Rear Drive Axle and Differential

Preliminary Inspection

1. Visually inspect the housing, seals, and pinion flange for obvious signs of mechanical damage.
2. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
3. If the cause is not visually evident, verify the symptom and REFER to Symptom Chart: NVH.

Symptom Chart(s)

Diagnostics in this manual assume a certain skill level and knowledge of Ford-specific diagnostic practices. REFER to: Diagnostic Methods (100-00 General Information, Description and Operation).

Symptom Chart - Differential

Symptom Chart - Differential

Condition	Possible Sources	Actions
Axle overheating	• Axle lubricant low	• CHECK the lubricant level. FILL the axle to specification. REFER to: Differential Fluid Level Check (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, General Procedures).
	• Incorrect or contaminated lubrication type	• INSPECT the axle for damage. REPAIR as necessary. CLEAN and REFILL the axle to specification as necessary. REFER to: Specifications (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Specifications).
	• Bearing preload adjusted too tight	• CHECK the ring and pinion for damage. INSPECT the ring and pinion wear pattern. ADJUST the preload as necessary. REFER to: Drive Pinion (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
	• Excessive gear wear	• INSPECT all the axle gears for wear or damaged. INSTALL new components as necessary. REFER to: Drive Pinion (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation). REFER to: Differential Carrier (205-02

		Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
	• Incorrect ring gear backlash	• INSPECT the ring gear for scoring. INSPECT the ring and pinion wear pattern. ADJUST the ring gear backlash as necessary. REFER to: Ring Gear Backlash Adjustment (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, General Procedures).
Broken gear teeth on the ring gear or pinion	• Overloading the vehicle	• INSTALL a new ring and pinion. REFER to: Drive Pinion (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation). REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
Differential side gears/pinion gears are scored	• Insufficient lubrication	• INSTALL new gears. FILL the axle to specification. REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
	• Incorrect or contaminated lubricant type	• INSTALL new gears. CLEAN and REFILL the axle to specification. REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
ELD does not engage in snow, mud or on ice	• Mode switch	• Refer to ELD DTC chart. REFER to: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Diagnosis and Testing).
	• Differential	• Refer to ELD DTC chart. REFER to: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Diagnosis and Testing).
	• Transfer Case Control Module (TCCM)	• Refer to ELD DTC chart. REFER to: Electronic Locking Differential (ELD) (205-02 Rear Drive

		Axle/Differential - Vehicles With: Dana M220, Diagnosis and Testing).
	• Wiring	• Refer to ELD DTC chart. REFER to: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Diagnosis and Testing).
Gray or milky axle lubricant in low mileage vehicles	• Marking compound in axle fluid	• Inspect axle housing and vent for damage or leaks. Refer to Axle Fluid Analysis in this section.
Lubricant leaking from the pinion seal, axle shaft oil seals or support arm to the housing	• Vent	• CLEAN the axle housing vent.
	• Damage in the seal contact area or dust slinger on the pinion flange dust shield	• INSTALL a new pinion flange and the pinion seal if damage is found.

Symptom Chart: NVH

Symptom Chart

Condition	Possible Sources	Actions
Axle howling or whine	• Axle lubricant low	• CHECK the lubricant level. FILL the axle to specification. REFER to: Differential Fluid Level Check (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, General Procedures).
	• Axle housing damage	• INSPECT and INSTALL a new axle assembly as necessary. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
	• Damaged, worn or incorrect ring and pinion gear contact	• INSPECT and INSTALL a new ring and pinion set as necessary. Refer to, Contact Pattern of this procedure, or REFER to: Drive Pinion (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
Driveline clunk - loud clunk when shifting from REVERSE to DRIVE	• Incorrect axle lubricant level	• CHECK the lubricant level. FILL the axle to specification. REFER to: Differential Fluid Level Check (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, General Procedures).
	• Excessive backlash in the axle	• CHECK for excessive axle backlash. ADJUST backlash as necessary. REFER to: Ring Gear Backlash Adjustment (205-02 Rear Drive Axle/Differential - Vehicles With: Dana

