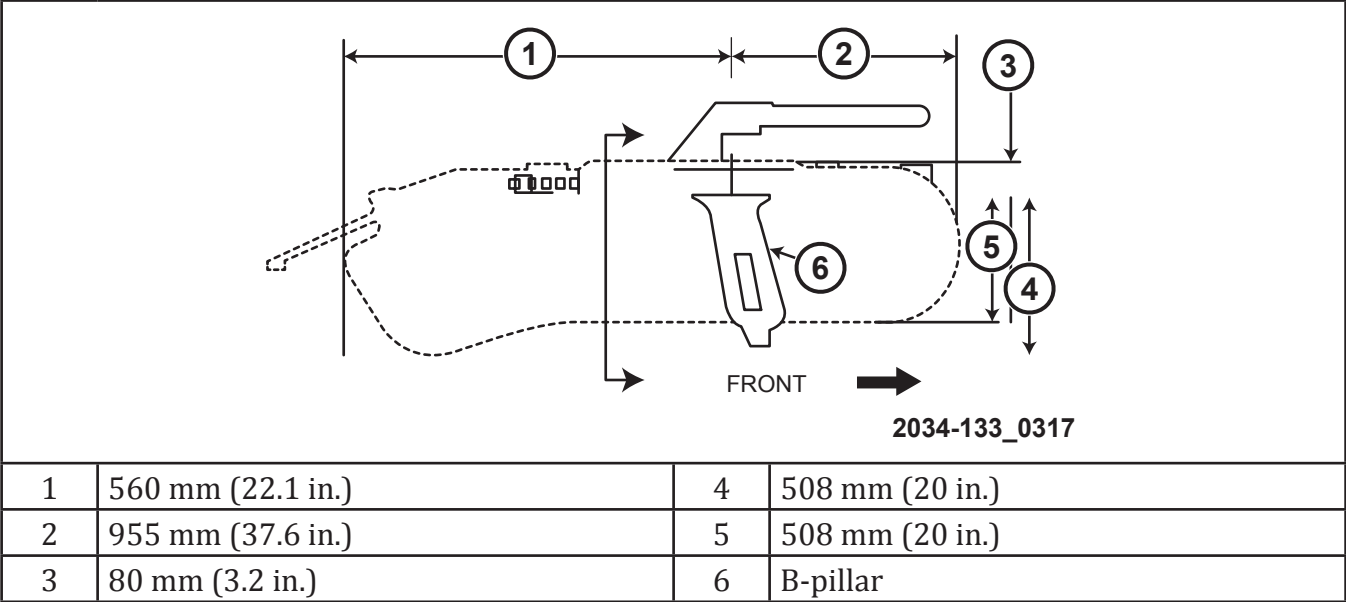


Figure 94 Side Curtain Deployment Zone

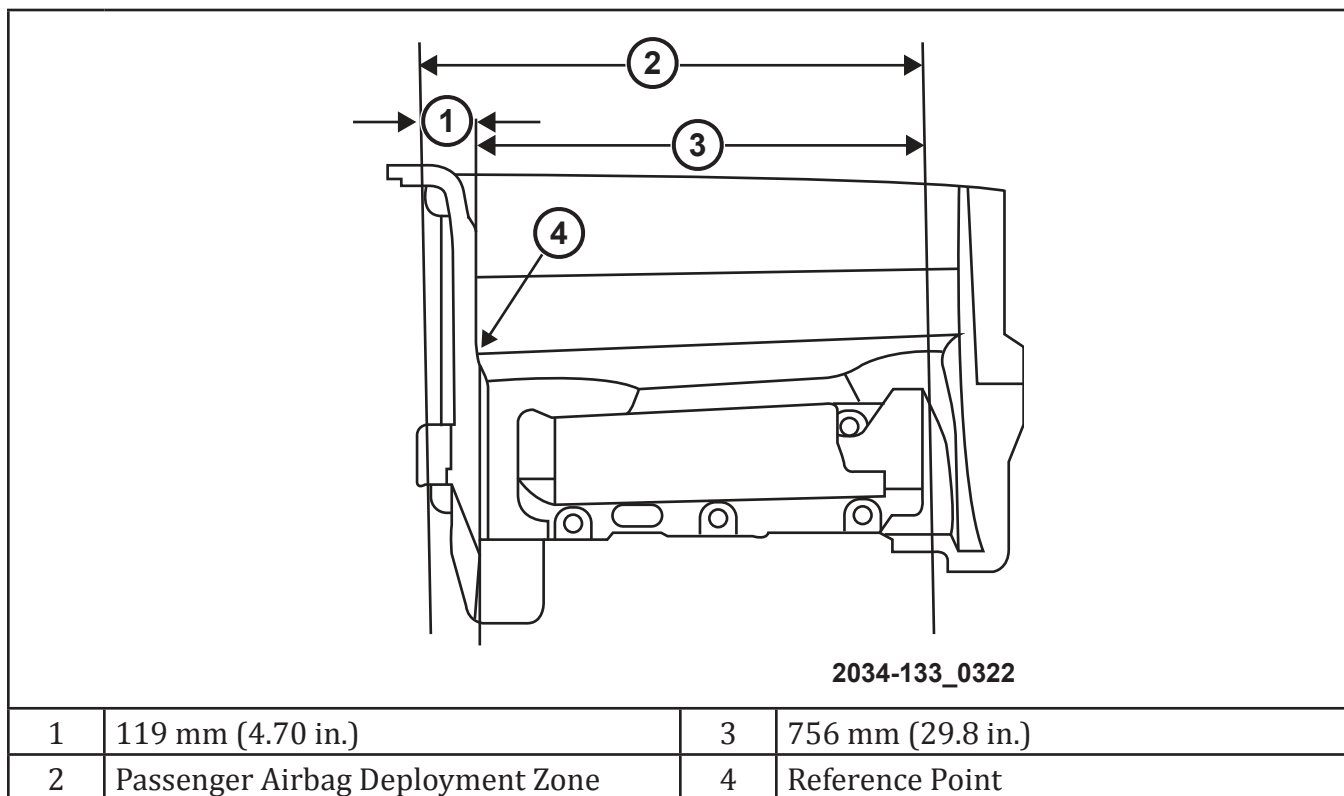
Passenger Side Instrument Panel

Figure 95 Deployment Zone

