

# Automotive Service Technician Level 4

## Automotive Service Technician

**Unit:** D1 Journeyperson Trainer

**Level:** Four

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

Level 1 in-school technical training offers an entry-level orientation to the challenges of apprenticeship training as it relates to the development of core tasks and skill requirements, as well as social competencies. This unit introduces senior apprentices to the responsibilities of workplace training that they will assume as supervising journeypersons. Most trades have a rich tradition of refreshing and sharing their trade skills from one generation of trade practitioner to the next. This unit orients senior apprentices to some of the practical and conceptual tools that can enable them to contribute to this trade heritage when they become certified journeypersons and, ultimately, journeyperson trainers.

The journeyperson's obligation to assist entry-level apprentices to develop skills and knowledge is complex and challenging. It involves safety considerations, employer expectations, provincial regulations, as well as the tradition of skills stewardship that links modern practice with the long history of workplace teaching and learning that defines the apprenticeable trades. The ability to offer timely and appropriate support to apprentices is itself an important area of trade learning. This unit presents material intended to help refine this ability through reflection and discussion by senior apprentices, and discussion with their in-school instructor and journeyperson trainer.

This content reflects Manitoba and Canadian standards prescribed for journeyperson-level supervisory capabilities, as well as key topics in current research on the importance of workplace training in apprenticeship systems. These detailed descriptors represent suggested focal points or guidelines for potentially worthwhile exploration, and are neither mandatory nor exhaustive.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Compare/contrast role-options and responsibilities of the supervising journeyperson.</b>	<b>50%</b>
a. Implicit vs. explicit standards and content: training goals are/are not codified; assessment measures are/are not used	
b. Accountability for results: e.g. journeyperson is/is not required to prepare performance evaluation that could affect apprentice's employability or wage-rate, etc.	
c. Long-term vs. short-term supervision assignments – e.g., considerable latitude/little latitude for apprentice to learn from mistakes	
d. Formally vs. informally structured – e.g. supervision assignment is part of a prescribed cycle of assignments involving coordination among multiple journeypersons; apprentice is trained according to an individual training plan negotiated with employer	
e. Types of supervisory role options and what is implied by each:	
• Journeyperson Trainer (JT) role: often initiated by someone other than apprentice, and limited to a particular skill set, task, or production requirement	
• Mentor role: often initiated by apprentice, and relatively open-ended regarding content, duration, etc.	

- Peer role: typically involves individual upgrading or cross-training of one journeyperson by another; can include senior apprentice assisting less-experienced trade learner
- Coordinator role: often a senior-level journeyperson appointed by an organization to assume responsibilities for monitoring progression of groups of apprentices
- Other roles: may be improvised by journeyperson, such as combination or multiple roles of the above

**2. Describe and demonstrate common requirements about providing journeyperson level supervision. 50%**

- Apprenticeship learning adapted to journeyperson supervision assignments and a journeyperson perspective
  - Application of adult education concepts to trades teaching and learning (e.g. responsibilities and expectations of senior-level apprentices)
  - Practical significance of 'styles' of adult learning and teaching
  - Helping senior-level apprentices integrate in-school technical training and on-the-job practical training experiences
  - Providing help and guidance about new tasks and skills
  - Providing help and guidance about fixing mistakes
  - Learning and teaching "the ropes" – socialization of apprentice within a community of trade practice (e.g. how to borrow a tool, interrupt a journeyperson, and seek advice of experienced co-workers)
  - Coverage and documentation of prescribed tasks and subtasks where applicable.
  - Discuss the limits of the journeyperson trainers' own responsibilities and competence (e.g. scope, willingness to train, etc.)
  - Benefits of maintaining a personal record of achievements, ideas, and needs as a journeyperson trainer (e.g. resume, portfolio, training credentials, logbook, etc.)
- Individual reflection and guided group discussion about personal experiences of workplace learning as an apprentice
  - Identification of best and worst practices of journeyperson trainer
  - Identification of workplace and other factors that can contribute to good and bad trades teaching/learning experiences
  - Development of professional standards and work ethics about responsibility to share one's knowledge and skill with others in the workplace (e.g., use/misuse of humour, rigour, discretion, craft-pride, etc.)
  - Qualities of a good journeyperson trainer
  - Components of workplace journeyperson training
  - Processes and recommended practices re: journeyperson training
  - Troubleshooting problems re: supervision assignments
- Role of assessment in supervising, coaching, or guiding other people to learn or improve their skills (e.g. formative and summative evaluation), and how this might contribute to how the journeyperson-level supervision task is approached in future
- Compare and contrast discussion results with current knowledge and resources about workplace training methods as they apply to journeyperson-level supervision assignments
- Other (as may be specified by instructor)

