PROGRAM OUTLINE

Automotive Service Technician (AST)
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Section 1

INTRODUCTION

Automotive Service Technician (AST)
Foreword

This revised Automotive Service Technician Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the 2016 Red Seal Occupational Standard (RSOS) and the Automotive Service Technician Occupational Analysis (2016) and British Columbia industry and instructor subject matter experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

This Program Outline includes a list of recommended reference textbooks that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

The Program Outline was prepared with the advice and assistance of the Automotive Service Technician Review Committee and will form the basis for further updating of the British Columbia Automotive Service Technician Program by the Industry Training Authority (ITA).

Competencies are to be evaluated through written exams and practical assessments. A passing grade is achieved by getting an overall mark of 70%. See the Assessment Guidelines in the Appendix for more details. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

Achievement Criteria are included for those competencies that require a practical assessment. The intent of including Achievement Criteria in the Program Outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measureable and that they reflect the skills spelled out in the competency as those required of a competent journeyperson. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the evaluation criteria.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.
Acknowledgements

Industry and Instructor Subject Matter Experts retained to assist in the development of the Occupational Analysis Chart and the Program Profile:

- Jamie Bloomfield  Okanagan College
- Dean Cadieux   Vancouver Island University
- Jeff Hoff      Napa AutoPro
- Russ Hunter   BC Institute of Technology
- Robert Kunka  Vancouver Community College
- Nic Nelson    Foreman's Integra Tire Auto Centre
- Loi Truong    Mercedes-Benz
- Matt Wilkie   Cloverdale Auto Repair

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- Russ Hunter   BC Institute of Technology
- Robert Kunka  Vancouver Community College
- Nic Nelson    Foreman's Integra Tire Auto Centre
- Loi Truong    Mercedes-Benz
- Chris Wylie    Searles Auto Repair

The Industry Training Authority would like to acknowledge the dedication and hard work of all the industry and training provider representatives appointed to identify the training requirements of the Automotive Service Technician (AST) occupation.
### How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

<table>
<thead>
<tr>
<th>Section</th>
<th>Training Providers</th>
<th>Employers/ Sponsors</th>
<th>Apprentices</th>
<th>Challengers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Credentialing Model</strong></td>
<td>Communicate program length and structure, and all pathways to completion</td>
<td>Understand the length and structure of the program</td>
<td>Understand the length and structure of the program, and pathway to completion</td>
<td>Understand challenger pathway to Certificate of Qualification</td>
</tr>
<tr>
<td><strong>OAC</strong></td>
<td>Communicate the competencies that industry has defined as representing the scope of the occupation</td>
<td>Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification</td>
<td>View the competencies they will achieve as a result of program completion</td>
<td>Understand the competencies they must demonstrate in order to challenge the program</td>
</tr>
<tr>
<td><strong>Training Topics and Suggested Time Allocation</strong></td>
<td>Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application</td>
<td>Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application</td>
<td>Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application</td>
<td>Understand the relative weightings of various competencies of the occupation on which assessment is based</td>
</tr>
<tr>
<td><strong>Program Content</strong></td>
<td>Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component</td>
<td>Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice</td>
<td>Provides detailed information on program content and performance expectations for demonstrating competency</td>
<td>Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels</td>
</tr>
<tr>
<td>Section</td>
<td>Training Providers</td>
<td>Employers/ Sponsors</td>
<td>Apprentices</td>
<td>Challengers</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------</td>
<td>---------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Training Provider Standards</strong></td>
<td>Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program</td>
<td>Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own</td>
<td>Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors</td>
<td>Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment</td>
</tr>
</tbody>
</table>

**Appendix – Glossary**

Defines program specific terminology and acronyms
Section 2

PROGRAM OVERVIEW

Automotive Service Technician (AST)
Program Credentialing Model

Apprenticeship Pathway

This graphic provides an overview of the Automotive Service Technician apprenticeship pathways.

