Career and Technical Education

Automotive 801B
Brake Systems
Automotive Technology
Brake Systems (AUT801B)

Course Description
Brakes are one of the most fundamental safety systems on a vehicle. This course focuses on the components, types, service, and diagnosis of brake systems. Students will develop a thorough knowledge of the fundamentals of friction and hydraulics related to brake component function. They will learn to service, diagnose, and repair drum brake systems, disc brake systems, and power brakes and will be introduced to antilock brake systems.

Classroom Component—Suggested time: 49 hours
This component of the curriculum is required to teach the knowledge and skills associated with the learning outcomes of the curriculum.

Skill Development Component—Suggested time: 61 hours
This component of the curriculum is required by the student to apply the knowledge and develop the skills related to the learning outcomes of the curriculum.

SCO - Identifies the Specific Curriculum Outcome (SCO)

<table>
<thead>
<tr>
<th>Column 1</th>
<th>SCO - Delineations</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCO - Identifies the Specific Curriculum Outcome (SCO)</td>
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<tr>
<td>Describes what the students are expected to know, be able to do, and value in order to achieve the SCO.</td>
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<tr>
<td>The teacher is responsible for the planning and facilitation of learning as well as the assessment of each SCO - Delineation.</td>
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<table>
<thead>
<tr>
<th>Column 2</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provides clarity to the SCO by describing the knowledge, abilities, and competencies that the students develop. This column is designed to indicate the depth and breadth of the SCO.</td>
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<tr>
<td>It is not necessary to use all of these suggestions or that all of the students be engaged in the same learning activity.</td>
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</table>

<table>
<thead>
<tr>
<th>Column 3</th>
<th>Teacher Lessons / Demonstrations</th>
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</thead>
<tbody>
<tr>
<td>Provides suggestions for developing and delivering the content for student learning.</td>
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<table>
<thead>
<tr>
<th>Column 4</th>
<th>Resources</th>
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</thead>
<tbody>
<tr>
<td>Lists a variety of resources that support the teaching and learning related to the SCO. These resources are suggested to support the teacher in developing an effective instructional package for delivery to the students.</td>
<td></td>
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</tbody>
</table>
Module 1: Brake System Fundamentals (~5 hours Classroom Component)

13. Students will be able to apply scientific principles to explain brake system operations.

Students will be expected to
13.1 explain the principles of operation of brake systems
13.2 state Pascal’s law and its implications for brake systems
13.3 choose the correct brake fluid for a given application, based on purpose, function, and characteristics of brake fluids

Module 2: Hydraulic System Components (~11 hours Classroom Component)

14. Students will be able to service and repair brake system hydraulic components.

Students will be expected to
14.1 explain the principles of operation, construction, and design features of common types of brake master cylinders
14.2 explain the principles of operation, construction, and design features of wheel cylinders and calipers used in brake systems
14.3 explain the construction and design features of brake hoses and lines
14.4 explain the purpose and operation of the metering, proportioning, and pressure differential valves
14.5 describe the operation of the hydraulic components when used as a system
14.6 diagnose, service, adjust, and repair brake system hydraulic components

Module 3: Drum Brake Systems (~8 hours Classroom Component)

15. Students will be able to service and repair drum brake systems.

Students will be expected to
15.1 explain the construction, design features, and operation of a drum brake system
15.2 service, adjust, and repair drum brake systems
15.3 explain the construction and design features of drum-type parking brake systems
15.4 service, adjust, and repair drum-type parking brake systems

Module 4: Disc Brake Systems (~8 hours Classroom Component)

16. Students will be able to service and repair disc brake systems.

Students will be expected to
16.1 explain the construction, operation, and design features of disc brake systems
16.2 service and repair disc brake systems
16.3 explain the construction and operation of disc-type parking brake systems
16.4 service, adjust, and repair disc-type parking brake systems
Module 5: Power Brakes (~5 hours Classroom Component)

17. Students will be able to diagnose and service power brakes.

Students will be expected to
17.1 describe the operation of vacuum-operated power brake units
17.2 describe the operation of hydraulically-operated power brake units
17.3 demonstrate a procedure for testing a power brake unit
17.4 diagnose problems related to a power brake

Module 6: Brake Systems Diagnosis and Service (~4 hours Classroom Component)

18. Students will be able to service, repair, and diagnose problems related to brake systems.

Students will be expected to
18.1 demonstrate brake flushing and bleeding procedures on brake systems
18.2 diagnose problems related to brake systems

Module 7: Anti-Lock Brake Systems (~8 hours Classroom Component)

19. Students will be able to diagnose and service anti-lock brake systems.

Students will be expected to
19.1 identify basic ABS components
19.2 explain the operation of an ABS system
19.3 demonstrate a brake bleeding procedures for an ABS system
19.4 demonstrate a diagnostic procedure for an ABS system
Brake System Fundamentals
(~5 hours Classroom Component)

Introduction
An apprentice must develop a thorough knowledge of the scientific fundamentals of friction and hydraulics, and how they apply to brake system operation. A clear understanding of brake components and their function is essential for the safe diagnosis and service of the automotive brake system.

Specific Curriculum Outcome
13. Students will be able to apply scientific principles to explain brake system operations.

SCO - Delineations
Students will be expected to
13.1 explain the principles of operation of brake systems
13.2 state Pascal's law and its implications for brake systems
13.3 choose the correct brake fluid for a given application, based on purpose, function, and characteristics of brake fluids

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 090105a, Brake System Fundamentals
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)
Brake System Fundamentals (~5 hours Classroom Component)

SCO 13. Students will be able to apply scientific principles to explain brake system operations.

### SCO - Delineations

*Students will be expected to*

13.1 **explain the principles of operation of brake systems**

13.2 **state Pascal's law and its implications for brake systems**

### Student Knowledge, Abilities, and Competencies

#### Topic: Fundamentals

- Explain the Canadian government brake system requirements for new vehicles and the responsibilities of the automotive service technician.
- Explain the purpose of a brake system.
- Define “energy”.
- Describe the forms of energy conversion involved in stopping a vehicle.
- Define the terms “work”, “torque”, and “power” as they apply to the braking system.
- Calculate work, torque and power using the appropriate units.
- Explain the law of conservation of energy.
- Define and calculate kinetic energy.
- Explain thermal energy and the three methods of heat transfer as they relate to braking systems.
- Describe friction and how it is used in the brake system.
- Explain coefficient of friction, static friction, and kinetic friction as they relate to braking systems.