		M220, General Procedures).
Driveline clunk — occurs as the vehicle starts to move forward following a stop	• Pinion gears	• CHECK and REPLACE as necessary. REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
Grinding, popping or chattering – noise from the rear axle when the vehicle is turning	• Damaged or worn differential (differential side gears and pinion gears)	• INSPECT the differential carrier and the components of the differential carrier. INSTALL a new differential carrier and/or differential carrier components as necessary. REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
Grunting — normally associated with a shudder experienced during acceleration from a complete stop	• Loose rear axle mount bolts or suspension fasteners	• CHECK for loose bolts. TIGHTEN to specifications. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
Howl – can occur at various speeds and driving conditions. Affected by acceleration and deceleration	• Incorrect ring and pinion contact, incorrect bearing preload or gear damage	• INSPECT and ADJUST as necessary. Refer to, Contact Pattern of this procedure, or REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Ring Gear Backlash Adjustment (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, General Procedures).
Chuckle – heard at coast/ deceleration. Also described as knock	• Incorrect ring and pinion contact or damaged teeth on the coast side of the ring and pinion	• INSPECT and INSTALL a new ring and pinion set as necessary. Refer to, Contact Pattern of this procedure, or REFER to: Drive Pinion (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
Knock – noise occurs at	• Gear tooth damage to	• INSPECT and INSTALL a new ring and

various speeds. Not affected by acceleration or deceleration	the driver side of the ring and pinion	pinion as necessary. REFER to: Drive Pinion (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation). REFER to: Differential Carrier (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly). REFER to: Differential Carrier - Vehicles With: Electronic Locking Differential (ELD) (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Disassembly and Assembly).
Scraping noise – a continuous low pitched noise starting at low speed	• Worn or damaged pinion bearings	• INSPECT and INSTALL new pinion bearings as necessary. REFER to: Drive Pinion Front Bearing (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
Driveline shudder – occurs during acceleration from a slow speed or stop	• Rear drive axle assembly mispositioned	• CHECK the axle mounts and the rear suspension for damage or wear. Repair as necessary. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
	• Loose rear axle bolts	• CHECK the rear axle for loose bolts. TIGHTEN the bolts as necessary. REFER to: Axle Assembly (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, Removal and Installation).
	• Driveline angles out of specification	• CHECK for correct driveline angles. REFER to: Driveshaft Angle Measurement (205-01 Driveshaft, General Procedures).

Axle Fluid Analysis

The appearance of milky or gray axle fluid in early mileage axles is a result of white marking compound used at the assembly plant to verify gear mesh contact pattern. The marking compound within the fluid will darken some over time. The milky fluid appearance will diminish and cause no harm and does not require a fluid change.

Analysis of Leakage

Clean up the leaking area enough to identify the exact source.

A plugged Rear axle housing vent can cause excessive pinion seal lip wear due to internal pressure buildup.

Verify the differential lubricant level is at the correct level.
REFER to: Differential Fluid Level Check (205-02 Rear Drive Axle/Differential - Vehicles With: Dana M220, General Procedures).

Axle Vent

A plugged vent will cause excessive seal lip wear due to internal pressure buildup. If a leak occurs, check the vent. If the vent cannot be cleared, install a new vent.

Drive Pinion Seal

Leaks at the drive pinion seal originate from the following causes:

- Damaged seal
- Worn seal journal surface

A new drive pinion flange must be installed if any of these conditions exist.

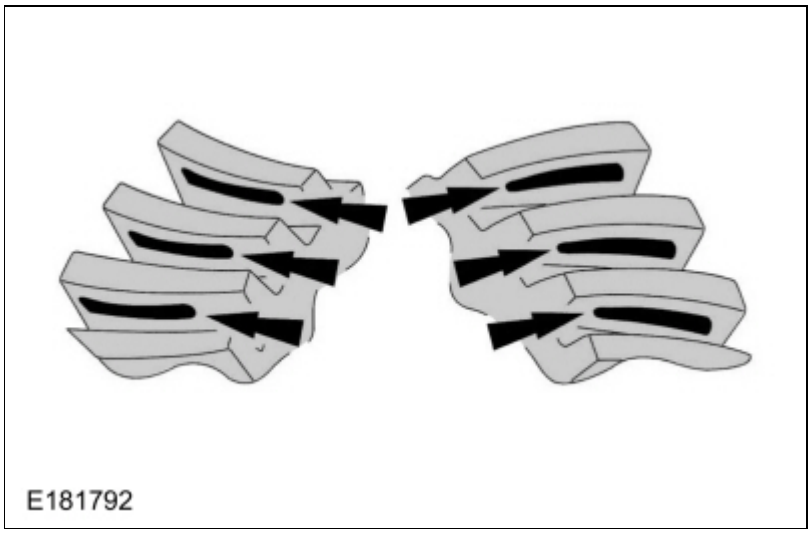
- Any damage to the seal bore (dings, dents, gouges or other imperfections) distorts the seal casing and allows leakage past the outer edge of the drive pinion seal.
- The drive pinion seal can be torn, cut or gouged if it is not installed correctly. The spring that holds the drive pinion seal against the pinion flange may be knocked out and allow fluid to pass the lip.
- Metal chips trapped at the sealing lip can cause oil leaks. These can cause a wear groove on the drive pinion flange and result in pinion seal wear.
- When a seal leak occurs, install a new drive pinion seal and check the vent to make sure it is clean and free of foreign material.