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## Automotive Service Technician

**Unit:** D2 Instrumentation and Information Displays and Entertainment Systems

**Level:** Four

**Duration:** 14 hours

Theory: 7 hours

Practical: 7 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about instrumentation and information displays when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers types of instrumentation systems and information displays, and their components and operation; the unit also covers the procedures used to adjust, diagnose, repair and replace instrumentation and information displays, and their related components.

<b>Objectives and Content:</b>	<b>Percent of Unit Mark (%)</b>
1. Define terminology associated with instrumentation and information displays, and entertainment systems.	10%
2. Identify hazards and describe safe work practices pertaining to instrumentation and information displays, and entertainment systems. a. Fuel tank b. Restraint systems	10%
3. Identify tools and equipment relating to instrumentation and information displays, and entertainment systems, and describe their applications and procedures for use.	5%
4. Identify types of instrumentation and information displays, and entertainment systems, and describe their components and operation.	30%
5. Identify types of instrumentation and information displays, and entertainment systems, and describe their purpose and operation.	30%
6. Describe the procedures used to diagnose and repair instrumentation and information displays, and entertainment systems.	15%

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## Automotive Service Technician

**Unit:** D3 Advanced 4WD/AWD Systems

**Level:** Four

**Duration:** 21 hours

Theory: 14 hours

Practical: 7 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about advanced 4WD/AWD systems when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers 4WD/AWD systems and their components, operation, power flow, and gear ratios. Finally, the unit will cover the procedures to diagnose, adjust, repair and replace 4WD/AWD systems and their related components.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with advanced 4WD/AWD systems.	10%
2. Identify hazards and describe safe work practices pertaining to advanced 4WD/AWD systems.	5%
3. Identify tools and equipment relating to advanced 4WD/AWD systems, and describe their applications and procedures for use.	10%
4. Identify types of advanced 4WD/AWD systems and describe their components and operation.	25%
5. Explain power flow and gear ratios as they relate to advanced 4WD/AWD systems.	10%
6. Identify types of lubricants, fasteners, gaskets, seals and sealants and describe their applications.	5%
7. Describe the procedures used to diagnose advanced 4WD/AWD systems.	15%
8. Describe and demonstrate the procedures used to adjust, repair and/or replace advanced 4WD/AWD systems, and their related components.	20%

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## Automotive Service Technician

**Unit:** D4 Diesel Engine Support Systems

**Level:** Four

**Duration:** 28 hours

Theory: 24 hours

Practical: 4 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about diesel fuel injection systems when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers types of diesel fuel injection systems and their components; the unit also covers the procedures used to adjust, diagnose, repair and replace diesel fuel injection systems and their components.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. <b>Define terminology associated with diesel fuel injection and emission control systems.</b>	<b>10%</b>
2. <b>Identify hazards and describe safe work practices pertaining to diesel fuel injection and emission control systems.</b>	<b>5%</b>
a. High pressure	
b. High amperage/voltage	
c. Emergency shut-off	
3. <b>Identify tools and equipment relating to diesel fuel injection and emission control systems, and describe their applications and procedures for use.</b>	<b>5%</b>
4. <b>Identify types of diesel fuel injection systems and describe their components and operation.</b>	<b>30%</b>
a. Electronic	
b. Mechanical	
5. <b>Identify diesel emission control systems and their components and operation.</b>	<b>15%</b>
a. Particulate filter	
b. Diesel exhaust fluid (DEF)	
c. Exhaust gas recirculation (EGR)	
6. <b>Identify types of tubing, hoses, gaskets, seals and sealants and describe their applications.</b>	<b>5%</b>
7. <b>Identify types of cold start systems such as pre-heaters, and describe their purpose and operation.</b>	<b>5%</b>

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|---|------------|
| <b>8. Identify methods to test diesel fuel quality and describe their associated procedures.</b>                | <b>5%</b>  |
| <b>9. Describe and demonstrate the procedures used to diagnose and repair diesel fuel injection systems.</b>    | <b>10%</b> |
| a. Adjustment procedures  |            |
| b. Component replacement  |            |
| <b>10. Describe and demonstrate the procedures used to diagnose and repair diesel emission control systems.</b> | <b>10%</b> |

