

2022 CHEVROLET CORVETTE SERVICE MANUAL

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ABS Description and Operation

Description and Operation

This vehicle is equipped with a Integrated Brake Control (IBC), also known as Brake System Control Module.

The Integrated Brake Control is an electromechanical device that interprets and converts driver input and provides a corresponding hydraulic pressure output to activate a standard brake system according to the drivers demand. The electro-hydraulic boost system replaces the conventional vacuum-based power assist brake system, which provides an advantage in efficiency. The electro-hydraulic brake system supplies "on-demand" power when the driver presses the brake pedal. In an event of no electrical energy or failure condition the drivers input is mechanically converted to a hydraulic pressure output.

Depending on options, the following vehicle performance enhancement systems are provided.

- ABS
- Traction Control
- Stability Control
- Brake Pad Life Monitoring
- Dynamic Rear Proportioning
- Panic Brake Assist
- Teen Mode Support
- Engine Drag Control
- Brake Drying/Cleaning
- Extended Hill Hold Start Assist
- Hill Descent Control
- Collision Imminent Braking
- Full Speed Range Adaptive Cruise Control Braking
- Park Brake Control Motor on Caliper/Drum (with Push/Push)
- Bi-directional WSS
- CAN messages:
 - - Chassis System Total Brake Axle Torque
 - DIC message during ABS (no pedal feedback)
 - Switch based ESC disable
 - Switch based Traction disable
 - ESC enable
- The Body control module (BCM) monitors the brake pedal position sensor signal when the brake pedal is applied and sends a high speed serial data message to the Brake System Control Module indicating the brake pedal position.

- **Instrument cluster** - The instrument cluster displays the vehicle speed based on the information from the engine control module. The engine control module sends the vehicle speed information via a high speed serial data to the body control module. The body control module then sends the vehicle speed information via a low speed serial data to the instrument cluster in order to display the vehicle speed, either in kilometers or miles, based on the vehicle requirements.
- **Multi-axis acceleration sensor** - The yaw rate, lateral acceleration and longitudinal acceleration sensors are combined into one multi-axis acceleration sensor, internal to the inflatable restraint sensing and diagnostic module. The Brake System Control Module receives serial data message inputs from the yaw rate, lateral acceleration and longitudinal acceleration sensor and activates stability control and hill hold start assist function depending on multi-axis acceleration sensor input.
- **Multifunction switch** - The traction control switch is a multifunction momentary switch. The body control module monitors the signal circuit from the traction control switch and sends a high speed serial data message to the Brake System Control Module indicating the switch position. The traction control and stability control are manually disabled or enabled by pressing the traction control switch.
- **Steering wheel angle sensor** - The Brake System Control Module receives serial data message inputs from the steering angle sensor. The steering wheel angle sensor signal is used to calculate the intended driving direction. The steering wheel angle sensor is installed as an internal part of the power steering gear.
- **Transmission control module** - The Brake System Control Module receives high speed serial data message inputs from the transmission control module indicating the gear position of the transmission for hill start assist or hill hold functions.
- **Wheel speed sensors** - This vehicle is equipped with unique directional wheel speed sensors that can detect wheel direction as well as zero wheel speed. The wheel speed sensors are Active sensors that receive a 12 V power supply voltage from the Brake System Control Module and provides an output signal to the module. As the wheel spins, the wheel speed sensor sends the Brake System Control Module a DC square wave signal. The Brake System Control Module uses the frequency of the square wave signal to calculate the wheel speed

Power-Up-Self Test

The Brake System Control Module is able to detect many malfunctions whenever the ignition is ON. However, certain failures cannot be detected unless active diagnostic tests are performed on the components. Shorted solenoid coil or motor windings, for example, cannot be detected until the components are commanded ON by the Brake System Control Module. Therefore, a power-up self-test is performed to verify correct operation of system components. The Brake System Control Module performs the first phase of the power-up self-test when the ignition is first turned ON. This phase consists of internal self-testing of the Brake System Control Module along with electrical checks of system sensors and circuits.

Antilock Brake System (ABS) Features

The active control/modulation of brake fluid hydraulic pressure to the front and/or rear brake corner subsystems (brake torque control) to preclude wheel lock-up and enhance tire-to-road longitudinal braking traction. Wheel lock-up (sliding wheel, not rolling wheel) occurs when the wheel brake torque exceeds the available tire-to-road traction. Avoidance of wheel lock-up provides the driver with the ability to maintain vehicle stability and steer-ability. Improved tire-to-road longitudinal braking traction minimizes vehicle stopping distance.