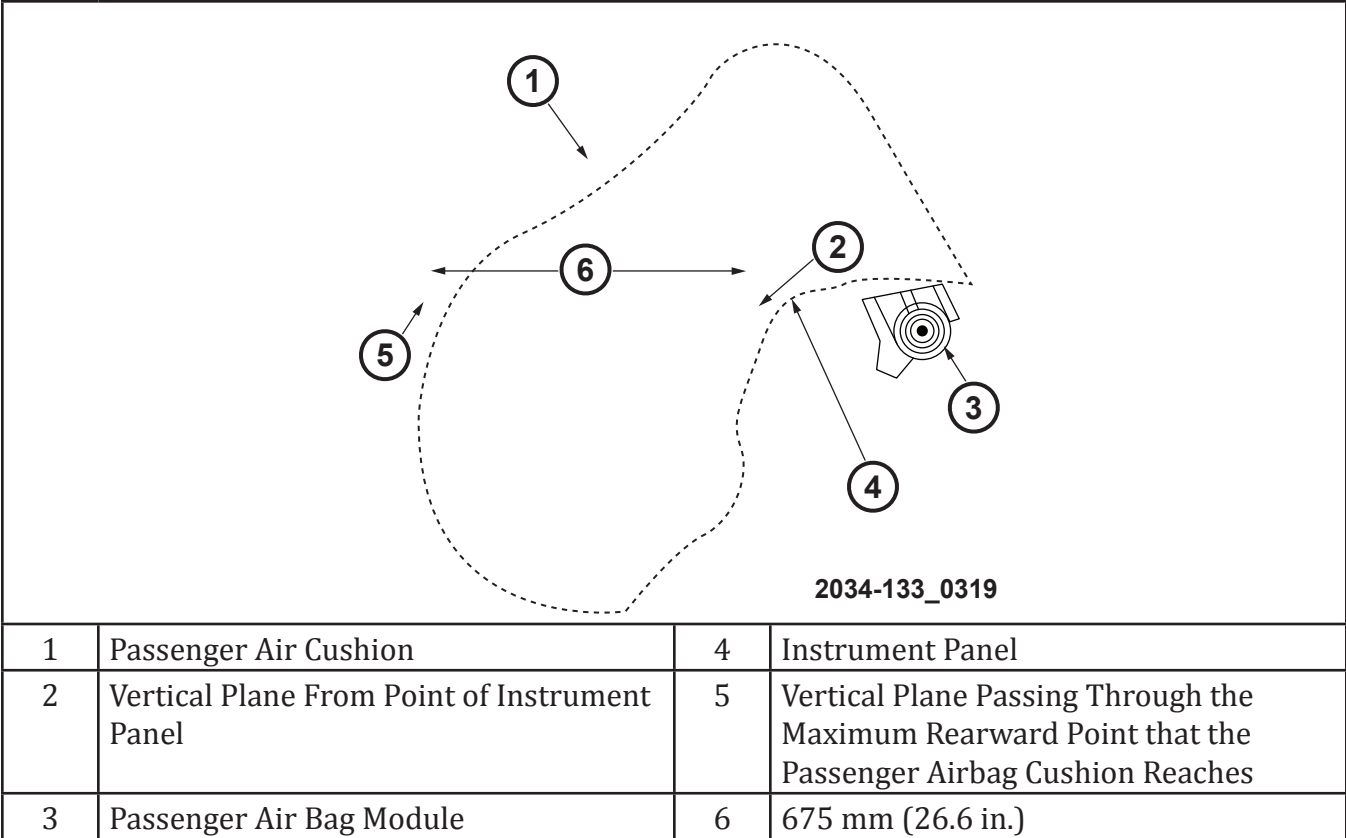


Figure 96 Passenger Airbag Deployment Zone

Note: The illustration represents the maximum dynamic deployment shape.

