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1999 JEEP Grand Cherokee OEM Service and Repair Workshop Manual

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NOTE

When all SSR conditions are met, the BSCM begins to disengage the EPB within 200 ms of the request and achieves full unclamp force in less than 1.5 seconds after the start of release.

TRACTION CONTROL SYSTEM (TCS)

The TCS system (also referred to as ESC) monitors the amount of wheel spin of each of the driven wheels. If wheel spin is detected, brake pressure is applied to the slipping wheel(s) to provide enhanced acceleration and stability. Engine torque manipulation is also used to reduce wheel spin.

The TCS can be deactivated using the ESC/TCS OFF button in the switch bank pod which sends its signals on a Local Interface Network (LIN) data bus. TCS effects can also be modified by the mode that is activated on the Terrain Select Switch or the 4WD LOW/HOLD switch, depending on whether the transfer case is in 4WD HI or LOW. If in 4WD LOW, the TCS defaults to OFF and cannot be activated.

On RWD models, the TCS is ON by default, but can be deactivated with the ESC/TCS OFF button in the switch bank pod. In Sport mode, the TCS is ON by default but can be deactivated with the ESC/TCS OFF button.

When Speed Control is activated and the TCS has been deactivated or is in a partial OFF mode, the ESC will return the TCS to full-ON. The ESC state indicators will continue to indicate the ESC mode that was requested by the customer during this re-engagement condition. The BSCM will return to this previously selected mode once speed control is no longer active or when speed control is overridden by the driver.

TRAILER SWAY CONTROL (TSC)

Trailer Sway Control (TSC) detects when a vehicle and trailer combination starts oscillating as the trailer will cause yaw oscillation of the towing vehicle (ESP sensors). There are no supplementary sensors on the trailer or trailer coupling device. This means that TSC is essentially a stabilizing device for the towing vehicle. When an oscillation motion has been detected, the vehicle/trailer combination is stabilized by means of alternate brake pressure build-up on the front axle, and also on the rear axle as necessary. In addition to this pressure build-up, the vehicle is decelerated by means of a superimposed brake pressure build-up on all wheels. If additional swinging is detected, the deceleration intervention is increased. The deceleration intervention is accompanied by a reduction in engine torque. The TSC does not change the critical speed of the vehicle/trailer combination.

If increasing oscillation of the towing vehicle is accurately detected on the basis of the target versus actual yaw rate comparison, the intervention must occur as quickly as possible. Only the ESP sensors in the vehicle are used.

In order to reduce the oscillation motion of the towing vehicle, two things happen. The brake pressure is built up alternately on the front axle (and optionally on the rear axle as well) and is synchronized with the vibration characteristics. This is accompanied by superimposed, regulated deceleration on all wheels. For this purpose, the engine torque may be reduced to a minimum level of zero torque in order to prevent the "Engine versus brake" situation from arising. The maximum drag torque may also be used.

- Control fluid modulation while the system is in a slip mitigation event
- Store diagnostic information
- Provide communication to the diagnostic scan tool while in diagnostic mode
- Illuminate the ABS indicator lamp, ESP indicator lamp, Red Brake Warning indicator lamp or the Malfunction Indicator Lamp (MIL)
- Illuminate the ESC function lamp when a vehicle dynamic event is occurring
- Provide vehicle speed information, by monitoring the wheel speed sensors, to all modules on the CAN bus
- Control the EPB system
- Monitor brake pressure in the hydraulic system by comparing the ABS Brake Pressure Sensor (Brake Booster Pressure) data and the Brake Pedal Pressure (Brake Pedal Pressure) sensor data in order to determine if the brake lights need to be activated (both pressure sensors are internal to the EBB)
- Monitor brake fluid temperature (the fluid temperature sensor is internal to the EBB)

The BSCM constantly monitors the brake system for proper operation. If the BSCM detects a fault, it will illuminate a warning indicator lamp and disable some functions. The base braking system will remain operational.

NOTE

TCS is standard equipment on all models. With TCS, the ESC function lamp will illuminate anytime the ABS warning indicator lamp illuminates.

