P215A: VEHICLE SPEED - WHEEL SPEED CORRELATION

OVERVIEW

Severity	:	High
DIY Difficulty Level	:	Intermediate
Repair Cost	:	$100-$350
Can I Still Drive?	:	No

What Does The P215A Code Mean?

If your OBD-II equipped vehicle has stored a code P215A, it means that the powertrain control module (PCM) has detected a discrepancy between the vehicle output speed sensor and one (or more) of the wheel speed sensors. The vehicle output speed sensor is most frequently called the vehicle speed sensor (VSS).

The output speed sensor and the wheel speed sensor are both intended to detect vehicle speed but each is a component of a separate network. The output speed sensor is part of the powertrain control network and the wheel speed sensor is part of the antilock brake system network.

The output speed sensor is an electromagnetic sensor which is mounted in close proximity to some type of toothed reluctor ring wheel or gear. The reluctor ring is mechanically affixed to an axle, transmission/transfer case output shaft, or driveshaft. The reluctor ring spins in conjunction with the axle.

As the reluctor ring teeth pass within thousandths-of-an-inch of the output speed sensor, the magnetic field completes the output speed sensor input circuit. The notches between the reluctor ring teeth create interruptions in the same circuit. These completions/interruptions occur in rapid succession as the vehicle rolls forward. These circuit completions and interruptions create wave form patterns that are received by the PCM (and other controllers) as output speed. As wave form pattern speed increases, estimated vehicle speed increases.

Likewise, as the input speed of the wave form slows, estimated vehicle speed decreases. Output speed sensor input voltage signals are compared by various controllers via the controller area network (CAN).

In much the same way as the PCM monitors output speed, the antilock brake control module (ABCM) monitors input data from the wheel speed sensors. Wheel speed sensors are mounted near a reluctor ring on a brake rotor, hub assembly, or differential ring gear. Most OBD-II vehicles are equipped with a four-wheel antilock brake system (ABS) but some applications have a rear-wheel only antilock braking system.

- Independent rear axle vehicles with four-wheel ABS have four wheel speed sensors
- Fixed rear axle vehicles with four-wheel ABS will incorporate three sensors
- Vehicles with an independent rear axle and rear-wheel ABS may have two sensors
- Vehicles with a fixed rear axle and a rear-wheel ABS system will have just one wheel speed sensor

The PCM is constantly monitoring vehicle output speed when the vehicle in moving forward. Individual wheel speed sensor inputs are constantly monitored by the ABCM or electronic brake control module (EBCRM). The two controllers share data via the CAN and compare the signals anytime the vehicle is in motion.

If either of the controllers detects a variation between output speed and wheel speed that exceeds the maximum threshold for a set amount of time, a code P215A will be stored and a malfunction indicator lamp (MIL) may be illuminated.

What Are The Symptoms Of The P215A Code?

Symptoms of a P215A diagnostic code may include:

- Erratic speedometer
- Inadvertent ABS or traction control system (TCS) activation
- Irregular transmission shift patterns
- ABS codes may be stored
- The ABS may be disabled

What Are The Potential Causes Of The P215A Code?

Causes for this P215A code may include:

- Excessive metallic debris on output/wheel speed sensor magnet
- Defective wheel speed/vehicle speed sensor
- Cut or damaged wiring or connectors
- Broken, damaged, or worn reluctor ring teeth

- Faulty PCM, ABCM, or EBCM

How Can You Fix The P215A Code?

A diagnostic scanner with a built-in oscilloscope, a digital volt/ohmmeter (DVOM), and a source of reliable vehicle information will be needed to diagnose a code P215A.

You will need the vehicle information resource for wiring diagrams, connector face views, connector pin-out charts, diagnostic flow charts, and component testing procedures/specifications. Without this information, a successful diagnosis is impossible.

Visually inspect of system related wiring and connectors

After performing a visual inspection of system related wiring and connectors, I would continue by connecting the scanner to the vehicle diagnostic port and retrieving all stored codes and freeze frame data. I like to write this information down as it may be helpful as the diagnostic process unfolds. After that, I clear the codes and test-drive the vehicle to see if the code is reset.

The following procedure applies to the output speed sensor and all individual wheel speed sensors.

- Connect the positive test lead of the scope to the signal circuit of the sensor being tested
- Select the appropriate voltage setting on the scope (sensor reference is typically 5-voolts)
- Connect the negative test lead to a ground (sensor ground or battery ground)
- With the drive wheels off the ground and the vehicle secured, run up the drive train while observing the wave form on the scope display
- You are looking for an even waveform pattern with no voltage spikes or glitches as you smoothly accelerate/decelerate through all the gears
- If inconsistencies are discovered, suspect a defective sensor or a poor electrical connection

Test the output speed sensor and the individual wheel speed sensors:

- Place the DVOM on the ohms setting and unplug the sensor being tested
- Use the test leads to probe the pins of the connector and compare your findings with sensor testing specifications
- Sensors which do not comply with specs should be considered faulty

Test output speed and individual wheel speed reference voltage:

- With the key on/engine off (KOEO) and the sensor being tested disconnected, probe the reference circuit pin of the sensor connector with the positive test lead of the DVOM
- At the same time, the negative test lead of the DVOM should be used to probe the ground pin of the same connector
- Reference voltage must be within the specifications provided in your vehicle information

resource (usually 5-volts)

Test output speed sensor and individual wheel speed sensor signal voltage:

- Reconnect the sensor and probe the signal circuit of the sensor being tested with the positive test lead of the DVOM (negative test lead to sensor ground or known good engine ground)
- With the key on and engine running (KOER) and the drive wheels safely secured off the ground, run up the driveline while observing the voltage display on the DVOM
- A speed to voltage chart may be found within the vehicle information source. You can use it to determine if the sensor is functioning properly at a variety of speeds
- If either of the sensors being tested fail to reflect the appropriate degree of voltage (according to speed) suspect that it is defective.

If the signal circuit reflected the correct degree of voltage at the sensor connector, use the DVOM to test the output speed sensor and individual wheel speed sensor signal circuits at their respective controller connectors:

- Use the positive test lead of the DVOM to probe the appropriate signal circuit at the controller
- The negative test lead should again be grounded

If there is an acceptable sensor signal at the sensor connector that is not at the controller connector, you have an open circuit between the controller and the sensor being tested.Suspect controller failure or a programing error only after exhausting all other possibilities.

- Use the vehicle information source to garner technical service bulletins (TSB) which match the vehicle, symptoms, and stored codes in question. A code which applies to your circumstances may help to develop an accurate diagnosis

Severity Description

The conditions which contribute to a code P215A being stored may result in ABS deactivation or erratic transmission shifting patterns. The code should be considered severe and addressed as quickly as possible.

Reference Sources

P215A Vehicle Speed - Wheel Speed Correlation, OBD-Codes.