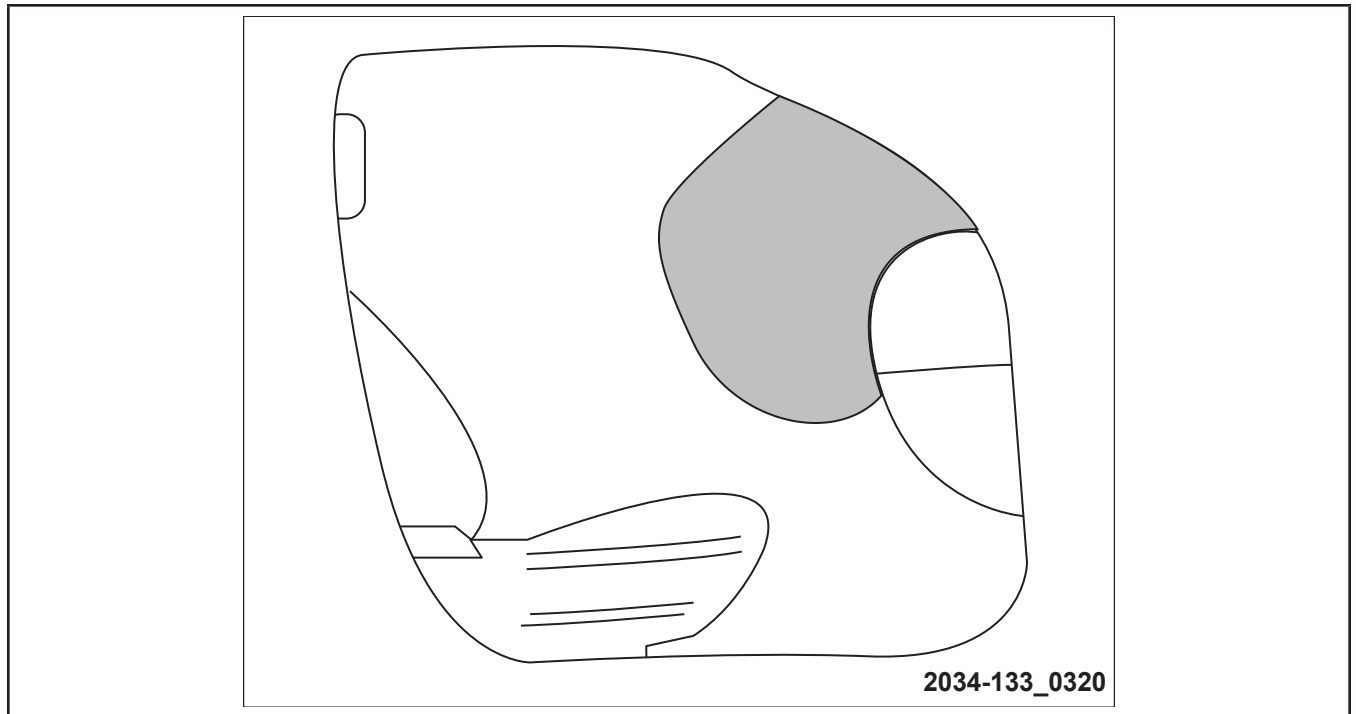


Figure 97 Final Passenger Airbag Deployment Shape

Note: The illustration represents the maximum dynamic deployment shape.

