

## DIAGNOSIS AND TESTING - FRONT AXLE

### DIAGNOSTIC CHART

Condition	Possible Causes	Correction
Wheel Noise	<ol style="list-style-type: none"> <li>1. Wheel loose.</li> <li>2. Faulty, brinelled wheel bearing.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten loose nuts.</li> <li>2. Replace bearing.</li> </ol>
Axle Shaft Noise	<ol style="list-style-type: none"> <li>1. Misaligned axle tube.</li> <li>2. Bent or sprung axle shaft.</li> <li>3. End play in pinion bearings.</li> <li>4. Excessive ring and pinion gear backlash.</li> <li>5. Improper pinion bearing adjustments.</li> <li>6. Loose pinion flange nut.</li> <li>7. Scuffed gear tooth contact surfaces.</li> <li>8. Noise from Front Axle Disconnect or right side of axle tube- damaged axle splines.</li> </ol>	<ol style="list-style-type: none"> <li>1. Inspect axle tube alignment. Correct as necessary.</li> <li>2. Inspect and correct as necessary.</li> <li>3. Refer to pinion pre-load information and correct as necessary.</li> <li>4. Check and adjustment ring and pinion gear backlash.</li> <li>5. Adjust the pinion bearings pre-load.</li> <li>6. Tighten pinion flange nut to specifications.</li> <li>7. Inspect and replace as necessary.</li> <li>8. Inspect and replaced as necessary.</li> </ol>
Axle Shaft Broke	<ol style="list-style-type: none"> <li>1. Misaligned axle tube.</li> <li>2. Vehicle overloaded.</li> <li>3. Erratic clutch operation.</li> <li>4. Grabbing clutch.</li> <li>5. Front Axle Disconnect broken, axle splines damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace broken shaft after correcting tube mis-alignment.</li> <li>2. Replace broken shaft and avoid excessive weight on vehicle.</li> <li>3. Replace broken shaft and avoid or correct erratic clutch operation.</li> <li>4. Replace broken shaft and inspect and repair clutch as necessary.</li> <li>5. Inspect and replace parts as necessary.</li> </ol>
Differential Cracked	<ol style="list-style-type: none"> <li>1. Improper differential bearing adjustment.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace case, inspect gears and bearings for further damage. Set differential bearing pre-load properly.</li> </ol>

Condition	Possible Causes	Correction
	<ul style="list-style-type: none"> <li>2. Excessive ring gear backlash.</li> <li>3. Vehicle overloaded.</li> <li>4. Erratic clutch operation.</li> </ul>	<ul style="list-style-type: none"> <li>2. Replace case and inspect gears and bearings for further damage. Set ring gear backlash.</li> <li>3. Replace case and inspect gears and bearings for further damage. Avoid excessive vehicle weight.</li> <li>4. Replace case and inspect gears and bearings for further damage. Avoid erratic use of clutch.</li> </ul>
Differential Gears Scored	<ul style="list-style-type: none"> <li>1. Insufficient lubrication.</li> <li>2. Improper grade of lubricant.</li> <li>3. Excessive spinning of one wheel/ tire.</li> </ul>	<ul style="list-style-type: none"> <li>1. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>2. Replace scored gears. Fill differential with the correct fluid type and quantity.</li> <li>3. Replace scored gears. Inspect all gears, pinion bores, and shaft for damage. Service as necessary.</li> </ul>
Loss Of Lubricant	<ul style="list-style-type: none"> <li>1. Lubricant level too high.</li> <li>2. Worn axle shaft seals.</li> <li>3. Cracked differential housing.</li> <li>4. Worn pinion seal.</li> <li>5. Worn/scored flange.</li> <li>6. Differential cover not sealed.</li> </ul>	<ul style="list-style-type: none"> <li>1. Drain lubricant to the correct level.</li> <li>2. Replace seals.</li> <li>3. Repair as necessary.</li> <li>4. Replace seal.</li> <li>5. Replace flange and seal.</li> <li>6. Remove, clean, and seal cover.</li> </ul>
Axle Overheating	<ul style="list-style-type: none"> <li>1. Lubricant level low.</li> <li>2. Improper grade of lubricant.</li> <li>3. Bearing pre-loads too high.</li> <li>4. Insufficient ring gear backlash.</li> </ul>	<ul style="list-style-type: none"> <li>1. Fill differential to correct level.</li> <li>2. Fill differential with the correct fluid type and quantity.</li> <li>3. Adjust bearing pre-loads.</li> <li>4. Adjust ring gear backlash.</li> </ul>
Gear Teeth Broke	<ul style="list-style-type: none"> <li>1. Overloading.</li> <li>2. Erratic clutch operation.</li> <li>3. Ice-spotted pavement.</li> </ul>	<ul style="list-style-type: none"> <li>1. Replace gears. Examine other gears and bearings for possible damage.</li> <li>2. Replace gears and examine the remaining parts for damage. Avoid erratic clutch operation.</li> <li>3. Replace gears and examine remaining parts for damage.</li> </ul>