#### Topic: Pascal's Law

- State the two basic principles of liquids in a system:
  - liquids are non-compressible
  - pressure is equal everywhere in the system
- Explain Pascal’s law and the relationship between pressure, force, and area.
- Describe two methods for increasing force output in a hydraulic system.
- Demonstrate an understanding of the difference between hydrostatic and hydrodynamic systems.
Brake System Fundamentals (~5 hours Classroom Component)

SCO 13. Students will be able to apply scientific principles to explain brake system operations.

**Teacher Lessons / Demonstrations**

*Topic: Fundamentals*
- Create a slideshow using graphics from the ILM.
- Show video on braking fundamentals from CDX.

*Topic: Pascal’s Law*
- Copy visuals of select images from the ILM graphics CD to support discussion.
- Using two syringes, IV tubing and coloured fluid (washer fluid), demonstrate that liquids are non compressible.

**Literacy**
- *Anticipation Guide:* Use as a pre-reading strategy for pp.2-12.

**Numeracy**
- Develop a math-enhanced lesson on calculating pressure, work, power, and energy (math skill: solving equations, ratio).

**Student Activities / Assessments**

- Label a diagram of a hydraulic brake system.
- Use diagrams to explain how force can be multiplied.
- Create simple hydraulic systems and explore Pascal’s law and the motion of fluid, using IV tubing, syringes, connectors and coloured fluid.

**Literacy**
- *Free Writing:* Use as a pre-reading strategy. Write for 3 minutes on an experience you have had related to brakes.

**Numeracy**
- Calculate work, energy, pressure, surface area, volume, and power.

**Resources**

*Texts / Teacher Resources*
Alberta Module 090105a
*Brake System Fundamentals* pp. 3-17

*Software / Databases*
CDX Global
StudentsAchieve (SAS)
AUT801B/Brake System Fundamentals
Brake System Fundamentals (~5 hours Classroom Component)

SCO 13. Students will be able to apply scientific principles to explain brake system operations.

**SCO - Delineations**

*Students will be expected to*

**13.3** choose the correct brake fluid for a given application, based on purpose, function, and characteristics of brake fluids

**Student Knowledge, Abilities, and Competencies**

*Topic: Brake Fluids*

- Explain common terms related to brake fluids.
- Identify the three ratings used to classify the composition and properties of brake fluids (DOT).
- Describe the compatibility of the various classifications of brake fluids.
- Identify DOT 5 brake fluid by colour recognition.
- Describe the effects of water contamination in brake systems.
- Demonstrate the ability to follow proper handling and disposal practices when working with brake fluids.
Brake System Fundamentals (~5 hours Classroom Component)
SCO 13. Students will be able to apply scientific principles to explain brake system operations.

Teacher Lessons / Demonstrations

Topic: Brake Fluids
- Develop a slideshow explaining the function, compatibility, and properties of brake fluids.
- Show a video on brake fluids (from CDX).

Student Activities / Assessments
- Complete a student worksheet on brake fluids.
- Select the correct brake fluid for a variety of vehicles (use service manuals and ALLDATA).
- Check and adjust brake fluid on shop vehicles.
- Complete CDX tasksheets C239 and C480.

Literacy
- Exploring Vocabulary: Use as a post-reading strategy to better understand new vocabulary.

<table>
<thead>
<tr>
<th>List new words that are specific to topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity</td>
</tr>
<tr>
<td>Boiling Point</td>
</tr>
<tr>
<td>Non-Corrosive</td>
</tr>
<tr>
<td>Hygroscopic</td>
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</tbody>
</table>

Examine new words. Which do you find difficult to pronounce? Break them apart and write the parts below.

Which of the new words is the most challenging to understand? Why?

List other words you know that relate to the new words.

Choose one word. Why do you need to know this word? How will it be useful?

Resources

Texts / Teacher Resources
Alberta Module 090105a
Brake System Fundamentals
pp. 18-21

Software / Databases
CDX Global
StudentsAchieve (SAS)
AUT801B/Brake System Fundamentals
Hydraulic System Components
(~11 hours Classroom Component)

Introduction
The vehicle brake system is the most critical of all of the vehicle safety systems. The braking system is in constant use and must function in a safe and reliable fashion at all times. Brake performance depends largely on the hydraulic components within the system. An apprentice must gain a thorough knowledge of the brake system's hydraulic components, their operation, and their service.

Specific Curriculum Outcome
14. Students will be able to service and repair brake system hydraulic components.

SCO - Delineations
Students will be expected to
14.1 explain the operation, construction, and design features of common types of brake master cylinders
14.2 explain the operation, construction, and design features of wheel cylinders and calipers used in brake systems
14.3 explain the construction and design features of brake hoses and lines
14.4 explain the purpose and operation of the metering, proportioning, and pressure differential valves
14.5 describe the operation of the hydraulic components when used as a system
14.6 diagnose, service, adjust, and repair brake system hydraulic components

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 090105b, Hydraulic System Components
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)
Hydraulic System Components (~11 hours Classroom Component)
SCO 14. Students will be able to service and repair brake system hydraulic components.

**SCO - Delineations**

*Students will be expected to*

14.1 **explain the operation, construction, and design features of common types of brake master cylinders**

14.2 **explain the operation, construction, and design features of wheel cylinders and calipers used in brake systems**

14.3 **explain the construction and design features of brake hoses and lines**

**Student Knowledge, Abilities, and Competencies**

*Topic: Master Cylinders*

- Explain the purpose and function of the master cylinder.
- Identify the major parts of a single piston master cylinder.
- Demonstrate an understanding of the operation of the master cylinder.
- State the purpose of a tandem master cylinder.
- Identify the major parts of a tandem master cylinder.
- Demonstrate an understanding of the operation of a tandem master cylinder.
- Demonstrate an understanding of the operation of the tandem master cylinder in the event of a hydraulic failure.
- Explain the design and purpose of a quick take-up master cylinder.

*Topic: Wheel Cylinders and Calipers*

- Explain the purpose and function of the wheel cylinder.
- Identify the major components of the wheel cylinder.
- Demonstrate an understanding of the design and operation of the wheel cylinder.
- Demonstrate an understanding of the design and operation of disc brake calipers.
- Identify the major components of disc brake calipers.
- Demonstrate an understanding of the function of floating, fixed, and low-drag calipers.