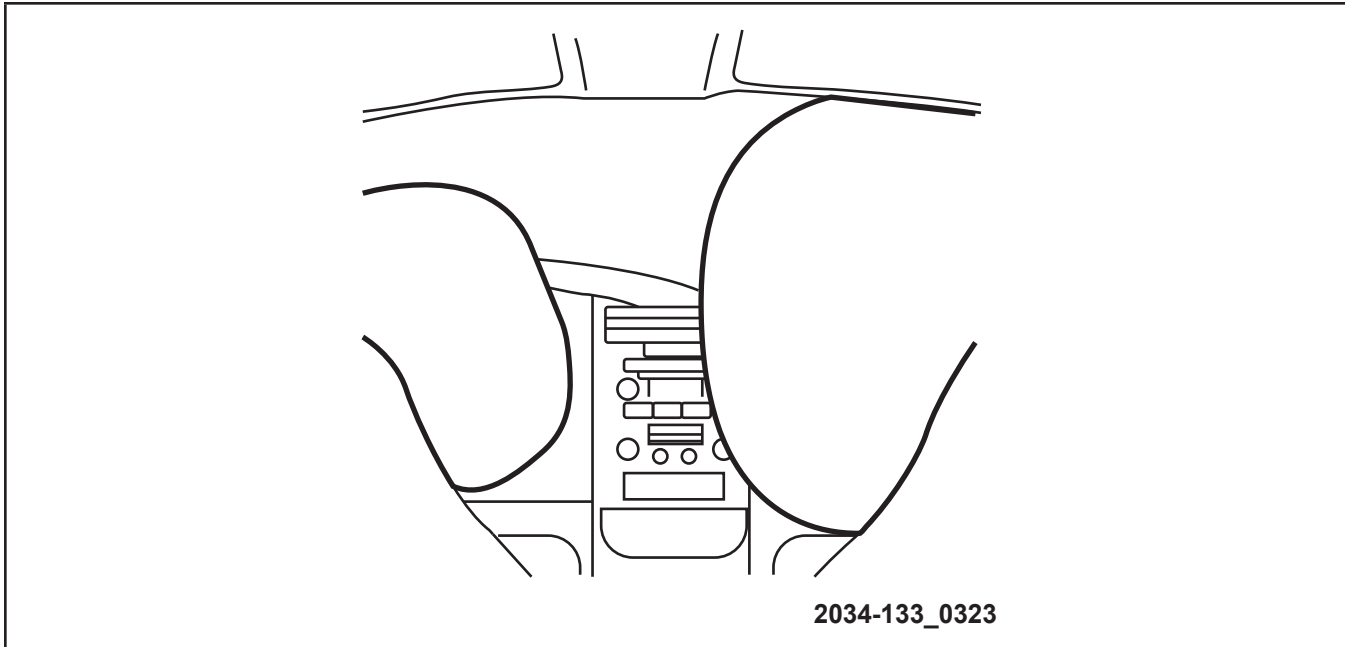


Figure 98 Center Interior Area

VEHICLE STORAGE

If a vehicle is not immediately delivered to the customer, store the vehicle according to the following guidelines:

