



ZF Industries

DESCRIPTION AND OPERATION

Clutch System

The purpose of the clutch is to connect and disconnect a manually operated transmission and the remainder of the powertrain system from the engine. This permits starting and stopping the vehicle and shifting.

The clutch consists of a clutch disc (7550) splined for the input shaft (7017) of the transmission (7003), the clutch pressure plate (7563) and clutch slave cylinder assembly.

Other internal clutch parts are a transmission input shaft pilot bearing (needle type) mounted in the rear face of the crankshaft which supports the end of the input shaft. The roller bearings are designed for long life and require no lubrication unless the clutch assembly is serviced.

For more information, refer to Sections 08-01 and 08-02 in the 1996 Ford Service Manual.

DIAGNOSIS AND TESTING

Inspection and Verification

1. Verify the vehicle owner's original concern by operating the clutch system to duplicate the condition.
2. Inspect to determine if any of the following mechanical concerns apply:
 - clutch release hub and bearing (7548)
 - clutch pedal (7519)
 - flywheel housing
 - clutch disc (7550)
3. Check transmission fluid level and fluid condition.
4. Check the vehicle for signs of clutch fluid leakage. Refer to Section 08-02 in the 1996 Ford Service Manual for an illustration of the clutch systems.
5. If the concern(s) remain after the inspection, determine the symptoms and proceed to the Symptom Chart.



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DIAGNOSIS AND TESTING

Symptom Chart

CLUTCH SYSTEM

CONDITION	POSSIBLE SOURCE	ACTION
<ul style="list-style-type: none"> Clutch Slippage 	<ul style="list-style-type: none"> Insufficient clutch pedal free play. Sticking clutch pedal. Damaged or weakened diaphragm spring. Worn clutch disc facing. Hardened or oiled clutch disc facing surface. Damaged flywheel. 	<ul style="list-style-type: none"> GO to Pinpoint Test A.
<ul style="list-style-type: none"> Clutch Chatter or Shudder <p>NOTE: A light chatter or shudder in the vehicle when engaging the clutch at low engine rpm is a normal occurrence. Therefore, drivetrain components, particularly the clutch disc and the clutch pressure plate, should not be replaced or rebuilt in an attempt to eliminate this condition.</p>	<ul style="list-style-type: none"> Loose or worn engine mount. Oil on clutch disc facing. Damaged clutch pressure plate or has excessive runout. Hardened or worn clutch disc facing. Damaged or hardened flywheel surface. 	<ul style="list-style-type: none"> GO to Pinpoint Test B.
<ul style="list-style-type: none"> Clutch Drag 	<ul style="list-style-type: none"> Insufficient brake fluid. Leakage of brake fluid. Excessive clutch pedal free play. Weakened diaphragm spring. Excessive runout or damaged clutch disc. Rusted or worn clutch disc splines. Oil on facing. 	<ul style="list-style-type: none"> GO to Pinpoint Test C.
<ul style="list-style-type: none"> Clutch Pedal Pulsation 	<ul style="list-style-type: none"> Clutch and brake pedal pivot shaft not properly lubricated. Excessive flywheel runout. 	<ul style="list-style-type: none"> GO to Pinpoint Test D.
<ul style="list-style-type: none"> Clutch-Related Vibrations 	<ul style="list-style-type: none"> Engine component grounding against frame. Accessory drive belt loose or damaged. Loose flywheel bolts. Excessive flywheel runout. Imbalanced clutch pressure plate. 	<ul style="list-style-type: none"> GO to Pinpoint Test E.



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Symptom Chart

CLUTCH SYSTEM (Continued)

CONDITION	POSSIBLE SOURCE	ACTION
<ul style="list-style-type: none">• Hard Shifting	<ul style="list-style-type: none">• Insufficient brake fluid.• Excessive clutch pedal free play.• Damaged or worn clutch release shaft.• Damaged clutch release hub and bearing.• Manual Transmission concern.	<ul style="list-style-type: none">• GO to Pinpoint Test F.
<ul style="list-style-type: none">• Fluid Leakage	<ul style="list-style-type: none">• Clutch master cylinder.• Clutch slave cylinder.• Hydraulic lines (tubes and connections).	<ul style="list-style-type: none">• GO to Pinpoint Test G.
<ul style="list-style-type: none">• Clutch Noise	<ul style="list-style-type: none">• Insufficient pedal free play.• Damaged clutch release hub and bearing.• Poor lubrication of clutch release hub and bearing sleeve.• Damaged or worn pilot bearing.• Worn pivot points or clutch release shaft (if equipped).• Excessive crankshaft end play.	<ul style="list-style-type: none">• GO to Pinpoint Test H.



