

## Ford Trucks and SUVs

### Diagnosing Noisy Front Hubs on 4x4 Applications

Customer complaints of clicking, ticking, grinding or ratcheting noises from the front hubs during 2WD mode may be due to a mechanical or a vacuum-related issue. The front hubs on the following applications are equipped with actuators referred to as Integrated Wheel Ends (IWE). These actuators function via engine vacuum and spring tension. Vehicles equipped with this hub arrangement include 2006-2020 F150 4x4 (except Raptor), 2003-2020 Expedition and Navigator 4x4.

#### Vacuum Operated Hubs

On these applications, the front hubs are engaged during periods of no vacuum to the actuators. When vacuum is applied to the actuators, the front hubs are disengaged, resulting in the vehicle operating in the 2WD or free-wheeling mode. This disengagement prevents wear and tear on components and improves fuel economy, as major components such as half shafts, components in the front differential and the front drive-shaft are not turning.

#### When the IWEs Make Noise

The clicking, ticking, grinding or ratcheting noises from the front hubs are usually the result of a partial engagement of an IWE. While the symptoms may be the result of mechanical damage to the IWE, loss of vacuum is usually the culprit. The absence of vacuum locks the hubs in position for 4x4 operation. A partial vacuum loss can result in a partial engagement of the hubs and the gear teeth grinding or shearing. A loss of vacuum on one IWE can result in noise or damage to the opposite IWE. Heavy acceleration resulting in a drop in manifold vacuum can affect engagement of the hubs.

If you have driven a vehicle with vacuum-operated windshield wipers, you can appreciate how throttle application can affect engine vacuum and the speed of the wipers. Under heavy throttle application, like ascending a steep grade, the wipers slow to a snail's pace due to a loss of manifold vacuum. The same condition can affect the IWE engagement, especially when compounded by a partial vacuum leak.



IT SOUNDS LIKE A NEST OF SQUIRRELS BUILDING AN APARTMENT COMPLEX IN MY FRONT HUBS!

#### IWE Components

- 1) Vacuum supply hose/source
- 2) Check valve
- 3) Solenoid
- 4) Vacuum reservoir
- 5) IWE/Actuators
- 6) Actuator control vacuum hoses

#### Quick Checks

For noise symptoms, perform some quick checks prior to removing the hub components to determine if mechanical damage has occurred to the teeth on the IWE.

With the front end of the vehicle supported safely on jack stands, rotate each tire/wheel while observing the half shaft on each side:

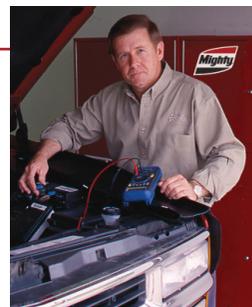
- 1) With the engine off, the half shafts should rotate while turning the tire/wheel, as the IWEs should be engaged due to the absence of vacuum.

- 2) With the engine idling, the half shafts should not rotate while turning the tire/wheel, as the presence of vacuum disengages the IWEs.

A faulty check valve, solenoid or leaking vacuum reservoir can result in a low vacuum condition. This can result in damage to the IWE teeth, requiring replacement of the components. The solenoid and check valve are common failure items. While performing a recent repair, we had difficulty obtaining the two components, as they were on backorder with Ford. The solenoid is often damaged due to water intrusion. Its position on the cowl makes it highly susceptible to water entry. Often, the water enters the solenoid and travels through the vacuum hoses, contaminating the IWEs, causing corrosion and thereby preventing engagement/disengagement of the hubs.

When driving the vehicle in 2WD, and you suspect partial engagement of one of the IWEs as the source of the noise, place the selector switch to a 4x4 position. If this eliminates the noise, partial engagement is the culprit.

With the exception of an electrical check on the vacuum control solenoid, a handheld vacuum pump and vacuum gauge will perform most tests necessary to pinpoint the problem.



By Larry Hammer  
Technical Services