If possible, store the vehicle indoors, in a clean and dry place. If vehicles must be stored outside;

- Avoid storage locations near obvious sources of industrial or environmental contamination (such as, trees, factories, steam or vapor vents, railroad tracks, etc.)
- Maintain tight security to help prevent vandalism; inspect the vehicle regularly to check for
- such damage
- If the vehicle must be parked on an incline, park it with the front end higher than the rear
 - This prevents hydrostatic lock caused by fuel draining into the engine
- Rinse the vehicle at least once a week; wash away the snow more often because it can trap harmful contaminants; dry all horizontal surfaces

IGNITION-OFF DRAW (IOD) FUSE

Figure 99

The RAM 1500 SSV is equipped with an ignition-OFF draw (IOD) fuse that is disconnected within the totally integrated power module (TIPM) when the vehicle is shipped from the factory. A laser printed fuse layout map is integral to the TIPM cover to ensure proper fuse identification. The IOD fuse is a 60-amp FMX series cartridge fuse. The fuse is secured within a white molded plastic fuse holder and puller unit that serves both as a tool for disconnecting and reconnecting the fuse in the TIPM cavity, and as a fuse holder that conveniently stores the fuse in the same cavity after it has been disconnected.

Circuits included with the IOD fuse are:

- A/C and heater control
- Amplifier
- Cluster (CCN)
- Compass
- Hands-free module (HFM)
- Multifunction switch
- Radio
- Underhood lamp
- Video screen module

Operation

The term ignition-OFF draw (IOD) identifies a normal condition where power is being drained from the battery with the ignition switch in the OFF position. The IOD fuse feeds the memory and sleep mode functions for some of the electronic modules in the vehicle as well as various other accessories that require battery current when the ignition switch is in the OFF position. The only reason the IOD fuse is disconnected is to reduce the normal IOD of the vehicle electrical system during new vehicle transportation and pre-delivery storage to reduce battery depletion, while still allowing vehicle operation so that the vehicle can be loaded, unloaded, and moved as needed by both vehicle transportation company and dealer personnel.

The IOD fuse is disconnected from totally integrated power module (TIPM) fuse cavity # J15 when the vehicle is shipped from the assembly plant. Dealer personnel must reconnect the IOD fuse when the vehicle is being prepared for delivery in order to restore full electrical system operation. After the vehicle is prepared for delivery, the IOD function of this fuse becomes transparent and the fuse that has been assigned the IOD designation becomes only another Fused B(+) circuit fuse.

The IOD fuse can be used by the vehicle owner as a convenient means of reducing battery depletion when a vehicle is to be stored for periods not to exceed about 30 days. However, it must be remembered that disconnecting the IOD fuse will not eliminate IOD, but only reduce this normal condition. If a vehicle will be stored for more than about 30 days, the battery negative cable should be disconnected to eliminate normal IOD, and the battery should be tested and recharged at regular intervals during the vehicle storage period to prevent the battery from becoming discharged or damaged.