Condition	Possible Causes	Correction
	4. Improper adjustments.	4. Replace gears and examine remaining parts for damage. Ensure ring gear backlash is correct.
Axle Noise	<ol style="list-style-type: none"> <li>1. Insufficient lubricant.</li> <li>2. Improper ring and pinion gear adjustment.</li> <li>3. Unmatched ring gear and pinion.</li> <li>4. Worn teeth on ring and pinion gears.</li> <li>5. Loose pinion bearings.</li> <li>6. Loose differential bearings.</li> <li>7. Loose or sprung ring gear.</li> <li>8. Loose differential bearing cap bolts.</li> <li>9. Housing not machined properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Fill differential with the correct fluid type and quantity.</li> <li>2. Check ring and pinion gear contact pattern.</li> <li>3. Replace gears with a matched ring gear and pinion.</li> <li>4. Replace ring and pinion gears.</li> <li>5. Adjust pinion bearing pre-load.</li> <li>6. Adjust differential bearing pre-load.</li> <li>7. Measure ring gear run-out. Replace components as necessary.</li> <li>8. Inspect differential components and replace as necessary. Ensure bearing caps are torqued to the proper specification.</li> <li>9. Replace housing.</li> </ol>

## GEAR NOISE

Axle gear noise can be caused by insufficient lubricant, incorrect backlash, tooth contact, worn/damaged gears or the carrier housing not having the proper offset and squareness.

Gear noise usually happens at a specific speed range. The noise can also occur during a specific type of driving condition. These conditions are acceleration, deceleration, coast, or constant load.

When road testing, first warm-up the axle fluid by driving the vehicle at least 5 miles and then accelerate the vehicle to the speed range where the noise is the greatest. Shift out-of-gear and coast through the peak-noise range. If the noise stops or changes greatly:

- Check for insufficient lubricant
- Incorrect ring gear backlash
- Gear damage

Differential side gears and pinions can be checked by turning the vehicle. They usually do not cause noise during straight-ahead driving when the gears are unloaded. The side gears are loaded during vehicle turns. A worn pinion mate shaft can also cause a snapping or a knocking noise.

## BEARING NOISE

The axle shaft, differential and pinion bearings can all produce noise when worn or damaged. Bearing noise can be either a whining, or a growling sound.

**Pinion bearings** have a constant-pitch noise. This noise changes only with vehicle speed. Pinion bearing noise will be higher pitched because it rotates at a faster rate. Drive the vehicle and load the differential. If bearing noise occurs, the rear pinion bearing is the source of the noise. If the bearing noise is heard during a coast, the front pinion bearing is the source.

**Differential bearings** usually produce a low pitch noise. Differential bearing noise is similar to pinion bearing noise. The pitch of differential bearing noise is also constant and varies only with vehicle speed.

**Axle shaft bearings** produce noise and vibration when worn or damaged. The noise generally changes when the bearings are loaded. Road test the vehicle. Turn the vehicle sharply to the left and to the right. This will load the bearings and change the noise level. Where axle bearing damage is slight, the noise is usually not noticeable at speeds above 30 mph.

## LOW SPEED KNOCK

Low speed knock is generally caused by a worn U-joint/Constant Velocity (CV) joint or by worn side-gear thrust washers. A worn pinion shaft bore will also cause low speed knock.

## VIBRATION

Vibration at the rear of the vehicle is usually caused by:

- Damaged driveshaft
- Missing driveshaft balance weight(s)
- Worn or out of balance wheels
- Loose wheel lug nuts
- Worn U-joint or Constant Velocity (CV) joint
- Loose/broken springs
- Damaged axle shaft bearing(s)
- Loose pinion gear nut
- Excessive pinion flange run out
- Bent axle shaft(s)

Check for loose or damaged front end components or engine/transmission mounts. These components can contribute to what appears to be a rear end vibration. Do not overlook engine accessories, brackets and drive belts.

All driveline components should be inspected before starting any repair.

## DRIVELINE SNAP

A snap or clunk noise when the vehicle is shifted into gear (or the clutch engaged) can be caused by:

- High engine idle speed
- Transmission shift operation
- Loose engine/transmission/transfer case mounts

- Worn U-joints or Constant Velocity (CV) joint
- Loose spring mounts
- Loose pinion gear nut and flange
- Excessive ring gear backlash
- Excessive side gear to case clearance

The source of a snap or a clunk noise can be determined with the assistance of a helper. Raise the vehicle on a hoist with the wheels free to rotate. Instruct the helper to shift the transmission into gear. Listen for the noise, a mechanics stethoscope is helpful in isolating the source of a noise.

## **FRONT AXLE DISCONNECT (FAD) CONTAMINATION**

The FAD system fails to provide 4WD consistently:

- Damaged intermediate shaft teeth
- Metal pieces in the FAD pocket

Thoroughly clean the FAD pockets in the axle housing.

Replace the FAD (Refer to 03 - Differential and Driveline/Front Axle/DISCONNECT, Front Axle/Removal and Installation).