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DIAGNOSIS AND TESTING

Pinpoint Tests

Pinpoint Test A: Clutch Slippage

TEST STEP		RESULT	ACTION TO TAKE
A1	CHECK FLUID LEVEL		
	<ul style="list-style-type: none">• Engine off.• Check the fluid level in the clutch master cylinder.• Is the fluid level full?	Yes No	Go to A2 . ADD brake fluid and CHECK for leaks in the clutch hydraulic system.
A2	INSPECT CLUTCH PEDAL		
	<ul style="list-style-type: none">• Inspect the clutch pedal pivot point for proper lubrication.• Is the clutch pedal pivot point properly lubricated?	Yes No	Go to A3 . LUBRICATE the clutch pedal pivot point.
A3	INSPECT CLUTCH ASSEMBLY (DISC/PRESSURE PLATE)		
	<ul style="list-style-type: none">• Inspect clutch disc for oil or grease.• Is clutch disc contaminated with oil or grease?	Yes No	CHECK and REPAIR source of grease or oil leak. REPLACE clutch disc. REFER to Section 08-01 in the 1996 Ford Service Manual. INSPECT clutch disc, clutch pressure plate, and flywheel for wear. REFER to Clutch Disc, Pressure Plate and Cover or Flywheel. Runout in this section. REPLACE as necessary. REFER to Section 08-01 in the 1996 Ford Service Manual for replacement procedures.



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Pinpoint Tests

Pinpoint Test B: Clutch Chatter or Shudder

TEST STEP		RESULT ➡	ACTION TO TAKE
B1	CHECK ENGINE OF TRANSMISSION MOUNTS		
	<ul style="list-style-type: none"> Inspect all engine and transmission mounts for looseness. Refer to Section 02-03 in the 1996 Ford Service Manual if necessary. Were any engine or transmission mounts loose or damaged? 	Yes ➡ No ➡	TIGHTEN or REPLACE the engine or transmission mounts. REFER to Support Insulators in the Removal and Installation portion of Section 02-03 in the 1996 Ford Service Manual. GO to B2 .
B2	INSPECT CLUTCH PRESSURE PLATE		
	<ul style="list-style-type: none"> Remove the clutch pressure plate. Refer to Section 08-01 in the 1996 Ford Service Manual. Inspect the clutch pressure plate and diaphragm springs for wear. Check for warping and discolored surface. Are there any signs of wear present on the clutch pressure plate? 	Yes ➡ No ➡	REPLACE the clutch pressure plate. REFER to Disc and Pressure Plate in the Removal and Installation portion of Section 08-01 in the 1996 Ford Service Manual. GO to B3 .
B3	CHECK CLUTCH DISC		
	<ul style="list-style-type: none"> Perform the clutch disc inspection procedure in this section. Is the clutch disc OK? 	Yes ➡ No ➡	INSPECT the flywheel for damage (warping or discoloring from excessive heat) and CHECK flywheel runout. REFER to the Flywheel Runout CHECK in the Cleaning and Inspection portion of this section. INSPECT clutch release hub and bearing. REPLACE to the clutch disc.



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Pinpoint Tests

Pinpoint Test C: Clutch Drag

TEST STEP		RESULT ➡	ACTION TO TAKE
C1	CHECK FLUID LEVEL		
	<ul style="list-style-type: none"> • Engine off. • Inspect the fluid level in the clutch master cylinder reservoir. • Is the fluid level full? 	Yes No	GO to C2 . ADD brake fluid and CHECK for leaks in the clutch hydraulic system.
C2	CHECK DIAPHRAGM SPRING		
	<ul style="list-style-type: none"> • Remove the transmission. Refer to Sections 07-03A and 07-03B in the 1996 Ford Service Manual. • Inspect the clutch pressure plate and diaphragm spring for wear. • Are there any signs of wear to the clutch pressure plate or diaphragm spring? 	Yes No	REPLACE the clutch pressure plate. REFER to Section 08-01 in the 1996 Ford Service Manual. INSPECT the clutch disc for damage and the flywheel for excessive runout. REPLACE as necessary. REFER to Section 08-01 in the 1996 Ford Service Manual.

