

this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new ABS module. REFER to: Anti-Lock Brake System (ABS) Module .

## DIAGNOSIS AND TESTING > ANTI-LOCK BRAKE SYSTEM (ABS) AND STABILITY CONTROL > PINPOINT TESTS > PINPOINT TEST J : STEERING WHEEL POSITION SENSOR SIGNAL FAULTS

### Normal Operation and Fault Conditions

The PSCM monitors steering wheel rotation speed, angle and direction of rotation and sends the information to the ABS module over the HS-CAN2. A failure of the HS-CAN2, PSCM or the internal sensors causes the ABS to set one or more Diagnostic Trouble Codes (DTCs).

### DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
C0051:62	Steering Wheel Position Sensor: Signal Compare Failure	This DTC sets in continuous memory and on-demand if the difference between the steering wheel angle signal and the calculated reference signal is too high.
C0051:64	Steering Wheel Position Sensor: Signal Plausibility Failure	This DTC sets in continuous memory and on-demand if the difference between the steering wheel angle signal and the calculated reference signal is too high or if the steering wheel angle sensor does not match other stability control sensor inputs (yaw rate, lateral acceleration, longitudinal acceleration, roll rate).
C0051:67	Steering Wheel Position Sensor: Signal Incorrect After Event	This DTC sets in continuous memory and on-demand if the center position of the steering wheel cannot be determined after 30 seconds of driving at a speed between 12 km/h (7 mph) and 50 km/h (31 mph).
C0051:85	Steering Wheel Position Sensor: Signal Above Allowable Range	This DTC sets in continuous memory and on-demand if the absolute value of the calculated steering wheel angle is greater than a predetermined threshold.

### Possible Causes

- Incorrectly mounted RCM
- Network communication concern
- Incomplete or incorrect stability control sensor calibration
- Wheels and tires
- Front suspension components
- Steering system components
- PSCM

## DIAGNOSIS AND TESTING > ANTI-LOCK BRAKE SYSTEM (ABS) AND STABILITY CONTROL > PINPOINT TESTS > PINPOINT TEST J : STEERING WHEEL POSITION SENSOR SIGNAL FAULTS > PINPOINT TEST J : STEERING WHEEL POSITION SENSOR SIGNAL FAULTS

### J1 CHECK THE WHEELS AND TIRES

Inspect the wheels and tires for any damage or excessive wear.

Verify all wheels and tires are the same size and match the size indicated on the VC label.

Verify the inflation pressure of all 4 tires is correct as indicated on the VC label.

#### Are the wheels and tires OK?

Yes	GO to J2
No	INSTALL the correct size wheel or tire as necessary. REFER to: Wheel and Tire . ADJUST tire pressure as necessary.

### J2 CHECK THE FRONT SUSPENSION AND STEERING COMPONENTS

With the transmission in NEUTRAL, position the vehicle on a hoist. REFER to: Jacking and Lifting - Overview .

Inspect the front suspension and steering components for any obvious signs of damage or missing components.

#### Are the front suspension and steering components OK?

Yes	GO to J3
No	REPAIR or INSTALL new components as necessary.

### J3 CHECK FOR PSCM (POWER STEERING CONTROL MODULE) DIAGNOSTIC TROUBLE CODES (DTCS)

Ignition ON.

Using a diagnostic scan tool, carry out the PSCM self-test.

#### Are there any Diagnostic Trouble Codes (DTCs) present in the PSCM?

<b>Yes</b>	DIAGNOSE all PSCM Diagnostic Trouble Codes (DTCs) before diagnosing any ABS C0051:xx codes. REFER to: POWER STEERING .
<b>No</b>	GO to J4

### J4 CHECK FOR ABS (ANTI-LOCK BRAKE SYSTEM) MODULE DIAGNOSTIC TROUBLE CODES (DTCS)

Using a diagnostic scan tool, carry out the ABS module self-test.

Retrieve and record all ABS module Diagnostic Trouble Codes (DTCs).

#### Are any of the following Diagnostic Trouble Codes (DTCs) present in the ABS module; wheel speed sensor, stability control sensor, lost communication with the PSCM or invalid data received from the PSCM?