Contact Pattern

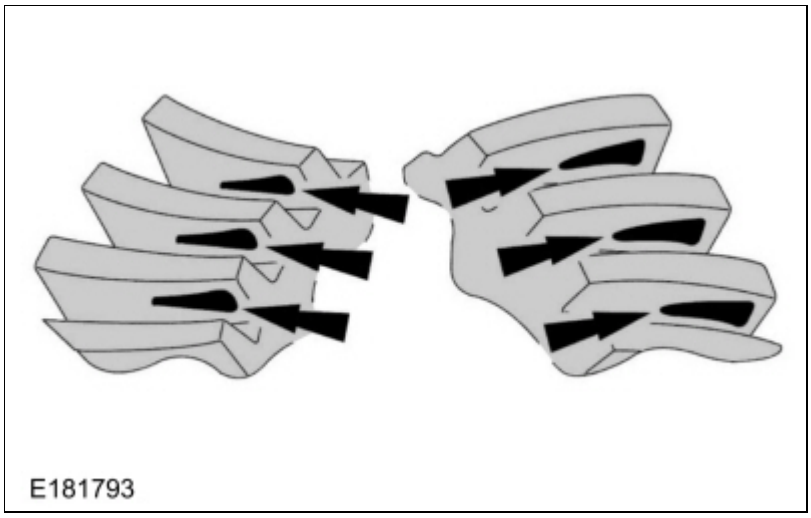
In general, desirable ring gear tooth patterns must have the following characteristics:

- Drive pattern on the drive side ring gear well centered on the tooth.
- Coast pattern on the coast side ring gear well centered on the tooth.
- Clearance between the pattern and the top of the tooth.
- No hard lines where the pressure is high.

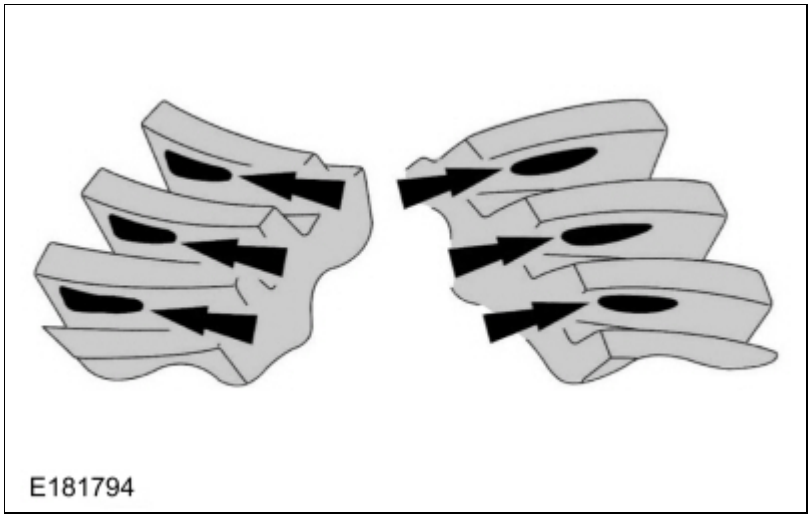
Acceptable ring gear tooth patterns for all axles.



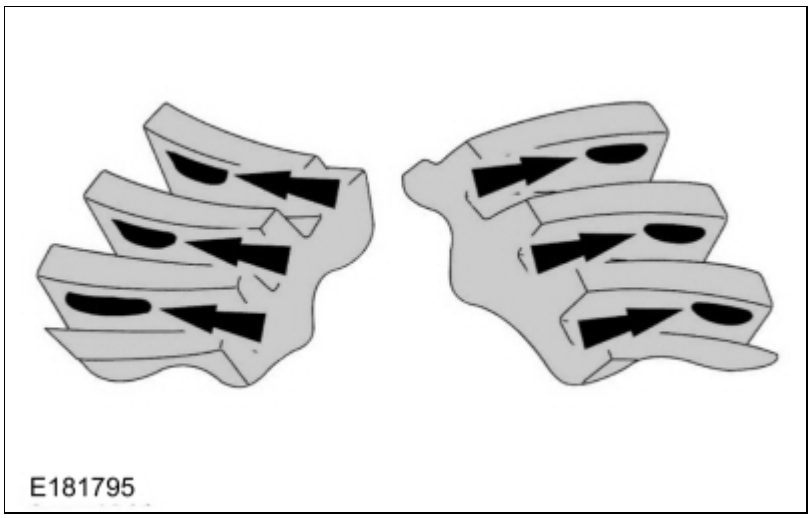
Correct backlash with a thinner pinion position shim required.



Correct backlash with a thicker pinion position shim required.



Correct pinion position shim that requires a decrease in backlash.



Correct pinion position shim that requires an increase in backlash.