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## Automotive Service Technician

**Unit:** D5 Automatic Transmissions and Transaxles

**Level:** Four

**Duration:** 42 hours

Theory: 21 hours

Practical: 21 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about automatic transmissions and transaxles when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers types of automatic transmissions and transaxles, and their components and operation; the unit also covers the procedures used to adjust, diagnose, repair and replace automatic transmissions and transaxles, and their related components.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with automatic transmissions and transaxles.	10%
2. Identify hazards and describe safe work practices pertaining to automatic transmissions and transaxles.	5%
3. Identify tools and equipment relating to automatic transmissions and transaxles and describe their applications and procedures for use.	10%
4. Identify types of automatic transmissions and transaxles and describe their components and operation. a. Electrically controlled b. Hydraulically controlled c. Constant variable transmission (CVT)	30%
5. Explain hydraulic principles related to automatic transmissions and transaxles. a. Pascal's law b. Power flow c. Schematics • Electric • Hydraulic d. Gear ratios	10%
6. Identify types of lubricants, fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.	5%
7. Describe and demonstrate the procedures used to diagnose and repair automatic transmissions and transaxles.	30%



- a. Adjustment procedures
- b. Component replacement

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## Automotive Service Technician

**Unit: D6 Heating, Ventilation and Air Conditioning Systems**

**Level:** Four

**Duration:** 42 hours

Theory: 28 hours

Practical: 14 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about heating, ventilation and air conditioning (HVAC) systems when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers the principles of the refrigeration cycle, types of heating and refrigeration systems, types of HVAC systems and their components and operation; the unit also covers the procedures used to adjust, diagnose, repair and replace HVAC systems and related components.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<b>1. Define terminology associated with HVAC systems.</b>	<b>10%</b>
<b>2. Identify hazards and describe safe work practices pertaining to HVAC systems.</b>	<b>5%</b>
a. Personal	
b. Shop/facility	
c. Environmental	
d. Jurisdictional refrigerant handling training	
<b>3. Identify tools and equipment relating to HVAC systems and describe their applications and procedures for use.</b>	<b>10%</b>
<b>4. Explain the principles of the refrigeration cycle.</b>	<b>10%</b>
<b>5. Identify types of HVAC heating systems and describe their components and operation.</b>	<b>35%</b>
a. Heating systems	
b. Refrigeration systems	
• Orifice tube	
• Thermal expansion valve	
• Refrigerants and lubricants	
c. Climate control	
• Manual	
• Automatic	
<b>6. Identify types of fasteners, tubing, hoses, gaskets, seals and sealants and describe their applications.</b>	<b>5%</b>

7. Describe and demonstrate the procedures used to identify, recover, evacuate and recharge refrigerant systems. 15%
8. Describe and demonstrate the procedures used to diagnose and repair HVAC systems. 10%

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## Automotive Service Technician

**Unit:** D7 Restraint Systems

**Level:** Four

**Duration:** 14 hours

Theory: 10 hours

Practical: 4 hours

### Overview:

This unit is designed to provide the apprentice with the knowledge about restraint systems when working with today's automotive vehicles and light trucks. Beginning with terminology and safe work practices, the unit covers types of restraint systems and their components; the unit also covers the procedures used to adjust, diagnose, repair and replace restraint systems and their components.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with restraint systems.	10%
2. Identify hazards and describe safe work practices related to restraint systems. a. Handling b. Disposal	10%
3. Identify types of tools and equipment relating to restraint systems and describe their applications and procedures for use.	10%
4. Identify types of restraint systems and describe their components and operation. a. Active systems b. Passive systems c. Collapsible steering column	40%
5. Identify types of restraint system warning indicators and describe their purpose.	5%
6. Describe and demonstrate the procedures used to diagnose and repair restraint systems. a. Adjustment procedures b. Component replacement	25%

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## Automotive Service Technician

**Unit:** D8 Hybrid and Electric Vehicle Systems

**Level:** Four

**Duration:** 35 hours

Theory: 21 hours

Practical: 14 hours

### Overview:

This unit of instruction builds on unit A13: Hybrid and Electric Vehicle Systems I and is designed to provide the Automotive Service Technician apprentice with exposure to hybrid and electric vehicle systems, including their components and their operation, in current-generation hybrid vehicles.