<b>Yes</b>	DIAGNOSE those ABS module Diagnostic Trouble Codes (DTCs) before diagnosing any C0051:xx codes, beginning with any lost communication or invalid data received from the PSCM, followed by any stability control sensor (yaw rate, lateral acceleration and longitudinal acceleration) Diagnostic Trouble Codes (DTCs) and finally any wheel speed sensor Diagnostic Trouble Codes (DTCs). GO to the DTC Chart: ABS Module in Diagnostic Trouble Code (DTC) Charts .
<b>No</b>	GO to J5

### J5 VERIFY STABILITY CONTROL SENSOR CALIBRATION

Using a diagnostic scan tool, carry out the IVD Initialization routine. Follow the diagnostic scan tool directions.

Ignition OFF.

Ignition ON.


Test drive the vehicle above 12 km/h (7 mph) and make at least 1 left turn and 1 right turn.

Using a diagnostic scan tool, carry out the ABS module self-test.

#### Are any C0051:xx Diagnostic Trouble Codes (DTCs) present?

<b>Yes</b>	GO to J6
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<b>No</b>	The condition that caused the concern is no longer present. The concern was most likely due to an incomplete calibration or a failed calibration of the stability control sensors.
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 **NOTE:** The vehicle must be on level ground and at a complete standstill. Any vehicle movement results in false values for this test.


#### J6 CHECK THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE YAW RATE VALUE (YAW\_RATE) PID (PARAMETER IDENTIFICATION)

Ignition ON.

Using a diagnostic scan tool, monitor the ABS module YAW\_RATE PID.

**Is the YAW\_RATE PID value between -0.05 and 0.05?**

<b>Yes</b>	GO to J7
<b>No</b>	GO to J9


 **NOTE:** The vehicle must be on level ground and at a complete standstill. Any vehicle movement results in false values for this test.

#### J7 CHECK THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE LATERAL ACCELERATION (LAT\_ACCL) PID (PARAMETER IDENTIFICATION)

Using a diagnostic scan tool, monitor the ABS module LAT\_ACCL PID.

**Is the LAT\_ACCL PID value between -0.4 and 0.4?**

<b>Yes</b>	GO to J8
<b>No</b>	GO to J9

 **NOTE:** The vehicle must be on level ground and at a complete standstill. Any vehicle movement results in false values for this test.

#### J8 CHECK THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE LONGITUDINAL ACCELERATION (LONG\_ACCL) PID (PARAMETER IDENTIFICATION)


Using a diagnostic scan tool, monitor the ABS module LONG\_ACCL PID.

**Is the LONG\_ACCL PID value between -0.4 and 0.4?**

<b>Yes</b>	GO to J10
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No	GO to J9
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#### J9 CHECK THE RCM (RESTRAINTS CONTROL MODULE) INSTALLATION AND MOUNTING SURFACE

 **WARNING:** Turn the ignition OFF and wait one minute to deplete the backup power supply. Failure to follow this instruction may result in serious personal injury or death in the event of an accidental deployment.

Ignition OFF.

Wait one minute then disconnect RCM C310A and C310B .


Inspect the RCM installation and make sure the fasteners are fully seated and tightened to specifications. REFER to: Restraints Control Module (RCM) .

Inspect the RCM mounting surface for damage, corrosion or dirt.

#### Is the RCM installed correctly and is the mounting surface clean and free from damage?

Yes	GO to J10
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No	CLEAN or REPAIR the mounting surface or correctly REINSTALL the RCM as necessary. REFER to: Restraints Control Module (RCM) .
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 **NOTE:** The ignition must be set to OFF when disconnecting PSCM electrical connectors. Failure to follow this direction may lead to Diagnostic Trouble Codes (DTCs) being set in the PSCM which can not be cleared and result in the need to install a new EPAS gear.

#### J10 VERIFY ALL WIRING CONNECTIONS

Ignition OFF.

Disconnect PSCM C1463A and C1463B (if not previously disconnected).

Using a good light source, inspect ABS module C135 for the following:

corrosion - install a new connector or terminal and clean module pins

damaged or bent pins - install new terminals or pins

pushed-out pins - install new pins as necessary

spread terminals - install new terminals as necessary

#### Are the connectors free of corrosion, damaged pins, bent pins, pushed-out pins and spread terminals?

<b>Yes</b>	GO to J11
<b>No</b>	REPAIR the affected connectors or terminals. Refer to CONNECTOR REPAIR PROCEDURES for schematic and connector information.

