## 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).

### 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 (308-03A Manual Transmission - 6-Speed Manual Transmission – MT82, 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.

2. Measure clutch pedal reserve.
   1. Attach a cable tie to the lower clutch pedal.
   2. Attach a tape measure to the cable tie.
   3. Apply the clutch fully and start the vehicle.
   4. Shift the transmission into 1st gear.
   5. Record the distance from the clutch pedal to the seam on the steering wheel.
   6. While observing the tape measure, slowly engage the clutch, noting when the vehicle starts to move forward or a noticeable engine rpm decrease occurs (noted on tachometer).
   - If the clutch pedal reserve is greater than or equal to 1 in (25mm), the clutch hydraulic system is OK.
   - If the clutch pedal reserve is less than 1 in (25mm), REFER to Symptom Chart: Clutch and Clutch Controls in this procedure.

### 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. Compare the road test results with the following symptom charts.

**Symptom Chart: Clutch and Clutch Controls**

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 Causes | Action |
|---|---|---|
| • Clutch slippage | • Clutch hydraulic tube<br>• Clutch disc<br>• Pressure plate<br>• Flywheel<br>• Clutch slave cylinder | • Inspect tube for kinks or damage.<br>• Inspect clutch disc for wear or damage.<br>• Inspect pressure plate for wear or damage.<br>• Inspect flywheel for wear or damage.<br>• Inspect clutch slave cylinder binding or not returning to retracted position. |
| • Clutch drag, Clutch fails to completely release, Hard to shift, Grinding while shifting | • Low fluid level<br>• Air in hydraulic system<br>• Clutch master cylinder<br>• Clutch slave cylinder<br>• Clutch disc<br>• Pressure plate<br>• Pilot bearing | • Adjust fluid level. Inspect clutch and brake systems for leaks.<br>• Bleed hydraulic system.<br>REFER to: Clutch System Bleeding (308-02 Clutch Controls - 6-Speed Manual Transmission – MT82, General Procedures).<br>• Inspect clutch master cylinder for external leaks.<br>• Inspect clutch slave cylinder for external leaks or binding.<br>• Inspect clutch disc for damage.<br>• Inspect pressure plate release fingers and diaphragm spring for damage. |

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| | | • Inspect input shaft and pilot bearing for sticking/binding/overheating. |
| • Clutch chatter or shudder | • Clutch disc oil or fluid contamination<br>• Pressure plate diaphragm spring<br>• Pressure plate, clutch disc, flywheel | • Inspect clutch disc for contamination. REPAIR source of contamination.<br>• Inspect pressure plate diaphragm spring for damage.<br>• Inspect friction surfaces for wear, damage, overheat checking, or cracks. |
| • Clutch pedal hard effort, difficult to disengage | • Clutch master cylinder<br>• Clutch pedal<br>• Pressure plate | • Inspect clutch master cylinder for binding.<br>• Inspect clutch pedal for binding or damage.<br>• Inspect pressure plate for wear or damage. |
| • Clutch pedal easy/soft effort, clutch does not disengage | • Low fluid level<br>• Air in hydraulic system<br>• Clutch master cylinder<br>• Clutch slave cylinder | • Adjust fluid level. Inspect clutch and brake systems for leaks.<br>• Bleed hydraulic system.<br>REFER to: Clutch System Bleeding (308-02 Clutch Controls - 6-Speed Manual Transmission – MT82, General Procedures).<br>• Inspect clutch master cylinder for external leaks.<br>• Inspect clutch slave cylinder for external leaks or binding. |
| • Clutch pedal pulsation | • Pressure plate diaphragm spring / release fingers<br>• Clutch slave cylinder release bearing | • Inspect pressure plate release fingers and diaphragm spring for damage.<br>• Inspect clutch slave cylinder release bearing for wear or damage. |
| • Excessive noise | • Clutch disc<br>• Pilot bearing<br>• Engine crankshaft | • Inspect clutch disc for damage.<br>• Inspect input shaft and pilot bearing for sticking/binding/overheating.<br>• Check for excessive crankshaft endplay. |

**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 Causes | Action |
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| • 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.<br>REFER to: Transmission Draining and Filling (308-03A Manual Transmission - 6-Speed Manual Transmission – MT82, General Procedures). |
| | • Internal shift mechanism | • CHECK the internal shift mechanism for smooth operation. REPAIR or INSTALL a new mechanism as necessary. |
| | • Sliding gears, synchronizers | • CHECK for free movement of gears and synchronizers. REPAIR or INSTALL new components as necessary. |
| | • Housings, shaft | • CHECK for binding condition between the input shaft and the engine crankshaft pilot bearing or bushing. REPAIR or INSTALL new components as necessary. |

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| | | REFER to: Pilot Bearing (308-01 Clutch - 6-Speed Manual Transmission – MT82, 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 - 2.3L EcoBoost (231kW/314PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation). REFER to: Clutch Disc and Pressure Plate - 3.7L Duratec (227kW/301PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation). REFER to: Clutch Disc and Pressure Plate - 5.0L 32V Ti-VCT (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation). |
| • Transmission will not shift — gearshift lever moves | • Gearshift lever damaged | • INSTALL a new gearshift lever. REFER to: Gearshift Lever (308-06A Manual Transmission External Controls - 6-Speed Manual Transmission – MT82, Removal and Installation). |
| | • Damaged or worn selector arm. Loose shift rail bushings | • CHECK the internal shift components. INSTALL new component as necessary. |
| | • Damaged or offset lever plate | • CHECK the internal shift components. INSTALL new component as necessary. |
| • **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.*<br>• Noisy in forward gears | • Lubricant | • ADD or DRAIN and FILL with specified lubricant. REFER to: Transmission Draining and Filling (308-03A Manual Transmission - 6-Speed Manual Transmission – MT82, 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 new components as necessary. |