The BSCM continuously monitors the speed of each wheel through the signals generated by the wheel speed sensors to determine if any wheel is beginning to lock. When a wheel locking tendency is detected, the BSCM commands the coils to actuate. The coils then open and close the valves that modulate brake fluid pressure in some or all of the hydraulic circuits. The BSCM continues to control pressure in individual hydraulic circuits until a locking tendency is no longer present. The BSCM contains a self-diagnostic program that monitors the antilock brake system for system faults. When a fault is detected, a warning indicator lamp is turned on and a Diagnostic Trouble Code (DTC) fault is then stored in a diagnostic program memory. A latched fault will disable certain system functionality for the current ignition cycle. An unlatched fault will disable certain system functionality until the fault condition disappears. These DTCs will remain in the BSCM memory even after the ignition has been turned OFF. The DTCs can be read and cleared from the BSCM memory by a technician using a diagnostic scan tool. If not cleared with a diagnostic scan tool, the fault occurrence and DTC will be automatically cleared from the BSCM memory after the identical fault has not been seen during the next 3,500 miles. Drive-off may be required for the amber ABS warning indicator lamp to go out on the next ignition cycle.

The BSCM works in conjunction with multiple subsystems including, APB, BAS, Drag Torque Control, EBD, EPB, ERM, ESC, HDC, HSA, ORA ESC, Rain Brake Support, Ready Alert Braking, TCS, TSC and YMC. All of these

The EPB switch signals are the following:

Hardwire Inputs

- Turn EPB switch icon indicator light ON/OFF

Hardwire Outputs

- ON/OFF state to BSCM

Hill Descent Control (HDC) or Selec-Speed Control (SSC) Switch

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The HDC switch will activate the HDC programming in the BSCM and is located in the right rear of the ESM bezel on the floor console. The HDC indicator lamp will be on solid when HDC is enabled.

If the vehicle is equipped with SSC, the SSC switch is located where the HDC switch would normally be. The vehicle can be equipped with either HDC or SSC, but not both.

Electronic Brake Booster (EBB) and Brake System Control Module 2 (BSCM2) Hydraulic Control Units (HCU)

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EBB

The EBB is located in the left rear corner of the engine compartment. The EBB consists of the brake fluid reservoir, and the HCU, which contains the valve body with pressure and temperature sensors, pump motor, low pressure accumulators, inlet valves, outlet valves and noise attenuators. Accumulators in the valve body store extra fluid released from the calipers during ABS mode operation. The motor is controlled by the BSCM. The valves modulate brake pressure during antilock braking and are controlled by the BSCM. During antilock braking, the solenoid valves are opened and closed as needed. They are cycled rapidly and continuously to modulate pressure and control wheel slip and deceleration. Brake Traction Control (TC) and ESP modulate pressure on each wheel individually without any driver brake input. The valves are all contained in the valve body portion of the EBB.

The BPTS provides the ABS system a linear signal representing the position of the brake pedal, from fully pressed to fully released. This signal is used by the ABS module to determine if there is driver input to the system resulting in fluid pressure buildup in the hydraulic system.

The BPTS is internal to the EBB and is not serviced separately from the EBB.

The data from the ABS Brake Pressure Sensor, also integral to the EBB, is used to help in determining if the driver is intentionally applying the brakes or if there is system generated pressure during autonomous braking events to illuminate the brake lights.

During antilock braking, solenoid valve pressure modulation occurs in three stages; pressure increase, pressure hold, and pressure decrease. A brief description of each pressure modulation follows:

OPERATION

EPB MENU MODES

In-Plant and Emissions Rolls Development (ERD) Mode

The EPB has an In-Plant Mode and Emissions Rolls Development Mode (ERD) where only static EPB switch Apply/Release functions are available along with only text messages related to these two functions activated.

NOTE

When In-Plant and ERD mode is active, Automatic Parking Brake and Safe Hold functions will not work.

Inspection Mode

The Inspection Function (IF) allows the EPB system to be tested for certain markets during the required Vehicle Inspection Mode. It automatically detects the tester using wheel speed inputs and runs an apply routine that exercises the EPB for testing. The BSCM detects the vehicle conditions autonomously. If the IF function is canceled or finished, the parking brakes will be released.

The parking brakes will build up a minimum clamp force when applying the EPB switch the first time and the EPB warning light in the IPC will illuminate continuously. Two different methods of increasing the clamp force are available, depending on the usage of the switch:

- The switch can be pulled to the Apply position for the first clamp force step, then released. Each consecutive EPB switch apply will step up the clamp force (executed immediately) until full clamp is achieved.
- If the EPB switch is held in Apply continuously, the function steps up the clamp force every 3 seconds for at least four steps. After the last apply step is reached, a final step will fully apply the parking brakes.

After the last apply step is reached for either method, a final step will fully apply the parking brakes. The parking brakes will be released before radio function exit.

