

Manual Transmission

Inspection and Verification

NOTICE: If transmission noise is reported, first check the transmission fluid level. The vehicle should not be driven if the transmission fluid level is low. A low transmission fluid level will damage the transmission.

NOTE: If an observed or reported concern is found, correct the cause before proceeding.

Gear driven units produce a certain level of noise. Some noise is acceptable and audible at certain speeds or under various driving conditions. Many conditions, such as road and weather can amplify normal vehicle noise.

The following overview is a guide to diagnose a transmission or clutch concern:

- Verify and document the customer concern.
 - During the customer interview, if a leak was noticed or if a leak is the concern, check the transmission fluid level. The vehicle should not be driven if the transmission fluid level is low.
- Check fluid level and condition.
- Evaluate the clutch hydraulic system.
- Evaluate the clutch.
- Inspect gearshift mechanism.
- Evaluate the transmission.

Check Fluid Level and Condition

An incorrect transmission fluid level may affect the transmission operation and can result in transmission damage.
REFER to: Transmission Fluid Level Check (308-03 Manual Transmission, General Procedures).

Check Fluid Level and Condition

NOTICE: Excessive temperatures may break down the transmission lubricant. If there is reason to believe the transmission has been subjected to temperatures exceeding 135°C (275°F) for an extended period (greater than 20 minutes), change the lubricant immediately.

A low transmission fluid level can result in poor transmission shifting, engagement or damage. It also indicates a leak in the transmission seals or gaskets.

1. Check the transmission fluid condition.
 - Allow the transmission fluid to drip onto a white cloth and examine the stain. Check the transmission fluid for contamination or metal particles.

Evaluate Clutch Hydraulic System

1. Verify the clutch hydraulic fluid reservoir is filled to the correct level.
 - If the clutch hydraulic fluid level is low, add fluid as necessary. Check the clutch hydraulic system for leaks.

Evaluate the Clutch

1. Apply and release the clutch pedal slowly to check pedal binding. Make sure the clutch pedal can be fully applied and is not restricted by the floor mat.
2. With the engine idling and the park brake applied, move the gearshift lever into 4th gear. Increase engine speed to 2,000 rpm and slowly release the clutch pedal.
 - If the engine stalls, the clutch is not slipping.
 - If the engine does not stall, the clutch is slipping.

Inspect Gearshift Mechanism

1. Inspect the gearshift mechanism for:
 - signs of damage.
 - missing or loose fasteners.
 - binding.
2. Repair as necessary.

Evaluate Transmission

NOTICE: The vehicle should not be driven if the transmission fluid level is low or damage may occur.

NOTE: Before attempting to repair any concerns, road test the vehicle to determine which system the concern is in.

1. Road test the vehicle. Use the following methods to diagnose the concern.
 - Start the engine.
 - Evaluate the noise in NEUTRAL while vehicle is parked.
 - Check whether the noise is present with the clutch fully disengaged (clutch pedal applied). Check to see if the pedal pulsates abnormally (clutch diaphragm finger runout).
 - Check whether the noise is present with the gearshift in the NEUTRAL position and the clutch fully engaged (clutch pedal released). Apply the park brake and move the gearshift towards the 1st gear position.
 - With the clutch fully engaged (clutch pedal released) check whether the noise is present as the engine speed is raised. If the noise reduces, note the engine speed at which this occurs.
 - Listen for any change in noise while applying and releasing the clutch pedal.
 - Listen for any change in noise while changing the engine rpm.
 - Drive the vehicle and shift through all the gears including REVERSE. Listen for any changes in noise.
 - Drive the vehicle in the gear in which the noise is most noticeable. Apply the clutch pedal and leave the gear engaged. Listen for any change in noise.
 - Drive the vehicle in the gear in which the noise is most noticeable. Apply the clutch pedal and shift the transmission into NEUTRAL. Release the clutch pedal and allow the vehicle to coast.
2. The following list of conditions are typical clutch concerns.
 - Clutch slippage
 - Clutch chatter or shudder
 - Clutch pedal feels spongy or has excessive travel. Clutch will not disengage
 - Clutch drag, also hard to shift
 - Clutch pedal pulsation
 - Clutch-related vibrations
 - Excessive noise
3. The following list of conditions are typical clutch hydraulic system concerns.
 - Clutch pedal feels spongy or has excessive travel. Clutch will not disengage
 - Clutch drag, also hard to shift
 - Clutch pedal pulsation
 - Clutch system leakage
4. Compare the road test results with the following symptom charts. The following list of conditions are typical transmission concerns:

Symptom Chart: Manual Transmission

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	Possible Sources	Action
• Transmission difficult to shift when cold	• Normal Condition	• Excessive force to select gears when the transmission is cold is a normal condition. Test drive the vehicle to see if the condition is still present when it warms up.

