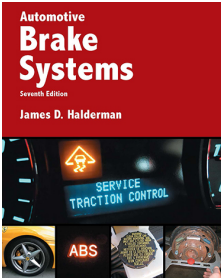


Automotive Brake Systems



CHAPTER 19

Electronic Stability Control Systems

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OBJECTIVES

- Discuss the need for electronic stability control (ESC).
- List the sensors needed for the ESC system.
- Describe how a traction control (TC) system works.
- List the steps in the diagnostic process for ESC and TC system faults.

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- Purpose and Function
 - Electronic stability control (ESC) is system designed to help drivers keep control of their cars
 - Helps prevent run-off-road crashes and rollovers

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - ESC has the following features:
 - Applies individual brakes to maintain directional stability.
 - Uses sensors to determine if vehicle is not under control.
 - Uses steering wheel position sensor to determine intended direction.

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - ESC has the following features:
 - Operates at all vehicle speeds except low speeds.

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - ESC applies individual brakes if either of these conditions occur:
 - Oversteering: rear of vehicle moves outward or breaks loose
 - Can result in loss of control

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - ESC applies individual brakes if either of these conditions occur:
 - Understeering: front of vehicle continues straight when turning

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - ESC lamp—called telltale lamp—remains on as long as malfunction exists when ignition is on
 - Telltale lamp flashes to indicate when ESC system is operating

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - Some manufacturers install switch to temporarily disable ESC
 - Feature useful on certain occasions
 - When a vehicle is stuck in sand or gravel

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - Feature useful on certain occasions
 - When vehicle is being operated on racetrack

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THE NEED FOR ELECTRONIC STABILITY CONTROL

- System Requirements
 - ESC automatically turns back on when ignition is turned off and then on again

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ESC SENSORS

- Steering Wheel Position Sensor
 - May also be called a hand-wheel position sensor
 - Provides computer with signals related to steering wheel position, speed, and direction

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ESC SENSORS

- Vehicle Speed Sensor
 - Used by Electronic Brake Control Module to help control suspension system
 - Vehicle speed (VS) sensor is magnetic sensor
 - VS sensor generates analog signal whose frequency increases as speed increases

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ESC SENSORS

- Lateral Acceleration Sensor
 - Provides suspension control module with feedback regarding cornering forces
 - This type of sensor called G-sensor

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ESC SENSORS

- Lateral Acceleration Sensor
 - Letter “G” stands for gravity
 - Information processed by suspension control module

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ESC SENSORS

- Lateral Acceleration Sensor
 - Module provides appropriate damping on inboard and outboard dampers during cornering events
 - This sensor can be stand-alone unit or combined with yaw rate sensor

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ESC SENSORS

- Lateral Acceleration Sensor
 - Typically mounted in passenger compartment:
 - Under front seat
 - In center console
 - On package shelf

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ESC SENSORS

- Yaw Rate Sensor
 - Provides information to suspension control module and EBCM
 - Information used to determine how far vehicle has deviated from intended direction

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ESC SENSORS

- Yaw Rate Sensor
 - Can be stand-alone unit or combined with lateral acceleration sensor
 - Typically mounted under front seat, in center console, or on rear package shelf
 - Sensor sets DTC codes

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TRACTION CONTROL

- Traction Control Operation
 - Outputs of TC system can include one or more of the following:
 - Retard ignition timing to reduce engine torque
 - Decrease fuel injector pulse-width to reduce fuel delivery to reduce engine torque

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TRACTION CONTROL

- Reduce amount of intake air if engine is equipped with an electronic throttle control (ETC)
 - Reducing intake air will reduce engine torque
 - Upshift the automatic transmission/transaxle
 - Shifting into higher gear reduces torque
- Traction Control Operation
 - Most TC systems can reduce positive wheel slip at all speeds

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ESC/TC DIAGNOSIS

- ESC and TC systems use some of same sensors and controllers
- Diagnosis is about the same for both
- Follow recommended procedures in service information

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ESC/TC DIAGNOSIS

- Usual procedure follows these steps:
 - STEP 1: Verify customer concern.
 - STEP 2: Perform thorough visual inspection.
 - STEP 3: Check service information for specified procedure to retrieve DTCs.
 - Check related technical service bulletins
 - Most vehicles require factory-brand scan tool

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ESC/TC DIAGNOSIS

- STEP 4: Following troubleshooting procedure specified to fix root cause of problem.
- STEP 5: Repair the fault.
- STEP 6: Road test the vehicle under same conditions that caused the fault.

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SUMMARY

- ESC lamp—called telltale lamp—remains on as long as malfunction exists when ignition is on
- VS sensor generates analog signal whose frequency increases as speed increases
- Most TC systems can reduce positive wheel slip at all speeds
- ESC and TC systems use some of same sensors and controllers

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