IF mode is activated/deactivated through the radio menus. The following conditions must exist:

- ignition in RUN
- all wheel speeds are valid
- both front wheel speeds are zero
- rear wheel speeds are within Min/Max tolerance
- EPB released
- no EPB faults present
- transmission in neutral
- throttle not applied

IF mode will be inhibited if the following conditions exist:

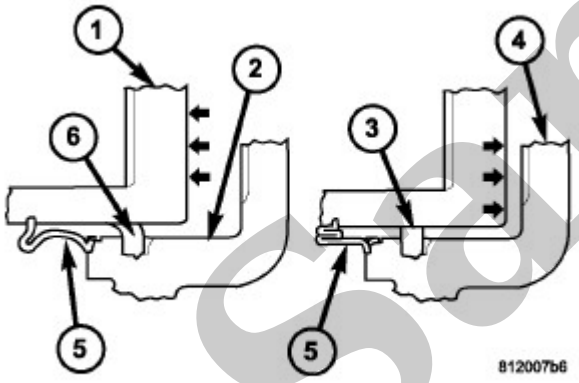
When the brakes are applied, fluid pressure is exerted against the caliper piston (2). The fluid pressure is exerted equally and in all directions. This means pressure exerted against the caliper piston and within the caliper bore will be equal.

Fluid pressure applied to the piston is transmitted directly to the inboard brake pad (5). This forces the inboard pad lining against the inboard surface of the disc brake rotor. At the same time, fluid pressure within the piston bore forces the caliper to slide inward on the mounting bolts. This action brings the outboard brake pad lining (6) into contact with the outboard surface of the disc brake rotor.

In summary, fluid pressure acting simultaneously on both piston and caliper, produces a strong clamping action. When sufficient force is applied, friction will attempt to stop the rotors from turning and bring the vehicle to a stop.

Application and release of the brake pedal generates only a very slight movement of the caliper and piston. Upon release of the pedal, the caliper and piston return to a rest position. The brake pads do not retract an appreciable distance from the rotor. In fact, clearance is usually at, or close to zero. The reasons for this are to keep road debris from getting between the rotor and lining and in wiping the rotor surface clear each revolution.

The caliper piston seal (4) controls the amount of piston (2) extension needed to compensate for normal lining wear.



During brake application, the seal is deflected outward (6) by fluid pressure and piston movement. When the brakes (and fluid pressure) are released, the seal relaxes (3) and retracts the piston (1).

The amount of piston retraction is determined by the amount of seal deflection. Generally the amount is just enough to maintain contact between the piston and inboard brake pad.

Electronic Brake Booster (EBB) Hydraulic Control Unit (HCU)

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4. Attempt to stop the vehicle with the parking brake only (do not exceed 40 km/h [25 mph]) and note grab, drag, noise, and others.

BRAKES DO NOT HOLD AFTER DRIVING THROUGH DEEP WATER PUDDLES

This condition is generally caused by water-soaked linings. If the lining is only wet, it can be dried by driving with the brakes very lightly applied for a mile or two. However, if the lining is both soaked and dirt contaminated, cleaning and or replacement will be necessary.

BRAKE PULL

Front brake pull condition could result from:

- Contaminated lining in one caliper.
- Seized caliper piston.
- Binding caliper.
- Loose caliper.
- Rusty caliper slide surfaces.
- Damaged rotor.
- Wheel alignment (caster, camber, and toe are possible out of spec).
- Tire pressure.
- Blocked or pinched brake hose.
- Blocked brake system orifice.

A worn and damaged wheel bearing or suspension component are further causes of pull. A damaged front tire (bruised, ply separation) can also cause pull.

A common and frequently misdiagnosed pull condition is where direction of pull changes after a few stops. The cause is a combination of brake drag followed by fade at one of the brake units.

As the dragging brake overheats, efficiency is so reduced that fade occurs. Since the opposite brake unit is still functioning normally, its braking effect is magnified. This causes pull to switch direction in favor of the normally functioning brake unit.

An additional point when diagnosing a change in pull condition concerns brake cool down. Remember that pull will return to the original direction, if the dragging brake unit is allowed to cool down (and is not seriously damaged).

BRAKE FADE

Brake fade is usually a product of overheating caused by brake drag. However, brake overheating and resulting fade can also be caused by riding the brake pedal, making repeated high deceleration stops in a short time span, or constant braking on steep mountain roads. Refer to the brake drag information in this section for causes.