• Transmission difficult to shift	• Lubricant	• ADD or DRAIN and FILL with specified lubricant. REFER to: Transmission Draining and Filling (308-03 Manual Transmission, General Procedures).
	• Internal shift mechanism	• CHECK the internal shift mechanism for smooth operation. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
	• Sliding gears, synchronizers	• CHECK for free movement of gears and synchronizers. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
	• Housings, shaft	• CHECK for binding condition between the input shaft and the pilot bearing. REPAIR or INSTALL new components as necessary. REFER to: Flywheel (303-01A Engine - 6.2L V8, Removal and Installation).
	• Loose pressure plate to flywheel bolts	• CHECK for loose bolts at the pressure plate. INSTALL new components as necessary. REFER to: Clutch Disc and Pressure Plate (308-01 Clutch, Removal and Installation).

• Transmission will not shift “gearshift lever moves	• Gearshift lever damaged	• INSTALL a new gearshift lever.
	• Damaged or worn selector arm. Loose shift rail bushings	• CHECK the internal shift components. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
	• Damaged or offset lever plate	• CHECK the internal shift components. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
• NOTE: While verifying the condition, determine whether the noise is gear rollover noise, release bearing rub or some other transmission-related noise. Gear rollover noise, inherent in manual transmissions, is caused by the constant mesh of gears turning at the engine idle speed while the clutch is engaged and the transmission is in NEUTRAL. Release bearing rub is sometimes mistaken for mainshaft bearing noise. Gear rollover noise will disappear when the clutch is disengaged or when the transmission is engaged in gear. Release bearing rub will disappear when the clutch is engaged. In the event that a bearing is damaged, the noise is more pronounced while engaged in gear under load or coast than in NEUTRAL. • Noisy in forward gears	• Lubricant	• ADD or DRAIN and FILL with specified lubricant. REFER to: Transmission Draining and Filling (308-03 Manual Transmission, General Procedures).
	• Components grounding out on the transmission	• CHECK for screws and bolts of body or other components grounding out. CORRECT as necessary.
	• Components housing bolts	• CHECK the torque on the transmission-to-flywheel housing bolts and the flywheel housing-to-engine block bolts. TIGHTEN the bolts to specification.

	• Bearings or gears	• INSPECT the bearings. INSPECT the gears and gear teeth for wear or damage. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
	• Axle howl or whine	• The 3160 transmission may be suspect of a gear whine noise, which seems to be emanating from the rear of the vehicle at or in excess of 80 km/h (50 mph) at full operating temperature. Drive the vehicle at customer complaint speeds in 5th gear (this is the direct gear) to eliminate manual transmission as noise source, reach full operating temperature and confirm if noise is still present. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).
• Gears clash when shifting from one forward gear to another	• Pilot bearing	• CHECK for a binding condition between the input shaft and the pilot bearing. INSTALL new components as necessary. REFER to: Flywheel (303-01A Engine - 6.2L V8, Removal and Installation).

	• Gear teeth and/or synchronizer	• Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
	• Damaged shift forks or worn shift fork inserts	• INSPECT for wear or damage. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
• Transmission jumps out of gear	• Transmission-to-engine mounting bolts	• TIGHTEN the bolts to specification.
	• Crankshaft pilot bearing	• INSTALL a new flywheel. REFER to: Flywheel (303-01A Engine - 6.2L V8, Removal and Installation).
	• Internal Damage	• INSPECT the synchronizer sleeves for free movement on their hubs. INSPECT the synchronizer blocking rings for widened index slots, rounded clutch teeth and smooth internal surface. CHECK shift forks for worn or loose mounting on shift rails. INSPECT the synchronizer sliding sleeve and the gear clutch teeth for wear or damage. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).

	• Gear teeth	• If worn or damaged, INSTALL new gears.
• Transmission will not shift into one gear “all others OK	• Manual shift linkage	• REPAIR or INSTALL new components as necessary.
	• Backup switch ball	• If REVERSE is the problem, CHECK reverse lamp switch for ball frozen in extended position.
	• Internal components	• INSPECT the shift rail and fork system, synchronizer system and the gear clutch teeth for restricted travel. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
• Transmission is locked in one gear and cannot be shifted out of that gear	• Internal components	• INSPECT the problem gears, shift rails, forks and the synchronizer for wear or damage. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
	• Fork on rail or shift rail	• CHECK the shift rail interlock system. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).
• Transmission leaks	• Lubricant	• CHECK the level and type.

	• Other component leaking	• IDENTIFY leaking fluid as engine, power steering or transmission fluid. REPAIR as necessary.
	• False report	• REMOVE all traces of lube on the exposed transmission surfaces. CHECK the vent for free breathing. OPERATE the transmission and INSPECT for new leakage. REPAIR as necessary.
	• Internal components	• INSPECT for leaks at the input shaft seal. INSPECT the case for sand holes or cracks. REPAIR or INSTALL a new case as necessary.
	• Fill and drain plugs	• CHECK fill and drain plugs and bore threads. REPAIR as necessary. TIGHTEN plugs to specified torque value.
• Bearing failure	• Other part failure • Raceways or rollers • Lubricant • Towing vehicle further than 80 km (50 mi) with driveshaft installed.	• REMOVE, DISASSEMBLE and CLEAN the transmission. Inspect for damaged parts and install new components as necessary. Install a new transmission as necessary. REFER to: Transmission (308-03 Manual Transmission, Removal).