*Topic: Brake Hoses and Lines*

- Explain the function of fluid lines in the brake system.
- Demonstrate an understanding of the design of steel lines used in brake systems.
- Identify the two types of flares (ISO, SAE) for brake fittings.
- Explain the design and application of flex lines.
Hydraulic System Components (~11 hours Classroom Component)
SCO 14: Students will be able to service and repair brake system hydraulic components.

Teacher Lessons / Demonstrations

**Topic: Master Cylinders**
- Use overhead transparencies to create visuals of select images from the ILM graphics CD, or develop a slideshow based on the ILM.
- Discuss the operation of tandem and quick take-up master cylinders.
- Use graphics from the ILM to explain the operation of a master cylinder.
- Have a master cylinder to pass around as a model.

**Topic: Wheel Cylinders and Calipers**
- *Compare and Contrast Diagram:* Use as a means to describe the similarity and differences between wheel cylinders and calipers.

![Compare and Contrast Diagram](image)

**Topic: Brake Hoses and Lines**
- Review flaring tools from *Specialty Hand Tools* (AUT801A).

Literacy
- *Anticipation Guide:* Use as a pre-reading strategy for pp. 2-27 of the ILM.

Student Activities / Assessments

- Label diagrams of master cylinders, wheel cylinders and calipers.
- Identify the components of a hydraulic system on a shop vehicle.
- Rebuild a master cylinder.
- Properly connect brake lines to all the components on a brake system training board. (Board should allow for students to use a variety of different flares when piping the board.)
- Replace brake lines on a shop vehicle.

Literacy
- *Free Writing:* Use as a pre-reading strategy. Write for 3 minutes on automotive tubing and flaring.
- *Compare and Contrast Diagram:* Use as a post-reading strategy to summarize the information on master cylinders from pp. 2-16.

Resources

**Texts / Teacher Resources**
- Alberta Module 090105b
- *Hydraulic System Components* pp. 2-27

**Software / Databases**
- CDX Global
- StudentsAchieve (SAS)
- AUT801B/Hydraulic System Components
Hydraulic System Components (~11 hours Classroom Component)

SCO 14. Students will be able to service and repair brake system hydraulic components.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
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<tbody>
<tr>
<td>Students will be expected to</td>
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<tr>
<td>14.4 explain the purpose and operation of the metering, proportioning, and pressure differential valves</td>
<td><strong>Topic: Valves</strong></td>
</tr>
<tr>
<td>14.5 describe the operation of the hydraulic components when used as a system</td>
<td>• Describe the purpose, location, and operation of the pressure differential valve.</td>
</tr>
<tr>
<td>14.6 diagnose, service, adjust, and repair brake system hydraulic components</td>
<td>• Describe the purpose and operation of the metering valve in a disc/drum brake system.</td>
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<td></td>
<td>• Describe the purpose and operation of the proportioning valve.</td>
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<td>• Identify the various functions of a combination valve in the braking system.</td>
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<td></td>
<td><strong>Topic: Operation</strong></td>
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<td></td>
<td>• Identify the brake components on a schematic diagram.</td>
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<td>• Explain the function of each component, both at rest and during application.</td>
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<td></td>
<td><strong>Topic: Service</strong></td>
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<td></td>
<td>• Demonstrate the ability to perform a visual inspection of the master cylinder.</td>
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<td></td>
<td>• List problems that would indicate that service of the master cylinder is required.</td>
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<td></td>
<td>• Demonstrate the ability to overhaul a master cylinder.</td>
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<tr>
<td></td>
<td>• Demonstrate the ability to perform a visual inspection of the disc calipers and wheel cylinders.</td>
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<tr>
<td></td>
<td>• List problems that would indicate that a disc caliper or wheel cylinder would require service.</td>
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<td></td>
<td>• Demonstrate the ability to overhaul a wheel cylinder and a disc caliper.</td>
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<td></td>
<td>• Demonstrate the ability to perform a visual inspection of the brake fluid lines (both rigid and flex hoses).</td>
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<td>• Demonstrate the ability to follow the proper procedures for cutting, bending, and flaring steel lines.</td>
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<td></td>
<td>• Demonstrate the ability to follow the proper procedures for fabricating and replacing steel lines and replacing flex hoses.</td>
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</table>
Hydraulic System Components (~11 hours Classroom Component)

SCO 14. Students will be able to service and repair brake system hydraulic components.

Teacher Lessons / Demonstrations

**Topic: Valves**
- Use graphics from the ILM to explain the operation of various types of valves.
- Show CDX videos related to proportioning valves.

**Topic: Operation**
- Review the function of each hydraulic component.
- Use graphics from the CD to explain how all the components work together.
- Show CDX video on principles of braking.

**Topic: Service**
- Demonstrate a procedure to overhaul a master cylinder.
- Demonstrate a procedure to inspect and overhaul wheel cylinders.
- Demonstrate procedures to inspect and replace brake lines and hoses.

Student Activities / Assessments

- Build/use a training board equipped with gauges to demonstrate the function of a metering proportional valve.
- Use diagrams to explain the basic operation of all the hydraulic components of a brake system.
- Inspect master cylinders, wheel cylinders and brake lines and hoses.
- Overhaul/repair master cylinders and wheel cylinders.
- Repair brake lines and hoses.
- **ALLDATA**: to search for manufacturer’s specifications related to hydraulic components.

Literacy
- **Component Guide**: Use as a during-reading strategy to organize and summarize the operation of the various valves covered on pp. 29-35.

Resources

**Texts / Teacher Resources**
Alberta Module 090105b
*Hydraulic System Components*
pp. 28-49

**Software / Databases**
CDX Global

StudentsAchieve (SAS)
AUT801B/Hydraulic Systems
Drum Brake Systems
(~8 hours Classroom Component)

Introduction
Drum brake systems are utilized on most vehicles on the road today. The apprentice must be familiar with the design and operation of drum brakes so as to diagnose, service, and repair these safety systems. It is critical that the brake system be maintained to the original specifications of the manufacturer.

Specific Curriculum Outcome
15. Students will be able to service and repair drum brake systems.