BRAKE DRAG

CONDITION	POSSIBLE CAUSES	CORRECTION
		information.
DISC BRAKE CHIRP	1. Excessive brake rotor runout.	1. Diagnose and replace as necessary.
	2. Lack of lubricant on brake caliper slides.	2. Lubricate brake caliper slides.
	3. Caliper or shoes not fully seated.	3. Reseat caliper or shoes.
	4. Inspect the linings for contamination.	4. Remove the source of contamination.
	5. Coating worn on abutment.	5. Replace the abutment clips.
DISC BRAKE RATTLE OR CLUNK	1. Broken or missing anti-rattle spring clips.	1. Replace anti-rattle spring clips/shims and brake pads.
	2. Caliper guide pin bolts loose.	2. Tighten guide pin bolts.
SQUEAK/SQUEAL	1. Brake shoe or pad linings.	1. Replace brake shoes or pads.
SCRAPING (METAL-TO-METAL).	1. Foreign object interference with brakes.	1. Inspect brakes and remove foreign object.
	2. Brake shoes or pads worn out.	2. Replace the brake shoes or pads. Inspect the rotors. Reface or replace as necessary.
	3. Rock caught between the splash shield and the brake rotor.	3. Remove the trapped rock(s).
SCRAPING OR WHIRRING	1. Wheel speed sensor hitting the tone wheel.	1. Inspect, correct or replace the ineffective component(s).