#### J11 CHECK FOR CORRECT PSCM (POWER STEERING CONTROL MODULE) OPERATION

Connect PSCM C1463A and C1463B . Make sure they seat and latch correctly.

Connect RCM C310A and C310B (if previously disconnected). Make sure they seat and latch correctly.

Operate the system and determine if the concern is still present.

#### Is the concern still present?

<b>Yes</b>	CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If a TSB exists for this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, REFER to the EPAS symptom chart or DTC chart.
<b>No</b>	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. ADDRESS the root cause of any connector or pin issues.

## DIAGNOSIS AND TESTING > ANTI-LOCK BRAKE SYSTEM (ABS) AND STABILITY CONTROL > PINPOINT TESTS > PINPOINT TEST K : WHEEL SPEED SENSOR ELECTRICAL FAULTS - FRONT

Refer to VEHICLE DYNAMIC SYSTEMS for schematic and connector information.

### Normal Operation and Fault Conditions

Active wheel speed sensors generate a square wave signal proportional to wheel speed which is sent to the ABS module. Each wheel speed sensor is connected to the ABS module through 2 wires and a connector at each wheel speed sensor. One wire is for sensor voltage supply from the ABS module and the other wire is for the signal return to the ABS module. With the ignition ON, the ABS module carries out a self-test by sending a reference voltage through the wheel speed sensors and their circuitry.

### DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
C0031:11	Left Front Wheel Speed Sensor: Circuit Short to Ground	These Diagnostic Trouble Codes (DTCs) set in continuous memory and on-demand if there is a short to ground in the sensor signal return circuit or if the sensor has an internal short to ground.
C0034:11	Right Front Wheel Speed Sensor: Circuit Short to Ground	

C0031:15	Left Front Wheel Speed Sensor: Circuit Short to Battery or Open	These Diagnostic Trouble Codes (DTCs) set in continuous memory and on-demand if there is a short to battery voltage or an open in the sensor signal return circuit. A short to battery voltage may be due to the sensor signal return circuit and the sensor voltage supply circuit shorted together. These Diagnostic Trouble Codes (DTCs) also set if the sensor has an internal short to battery voltage or an open circuit.
C0034:15	Right Front Wheel Speed Sensor: Circuit Short to Battery or Open	


### Possible Causes

- Wiring, terminals or connectors
- Wheel speed sensors
- ABS module

### Visual Inspection and Diagnostic Pre-checks

- Make sure the wheel speed sensor harness is routed correctly and is undamaged.
- Make sure the wheel speed sensor electrical connector is free from any corrosion or other contaminants.

## DIAGNOSIS AND TESTING > ANTI-LOCK BRAKE SYSTEM (ABS) AND STABILITY CONTROL > PINPOINT TESTS > PINPOINT TEST K : WHEEL SPEED SENSOR ELECTRICAL FAULTS - FRONT > PINPOINT TEST K : WHEEL SPEED SENSOR ELECTRICAL FAULTS - FRONT

 **NOTE:** Use the correct probe adapter(s) when making measurements. Failure to use the correct probe adapter(s) may cause damage to the connector

### K1 CHECK FOR FAULT REPEATABILITY

Ignition ON.

Using a diagnostic scan tool, clear all ABS module Diagnostic Trouble Codes (DTCs).

Ignition OFF.

Ignition ON.

Test drive the vehicle above 20 km/h (12 mph) and carry out at least 1 ABS stop.

Bring the vehicle to a safe stop.

Using a diagnostic scan tool, carry out the ABS module self-test.

**Is DTC C0031:11, C0031:15, C0034:11 or C0034:15 present?**

<b>Yes</b>	If the Rotunda Active Wheel Speed Sensor Tester <b>is</b> available, GO to K2 If the Rotunda Active Wheel Speed Sensor Tester <b>is not</b> available and DTC C0031:15 or C0034:15 is present, GO to K5 If the Rotunda Active Wheel Speed Sensor Tester <b>is not</b> available and DTC C0031:11 or C0034:11 is present, GO to K7
<b>No</b>	The system is operating correctly at this time. INSPECT both front wheel speed sensor electrical connectors and the ABS module electrical connector. REPAIR or CLEAN the connector as necessary. ADDRESS the root cause of any connector or pin issues.