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| | • Axle howl or whine | • The MT82 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.<br>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 engine crankshaft pilot bearing. INSTALL new components as necessary.<br>REFER to: Pilot Bearing (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation). |
| | • Gear teeth and/or synchronizer | • REPAIR or INSTALL new components as necessary. |
| | • Damaged shift forks or worn shift fork inserts | • INSPECT for wear or damage. INSTALL new components as necessary. |
| • Transmission jumps out of gear | • Transmission-to-engine mounting bolts | • TIGHTEN the bolts to specification. |
| | • Crankshaft pilot bearing | • INSTALL a new pilot bearing.<br>REFER to: Pilot Bearing (308-01 Clutch - 6-Speed Manual Transmission – MT82, 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. REPAIR or INSTALL a new component as necessary. |
| | • 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. |

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| | • Internal components | • INSPECT the shift rail and fork system, synchronizer system and the gear clutch teeth for restricted travel. REPAIR or INSTALL new components as necessary. |
| • 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. REPAIR as necessary. |
| | • Fork on rail or shift rail | • CHECK the shift rail interlock system. REPAIR as necessary. |
| • 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<br>• Raceways or rollers<br>• Lubricant<br>• 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. (Note: RESET the bearing preload if any new tapered bearings are installed.) |
| | • Vibration break-up of retainer and brinelling of races<br>• Bearing(s)<br>• Shafts or bore<br>• Incorrect preload | • DETERMINE the cause of vibration and CORRECT. Otherwise, PROCEED as above. |
| | • Input shaft oil dam | • INSTALL new components as necessary and VERIFY the oil dam installation is correct. CHECK for correct installation of the snap ring on the mainshaft next to the oil dam. |
| | • Oil baffle in the input bearing shim pack | • INSTALL a new oil baffle, making sure it is not damaged during assembly. |

**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 Causes | Action |
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| • **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.*<br>• 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.<br>REFER to: Transmission Fluid Level Check (308-03A Manual Transmission - 6-Speed Manual Transmission – MT82, 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 MT82 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.<br>REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).<br>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. |

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| • 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<br>•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.<br>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.<br>REFER to: Driveshaft (205-01 Driveshaft, Diagnosis and Testing). |
| | • Axle howl or whine | • The MT82 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.<br>REFER to: Suspension System (204-00 Suspension System - General Information, Diagnosis and Testing).<br>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. |
| • Boom noise while accelerating | • Broken Dual Mass Flywheel | • Accelerate the vehicle in the highest gear from 1000 rpm to 2000 rpm at wide open throttle. If the boom noise is noticeable during acceleration but it stops after the accelerator pedal is released, remove the clutch and inspect the flywheel.<br>REFER to: Clutch Disc and Pressure Plate - 3.7L Duratec (227kW/301PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation).<br>REFER to: Flywheel Inspection - 3.7L Duratec (227kW/301PS) (303-00 Engine System - General Information, General Procedures). |
| • Rattle/Harsh vibration while driving | • Broken Dual Mass Flywheel | • Gently accelerate the vehicle between idle and 2000 rpm. If there is excessive rattle and harsh vibration, remove the clutch and inspect the flywheel.<br>REFER to: Clutch Disc and Pressure Plate - 3.7L Duratec (227kW/301PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation).<br>REFER to: Flywheel Inspection - 3.7L Duratec (227kW/301PS) (303-00 Engine System - General Information, General Procedures). |

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| • Rattle at idle | • Broken Dual Mass Flywheel | • With the engine idling and the transmission in NEUTRAL, slowly press the clutch. If an excessive gear rattle is heard while cycling the clutch, remove the clutch and inspect the flywheel.<br>REFER to: Clutch Disc and Pressure Plate - 3.7L Duratec (227kW/301PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation).<br>REFER to: Flywheel Inspection - 3.7L Duratec (227kW/301PS) (303-00 Engine System - General Information, General Procedures). |
| • Rattle at Start up | • Broken Dual Mass Flywheel | • Start the engine with the transmission in NEUTRAL. If an excessive gear rattle is heard during start-up, remove the clutch and inspect the flywheel.<br>REFER to: Clutch Disc and Pressure Plate - 3.7L Duratec (227kW/301PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation).<br>REFER to: Flywheel Inspection - 3.7L Duratec (227kW/301PS) (303-00 Engine System - General Information, General Procedures). |
| • Rattle at shut down | • Broken Dual Mass Flywheel | • With the engine running and the transmission in NEUTRAL, turn the ignition to the OFF position. If a harsh metallic noise is heard during the last revolutions just before the engine stops, remove the clutch and inspect the flywheel.<br>REFER to: Clutch Disc and Pressure Plate - 3.7L Duratec (227kW/301PS) (308-01 Clutch - 6-Speed Manual Transmission – MT82, Removal and Installation).<br>REFER to: Flywheel Inspection - 3.7L Duratec (227kW/301PS) (303-00 Engine System - General Information, General Procedures). |

**Diagnostic Trouble Code (DTC) Chart**

| Module | DTC | Description | Action |
|---|---|---|---|
| PCM | P0720:00 | Output Shaft Speed Sensor Circuit: No Sub Type Information | GO to Pinpoint Test A |
| PCM | P0721:00 | Output Shaft Speed Sensor Circuit Range/Performance: No Sub Type Information | GO to Pinpoint Test A |
| PCM | P0722:00 | Output Shaft Speed Sensor Circuit No Signal: No Sub Type Information | GO to Pinpoint Test A |

**Pinpoint Tests**

**PINPOINT TEST A: OSS SENSOR**