

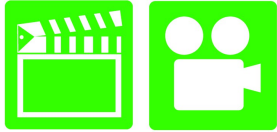
Manual Drive Train and Axles 1st Edition

Chapter 4 Clutch Parts and Operation

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers operation and service of Manual Drive Trains and Axles . It correlates material to task lists specified by ASE and NATEF.
Motivate Learners	Explain how the knowledge of how something works translates into the ability to use that knowledge to figure why the engine does not work correctly and how this saves diagnosis time, which translates into more money.
State the learning objectives for the chapter or course you are about to cover and explain this is what they should be able to do as a result of attending this session or class.	Explain the chapter learning objectives to the students. <ol style="list-style-type: none">1. Prepare for ASE Manual Drive Train and Axles (A3) certification test content area "A" (Clutch Diagnosis and Repair).2. List the parts that are included in the clutch system.3. Discuss the purpose and function of clutch discs.4. Discuss the purpose and function of pressure plates.5. State the characteristics of a flywheel and explain how a dual-mass flywheel works.6. Describe how a clutch pedal linkage and a clutch pedal switch works.7. Describe the operation of the release bearing and state the types of release bearings.
Establish the Mood or Climate	Provide a <i>WELCOME</i> , Avoid put downs and bad jokes.
Complete Essentials	Restrooms, breaks, registration, tests, etc.
Clarify and Establish Knowledge Base	Do a round robin of the class by going around the room and having each student give their backgrounds, years of experience, family, hobbies, career goals, or anything they want to share.

ICONS



Ch04 Clutch Parts and Operation

1. SLIDE 1 CLUTCH PARTS & OPERATION
2. SLIDES 2-4 EXPLAIN OBJECTIVES

Check for **ADDITIONAL VIDEOS & ANIMATIONS**
@ <http://www.jameshalderman.com/>
WEB SITE IS CONSTANTLY UPDATED

USE ANIMATION EPA HAZARDOUS MATERIAL IDENTIFICATION [WWW.MYAUTOMOTIVELAB.COM](http://www.myautomotivelab.com)

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A1_ANIMATION/CHAPTER_02_FIG_02_11/INDEX.HTM](http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/a1_animation/chapter_02_fig_02_11/index.htm)

5. SLIDE 5 EXPLAIN Major Parts Included and how the Clutch Works
6. SLIDE 6 EXPLAIN FIGURE 4-2a When the clutch is in the released position (clutch pedal depressed), the clutch fork is applying a force to the throwout (release) bearing, which pushes on the diaphragm spring, releasing the pressure on the friction disc.
7. SLIDE 7 EXPLAIN FIGURE 4-2b When the clutch is in the engaged position (clutch pedal up), the diaphragm spring exerts force on the clutch disc, holding it between the flywheel and the pressure plate.
8. SLIDES 8-9 EXPLAIN Purpose & Function of Clutch Discs











DISCUSSION: SHOW LEVERAGE ADVANTAGES USED IN CLUTCH APPLICATIONS, LENGTH OF THE CLUTCH FORK PUSHING ON THE THROWOUT BEARING IN FIG 4-2. ANOTHER EXAMPLE WOULD BE LEVERS USED IN LEVER & ROD LINKAGE












DEMONSTRATION: SHOW EXAMPLES OF A CLUTCH DISC, THROW-OUT BEARING AND PRESSURE PLATE




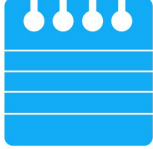



DEMONSTRATION: SHOW TORSION DAMPENING SPRINGS IN CLUTCH DISC. DEMONSTRATE HOW SPRINGS DAMPEN TWISTING MOTION OF CLUTCH DISC AS CLUTCH IS ENGAGED.

SHOW ANIMATION: CLUTCH OPERATION [WWW.MYAUTOMOTIVELAB.COM](http://www.myautomotivelab.com)

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYAUTOMOTIVELAB_2/ANIMATIONS/A8_ANIMATION/CHAPTER94_FIG_94_2/INDEX.HTM](http://media.pearsoncmg.com/ph/chet/chet_myautomotivelab_2/animations/a8_animation/chapter94_fig_94_2/index.htm)

ICONS	Ch04 Clutch Parts and Operation
	<p><u>Cable Clutch Operation</u> <u>Clutch Hydraulic Operation</u> <u>Clutch Operation</u></p>
  <p>QUESTION</p>	<p><u>DISCUSSION:</u> DISCUSS THE EXPERIENCES THEY MAY HAVE HAD WITH CLUTCHES</p>
 <p>DEMO</p>	<p><u>DEMONSTRATION:</u> SHOW EXAMPLES OF A PILOT BEARING AND A BUSHING.</p>
  <p>QUESTION</p>	<p><u>DISCUSSION:</u> DISCUSS DIFFERENCE BETWEEN THE PILOT BEARING AND THE BUSHING. WHICH WOULD BE THE BETTER STYLE TO USE AND WHY?</p>
	<p><u>HANDS-ON TASK:</u> HAVE STUDENTS INSPECT LEVER-AND-ROD, CABLE, & HYDRAULIC CLUTCH LINKAGE SYSTEMS. WHAT ARE ADVANTAGES AND DISADVANTAGES OF EACH?</p>
	<p><u>HANDS-ON TASK: CROSS-CURRICULAR ACTIVITY: PHYSICS:</u> USE INTERNET TO RESEARCH LEVERS & FULCRUMS. HAVE STUDENTS MAKE A LIST OF AT LEAST 4 LEVERS & FULCRUMS USED IN EVERYDAY LIFE. (EXAMPLES: BIKE PEDAL CRANK, VEHICLE JACK HANDLE, AND PLAYGROUND EQUIPMENT.) DEVELOP A SIMPLE PICTURE OF EACH EXAMPLE TO SHARE WITH THE CLASS.</p>
	<p><u>CLUTCH SYSTEM COMPONENTS</u> <u>WWW.MYAUTOMOTIVELAB.COM</u></p>
	<p><small>HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=CLUTCH%20SYSTEM%20COMPONENTS&CLIP=PANDC/CHET/2012/AUTOMOTIVE/AUTO_PARTS_SPECIALIST/EXP18.MOV&CAPTION=CHET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/AUTO_PARTS_SPECIALIST/XML/EXP18.XML</small></p>
	<ol style="list-style-type: none"> 10. SLIDES 10-12 EXPLAIN Flywheel 13. SLIDE 13 EXPLAIN FIGURE 4–11 The ring gear, which is attached to the outer rim of the flywheel, provides the teeth needed to mesh with the starter pinion gear. 14. SLIDE 14 EXPLAIN FIGURE 4–12 A flywheel being machined (ground) to provide the correct surface finish for the replacement clutch disc. 15. SLIDE 15 EXPLAIN FIGURE 4–13 A stepped flywheel has more mass on the outer edge which helps smooth out the impulses from a four-cylinder engine