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship
C of C = Certificate of Completion
WBT = Work-Based Training

CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of these programs:

- C of Q Truck and Transport Mechanic
  Technical Training: None
  Work-Based Training: 1,590 hours*

- C of Q Heavy Duty Equipment Technician
  Technical Training: None
  Work-Based Training: 1,590 hours*

*Individuals who are holders of both certificates will only be awarded credit for 1,590 WBT hours total
**Occupational Analysis Chart**

**AUTOMOTIVE SERVICE TECHNICIAN**

**Occupation Description:** “Automotive Service Technicians” possess the full range of knowledge and abilities required to perform preventative maintenance, diagnose problems and repair vehicle systems including engines, vehicle management, hybrids, steering, braking, tires, wheels, drivetrains, suspension, electrical, electronics, heating, ventilation and air conditioning (HVAC), restraints, trim and accessories of automotive vehicles and light trucks with a gross vehicle weight less than 5,500 kg.

<table>
<thead>
<tr>
<th>PERFORM SAFETY-RELATED FUNCTIONS</th>
<th>Maintain safe work environment</th>
<th>Use personal protective equipment (PPE) and safety equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
<td>A2</td>
</tr>
<tr>
<td>USE TOOLS, EQUIPMENT AND DOCUMENTATION</td>
<td>Use tools and equipment</td>
<td>Use fasteners, tubing, hoses and fittings</td>
</tr>
<tr>
<td>B1</td>
<td>B2</td>
<td></td>
</tr>
<tr>
<td>USE COMMUNICATION AND MENTORING TECHNIQUES</td>
<td>Use communication techniques</td>
<td>Use mentoring techniques</td>
</tr>
<tr>
<td>C1</td>
<td>C2</td>
<td></td>
</tr>
<tr>
<td>DIAGNOSE AND REPAIR ENGINE SYSTEMS</td>
<td>Diagnose and repair cooling systems</td>
<td>Diagnose and repair lubricating systems</td>
</tr>
<tr>
<td>D1</td>
<td>D2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diagnose and repair engine assembly</td>
<td>Diagnose and repair accessory drive systems</td>
</tr>
<tr>
<td></td>
<td>D3</td>
<td>D4</td>
</tr>
</tbody>
</table>
## HARMONIZED PROGRAM OUTLINE
### Program Overview

#### DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

| E  | Diagnose and repair gasoline advanced wiring and electronics | E1 | 3 | 3 | E2 | 3 | 3 | E3 | 3 | 3 | E4 | 3 | 3 | E5 | 3 | 3 | E6 | 3 |

#### DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS

| F  | Diagnose and repair diesel fuel delivery and injection systems | F1 | 4 | 4 | F2 | 4 | 4 | F3 | 4 | 4 |

#### DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS

| G  | Identify type of networking system | G1 | 3 | 3 | G2 | 3 | 3 |

#### DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

| H  | Diagnose and repair drive shafts and axles | H1 | 1 | 2 | H2 | 2 | 4 | H3 | 2 | 4 | H4 | 2 | 4 | H5 | 3 | 4 | H6 | 3 |
|    | Diagnose and repair final drive assemblies | H7 | 2 |

#### DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS

| I  | Diagnose and repair basic wiring and electrical systems | I1 | 1 | 2 | I2 | 2 | 3 | I3 | 3 | 4 | I4 | 3 | 4 | I5 | 3 | 4 | I6 | 3 |

Diagnose and repair gasoline delivery and injection systems

Diagnose and repair gasoline ignition systems

Diagnose and repair engine management systems

Diagnose and repair gasoline intake and exhaust systems

Diagnose and repair gasoline emissions control systems

Diagnose and repair diesel fuel delivery and injection systems

Diagnose and repair diesel intake and exhaust systems

Diagnose and repair diesel emission control systems

Identify type of networking system

Diagnose and repair networking systems

Diagnose and repair manual transmissions and transaxles

Diagnose and repair automatic transmissions and transaxles

Diagnose and repair clutches

Diagnose and repair mechanical transfer cases

Diagnose and repair all-wheel drive (AWD) systems

Diagnose and repair basic wiring and electrical systems

Diagnose and repair starting and charging systems and batteries

Diagnose and repair lighting and wiper systems

Diagnose and repair electrical options and accessories

Diagnose and repair instrumentation, entertainment systems and displays
<table>
<thead>
<tr>
<th>Category</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive Service Technician Industry Training Authority</td>
<td>Harmonized Program</td>
</tr>
<tr>
<td>Program Overview</td>
<td></td>
</tr>
<tr>
<td>HARMONIZED PROGRAM OUTLINE</td>
<td></td>
</tr>
</tbody>
</table>

### DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS

- Diagnose and repair air flow control and heating systems **J1**
- Diagnose and repair refrigerant systems **J2**

### DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

- Diagnose and repair steering and control systems **K1**
- Diagnose and repair suspension and control systems **K2**
- Diagnose and repair braking and control systems **K3**
- Diagnose and repair tires, wheels, hubs and wheel bearings **K4**

### DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM

- Diagnose and repair restraint systems **L1**
- Diagnose and repair wind noises, rattles and water leaks **L2**
- Diagnose and repair interior and exterior components, accessories and trim **L3**
- Diagnose and repair latches, locks and movable glass **L4**

### DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)

- Implement specific safety protocols for hybrid and electric vehicles (EV) **M1**
- Diagnose and repair hybrid and electric vehicle (EV) systems **M2**
# Training Topics and Suggested Time Allocation: Level 1

## AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 1

<table>
<thead>
<tr>
<th>Line</th>
<th>Training Topic</th>
<th>% of Time</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line A</td>
<td>PERFORM SAFETY-RELATED FUNCTIONS</td>
<td>4%</td>
<td>70%</td>
<td>30%</td>
<td>100%</td>
</tr>
<tr>
<td>A1</td>
<td>Maintain safe work environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>Use personal protective equipment (PPE) and safety equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line B</td>
<td>USE TOOLS, EQUIPMENT AND DOCUMENTATION</td>
<td>14%</td>
<td>40%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>B1</td>
<td>Use tools and equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>Use fasteners, tubing, hoses and fittings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>Use hoisting and lifting equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B4</td>
<td>Use technical information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line C</td>
<td>USE COMMUNICATION AND MENTORING TECHNIQUES</td>
<td>1%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>C1</td>
<td>Use communication techniques</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line H</td>
<td>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</td>
<td>7%</td>
<td>40%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>H1</td>
<td>Diagnose and repair drive shafts and axles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line I</td>
<td>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</td>
<td>20%</td>
<td>50%</td>
<td>50%</td>
<td>100%</td>
</tr>
<tr>
<td>I1</td>
<td>Diagnose and repair basic wiring and electrical systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I2</td>
<td>Diagnose and repair starting and charging systems and batteries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line K</td>
<td>DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS</td>
<td>50%</td>
<td>50%</td>
<td>50%</td>
<td>100%</td>
</tr>
<tr>
<td>K1</td>
<td>Diagnose and repair steering and control systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K2</td>
<td>Diagnose and repair suspension and control systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K3</td>
<td>Diagnose and repair braking and control systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K4</td>
<td>Diagnose and repair tires, wheels, hubs and wheel bearings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line L</td>
<td>DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM</td>
<td>3%</td>
<td>80%</td>
<td>20%</td>
<td>100%</td>
</tr>
<tr>
<td>L2</td>
<td>Diagnose and repair wind noises, rattles and water leaks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Diagnose and repair interior and exterior components, accessories and trim</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L4</td>
<td>Diagnose and repair latches, locks and movable glass</td>
<td></td>
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</tbody>
</table>
### Automotive Service Technician Industry Training Authority

#### Harmonized Program

**Harmonized Program Outline**

**Program Overview**

<table>
<thead>
<tr>
<th>Line</th>
<th>% of Time Allocated to:</th>
<th>% of Time</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td></td>
<td>1%</td>
<td>100%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>M1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Percentage for AST Level 1</strong></td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Line M**: DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)
- **Line M1**: Implement specific safety protocols for hybrid and electric vehicles (EV)
# Training Topics and Suggested Time Allocation: Level 2

**AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 2**

<table>
<thead>
<tr>
<th>Line</th>
<th>Topic</th>
<th>% of Time Allocated to:</th>
<th>Theory</th>
<th>Practical</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>D</td>
<td>DIAGNOSE AND REPAIR ENGINE SYSTEMS</td>
<td>38%</td>
<td>40%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>D1</td>
<td>Diagnose and repair cooling systems</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>Diagnose and repair lubricating systems</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>Diagnose and repair engine assembly</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>Diagnose and repair accessory drive systems</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</td>
<td>31%</td>
<td>40%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>H2</td>
<td>Diagnose and repair manual transmissions and transaxles</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4</td>
<td>Diagnose and repair clutches</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H7</td>
<td>Diagnose and repair final drive assemblies</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</td>
<td>17%</td>
<td>40%</td>
<td>60%</td>
<td>100%</td>
</tr>
<tr>
<td>I2</td>
<td>Diagnose and repair starting and charging systems and batteries</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I3</td>
<td>Diagnose and repair lighting and wiper systems</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS</td>
<td>14%</td>
<td>60%</td>
<td>40%</td>
<td>100%</td>
</tr>
<tr>
<td>K1</td>
<td>Diagnose and repair steering and control systems</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K2</td>
<td>Diagnose and repair suspension and control systems</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K3</td>
<td>Diagnose and repair braking and control systems</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Percentage for AST Level 2: 100%
# HARMONIZED PROGRAM OUTLINE
## Program Overview

### Training Topics and Suggested Time Allocation: Level 3

#### AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 3

<table>
<thead>
<tr>
<th>Line</th>
<th>Topic</th>
<th>% of Time</th>
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**Total Percentage for AST Level 3**: 100%
# Training Topics and Suggested Time Allocation: Level 4

**AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 4**

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**Total Percentage for AST Level 4**

100%
Section 3

PROGRAM CONTENT

Automotive Service Technician
Level 1

Automotive Service Technician
LINE (GAC): A PERFORM SAFETY-RELATED FUNCTIONS
Competency: A1 Maintain safe work environment

Objectives
To be competent in this area, the individual must be able to:
• Apply safe work practices.

LEARNING TASKS
1. Describe WorkSafeBC and OHS regulations
   • Rights and responsibilities
     o Right to refuse work
     o Reporting accidents
     o Investigations
   • Personal Protective Equipment (PPE)
   • Safe vehicle operation
     o Speed limit
     o Parking on a hoist
     o Road test
   • Clean and organized work area
   • Correct use of tools and equipment
     o Maintenance
     o Function
     o Operation
   • Lockout procedures
   • Flammable, explosion, and electrical hazards
   • Using compressed air

2. Describe safe work practices
   • Component and causes of fire
     o Fuel
     o Heat
     o Oxygen
   • Flammability
     o Flash points
   • Types of fires
     o Class A, B, C and D fires
   • Use of fire extinguishers
   • Fire prevention equipment
     o Emergency fire blanket
   • Precautions when working with flammable substances
   • Storage of flammable materials
     o Gasoline
     o Oily rags

3. Describe fire safety procedures

CONTENT
• Rights and responsibilities
  o Right to refuse work
  o Reporting accidents
  o Investigations
• Personal Protective Equipment (PPE)
• Safe vehicle operation
  o Speed limit
  o Parking on a hoist
  o Road test
• Clean and organized work area
• Correct use of tools and equipment
  o Maintenance
  o Function
  o Operation
• Lockout procedures
• Flammable, explosion, and electrical hazards
• Using compressed air
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• Flammability
  o Flash points
• Types of fires
  o Class A, B, C and D fires
• Use of fire extinguishers
• Fire prevention equipment
  o Emergency fire blanket
• Precautions when working with flammable substances
• Storage of flammable materials
  o Gasoline
  o Oily rags
LEARNING TASKS
4. Use Workplace Hazardous Materials Information System (WHMIS)

CONTENT
- WHMIS
  - Right to know
  - Worker education
  - Product identification
- Roles and responsibilities
  - Employers
  - Suppliers
  - Workers
- Labelling
  - Symbols
- MSDS
  - Hazards
  - Handling
  - Ingredients
- Storage
Line (GAC): A PERFORM SAFETY-RELATED FUNCTIONS
Competency: A2 Use personal protective equipment (PPE) and safety equipment

Objectives
To be competent in this area, the individual must be able to:

- Select and use personal protective equipment (PPE).
- Use shop emergency equipment and procedures.