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
1. Define terminology associated with hybrid and electric vehicle systems.	10%
2. Identify hazards and describe safe work practices pertaining to hybrid and electric vehicle systems.	5%
3. Identify tools and equipment relating to hybrid and electric vehicle systems, and describe their applications and procedures for use.	10%
4. Identify types of hybrid and electric vehicle systems and describe their components and operation.	25%
a. Gasoline engine	
b. Wiring and cables	
c. Hybrid control modules	
d. Driver information center/instrument panel	
e. Converters and inverters	
f. Electric motors	
g. High-voltage batteries	
5. Describe modes of operation of hybrid and electric vehicles.	25%
a. Idle shut off	
b. Lean burn	
c. Acceleration assist	
d. Full electric	
e. High voltage battery charging	
f. Vehicle towing	
g. Regenerative braking	
h. Transmissions	
i. HVAC systems for hybrid and electric vehicle applications	

- 6. Describe high voltage battery operation. 10%**
- a. Dual-voltage system
  - b. Disconnect procedures for different manufacturers
  - c. Re-connect procedures for different manufacturers
  - d. High voltage interrupt relays
  - e. State of charge
  - f. Battery cooling
    - Fans
    - Temperature sensors
  - g. Testing
  - h. Battery control module
  - i. Charging procedures
  - j. Boosting procedures
- 7. Describe and demonstrate the procedures used to diagnose and repair hybrid and electric vehicle systems. 15%**

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## Automotive Service Technician

**Unit:** D9 Pre-Interprovincial Review

**Level:** Four

**Duration:** 7 hours

Theory: 7 hours

Practical: 0 hours

### Overview:

This unit offers senior apprentices a systematic review of skills and knowledge required to pass the Interprovincial Examination. It promotes a purposeful personal synthesis between on-the-job learning and the content of in-school technical training. The unit includes information about the significance of Interprovincial certification and the features of the Interprovincial Examination. **Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.**

<b>Objectives and Content:</b>	<b><u>Percent of Unit Mark (%)</u></b>
<p><b>1. Describe the significance, format and general content of Interprovincial (IP) Examinations for the trade of Automotive Service Technician.</b></p> <p>a. Scope and aims of Interprovincial certification; value of certifications</p> <p>b. Obligations of candidates for Interprovincial certification</p> <ul style="list-style-type: none"> <li>• Relevance of Interprovincial Examinations to current, accepted trade practices; industry-based provincial and national validation of test items</li> <li>• Supplemental Policy (retesting)</li> <li>• Confidentiality of examination content</li> </ul> <p>c. Multiple-choice format (four-option) item format, Red Seal standards for acceptable test items</p> <p>d. Government materials relevant to the Interprovincial Examinations for apprentice Automotive Service Technicians</p> <ul style="list-style-type: none"> <li>• Red Seal Occupational Standard (RSOS); prescribed scope of the skills and knowledge which comprise the trade</li> <li>• RSOS "Pie-chart" and its relationship to content distribution of Interprovincial Examination items</li> <li>• Apprenticeship Manitoba Technical Training package.</li> </ul>	n/a
<p><b>2. Identify resources, strategies and other considerations for maximizing successful completion of written examinations.</b></p> <p>a. Personal preparedness</p> <ul style="list-style-type: none"> <li>• Rest</li> <li>• Nutrition</li> <li>• Personal study regimen</li> <li>• Prior experience in test situations (e.g., Unit Tests)</li> </ul> <p>c. Self-assessment, consultation and personal study plan</p>	n/a

- Self-assessment of individual strengths/weaknesses in trade related skills and knowledge
  - Approved textbooks
  - Study groups
3. **Review program content for performing common occupational skills.** n/a
  4. **Review program content for performing diagnoses and repairs of engine and engine support systems.** n/a
  5. **Review program content for performing diagnoses and repairs of vehicle module communications systems.** n/a
  6. **Review program content for performing diagnoses and repairs of driveline systems.** n/a
  7. **Review program content for performing diagnoses and repairs of electrical and comfort control systems.** n/a
  8. **Review program content for performing diagnoses and repairs of steering and suspension, braking, control systems, tires, hubs, and wheel bearings.** n/a
  9. **Review program content for performing diagnoses and repairs of restraint systems, body components, accessories and trim.** n/a
  10. **Review program content for performing diagnoses and repairs of hybrid and electric vehicles (EV).** n/a

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