



Tech Tip

HUB BEARINGS 178

HUB BEARINGS AND SENSORS When They Fail the Symptoms Can Be Elusive

When a hub bearing or wheel speed sensor failure occurs, the symptoms may involve a noise related complaint, illuminated malfunction indicator lamps, antilock brake related symptoms, traction control issues, or even transmission related symptoms. Following a transmission replacement, imagine having to explain to the customer that the loss of power symptom was due to a defective wheel speed sensor instead of a defective transmission, as originally diagnosed. It has happened and it will be addressed later in the article.

Pinpointing the source of a bearing noise can be difficult, especially if you have any type of hearing impairment. Sitting a few feet from a supercharger and straddling a gear box with spur-cut gears will leave you with some permanent hearing damage. Early years of drag boat racing has left me with a constant ringing in the ears and difficulty in pinpointing noises. Always take precautions to protect your hearing and eyesight.

WHEN BEARINGS FAIL

Some common causes of bearing failure:

- 1) Moisture and road debris often enters the bearings due to seal damage.
- 2) Improper torque when tightening the axle nut promotes movement, especially when turning.
- 3) Custom wheels with excessive off-set stresses the bearings.
- 4) Normal wear from prolonged service.
- 5) Impact damage from curbing, a wreck, or hitting pot holes.

Noises resulting from bearing failure:

- 1) Roaring.
- 2) Popping when turning (this can result from excessive bearing end play).
- 3) Clicking (not to be confused with CV joint wear).
- 4) Grinding.
- 5) Vibrations.

Noises can be difficult to pinpoint:

- 1) Noise from worn or damaged tires is often blamed on worn or damaged bearings, as the symptoms are similar.

- 2) Road surface conditions can promote bearing related noise symptoms.
- 3) Some bearing noises may only be present when turning, as inertia promotes a change in bearing load.

IDENTIFYING DEFECTIVE BEARINGS

- 1) With the vehicle safely supported on a lift or jack stands, grasp the tire and wheel at 12:00 and 6:00 o'clock position (see illustration) and check for looseness. Repeat the same procedure with the hands positioned at 3:00 and 9:00 o'clock position. Having a helper observe the source of any movement is recommended.



- 2) Check for roughness or looseness while turning the wheel and tire assembly. Push and pull while turning.
- 3) In some cases it may be necessary to check bearing end play with a dial indicator. With the calipers and mounting brackets removed and a dial indicator needle positioned on the center hub flange, rotate the hub bearing while pushing and pulling on the bearing assembly. The maximum allowable end play movement (in/out) will vary from .001-.004 inches, depending on the vehicle manufacturer.
- 4) While driving, make a series of turns. A defective bearing will often be evident when putting a load on the bearing. For example, making a right turn will load the left front bearing. Making a left turn will load the right front bearing.

- 5) Hub bearing damage resulting from a wreck or suspension damage may be difficult to pinpoint. Small indentations on the bearing surface created from the impact can promote bearing noise. Diagnosing this condition may require removing the hub bearing assembly from the vehicle for a hands-on inspection. While holding the hub bearing assembly with both hands, rotate the bearing clockwise and counterclockwise while observing for any evidence of roughness (see illustration). A minor roughness or imperfection can promote major noise related symptoms, especially when loaded with the vehicle's weight and while turning.



- 6) Some hub bearing assemblies contain internal wheel speed sensors while others utilize external sensors. Movement due to excessive bearing end play can result in damage to the sensors. Corrosion and road hazards in the form of sticks and stones can also result in sensor failure.

CONTAMINATED WHEEL SPEED SENSORS

GM acknowledges that a contaminated wheel speed sensor may result in an ABS system fault, Service Traction Message, Service Stabilitrak Message, Service Steering Message and a clicking or ratchet type noise. The following diagnostic trouble codes may be stored in memory: C0035, C0040, C0045 and C0050 with symptom bytes 18, 5A, OF. The applications are too numerous to post in this writing, as

the sensor is widely used by GM. The production models include 2007–2014 applications and they are referenced in GM Service Bulletin PIC5428F.

The symptoms described may be the result of particles of metallic debris attached to a wheel speed sensor magnetic encoder ring, which is a part of the hub bearing assembly. Some of the newer applications use a nitrile rubber encoder ring instead of the traditional mechanical type tooth tone wheel. The encoder ring consists of multiple North and South Pole pairs. When the magnetic encoder ring rotates past the wheel speed sensor, a sine wave is generated in the wheel speed sensor. The wheel speed sensor converts an analog signal to a digital square wave and then provides this signal to the electronic brake control module (EBCM). The EBCM uses this signal to calculate wheel speed. Debris, attached to the magnetic encoder ring, has an effect on the signal strength. If debris is present, it must be cleaned from the magnetic encoder ring. GM cautions not to use a magnetic tool of any type, as damage to the encoder ring can occur. Attempt to remove the debris with a soft bristle brush. If this method of cleaning is not successful, wash the encoder ring with a mild detergent and dry with a shop cloth. On some applications, it may be necessary to remove the hub bearing assembly to thoroughly clean the encoder ring. It is possible for a single wheel speed sensor to set the four previously mentioned wheel speed sensor codes, especially when a single sensor trouble code repeatedly sets.

TRANSMISSION RELATED SYMPTOMS

Vehicle has a loss of power from 0-40 mph but the power is normal above 40 mph with no fault codes stored in memory. Applications involved include 2007–2012 Nissan Maximas. Nissan cautions their technicians to first inspect and repair or replace any defective wheel speed sensors when the described symptoms occur. Line graph diagnostics should be performed on each wheel speed sensor while driving the vehicle. Repair or replace any sensor that reflects a spike in the output signal or one that varies in comparison to the other sensors. Check the wiring and the sensors for evidence of contamination, which may affect the sensor signals. Systems affected include the Anti-Lock Brake System, Vehicle Dynamic Control and the Traction Control System.

Continuously Variable Transmissions (CVT) and Transmission Control Modules (TCM) have been replaced in a futile effort to alleviate the described symptoms, when the solution was replacing a defective wheel speed sensor.

In summary: Be thorough in your diagnosis and take the necessary time to make an accurate diagnosis.

LARRY HAMMER, Technical Services
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