**K2 CHECK THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE OUTPUT USING THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER**

Ignition OFF.

Disconnect the suspect wheel speed sensor electrical connector.

Connect the Rotunda Active Wheel Speed Sensor Tester to the wheel speed sensor connectors.

Ignition ON.

Select the correct system polarity on the Rotunda Active Wheel Speed Sensor Tester and turn the power switch to the ON position.

**Is the tester output LED illuminated?**

<b>Yes</b>	GO to K3
<b>No</b>	GO to K5

**K3 CHECK THE WHEEL SPEED SENSOR FOR A SHORT TO VOLTAGE WITH THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER**

Observe the current overload LED on the Rotunda Active Wheel Speed Sensor Tester.

**Is the current overload LED illuminated?**

<b>Yes</b>	REPAIR the suspect wheel speed sensor circuit for a short to voltage.
<b>No</b>	GO to K4

**K4 CHECK THE WHEEL SPEED SENSOR OUTPUT WITH THE ROTUNDA ACTIVE WHEEL SPEED SENSOR TESTER**



Raise the suspect wheel until it can spin freely. REFER to: Jacking and Lifting - Overview .

While monitoring the Rotunda Active Wheel Speed Sensor Tester, slowly spin the suspect wheel.

**Do the sensor output Light-emitting Diodes (LEDs) illuminate and flash?**

<b>Yes</b>	The system is operating correctly at this time. INSPECT all wheel speed sensor electrical connectors and the ABS module electrical connectors. REPAIR or CLEAN the connector as necessary. ADDRESS the root cause of any connector or pin issues.
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<b>No</b>	INSTALL a new wheel speed sensor. REFER to: Front Wheel Speed Sensor .
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**K5 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR A SHORT TO BATTERY VOLTAGE**



Ignition OFF.

Disconnect ABS module C135 .



Disconnect the suspect wheel speed sensor electrical connector.

Ignition ON.

For the LH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C135-9		Ground
C135-8		Ground

For the RH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C135-5		Ground
C135-4		Ground

**Is any voltage present?**

<b>Yes</b>	REPAIR the circuit.
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<b>No</b>	GO to K6
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**K6 CHECK THE WHEEL SPEED CIRCUITS FOR AN OPEN**

Ignition OFF.

For the LH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C135-9	$\Omega$	C150-1
C135-8	$\Omega$	C150-2

For the RH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C135-5	$\Omega$	C160-1
C135-4	$\Omega$	C160-2

**Are the resistances less than 3 ohms?**

<b>Yes</b>	GO to K7
<b>No</b>	REPAIR the circuit.

#### K7 CHECK FOR SHORTED WHEEL SPEED SENSOR CIRCUITS

Ignition OFF.

Disconnect ABS module C135 (if not previously disconnected).

Disconnect the suspect wheel speed sensor electrical connector (if not previously disconnected).

For the LH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C150-1	$\Omega$	C150-2

For the RH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C160-1	$\Omega$	C160-2

**Is the resistance greater 10, 000 ohms?**

<b>Yes</b>	If DTC C0031:11 or C0034:11 is present, GO to K8 If DTC C0031:15 or C0034:15 is present, GO to K9
<b>No</b>	REPAIR the circuit.

#### K8 CHECK THE WHEEL SPEED SENSOR CIRCUITS FOR A SHORT TO GROUND

For the LH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C135-9	$\Omega$	Ground
C135-8	$\Omega$	Ground


For the RH front wheel speed sensor, measure:


Positive Lead	Measurement / Action	Negative Lead
C135-5	$\Omega$	Ground
C135-4	$\Omega$	Ground

**Are the resistances greater than 10, 000 ohms?**

<b>Yes</b>	GO to K9
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<b>No</b>	REPAIR the circuit.
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 **NOTE:** Make sure all test connections are made at the wheel speed sensor **before** the ignition is set to ON.

 **NOTE:** Use a meter with a min-max feature or recording capabilities to obtain accurate measurements. The ABS module immediately disables the voltage output if the wheel speed sensor is not present.