Brake Assist Features

The Brake Assist provides additional brake pressure over the pressure provided by the conventional brake apply system.

Panic Brake Assist

This feature will apply brakes more quickly when a panic brake situation is determined. Panic Brake Assist detects that the driver intent is to stop the vehicle as quickly as possible, but does not apply sufficient brake pressure to do so. The feature will detect the driver intent then actively apply brake pressure to maximum pressure, thus activating the ABS system and stopping the vehicle as quickly as possible.

Electronic Pre-Fill

This feature is used to reduce the brake response time when the driver quickly releases the accelerator pedal. This will also be used to support the use of low drag calipers.

Electronic Stability Control (ESC) Features

Roll Over Mitigation / Preemptive ESC

Using the standard ESC sensor set, Roll Over Mitigation will detect driving situations that could cause a vehicle rollover. After detection, ESC brake control will be modified to reduce the chance of vehicle rollover.

Torque Vectoring by Brakes

Torque Vectoring by Brakes enhances vehicle agility by using active brake applies and engine torque requests to maximize traction on drive wheels. While cornering, brakes are applied to the inside drive wheels, thus allowing more torque to the outside wheels without slipping the inside

wheels. Increasing the engine torque, above driver request, gives more torque to outer wheels. Torque Vectoring by Brakes is designed for all around performance, while this feature is solely designed for high cornering maneuvers.

Flat Tire ESC Enable (UJM)

If flat tire is detected, ESC system shall not be allowed to be disabled by the driver (ESC shall be re-enabled if driver has already disabled). The traction control system will be allowed to be disabled by the driver.

Traction Control System (TCS) Features

Vehicle Stuck Control

The traction control system shall recognize a vehicle "stuck" condition by monitoring excessive wheel slip for greater than 5 seconds with a vehicle reference velocity of less than 3 kph. Once detected, TCS will allow additional wheel slip of 5% to "dig" the vehicle out. This feature does not guarantee the vehicle to get unstuck, only to assist the driver.

Engine Drag Control

This feature is designed to mitigate drop-throttle-oversteer/understeer.

This feature will slowly reduce the engine torque in order to maintain vehicle stability.

The Enabling Conditions include: Engine is required to be running, Clutch is released for Manual Trans , Vehicle speed is above 18kph (12mph) and the Powertrain is engaged through fault message from ECM/TCM/PCM

Brake System Control Module Features

Engine Torque Steer Control

Engine torque steer control uses steering wheel angle, vehicle speed, accelerator pedal position, accelerator pedal position rate, and engine speed as input parameters to control engine torque as preventive measure to avoid creating torque steer in the vehicle. If the actual engine torque exceeds the maximum allowed engine torque, the Brake System Control Module shall command the maximum allowed engine torque to the powertrain control module in same manner as if requesting engine torque during traction control event.

Brake Drying/Cleaning

Brake Drying/Cleaning autonomously applies a small amount of brake pressure during long driving on wet roads in order to remove water from the rotor surface. The brake application is unperceivable to the driver, but should result in improved brake feel and performance. Conditions to enable Brake Drying/Cleaning.

- Wipers need to be ON
- If Cruise is Active, Brake Drying/Cleaning will not function as minimum pedal position is required
- If driver brakes, the distance counter will be reset
- Brake pressure need to build up to 3 bar at all 4 wheels

Hill Start Assist

Hill Start Assist is a feature that will temporarily hold the vehicle while on a grade. This feature will hold the vehicle 2-5 seconds after the driver has removed their foot from brake pedal and the vehicle is on a grade exceeding 5%. The design is to prevent the vehicle from rolling down the hill before the driver has an opportunity to apply accelerator pedal.

Driveline Damping

Driveline Damping is required on vehicles with ESC, Stop/Start functionality and an automatic transmission. This feature holds brake pressure to dampen driveline acceleration disturbance as engine is restarted and holds brake pressure to retard or prevent the vehicle from rolling. It is used for driver comfort and has also been used to extend vehicle hold on a steep grade.

Extended Hold Hill Start Assist

Extended Hold Hill Start Assist will function the same as Hill Start Assist except there will be an indefinite vehicle hold instead of a temporary vehicle hold. The vehicle will be held by the Brake System Control Module, and then will transfer the hold to Electronic Park Brake when necessary. All of the driver exit strategies of Hill Start Assist with Electronic Park Brake will also apply to this feature.