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          	<p>especially at idle speed.</p> <p>16. SLIDE 16 EXPLAIN FIGURE 4-14 A dual-mass wheel consists of two flywheels connected between with a spring to help absorb engine pulsations.</p> <p>DEMONSTRATION: SHOW FLYWHEELS WITH PILOT BEARINGS AND SOME WITHOUT.</p> <p>SAFETY FLYWHEELS CAN BE VERY HEAVY, AND CAUTION SHOULD BE USED WHEN LIFTING. FLYWHEELS ALSO PRESENT A FINGER PINCHING HAZARD. REMIND THE STUDENTS TO FOLLOW APPROPRIATE SAFETY PRECAUTIONS.</p> <p>DEMONSTRATION: SHOW TWO ROTATING OBJECTS OF CONSIDERABLY DIFFERENT WEIGHTS. AN EXAMPLE WOULD BE A BICYCLE TIRE COMPARED TO A CAR TIRE. DEMONSTRATE DIFFERENCE IN <u>INERTIA</u> BETWEEN THE TWO. THE RING GEAR CAN BE WELDED OR PRESS-FIT ON A FLYWHEEL</p> <p>17. SLIDE 17 EXPLAIN Clutch Pedal Linkage and Clutch Pedal Switch</p> <p>DISCUSSION: DISCUSS THE OPERATION OF THE CLUTCH-FORK PIVOT. HOW CAN WEAR ON THIS PIVOT AFFECT THE OPERATION OF THE CLUTCH?</p> <p>DISCUSSION: DISCUSS THE EFFECT OF BAD RELEASE BEARING. WHAT WOULD THE DRIVER NOTICE ABOUT THE OPERATION OF THE CLUTCH?</p> <p>DEMONSTRATION: SHOW RELEASE BEARING. SHOW HOW ONE PART IS STATIONARY WITH THE VEHICLE AND THE OTHER PART MUST SPIN AT ENGINE SPEED.</p>

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   	<p>DISCUSSION: DISCUSS THE IMPORTANCE OF PROPER ALIGNMENT AND LUBRICATION OF RELEASE BEARING.</p> <p>HANDS-ON TASK: HAVE STUDENTS PUSH IN AND RELEASE CLUTCH ON A VEHICLE & FEEL FOR TRANSMITTED CLUTCH FEEL IN LEVER SYSTEM</p> <p>EVEN A GOOD CLUTCH SYSTEM MAKES NOTICEABLE NOISE CHANGES DURING RELEASE AND ENGAGEMENT.</p> <p>THERE IS MORE TRANSMITTED FEEL IN A LEVER SYSTEM THAN IN A HYDRAULIC OR CABLE SYSTEM.</p> <p>18. SLIDES 18-19 EXPLAIN Release Bearings</p> <p>20. SLIDE 20 EXPLAIN FIGURE 4–20a A release (throwout) bearing on a transmission that uses a clutch fork and a mechanical or cable operated linkage.</p> <p>21. SLIDE 21 EXPLAIN FIGURE 4–20b A style of release bearing that includes the slave cylinder, sometimes called a concentric slave cylinder.</p> <p>22. SLIDE 22 EXPLAIN FIGURE 4–20c A combination release bearing and slave cylinder showing the two hydraulic lines. The lower line is from the master clutch cylinder and the upper line is used to bleed air from the hydraulic system.</p>
	<p>DEMONSTRATION: SHOW THE PROPER WAY TO LUBRICATE THE BUSHING, RELEASE BEARING, OUTPUT SHAFT SPLINES, AND RELEASE BEARING SUPPORT.</p>
	<p>DEMONSTRATION: SHOW HOW TO PROPERLY CHECK CLUTCH-PEDAL FREE TRAVEL. USE A DIAL INDICATOR TO MEASURE FOR PROPER FREE TRAVEL</p>
	<p>SEARCH INTERNET: HAVE STUDENTS RESEARCH AUTOMOTIVE CAREERS THAT REQUIRE ABILITY TO REPAIR, REPLACE, & TROUBLESHOOT CLUTCHES. PREPARE TO PRESENT TO GROUPS AT NEXT CLASS: CAREER OPPORTUNITIES, THEIR ADVANTAGES AND DISADVANTAGES, & COMPENSATION LEVELS.</p>

ICONS

Ch04 Clutch Parts and Operation



23. SLIDES 23-24 EXPLAIN Summary