Pinpoint Test D: Clutch Pedal Pulsation

TEST STEP		RESULT ➡	ACTION TO TAKE
D1	INSPECT CLUTCH PEDAL		
	<ul style="list-style-type: none"> • Inspect the clutch pedal pivot point for proper lubrication. • Is the clutch pedal pivot point properly lubricated? 	Yes No	GO to D2 . LUBRICATE clutch pedal pivot point (shaft and bushing). REFER to Section 08-02 in the 1996 Ford Service Manual.
D2	CHECK FLYWHEEL RUNOUT		
	<ul style="list-style-type: none"> • Remove transmission. Inspect flywheel for excessive runout. • Is flywheel runout excessive? 	Yes No	REPLACE as necessary. REFER to Section 08-01 in the 1996 Ford Service Manual. INSPECT clutch disc for excessive runout..



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DIAGNOSIS AND TESTING

Pinpoint Tests

Pinpoint Test E: Clutch-Related Vibrations

TEST STEP		RESULT ➡	ACTION TO TAKE
E1	CHECK FOR ENGINE COMPONENT GROUNDING		
	<ul style="list-style-type: none"> • Raise the vehicle on a hoist. • Check the engine mount interlocks for grounding. • Check the exhaust manifold or other engine component grounding on the body or frame. • Is there evidence of grounding on body or frame? 	Yes ➡ No ➡	REPAIR the components as necessary. GO to E2 .
E2	CHECK FOR ACCESSORY DRIVE VIBRATIONS		
	<ul style="list-style-type: none"> • Disconnect the accessory drive belts one at a time and check for vibration. • Does the vibration stop when the drive belts are removed from the engine? 	Yes ➡ No ➡	REFER to Section 03-05 in the 1996 Ford Service Manual to diagnose the accessory drive belt components. GO to E3 .
E3	CHECK FOR RELEASE BEARING NOISE		
	<ul style="list-style-type: none"> • Start the engine. • Depress and hold clutch pedal. • Is a whirring, grating or grinding noise present? 	Yes ➡ No ➡	REPLACE the clutch release hub and bearing. REFER to Section 08-02 in the 1996 Ford Service Manual. GO to E4 .
E4	INSPECT FLYWHEEL		
	<ul style="list-style-type: none"> • Remove the transmission. • Inspect for loose flywheel bolts. • Perform Flywheel Runout Check in the Cleaning and Inspection portion of this section. • Is the flywheel OK? 	Yes ➡ No ➡	GO to E5 . TIGHTEN or REPLACE the flywheel.
E5	CHECK FOR PRESSURE PLATE IMBALANCE		
	<ul style="list-style-type: none"> • Remove the transmission. • Support the engine securely. • Verify vibration with pressure plate installed. • Operate the engine with the transmission removed. • Remove clutch pressure plate. • Is the vibration still present? 	Yes ➡ No ➡	REFER to Section 03-00 in the 1996 Ford Service Manual to diagnose the engine vibration concern. REPLACE the clutch pressure plate.



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DIAGNOSIS AND TESTING

Pinpoint Tests

Pinpoint Test F: Hard Shifting

TEST STEP		RESULT	ACTION TO TAKE
F1	CHECK HIGH SHIFTING EFFORTS		
	<ul style="list-style-type: none"> Set parking brake. With shift control selector in reverse, clutch disengaged and engine idling, move shift lever to a position halfway between reverse and neutral. Slowly engage clutch. Gear clash can now be heard if an attempt is made to shift into reverse with clutch engaged, and clutch reverse can now be measured. While maintaining light pressure on shift selector, slowly press clutch pedal toward the floor. At a point in the travel of the clutch pedal the gear clash will stop and the shift selector will slide easily into reverse position. The amount of travel remaining until the pedal touches the floor is defined as reserve. If pedal is all the way to the floor before stopping gear clash, clutch pedal reserve is not adequate. Is there adequate clutch pedal reserve? 	Yes No	Clutch system OK. ADD brake fluid and CHECK for leaks in the clutch system. If OK, GO to F2 .
F2	INSPECT CLUTCH DISC AND PRESSURE PLATE		
	<ul style="list-style-type: none"> Check clutch disc and pressure plate for wear and warpage. Is clutch disc and/or clutch pressure plate worn or warped? 	Yes No	REPLACE clutch disc and clutch pressure plate as required. REFER to Section 08-01 in the 1996 Ford Service Manual. GO to F3 .
F3	INSPECT CLUTCH RELEASE HUB AND BEARING		
	<ul style="list-style-type: none"> Check for worn or damaged clutch release lever (if equipped). Check for worn transmission input shaft pilot bearing or clutch release bearing. Is clutch, transmission input shaft pilot bearing, clutch release lever or clutch release hub and bearing worn or damaged? 	Yes No	REPLACE parts as necessary. REFER to Section 08-02 in the 1996 Ford Service Manual. CHECK transmission. REFER to Section 07-03A or Section 07-03B in the 1996 Ford Service Manual.