SCO - Delineations
Students will be expected to
15.1 explain the construction, design features, and operation of a drum brake system
15.2 service, adjust, and repair drum brake systems
15.3 explain the construction and design features of drum-type parking brake systems
15.4 service, adjust, and repair drum-type parking brake systems

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 090205c, Drum Brake Systems
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)
Drum Brake Systems (~8 hours Classroom Component)

SCO 15. Students will be expected to service and repair drum brake systems.

**SCO - Delineations**

*Students will be expected to*

15.1 explain the construction, design features, and operation of a drum brake system

**Student Knowledge, Abilities, and Competencies**

*Topic: Drum Brakes*

- Identify the major components of a drum brake system.
- Demonstrate an understanding of the design and operation of a drum brake system.
- Define terminology related to the brake shoe.
- Identify the components of a dual-servo brake shoe arrangement.
- Demonstrate an understanding of the operation of a dual-servo brake shoe design.
- Identify the components of a leading-trailing drum brake assembly.
- Demonstrate an understanding of the operation of leading-trailing brakes.
- Identify other combinations of brake shoe configurations.
- Explain the design and function of the backing plate.
- Explain the design and function of the brake shoes.
- Explain the design and composition of brake linings.
- Explain the design and function of the wheel cylinder.
- Explain the design and function of the various springs in a drum brake assembly.
- Explain the design and function of brake adjusters.
- Demonstrate an understanding of the purpose, design, and composition of brake drums.
Drum Brake Systems (~8 hours Classroom Component)
SCO 15. Students will be able to service and repair drum brake systems.

Teacher Lessons / Demonstrations

*Topic: Drum Brakes*
- **CDX:** Review material under the brakes menu that relates to drum brakes, wheel cylinders, and brake fundamentals.
- Lead a class discussion on the function and operation of a drum brake system.
- **Component ID:** With small groups of students, identify the components of the drum brake system on a shop vehicle.
- Create a slideshow or overhead transparencies from the graphics found in the ILM (to help with component ID).

Student Activities / Assessments

- Complete a matching activity comparing the parts of a brake drum and the function of each part.
- **Component ID:** Identify all the components of the drum brake system on a shop vehicle and/or training board.

Literacy

- **Vocabulary Development:** Use as a during-reading strategy while covering the terminology and component section of ILM (pp. 3-21).

<table>
<thead>
<tr>
<th>Term/Component</th>
<th>Visual Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heel and Toe</td>
<td>Draw image here (could be multiple examples)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Definition/Function</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Toe: the end of the shoe closest to the applying force.</td>
<td></td>
</tr>
<tr>
<td>Heel: the end of the shoe closest to the anchor.</td>
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</tbody>
</table>

- **Jigsaw:** Break into groups. Each group will be assigned one of the major components of a drum brake system. Each group must study, summarize, and report on that particular component. The summary must include a written overview of the function and operation of the component, as well as any relevant drawings or illustrations. Share this information with the other groups to create a study guide for this section of the ILM (pp. 9-21).

Resources

**Texts / Teacher Resources**
Alberta Module 090105c
*Drum Brake Systems*  
pp. 2-25

**Software / Databases**
CDX Global

StudentsAchieve (SAS)  
AUT801B/Drum Brakes
Drum Brake Systems (~8 hours Classroom Component)
SCO 15. Students will be able to service and repair drum brake systems.

**SCO - Delineations**

_Students will be expected to_

**15.2 service, adjust, and repair drum brake systems**

**Student Knowledge, Abilities, and Competencies**

*Topic: Service*

- Demonstrate an understanding of the safety precautions that must be practised while servicing and repairing brake systems.
- Demonstrate the proper procedure for marking and removing brake drums.
- Demonstrate the proper procedure for cleaning, inspecting, and measuring brake drums.
- Explain the procedure used to machine a brake drum.
- Demonstrate the proper procedure for disassembling the brake shoes and hardware.
- Demonstrate the procedure for servicing or replacing wheel cylinders.
- Demonstrate the procedures for cleaning, inspecting, and replacing the backing plate.
- Demonstrate the procedures for inspecting and evaluating brake shoe condition.
- Demonstrate the proper procedures for replacing brake shoes, and for servicing and installing brake hardware.
- Demonstrate the proper procedure for installing brake drums.
Drum Brake Systems (~8 hours Classroom Component)

SCO 15. Students will be able to service and repair drum brake systems.

**Teacher Lessons / Demonstrations**

*Topic: Service*

- Review safety precautions to consider when working on brake systems.  
  **Note. The following demonstrations should be delivered to small groups. It would be a good idea to do these demonstrations while other students are working on the jigsaw or other theory assignments.**

- Demonstrate proper cleaning of brakes and disposal of brake dust.
- Demonstrate the removal of the brake drum from a shop vehicle.
- Demonstrate proper cleaning and inspection of a brake drum.
- Review the procedure for machining a drum.
- Demonstrate proper procedures for servicing, inspecting and cleaning the backing plate and other components.
- *CDX*: Demonstrate the procedure for replacing worn liners and inspecting wheel cylinders.

**Student Activities / Assessments**

- Remove a wheel drum, identify each component, and rebuild the drum on either a shop vehicle or training board.
- Take apart and rebuild a wheel cylinder.
- Perform a brake inspection on a shop vehicle.
- Install/replace brake linings on shop vehicles or mock-ups.
- *CDX*: Complete the following tasksheets:  
  - C246—inspect and measure brake drums  
  - C248—remove, clean, and inspect drum brake components  
  - C249—Remove and inspect drum brake wheel cylinders

**Resources**

**Texts / Teacher Resources**

Alberta Module 090105c  
*Drum Brake Systems*  
pp. 26-42

**Software / Databases**

*CDX* Global

*StudentsAchieve (SAS)*  
AUT801B/Drum Brakes
Drum Brake Systems (~8 hours Classroom Component)
SCO 15. Students will be able to service and repair drum brake systems.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
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<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>Topic: Parking Brake</strong></td>
</tr>
</tbody>
</table>
| 15.3 explain the construction and design features of drum-type parking brake systems | - Identify the parking brake assembly components.  
- Demonstrate an understanding of the design and function of the parking brake assembly. |
| 15.4 service, adjust, and repair drum-type parking brake systems | **Topic: Parking Brake Service** |
| | - Demonstrate the proper procedures for removing and replacing parking brake cables.  
- Demonstrate the proper procedure for adjusting brake cables. |
Drum Brake Systems (~8 hours Classroom Component)
SCO 15. Students will be able to service and repair drum brake systems.

