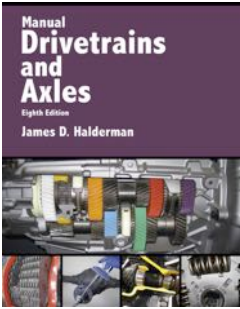


**Manual Drivetrains and Axles**  
8<sup>th</sup> Edition



**Chapter 5**  
Clutch Diagnosis and Service

ALWAYS LEARNING    Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.    PEARSON

---

---

---

---

---

---

---

---

**Learning Objectives (1 of 2)**

**1.1** Prepare to take the ASE certification test A3 Manual Transmission and Axles in content area “A” (Clutch Diagnosis and Repair).

**1.2** Discuss clutch pedal free travel and clutch fluid level.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.    PEARSON

---

---

---

---

---

---

---

---

**Learning Objectives (2 of 2)**

**1.3** Explain the diagnosis of common clutch problems and recommend the proper repair procedures.

**1.4** Explain how to remove and replace a clutch assembly.

**1.5** Discuss the inspection of used clutch components to determine if they are usable.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.    PEARSON

---

---

---

---

---

---

---

---

### Introduction

- Most automotive technicians perform three different levels of clutch service.
  - What are they?

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Inspection (1 of 2)

- Typical maintenance and service items for a clutch:
  - 1. Checking clutch pedal free travel, or free play (older vehicles).
    - Checking the clutch pedal free travel is always the first step!
  - 2. Inspecting mechanical linkage systems (older vehicles).
  - 3. Checking the fluid level in hydraulic systems.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Inspection (2 of 2)

- Clutch fluid level is checked by looking at the fluid level at the clutch master cylinder reservoir.
- The fluid level will rise slightly as the clutch facing wears.
  - A low fluid level usually indicates a leak in the system.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

Figure 5-2 A typical clutch master cylinder and reservoir mounted on the bulkhead on the driver's side of the vehicle.



Copyright © 2010, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Problem Diagnosis (1 of 3)

- If there is a fault in the clutch, linkage, or hydraulic system:
  - The transmission will be difficult (or impossible) to shift into reverse.
  - The transmission will be difficult (or impossible) to shift between forward gears.
- Fluid leaks
  - Repairs could include: Tightening a loose line fitting; Replacing an O-ring, fluid line or hose; Replacing the clutch master cylinder or slave cylinder.

Copyright © 2010, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Problem Diagnosis (2 of 3)

- Check the slave cylinder travel.
- Clutch slippage
  - Check/adjust clutch pedal free travel.
  - Warm up the engine to operating temperature, block the wheels, and apply the parking brake completely.
  - Shift the transmission into high gear and let out the clutch pedal smoothly. The engine should stall immediately.
    - A delay indicates slow engagement and slipping.

Copyright © 2010, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Problem Diagnosis (3 of 3)

- Clutch Spin-Down Test
  - Check/adjust clutch pedal free travel.
  - Warm up the engine to operating temperature.
  - Push in the clutch pedal, wait 9 seconds, and shift the transmission into reverse.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

---

---

### Clutch Symptom Guide

- Clutch Slips
  - What are possible causes?
- Clutch grabs
  - What are possible causes?
- Clutch noises
  - What are possible causes?

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

---

---

### Clutch Replacement (1 of 3)

- Parts Involved
- Hoist the vehicle safely and mark and remove the driveshaft.
- Disconnect the shift linkage, speedometer connections, reverse light switch connection, and clutch linkage or cable or slave cylinder.
- Support the transmission with a transmission jack and then remove the rear cross member and bell housing bolts.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

---

---

### Clutch Replacement (2 of 3)

- Carefully move the transmission toward the rear.
- After the transmission has cleared the clutch, it can be lowered and inspected before being reinstalled after the clutch assembly has been replaced.
- Mark the pressure plate and flywheel if they are to be reused.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

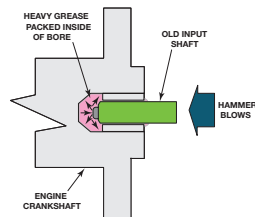
---

---

---

### Clutch Replacement (3 of 3)

- Remove the clutch pressure plate retaining bolts, and remove the clutch assembly including the release bearing, pressure plate, and clutch disc.
- Pilot Bearing



Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Component Inspection (1 of 2)

- Technicians should check each part to see if it is usable and why it failed.
  - Importance of inspection
  - Flywheel
    - Check for grooves, nicks, and heat damage.
  - Flywheel resurfacing
  - Flywheel axial runout
  - Pressure plate assembly inspection
    - Check for: friction surface damage, release lever wear, lever pivot wear, cover distortion

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Clutch Component Inspection (2 of 2)

- Clutch disc inspection
  - Check for: facing thickness, damper spring condition, wear of the hub splines, contaminated or oil soaked facing material, warpage or axial runout
- Clutch/bell Housing inspection
  - Check for: oil/grease residue, face and bore surfaces, excessive runout
- House bore runout
- Release bearing
  - There are no effective checks except for feeling for roughness or seeing obvious wear/discoloration

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

Figure 5-8 The thickness of the clutch disc facing can be measured using a vernier caliper.



Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

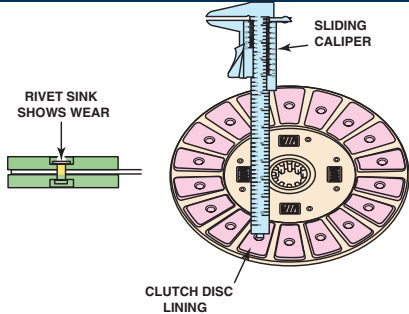
---

---

---

---

Figure 5-9 The overall disc thickness can be measured using a vernier caliper by first compressing the marcel spring using pliers.



Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Summary (1 of 2)

- Clutch system preventive maintenance ensures proper clutch pedal free travel and/or proper master cylinder fluid level.
- Excessive slippage, grab, chatter, and unusual noise are common indications of clutch problems.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---

### Summary (2 of 2)

- A clutch job requires transmission/transaxle removal to replace the pressure plate, disc, release bearing, and pilot bearing.
- Abnormal clutch failure requires additional checks to locate the root cause of the failure.

Copyright © 2016, 2014, 2012 Pearson Education, Inc. All Rights Reserved.

PEARSON

---

---

---

---

---

---

---

---