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DIAGNOSIS AND TESTING

Pinpoint Tests

Pinpoint Test G: Fluid Leakage

TEST STEP		RESULT ➡	ACTION TO TAKE
G1	INSPECT CLUTCH FLUID LEVEL		
	<ul style="list-style-type: none"> • Engine off. • Inspect the fluid level in the clutch master cylinder reservoir. • Is the fluid level full? 	Yes ➡ No ➡	CHECK for air in system. RETURN to Symptom Chart. GO to G2 .
G2	INSPECT CLUTCH MASTER CYLINDER		
	<ul style="list-style-type: none"> • Inspect clutch master cylinder (from underneath dash). • Check all tube connections. • Inspect clutch slave cylinder. • Is clutch hydraulic system leaking? 	Yes ➡ No ➡	REPLACE parts as necessary. REFER to Section 08-02 in the 1996 Ford Service Manual. BLEED system. REFER to bleed procedures in the Adjustments portion of this section. Clutch hydraulic system OK.

Pinpoint Test H: Excessive Noise

TEST STEP		RESULT ➡	ACTION TO TAKE
H1	TRANSMISSION NEUTRAL GEAR ROLLOVER TEST		
	<ul style="list-style-type: none"> • Start the engine and let idle. • Depress the clutch pedal. NOTE: With the clutch pedal fully depressed, the transmission input shaft will stop rotating. • Does the noise stop when the clutch pedal is depressed? 	Yes ➡ No ➡	CHECK transmission input shaft pilot bearing. If OK, REFER to Sections 07-03A and 07-03B in the 1996 Ford Service Manual to diagnose transmission noise concern. GO to H2 .
H2	CHECK FLUID LEVEL		
	<ul style="list-style-type: none"> • Check the fluid level in the clutch master cylinder. • Is the fluid level full? 	Yes ➡ No ➡	GO to H3 . ADD brake fluid and CHECK clutch hydraulic system for leaks.



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DIAGNOSIS AND TESTING

Pinpoint Tests

Pinpoint Test H: Excessive Noise (Continue)

TEST STEP		RESULT ➡	ACTION TO TAKE
H3	CHECK RELEASE HUB AND BEARING		
	<ul style="list-style-type: none"> Remove the transmission. Refer to Sections 07-03A or 07-03B in the 1996 Ford Service Manual. Inspect the clutch release hub and bearing for wear or loss lubrication. Are there any signs of wear or loss of lubrication? 	Yes ➡ No ➡	REPLACE the clutch release hub and bearing. REFER to Section 08-01 in the 1996 Ford Service Manual. GO to H4 .
H4	CHECK TRANSMISSION INPUT SHAFT PILOT BEARING		
	<ul style="list-style-type: none"> Inspect the transmission input shaft pilot bearing for damage. Is the transmission input shaft pilot bearing OK? 	Yes ➡ No ➡	GO to H5 . REPLACE the transmission input shaft pilot bearing. REFER to Section 08-01 in the Ford Service Manual.
H5	CHECK RELEASE LEVER (IF EQUIPPED)		
	<ul style="list-style-type: none"> Inspect the clutch release lever for wearing or damage. Are there any signs of wear or damage? 	Yes ➡ No ➡	REPLACE the clutch release lever. GO to H6 .
H6	CHECK TORSION SPRING		
	<ul style="list-style-type: none"> Inspect the torsion spring for fatigue. Are there any signs of fatigue? 	Yes ➡ No ➡	REPLACE the clutch disc. REFER to Section 08-01 in the 1996 Ford Service Manual. INSPECT the crankshaft end play. REFER to Section 03-00 in the 1996 Ford Service Manual.