**Teacher Lessons / Demonstrations**

*Topic: Parking Brake*
- Put a vehicle on a hoist and ID the components of a parking brake system.
- Create visuals from the ILM to help explain the function and operation of the parking brake.

*Topic: Parking Brake Service*
- Demonstrate how to inspect, adjust, and replace parking brake cables.

**Student Activities / Assessments**

- *Component ID:* Identify all parking brake components on a shop vehicle.
- *CDX:* Complete tasksheet C250—parking brake service.
- Perform an inspection of a parking brake to determine whether any service is required
- Service parking brakes.

**Resources**

*Texts / Teacher Resources*
Alberta Module 090105c
*Drum Brake Systems*
pp. 43-49

*Software / Databases*
CDX Global

StudentsAchieve (SAS)
AUT801B/Drum Brakes
Disc Brake Systems
(~8 hours Classroom Component)

Introduction
Disc brakes are used on almost every vehicle on the road today. The apprentice must be able to service, diagnose, and repair these systems, maintaining them to the manufacturer’s specifications. Careful attention to detail is essential to ensure effective functioning of the disc brake system.

Specific Curriculum Outcome

16. Students will be able to service and repair disc brake systems.

SCO - Delineations
Students will be expected to
16.1 explain the construction, operation, and design features of disc brake systems
16.2 service and repair disc brake systems
16.3 explain the construction and operation of disc-type parking brake systems
16.4 service, adjust, and repair disc-type parking brake systems

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 090105d, Disc Brake Systems
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)
Disc Brake Systems (~8 hours Classroom Component)
SCO 16. Students will be able to service and repair disc brake systems.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>16.1</strong> explain the construction, operation, and design features of disc brake systems</td>
<td><strong>Topic: Disc Brakes</strong></td>
</tr>
<tr>
<td></td>
<td>• Explain the advantages of disc brakes over drum brakes.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate an understanding of the basic design, construction, and operation of disc brakes.</td>
</tr>
<tr>
<td></td>
<td>• Identify the components of a disc brake system.</td>
</tr>
<tr>
<td></td>
<td>• Explain the design and construction of calipers.</td>
</tr>
<tr>
<td></td>
<td>• Demonstrate an understanding of the basic operation of the disc calipers in applied and released modes.</td>
</tr>
<tr>
<td></td>
<td>• Compare and contrast the difference between fixed and floating calipers.</td>
</tr>
<tr>
<td></td>
<td>• Describe how a caliper is mounted.</td>
</tr>
<tr>
<td></td>
<td>• Identify the components of the caliper and brake pad.</td>
</tr>
<tr>
<td></td>
<td>• Identify and analyse brake pad wear problems.</td>
</tr>
</tbody>
</table>
Disc Brake Systems (~8 hours Classroom Component)
SCO 16. Students will be able to service and repair disc brake systems.

Teacher Lessons / Demonstration

Topic: Disc Brakes
- Lead a class discussion on the function and operation of disc brakes.
- Compare the function of a fixed caliper and a floating caliper.
- CDX: Review material under the “Brakes” menu that relates to disc brakes.
- Component ID: With small groups of students, identify the components of the disc brake system on a shop vehicle.
- To help with component ID, create a slide show or overhead transparencies from the graphics found in the ILM.

Student Activities / Assessments

- Complete a matching activity comparing the parts of a disc brake system and the functions of the parts.
- Component ID: Identify disc brake components on a shop vehicle and/or training board.
- Identify various types of wear on brake pads.

Literacy

- Vocabulary Development: Use as a during-reading strategy while covering terminology and component section of ILM (pp. 2-19).

- Jigsaw: Break into groups. Each group will be assigned one section from the first 20 pages of the ILM. Each group must study, summarize, and report on that particular section. The summary must include a written overview as well as any relevant drawings or illustrations. Share this information with the other groups to create a study guide for this section of the ILM (pp. 2-19).

Resources

Texts / Teacher Resources
Alberta Module 090105d
Disc Brake Systems
pp. 2-19

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801B/Disc Brakes
Disc Brake Systems (~8 hours Classroom Component)
SCO 16. Students will be able to service and repair disc brake systems.

SCO - Delineations

Students will be expected to

16.2 service and repair disc brake systems

Student Knowledge, Abilities, and Competencies

Topic: Service

- Demonstrate the ability to inspect brake pads and diagnose any problems.
- List six reasons to replace brake pads.
- Demonstrate the ability to inspect brake calipers and diagnose any problems.
- Demonstrate the proper procedure used to bleed and remove brake calipers.
- Demonstrate the ability to service, repair, or rebuild a caliper.
- Demonstrate the ability to examine the brake disc condition to ensure that it meets the manufacturer’s specifications.
- List reasons to resurface or replace a brake disc.
- Test a brake disc for runout, and measure thickness.
- List things to consider in machining or replacing a disc.
- Demonstrate an understanding of the procedure used to machine a brake disc.
Disc Brake Systems (~8 hours Classroom Component)
SCO 16. Students will be able to service and repair disc brake systems.

Teacher Lessons / Demonstration

**Topic: Service**
- Review safety precautions to consider when working on brake systems.
  **Note. The following demonstrations should be delivered to small groups. It would be a good idea to do these demonstrations while other students are working on the jigsaw or other theory assignments**
- Demonstrate proper procedures for inspecting and replacing brake pads.
- Lead a class discussion on the need for quality brake pads.
- Demonstrate proper procedures for servicing, inspecting, and replacing calipers.
- Demonstrate proper procedures for servicing, inspecting, and replacing discs.
- Demonstrate procedure for checking runout and parallelism.
- Review the procedure for machining a disc.
- CDX: Demonstrate the procedure for checking and replacing brake pads.

Student Activities / Assessments

- Install and inspect brake pads.
- Disassemble and reassemble a brake caliper.
- Check for runout and parallelism.
- Perform brake inspections on shop vehicles.
- Install/replace/adjust brake pads/shoes on shop vehicles.
- CDX: Complete the following tasksheets:
  - C253—remove and inspect brake calipers
  - C254—clean and inspect brake caliper mounting and slides
  - C255—remove and inspect brake pads
  - C259—remove and install disc brake router

Numeracy
- Complete a worksheet on measurements of the thickness of the rotors, pads, etc.