#### K9 CHECK THE ABS (ANTI-LOCK BRAKE SYSTEM) MODULE OUTPUT

Ignition OFF.

Connect ABS module C135 .

Connect the meter to the suspect wheel speed sensor electrical connector, harness side.

Set the meter to measure DC voltage.

Set the meter range to greater than 15 volts.

Enable the min-max or recording feature on the meter.

Ignition ON.

For the LH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
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C150-1		C150-2
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For the RH front wheel speed sensor, measure:

Positive Lead	Measurement / Action	Negative Lead
C160-1		C160-2

Check the maximum recorded voltage on the meter.

**Is the voltage greater 10 volts?**

<b>Yes</b>	INSTALL a new wheel speed sensor. REFER to: Front Wheel Speed Sensor .
<b>No</b>	GO to K10

**K10 VERIFY ALL WIRING CONNECTIONS**

Ignition OFF.

Disconnect ABS module C135 (if not previously disconnected).

Using a good light source, inspect ABS module C135 for the following:

- corrosion - install a new connector or terminal and clean module pins
- damaged or bent pins - install new terminals or pins
- pushed-out pins - install new pins as necessary
- spread terminals - install new terminals as necessary

**Are the connectors free of corrosion, damaged pins, bent pins, pushed-out pins and spread terminals?**

<b>Yes</b>	GO to K11
<b>No</b>	REPAIR the affected connectors or terminals. Refer to CONNECTOR REPAIR PROCEDURES for schematic and connector information.

**K11 CHECK FOR CORRECT ABS (ANTI-LOCK BRAKE SYSTEM) MODULE OPERATION**

Connect ABS module C135 . Make sure it seats and latches correctly.

Connect the suspect wheel speed sensor electrical connector. Make sure it seats and latches correctly.

Operate the system and determine if the concern is still present.

**Is the concern still present?**

<b>Yes</b>	CHECK OASIS for any applicable Technical Service Bulletins (TSBs). If a TSB exists for this concern, DISCONTINUE this test and FOLLOW the TSB instructions. If no Technical Service Bulletins (TSBs) address this concern, INSTALL a new ABS module. REFER to: Anti-Lock Brake System (ABS) Module .
<b>No</b>	The system is operating correctly at this time. The concern may have been caused by a loose or corroded connector. ADDRESS the root cause of any connector or pin issues.

## DIAGNOSIS AND TESTING > ANTI-LOCK BRAKE SYSTEM (ABS) AND STABILITY CONTROL > PINPOINT TESTS > PINPOINT TEST L : WHEEL SPEED SENSOR ELECTRICAL FAULTS - REAR

Refer to VEHICLE DYNAMIC SYSTEMS for schematic and connector information.

### Normal Operation and Fault Conditions

Active wheel speed sensors generate a square wave signal proportional to wheel speed which is sent to the ABS module. Each wheel speed sensor is connected to the ABS module through 2 wires and a connector at each wheel speed sensor. One wire is for sensor voltage supply from the ABS and the other wire is for the signal return to the ABS. With the ignition ON, the ABS module carries out a self-test by sending a reference voltage through the wheel speed sensors and their circuitry.

### DTC Fault Trigger Conditions

DTC	Description	Fault Trigger Conditions
C0037:11	Left Rear Wheel Speed Sensor: Circuit Short to Ground	These Diagnostic Trouble Codes (DTCs) set in continuous memory and on-demand if there is a short to ground in the sensor signal return circuit or if the sensor has an internal short to ground.
C003A:11	Right Rear Wheel Speed Sensor: Circuit Short to Ground	
C0037:15	Left Rear Wheel Speed Sensor: Circuit Short to Battery or Open	These Diagnostic Trouble Codes (DTCs) set in continuous memory and on-demand if there is a short to battery voltage or an open in the sensor signal return circuit. A short to battery voltage may be due to the sensor signal return circuit and the sensor voltage supply circuit shorted together. These Diagnostic Trouble Codes (DTCs) also set if the sensor has an internal short to battery voltage or an open circuit.
C003A:15	Right Rear Wheel Speed Sensor: Circuit Short to Battery or Open	

### Possible Causes

- Wiring, terminals or connectors