Notes:

Notes:

GLOSSARY

a/c service port	Refrigerant system service ports are used to recover, recycle, evacuate, charge, and test the A/C refrigerant system
active restraints	An occupant restraint system is standard factory-installed safety equipment on this vehicle; active restraints are those which require the vehicle occupants to take some action to employ
ampere-hours (AH)	The ampere-hours (AH) rating specifies the current (in amperes) that a battery can deliver steadily for 20 hours, with the voltage in the battery not falling below 10.5 volts
antilock brake system (ABS)	The antilock brake system (ABS) is an electronically operated, four channel brake control system which is part of electronic stability control (ESC); the system is designed to prevent wheel lockup and maintain steering control during braking; preventing lockup is accomplished by modulating fluid pressure to the wheel brake units
audible warnings	The CCN electronic circuit board is equipped with an audible tone transducer and programming that allows it to provide various audible alerts to the vehicle operator, including chime tones and beep tones, and emulates the sound of a conventional turn signal or hazard warning flasher
cabin compartment node	The cabin compartment node (CCN) is located in the instrument cluster, which is located in the instrument panel above the steering column opening; the CCN includes the hardware and software necessary to serve as the electronic body control module and regular instrument panel functions
clockspring	The clockspring is located near the top of the steering column, directly beneath the steering wheel; it is the wires needed to connect the steering wheel air bag to the deployment systems; the wires are wound to allow for steering wheel movement
cold cranking amperage (CCA)	The cold cranking amperage (CCA) rating specifies how much current (in amperes) the battery can deliver for 30 seconds at -18°C (0°F)
communications system	See network
data link connector (DLC)	The data link connector allows access to the vehicle diagnostic system and an interface port for diagnostic tools such as wiTECH
DealerCONNECT/ TechAUTHORITY	Information containing resources, procedures, cautions, and warnings related to the repair of the vehicle; see TechCONNECT
diagnostic trouble code (DTC)	An electronic signal stored in an onboard automotive computer that indicates a possible fault detected in the inputs or outputs of a monitored system
electronic range selection (ERS)	ERS (or TOW/HAUL mode) enables an additional underdrive gear that is not normally used during through-gear accelerations

enhance accident response support	The CCN monitors an input from the occupant restraint controller (ORC) and, following an airbag deployment; the CCN monitors an input from the powertrain control module (PCM) to automatically turn on the interior lighting after an airbag deployment event, 10 seconds after the vehicle speed is zero
exterior lighting fail-safe	The TIPM provides default park lamp and headlamp low beam operation and the CCN turns on the cluster general illumination lighting at full intensity if there is a failure of the electronic data bus communication between the CCN and the TIPM
foundation brakes	Base brake components consist of the brake pads, calipers, brake drum-in-hat rotor in the rear, rotors, brake lines, master cylinder, booster, and parking brake components
front impact sensor	Two front impact sensors are used, one left side and one right side; one sensor is located on the back side of each end of the lower radiator support cross member on each side of the cooling module and below the inboard side of each front lamp unit
gain	The gain setting is used to set the trailer brake control for the specific towing condition and should be changed as towing conditions change; changes to towing conditions include trailer load, vehicle load, road conditions, and weather
gear ratio	The ratio of the speed of rotation of the powered gear to that of the driven gear
hour meter	The vehicle has software programmed into the PCM that is different from that of the civilian version; the package contains an algorithm that prompts the driver to change the oil after predetermined hours of engine operation based on the parameters listed above
instrument panel synchronization	The CCN monitors hard-wired multiplexed inputs from the headlamp switch on the instrument panel, then transmits electronic panel lamp dimming level messages that allows all other electronic modules on the CAN data bus to coordinate their illumination intensity with that of the CCN
integrated trailer brake module (ITBM)	An integrated trailer brake module for electric trailer brakes
interior lamp load shedding	The CCN provides a battery saver feature which will automatically turn off all interior lamps and the cargo lamps if they remain on after a timed interval of about 5 minutes
liquid crystal display	The instrument cluster includes an odometer/trip odometer display that is a liquid crystal display (LCD)
multiple displacement system (MDS)	The multiple displacement system (MDS) selectively deactivates cylinders 1, 4, 6, and 7 during steady speed, low acceleration, and shallow grade climbing conditions to increase fuel economy