Resources

**Texts / Teacher Resources**
Alberta Module 090105d
Disc Brake Systems
pp. 20-40

**Software / Database**
CDX Global

StudentsAchieve (SAS)
AUT801B/Disc Brakes
Disc Brake Systems (≈8 hours Classroom Component)
SCO 16. Students will be able to service and repair disc brake systems.

SCO - Delineations

Students will be expected to

16.3 explain the construction and operation of disc-type parking brake systems

16.4 service, adjust, and repair disc-type parking brake systems

Student Knowledge, Abilities, and Competencies

Topic: Parking Brake

- Describe the two types of parking brakes employed on disc brake systems.
- Identify the components of a drum-in-hat parking brake system.
- Explain the design and operation of a drum-in-hat parking brake system.
- Describe the two common types of integral parking brakes (lead-screw, ball-and-ramp).
- Identify the components of an integral parking brake.
- Explain the design and operation of an integral parking brake system.

Topic: Parking Brake Service

- Explain the procedure required to adjust a drum-in-hat parking brake system.
- Demonstrate the procedure to replace the brake shoes in a drum-in-hat parking brake system.
- Demonstrate the procedure for removing a mechanical caliper parking brake.
- List the special considerations in the removal of mechanical calipers.
- Demonstrate the installation of brake pads and calipers in an integral caliper parking brake system.
Disc Brake Systems (~8 hours Classroom Component)
SCO 16. Students will be able to service and repair disc brake systems.

Teacher Lessons / Demonstration

*Topic: Parking Brake*
- Put a vehicle on a hoist and identify the components of a parking brake system.
- Create visuals from the ILM to help explain the function and operation of both the drum-in-hat and integral parking brake systems.

*Topic: Parking Brake Service*
- Demonstrate how to adjust both the drum-in-hat and integral parking brake systems.

Student Activities / Assessments

- *Component ID:* Identify all parking brake components on a shop vehicle.
- Perform an inspection of a parking brake to determine whether any service is required.
- Service parking brakes.

Resources

*Texts / Teacher Resources*
Alberta Module 090105d
*Disc Brake Systems*
pp. 41-51

*Software / Databases*
CDX Global
StudentsAchieve (SAS)
AUT801B/Disc Brakes

*Visuals / Handouts / Tests*
Self Test
*Disc Brake Systems,* pp. 52-55
**Power Brakes**  
(~5 hours Classroom Component)

**Introduction**

Most vehicles use some form of power-assist to aid the effort applied by the driver on the brake pedal. The apprentice must understand the design and operating characteristics of power brake systems, and appreciate the safety precautions required in their service and repair.

**Specific Curriculum Outcome**

17. Students will be able to diagnose and service power brakes.

**SCO - Delineations**

*Students will be expected to*

17.1 describe the operation of vacuum-operated power brake units
17.2 describe the operation of hydraulically-operated power brake units
17.3 demonstrate a procedure for testing a power brake unit
17.4 diagnose problems related to a power brake

**Assessment Strategies**

- Paper/Pencil
- Self/Peer-Assessments
- Skills Performance
- Teacher Observation
- Career Portfolio

**Resources**

- Alberta Module 090105e, *Power Brakes*
- CDX Global
- StudentsAchieve (http://sas.edu.pe.ca)
Power Brakes (~5 hours Classroom Component)

SCO 17. Students will be able to diagnose and service power brakes.

SCO - Delineations

Students will be expected to

17.1 describe the operation of vacuum-operated power brake units

17.2 describe the operation of hydraulically-operated power brake units

Student Knowledge, Abilities, and Competencies

Topic: Vacuum Operation
- Demonstrate an understanding of the principle of operation of a vacuum brake booster.
- List the principle applications of a vacuum booster.
- Identify the components in a vacuum-suspended brake booster system.
- Explain the operation of the vacuum suspended booster in the released, applied, and holding positions.

Topic: Hydraulic Power Brakes
- Demonstrate an understanding of the principle of operation of a hydraulic brake booster.
- List the principle applications of a hydraulic brake booster.
- Identify the components of a hydraulic booster system.
- Explain the stages of operation of the hydraulic brake booster in the unapplied, applied, holding, and released positions.
- Describe the role of the accumulator.
Power Brakes (-5 hours Classroom Component)
SCO 17. Students will be able to diagnose and service power brakes.

Teacher Lessons / Demonstrations

Topic: Vacuum Operation
• Create a slideshow on the components and operation of power brakes.
• Demonstrate the function and operation of power brakes on training board and/or shop car.

Topic: Hydraulic Power Brakes
• Introduce the concept of a hydraulic booster system.

Literacy
• Anticipation Guide: Use as a pre-reading strategy to support the reading in the ILM.

Numeracy
• Develop a 7-Step math-enhanced lesson on braking pressures and working with formulas. (Refer to 701A - Communication for 7-step model)

Student Activities / Assessments
• Vocabulary Development: Use as a during-reading strategy for pp. 4-23.

<table>
<thead>
<tr>
<th>Term/Component</th>
<th>Visual Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Rods</td>
<td>Draw image here (could be multiple examples)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Definition/Function</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Rod: connected to the brake pedal</td>
<td></td>
</tr>
<tr>
<td>Output Rod: connected to the diaphragm/power piston</td>
<td></td>
</tr>
</tbody>
</table>
Power Brakes (~5 hours Classroom Component)

SCO 17. Students will be able to diagnose and service power brakes.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
</table>
| **17.3** demonstrate a procedure for testing a power brake unit | **Topic: Testing**
| | Vacuum-Assist Power Brake Units
| | • List the two common causes of vacuum-assist power brake problems.
| | • List the items to check prior to testing the booster unit.
| | • Demonstrate the procedure used to perform a booster function test.
| | • Demonstrate the procedure used to perform an unapplied leakage test.
| | • Demonstrate the procedure used to perform an applied leakage test.
| | Hydraulic-Assist Power Brake Units
| | • List the items to check prior to testing the hydraulic-assist power brake unit.
| | • Demonstrate the procedure used to perform a pedal drop test.
| | • Describe the procedure used to perform an accumulator test. |
| **17.4** diagnose problems related to a power brake | **Topic: Diagnosis**
| | Troubleshooting Vacuum-Assist Power Brake Units
| | • List four indications of a defective booster.
| | • Describe the steps required to remove a vacuum-assist booster.
| | • Describe the procedure used to adjust the pushrod length in a new booster.
| | • Describe the steps required to install a new brake booster.
| | Troubleshooting Hydraulic-Assist Power Brake Units
| | • List five possible problems exterior to the hydraulic booster that may affect booster performance.
| | • Demonstrate the procedure used to test the power steering pump.
| | • Identify seal leaks and diagnose the required repair.
| | • List problems that would cause a hard pedal or lack of power-assist.
| | • List possible causes of slow pedal return.
| | • List three likely causes of chatter or vibration in the pedal or booster.
| | • List two causes of “grabby” brakes. |
Power Brakes (~5 hours Classroom Component)
SCO 17. Students will be able to diagnose and service power brakes.