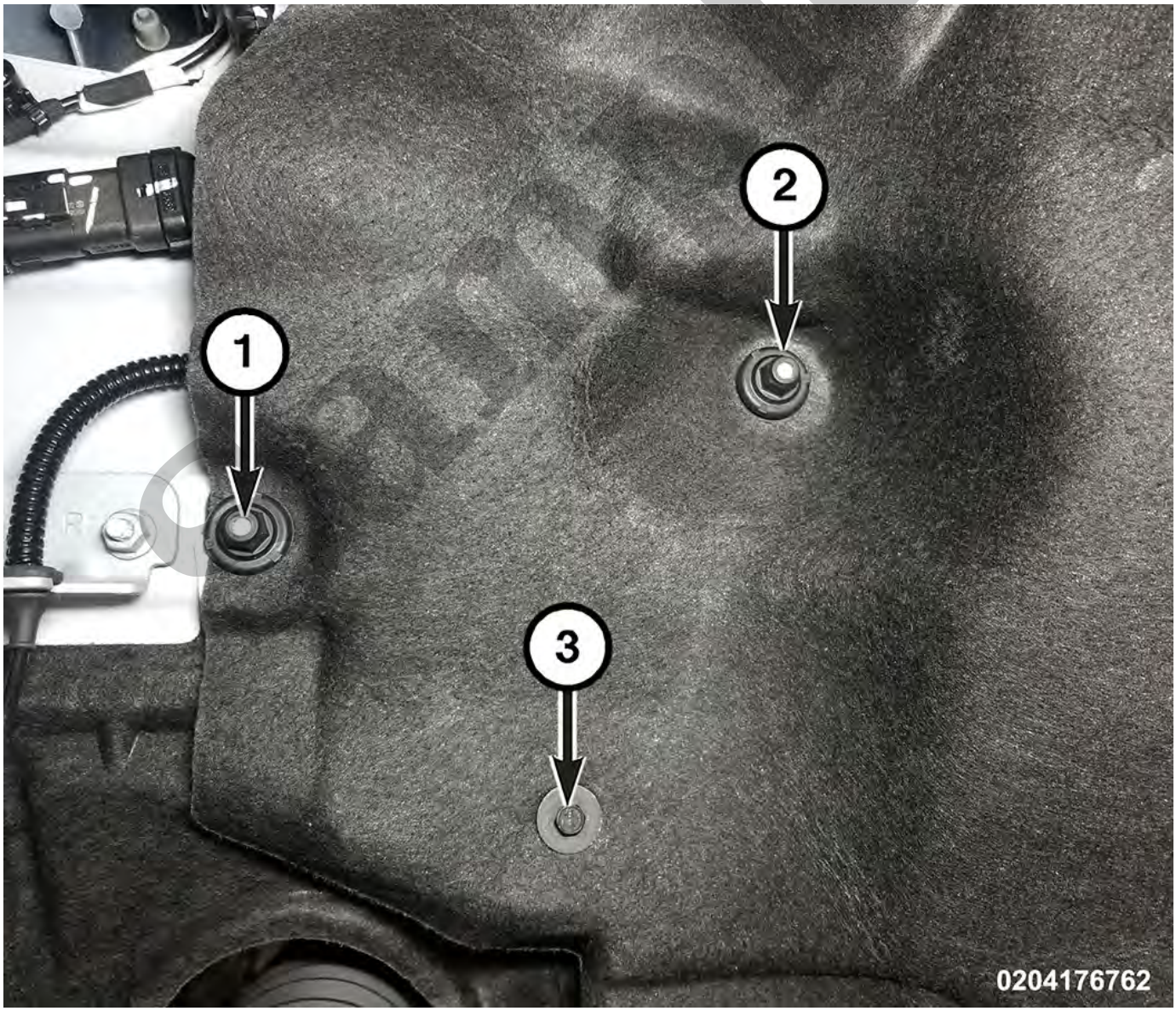
OTHER BRAKE CONDITIONS

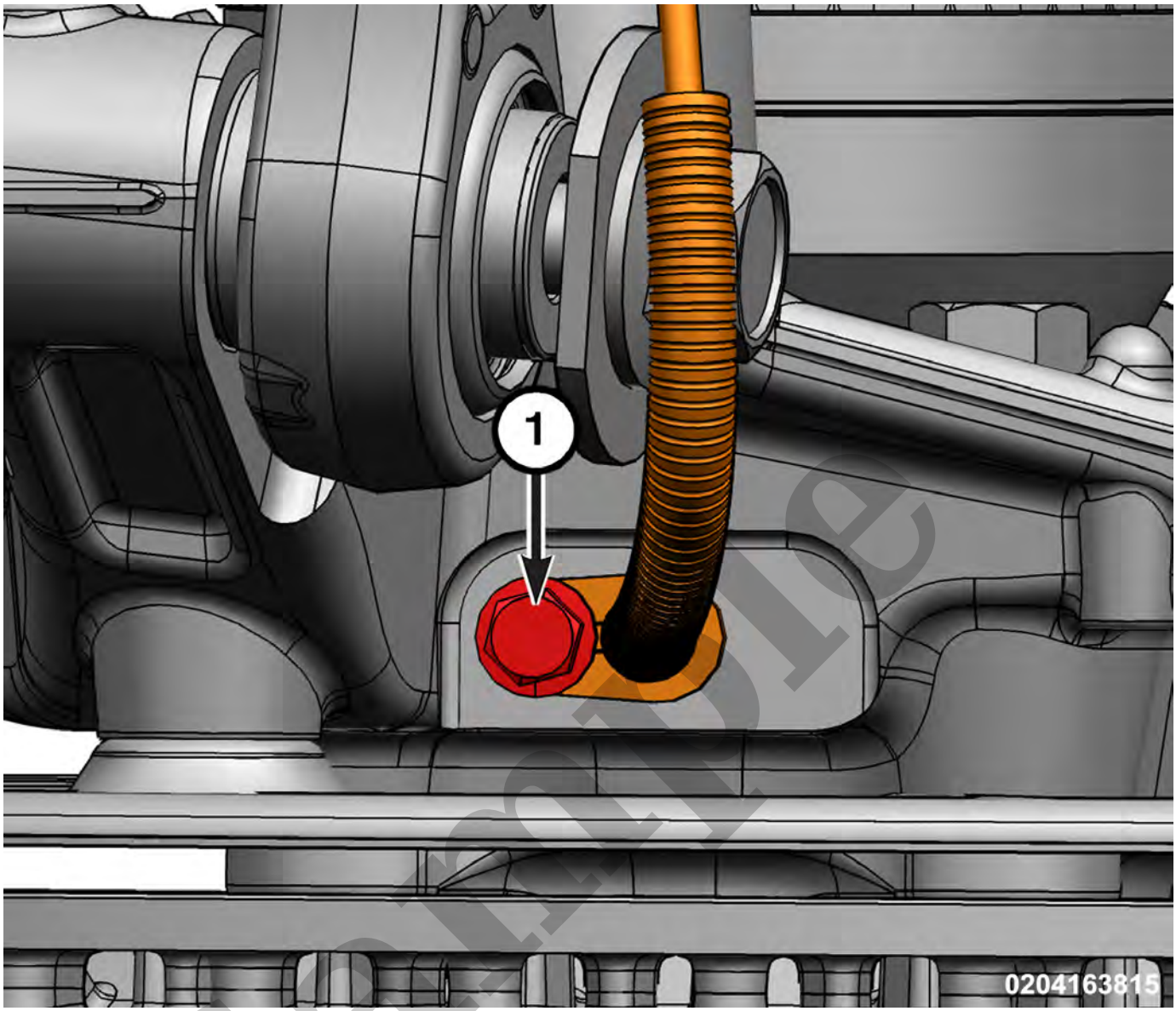
Front Wheel Speed Sensor

FRONT WHEEL SPEED SENSOR

REMOVAL

1. Raise and support the vehicle (Refer to Vehicle Quick Reference/Hoisting/Standard Procedure).





1 - Wheel Speed Sensor Bolt

3. Remove the wheel speed sensor bolt.

4. Disengage the wheel speed sensor wire harness from the routing clips.