network	Network communication is a way to send multiple messages over a single wire or a pair of twisted wires; modules share information between each other across these common wires
park shift interlock (BTSI)	The park shift interlock is also referred to as a brake transmission shift interlock (BTSI)
passive restraints	An occupant restraint system is standard factory-installed safety equipment on this vehicle; passive restraints require no action by the vehicle occupants to be employed
PCM inputs	The sensors and switches that provide inputs to the PCM are considered powertrain control module (PCM) inputs
PCM outputs	The PCM regulates various engine and vehicle operations through different system components; these components are referred to as powertrain control module (PCM) outputs
power distribution center (PDC)	The PDC contains fuses and relays that enable an up-fitter to connect to the vehicle's electrical system with the provided circuit protection and control circuits available in one location
reserve capacity	The reserve capacity (RC) rating specifies the time (in minutes) it takes for battery terminal voltage to fall below 10.5 volts, at a discharge rate of 25 amperes
secondary load label	After up-fitting is complete, the vehicle must have a secondary label added to certify the new weight capacity of the vehicle with the added equipment; this label is the responsibility of the up-fitter and may be hand written
sentry key immobilizer system (SKIS)	The Sentry Key® immobilizer system prevents unauthorized vehicle operation by disabling the engine; the system does not need to be armed or activated; operation is automatic, regardless of whether the vehicle is locked or unlocked
service information	Information containing resources, procedures, cautions, and warnings related to the repair of the vehicle See TechCONNECT
side window demister outlet	A heater that removes mist from the windshield or glass of a car (i.e. window defroster)
steering column module	The steering control module (SCM), is an electronic circuit board with a microprocessor that is internal to the multi-function switch housing; the SCM is a local interface network (LIN) slave and communicates over a dedicated LIN bus circuit with the electromechanical instrument cluster (EMIC); also known as the cab compartment node (CCN), which is the LIN master and also provides a gateway to the controller area network (CAN) data bus
TechCONNECT/ Tech Authority	TechCONNECT and Tech Authority are web-based resources that can be accessed to help locate service related information of the vehicle

tire and loading information label	The tire and loading label that may contains information on the number of people that can be carried in the vehicle, total weight the vehicle carry, proper tire size, correct tire pressures, and the last eight numbers of the vehicle identification number
tire pressure monitor (TPM)	The TPM system consists of tire pressure monitoring sensors attached to each road wheel (and spare if equipped with a sensor) valve stem, a central receiver module, an indicator lamp, and (on some applications) a light load switch located on the instrument panel center stack
totally integrated power module (TIPM)	The totally integrated power module (TIPM) is a combination unit that performs the functions of the power distribution center (PDC) and the front control module
tow-haul mode	Tow/haul mode over-rides normal transmission programing and the transmission will shift to third gear and fourth gear, will be enabled under steady cruise conditions
transmission limp in mode	A loss of power to the transmission solenoids causes the solenoids to revert to their default, power off state; when this condition occurs, the transmission is said to be in a limp-in mode
variable cam timing (VCT)	This variable cam timing is controlled by the powertrain control module (PCM). The PCM varies the timing of the valves, advancing or retarding the opening relative to piston motion
vehicle identification number (VIN)	The VIN contains 17 characters that provide data concerning the vehicle
viscosity	The internal property of a fluid that offers resistance to flow
wireless ignition node (WIN)	The WIN is an integrated electronic receiver that replaces the ignition switch; the WIN communicates with other electronic modules in the vehicle over the controller area network (CAN) data bus



UNITED STATES AND CANADA

The special service tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source, are available through the following outlet.

28635 Mound Road, Warren, Michigan 48092, U.S.A.

MILLER SPECIAL TOOLS OTC Division, SPX Corporation

Telephone 1-800-801-5420

FAX 1-800-578-7375

The special tools referred to herein are required for certain service operations. These special service tools or their equivalent, if not obtainable through a local source, are available through the following outlets.

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SPX Jatek 5-53 Minowacho, 2-Chome Kohoku-Ku, Yokohama Kanagawa 223-0051 Japan Fax: 81-45-562-7800	SPX De Mexico Mitla No. 442 Col. Vertiz Narvarte 03600 Mexico D.F. Fax: 52-55-2595-1639	



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