Teacher Lessons / Demonstrations

*Topic: Testing*
- Demonstrate the proper procedures to follow when performing the tests listed in column 2.

*Topic: Diagnosis*
- Demonstrate the proper procedures to follow when performing the tests listed in column 2.

Student Activities / Assessments

- Perform the following tests:
  - function test
  - unapplied leakage test
  - applied leakage test
  - pedal drop test
  - accumulator test
  - seal leaks

  *ALLDATA*: Confirm manufacture specifications for the above tests.

Resources

**Texts / Teacher Resources**
Alberta Module 090105e
*Power Brakes*
p. 25-32

**Software / Databases**
CDX Global

StudentsAchieve (SAS)
AUT801B/Drum Brakes

**Visuals / Handouts / Tests**
Self Test
*Power Brakes*, pp. 33-36
Brake Systems Diagnosis and Service
(~4 hours Classroom Component)

Introduction
Brakes are one of the most fundamental safety systems on a vehicle. The apprentice must be able to diagnose problems accurately and efficiently, maintaining the braking system to the original manufacturer's specifications.

Specific Curriculum Outcome
18. Students will be able to service, repair, and diagnose problems related to brake systems.

SCO - Delineations
Students will be expected to
18.1 demonstrate brake flushing and bleeding procedures on brake systems
18.2 diagnose problems related to brake systems

Assessment Strategies
Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources
Alberta Module 090105f, Brake System Diagnosis and Service
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)
Brake Systems Diagnosis and Service (~4 hours Classroom Component)
SCO 18. Students will be able to service, repair, and diagnose problems related to brake systems.

SCO - Delineations

Students will be expected to

18.1 demonstrate brake flushing and bleeding procedures on brake systems

Student Knowledge, Abilities, and Competencies

Topic: Brake Flushing and Bleeding

• Demonstrate the ability to follow the procedure to check the brake fluid level.
• Inspect brake fluid for contamination.
• List reasons for flushing a brake system.
• Explain the need to bleed brake systems.
• List four methods of bleeding or flushing the brake system.
• Demonstrate the use of appropriate safety equipment and proper preparation of the vehicle.
• Demonstrate the freeing, removal, and cleaning of the bleed screws.
• Interpret manufacturer’s specifications to select the proper brake fluid.
• Demonstrate the ability to follow the procedure for bleeding and collecting the used brake fluid.
• Dispose of the fluid in a proper manner.
• Demonstrate the ability to follow the proper sequence for bleeding the system.
• Practise special considerations when dealing with anti-lock brake systems (ABS)—consulting with manufacturer’s specifications.
• Demonstrate the gravity bleed technique and list the advantages and limitations of this method.
• Demonstrate the manual bleed technique and list the advantages and limitations of this method.
• Describe the procedure for pressure bleeding and list the advantages and limitations.
• Describe the procedure for vacuum bleeding and list the advantages and limitations.
Brake Systems Diagnosis and Service (~4 hours Classroom Component)
SCO 18. Students will be able to service, repair, and diagnose problems related to brake systems.

Teacher Lessons / Demonstrations

Topic: Brake Flushing and Bleeding
- Lead a class discussion on the flushing of a brake system (based on responses from an anticipation guide or similar activity).
- Demonstrate proper service, handling, and disposal of brake fluids.
- Demonstrate gravity, manual and vacuum bleeding procedures on a shop vehicle.

Literacy
- Anticipation Guide: Use as a pre-reading strategy for this section of the ILM.

Student Activities / Assessments
- ALLDATA: Consult manufacturer’s specifications for the proper procedures for bleeding brakes on a variety of vehicles.
- Perform a brake bleeding procedure on a shop vehicle.
- Properly handle and dispose of brake fluids.

Resources

Texts / Teacher Resources
Alberta Module 090105f
Brake Systems Diagnosis and Service
pp. 2-14

Software / Databases
CDX Global
StudentsAchieve (SAS)
AUT801B/Brake System Diagnosis and Service
Brake Systems Diagnosis and Service (~4 hours Classroom Component)
SCO 18. Students will be able to service, repair, and diagnose problems related to brake systems.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>18.2 diagnose problems related to brake systems</strong></td>
<td><strong>Topic: Diagnosis</strong></td>
</tr>
<tr>
<td>Students will be expected to</td>
<td>- Describe how to prepare for a road test.</td>
</tr>
<tr>
<td></td>
<td>- List problems you may diagnose by testing the pedal feel.</td>
</tr>
<tr>
<td></td>
<td>- Identify things to check during a road test.</td>
</tr>
<tr>
<td></td>
<td>- List possible diagnoses that could be made by listening to brake noises.</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate an understanding of the process used to check for vibration/pulsation problems.</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate an understanding of the process used to diagnose brake-pull problems.</td>
</tr>
<tr>
<td></td>
<td>- Evaluate vehicle braking efficiency and ABS operation.</td>
</tr>
<tr>
<td></td>
<td>- Analyse observed symptoms to create a diagnostic plan.</td>
</tr>
<tr>
<td></td>
<td>- Consult manufacturer’s information bulletins, service manuals, and on-line technical support.</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate procedures used to disassemble and inspect brake components.</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate the proper procedures used to repair or replace faulty components, using approved parts and methods.</td>
</tr>
<tr>
<td></td>
<td>- Verify proper operation of the braking system.</td>
</tr>
<tr>
<td></td>
<td>- Demonstrate an understanding of safety precautions required in the service and repair of brake systems, and the legal implications of not taking safety precautions.</td>
</tr>
</tbody>
</table>
Brake Systems Diagnosis and Service (~4 hours Classroom Component)
SCO 18. Students will be able to service, repair, and diagnose problems related to brake systems.