	• Vibration break-up of retainer and brinelling of races • Bearing(s) • Shafts or bore • Incorrect preload	• INSTALL a new transmission. REFER to: Transmission (308-03 Manual Transmission, Removal).
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Symptom Chart: NVH

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	Possible Sources	Action
• NOTE: NVH symptoms should be identified using the diagnostic tools that are available. Since it is possible any one of multiple systems may be the cause of a symptom, it may be necessary to use a process of elimination type of diagnostic approach to pinpoint the responsible system. If this is not the causal system for the symptom, check for the next likely system and continue diagnosis. • Transmission rattle noise “ noise occurs at 1st and 2nd gear on light acceleration.	• Gear engagement	• Acceptable operating condition. Caused by the contact pattern of these gears.
• Transmission rattling/clattering noise “ occurs in NEUTRAL or in gear, at idle	• Incorrect fluid level or fluid quality	• COMPARE with other like vehicles. CHECK that the transmission is filled to the correct level and with the specified fluid. REFER to: Transmission Fluid Level Check (308-03 Manual Transmission, General Procedures).
• Transmission rattling/clattering noise “ noise at idle in NEUTRAL	• Worn or rough reverse idler gear	• CHECK the reverse idler gear. REPAIR as necessary.
	• Excessive backlash in gears	• CHECK the gear backlash. ADJUST as necessary.
	• Worn countershaft gears	• REPAIR as necessary.
• Transmission whine “ a mild whine at extreme speeds or high rpm	• Rotating gears/geartrain	• Acceptable noise.
• Transmission whine “ a high pitched whine, also described as a squeal	• Transmission gears are worn (high mileage vehicle)	• Result of normal gear wear. REPAIR as necessary.

	Mismatched gear sets	INSPECT the gear sets for an uneven wear pattern on the face of the gear teeth. REPAIR as necessary.
	Damaged or worn transmission bearing	INSPECT the transmission bearings. INSTALL new bearings as necessary.
Transmission growling/humming “ noise occurs in the forward gears. The noise is more prominent when the gear is loaded. The problem gear can be located as the noise occurs in a specific gear position	Gear is cracked, chipped or rough	INSPECT the transmission gears for damage or wear. INSTALL new gears as necessary.
	Axle howl or whine	The 3160 transmission may be suspect of a gear whine noise, which seems to be emanating from the rear of the vehicle at or in excess of 80 km/h (50 mph) at full operating temperature. Drive the vehicle at customer complaint speeds in 5th gear (this is the direct gear) to eliminate manual transmission as noise source, reach full operating temperature and confirm if noise is still present. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing). If noise is not present, proceed with gear noise analysis.
Transmission hissing “ noise in NEUTRAL or in forward gears. As bearings wear or break up, the noise changes to a thumping noise	Damaged or worn bearings	INSPECT the transmission bearings. INSTALL new bearings as necessary.
Transmission knocking/thudding “ noise at low speeds in forward gears	Bearings with damaged balls or rollers or with pitted and spalled races	INSPECT the transmission bearings. INSTALL new bearings as necessary.
- Transmission growling/humming “ noise occurs in the forward gears. The noise is more prominent when the gear is loaded. The problem gear can be located as the noise occurs in a specific gear position - Transmission rumble/growl “ noise at higher speeds in forward gears, more pronounced in a coast/deceleration condition	Incorrect driveline angle	CHECK the driveline angle. REPAIR as necessary. REFER to: Driveshaft (205-01 Driveshaft, Diagnosis and Testing).
	Driveshaft out of balance or damaged	CHECK the driveshaft for damage, missing balance weights or undercoating. REFER to the driveshaft runout and balance test. REFER to: Driveshaft (205-01 Driveshaft, Diagnosis and Testing).

	• Axle howl or whine	• The 3160 transmission may be suspect of a gear whine noise, which seems to be emanating from the rear of the vehicle at or in excess of 80 km/h (50 mph) at full operating temperature. Drive the vehicle at customer complaint speeds in 5th gear (this is the direct gear) to eliminate manual transmission as noise source, reach full operating temperature and confirm if noise is still present. REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing). If noise is not present, proceed with gear noise analysis.
• Transmission rumble/growl noise at all speeds in forward gears, more pronounced in a heavy acceleration condition	• Damaged or worn transmission bearing or gears (high mileage vehicles)	• CHECK transmission fluid for excessive metal particles. REPAIR as necessary.