Teacher Lessons / Demonstrations

Topic: Diagnosis
• Review road test procedures.

Literacy
• Anticipation Guide: Use as a pre-reading strategy for this section of the ILM.

Student Activities / Assessments
• Create a diagnostic plan for a vehicle with brake problems.
• ALLDATA: Consult manufacture specifications to confirm/support a diagnostic plan.

Resources

Texts / Teacher Resources
Alberta Module 090105f
Brake Systems Diagnosis and Service
pp. 15-21

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801B/Brake System Diagnosis and Service

Visuals / Handouts / Tests
Self Test
Brake Systems Diagnosis and Service,
pp. 22-23
Anti Lock Brake Systems
(~8 hours Classroom Component)

Introduction

Anti-lock brake systems are designed to prevent wheel lock and maintain vehicle steering and stability while performing braking operations during emergency situations. Most vehicles produced today come equipped with standard ABS brakes, and it is therefore important to understand how to correctly diagnose and repair both the electrical and hydraulic components of an ABS system.

Specific Curriculum Outcome

19. Students will be able to diagnose and service anti-lock brake systems.

SCO - Delineations

Students will be expected to

19.1 identify basic ABS components
19.2 explain the operation of an ABS system
19.3 demonstrate a brake bleeding procedures for an ABS system
19.4 demonstrate a diagnostic procedure for an ABS system

Assessment Strategies

Paper/Pencil
Self/Peer-Assessments
Skills Performance
Teacher Observation
Career Portfolio

Resources

Alberta Module 090105g, Anti-lock Brake Systems
CDX Global
StudentsAchieve (http://sas.edu.pe.ca)
Anti-lock Brake Systems (-8 hours Classroom Component)
SCO 19. Students will be able to diagnose and service anti-lock brake systems.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>Topic: Components</strong></td>
</tr>
<tr>
<td>19.1 identify basic ABS components</td>
<td>• State the purpose of an ABS brake system.</td>
</tr>
<tr>
<td></td>
<td>• Describe the effects of wheel lock-up on the directional control of a vehicle.</td>
</tr>
<tr>
<td></td>
<td>• Describe the benefits of ABS as related to braking distances.</td>
</tr>
<tr>
<td></td>
<td>• Define “tire slip”.</td>
</tr>
<tr>
<td></td>
<td>• Describe factors that affect tire slip, and explain how to control tire slip.</td>
</tr>
<tr>
<td></td>
<td>• Describe the basic components of an ABS system.</td>
</tr>
<tr>
<td></td>
<td>• Describe integral and add-on ABS systems.</td>
</tr>
<tr>
<td></td>
<td>• Describe the function and operation of the control channels.</td>
</tr>
<tr>
<td></td>
<td>• Describe the function and operation of the wheel speed sensors.</td>
</tr>
<tr>
<td></td>
<td>• Describe the function and operation of the hydraulic and electrical control units.</td>
</tr>
<tr>
<td>19.2 explain the operation of an ABS system</td>
<td><strong>Topic: ABS Operation</strong></td>
</tr>
<tr>
<td></td>
<td>• Describe the ECU system self-test.</td>
</tr>
<tr>
<td></td>
<td>• Describe the operation of the ABS system.</td>
</tr>
<tr>
<td></td>
<td>• Describe the effects of the ABS on the brake pedal.</td>
</tr>
<tr>
<td></td>
<td>• Describe the function and operation of traction control.</td>
</tr>
</tbody>
</table>
Anti-lock Brake Systems (~8 hours Classroom Component)
SCO 19. Students will be able to diagnose and service anti-lock brake systems.

Teacher Lessons / Demonstrations

Topic: Components
- Create overhead transparencies or a slideshow of select images from the ILM graphics CD.

Topic: ABS Operation
- CDX: Show videos and related information related to anti-lock brakes.

Literacy
- Anticipation Guide: Use as a pre-reading strategy for this section of the ILM.

Student Activities / Assessments
- Label diagrams related to anti-lock brakes.

Resources

Texts /Teacher Resources
Alberta Module 090105g
Anti-lock Brake Systems
pp. 2-19

Software / Databases
CDX Global

StudentsAchieve (SAS)
AUT801B/Anti-lock Brake Systems
Anti-lock Brake Systems (~8 hours Classroom Component)

SCO 19. Students will be able to diagnose and service anti-lock brake systems.

<table>
<thead>
<tr>
<th>SCO - Delineations</th>
<th>Student Knowledge, Abilities, and Competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students will be expected to</strong></td>
<td><strong>Topic: Bleeding Procedures</strong></td>
</tr>
<tr>
<td>19.3 demonstrate a brake bleeding procedure for an ABS system</td>
<td>• Demonstrate the ability to use safety precautions while performing a bleeding or flushing procedure.</td>
</tr>
<tr>
<td>19.4 demonstrate a diagnostic procedure for an ABS system</td>
<td>• Demonstrate the ability to follow proper brake bleeding procedures.</td>
</tr>
<tr>
<td></td>
<td><strong>Topic: Diagnosis</strong></td>
</tr>
<tr>
<td></td>
<td>• Perform diagnostic pre-checks.</td>
</tr>
<tr>
<td></td>
<td>• Describe the critical guidelines to follow when servicing ABS systems.</td>
</tr>
<tr>
<td></td>
<td>• Describe the ABS diagnostic procedure as outlined in service manuals.</td>
</tr>
</tbody>
</table>
Anti-lock Brake Systems (~8 hours Classroom Component)
SCO 19. Students will be able to diagnose and service anti-lock brake systems.

### Teacher Lessons / Demonstrations

**Topic: Bleeding Procedures**
- Demonstrate proper bleeding procedures.

**Topic: Diagnosis**
- Demonstrate how to perform a diagnostic system check.

### Student Activities / Assessments

- Perform a brake bleeding operation.
- **ALLDATA:** Locate manufacturer’s specifications related to ABS diagnostic system checks for shop vehicles.
- Perform diagnostic system checks on an ABS system.

### Resources

**Texts / Teacher Resources**
- Alberta Module 090105g
  - *Anti-lock Brake Systems*
  - pp. 20-24

**Software / Databases**
- CDX Global
- StudentsAchieve (SAS)
  - AUT801B/Anti-lock Brake Systems