LEARNING TASKS

1. Describe personal safety
   - Personal apparel
   - Personal protective equipment (PPE)
     - Safety glasses
     - Boots
     - Face shield
   - Exhaust extraction
   - Hazard awareness
   - Ergonomic lifting

2. Describe shop emergency equipment and procedures
   - Emergency shutoffs
   - Fire control
   - Eye-wash facilities
   - Spill kit
   - Emergency exits
   - First aid facilities
   - Outside meeting place

Achievement Criteria

Performance The learner will wear PPE as needed for each task.
Conditions The learner will be given
- Access to PPE
Criteria The learner will be evaluated on
- PPE selection
- PPE fit
- Consistency of usage
Line (GAC): B USE TOOLS, EQUIPMENT AND DOCUMENTATION
Competency: B1 Use tools and equipment

Objectives
To be competent in this area, the individual must be able to:
- Use tools and equipment.
- Demonstrate safe use of welding equipment.

LEARNING TASKS

1. Use hand tools
   - Types
     - Wrenches
     - Sockets
     - Pliers
   - Special application tools
     - Chisels and punches
     - Tap and die
   - Safety
   - Storage
   - Cleaning and maintenance

2. Use measuring tools
   - Types
     - Vernier calipers
     - Micrometers
     - Feeler gauges
   - Safety
   - Storage
   - Cleaning and maintenance

3. Use power tools
   - Types
     - Impact wrench
     - Grinders
     - Drills
     - Pneumatic
     - Electric
   - Safety
   - Storage
   - Cleaning and maintenance

4. Use shop equipment
   - Types
     - Presses and pullers
     - Solvent tank
   - Safety
### HARMONIZED PROGRAM OUTLINE

**Program Content**

**Level 1**

#### LEARNING TASKS

<table>
<thead>
<tr>
<th>CONTENT</th>
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</table>
| 5. Describe oxyacetylene components
  * Storage
  * Cleaning and maintenance |
| 6. Demonstrate oxyacetylene procedures
  * Safety
  * Gases
  * Cylinders, regulators and hoses
  * Torches
  * Set up
  * Lighting
  * Heating and cutting
  * Shut down
  * Storage
  * Inspection and maintenance |
| 7. Describe MIG (GMAW) welding components and methods
  * Gas Metal Arc Welding (GMAW)
  * Safety
  * Gases
  * Cylinders, regulator and hose
  * Ground terminal
  * Set up
  * Welding
  * Shut down
  * Storage
  * Inspection and maintenance |
| 8. Demonstrate MIG (GMAW) welding procedures
  * Safety
  * Tool selection
  * Tool usage |

#### Achievement Criteria

| Performance | The learner will select and use tools as needed for each task. |
| Conditions | The learner will be given |
| Access to tools |
| Criteria | The learner will be evaluated on |
| Safety |
| Tool selection |
| Tool usage |
Line (GAC): B USE TOOLS, EQUIPMENT AND DOCUMENTATION
Competency: B2 Use fasteners, tubing, hoses and fittings

Objectives
To be competent in this area, the individual must be able to:
- Use fasteners.
- Describe tubing, hoses, fluids, fittings, and belts.

<table>
<thead>
<tr>
<th>LEARNING TASKS</th>
<th>CONTENT</th>
</tr>
</thead>
</table>
| 1. Describe fasteners | • Types  
  o Bolts  
  o Studs  
  o Nuts  
  o Washers  
  o Keys  
  o Snap rings |
| 2. Use fasteners | • Selection  
  o Imperial  
  o Metric  
  • Torquing  
  o Sequence  
  o Torque to yield  
  • Repair  
  o Extraction  
  o Helicoils |
| 3. Identify lubricants and fluids | • Types  
  o Greases  
  o Engine oil  
  o Transmission fluids  
  o Brake fluids  
  o Anti-freeze  
  o Shop fluids  
  - Cleaners/detergents  
  - Penetrating fluids |
| 4. Describe tubing, hoses and fittings | • Selection  
  • Recycling  
  • Selection  
  • Types  
  • Materials  
  • Bending, cutting, flaring |
5. Describe accessory drive belts

- Types
  - Serpentine
  - Stretch
  - V-belt
- Inspection and maintenance
- Installation
Objectives
To be competent in this area, the individual must be able to:
• Use hoisting and lifting equipment.

LEARNING TASKS
1. Describe hoisting and lifting safety procedures

2. Use hoisting and lifting equipment

CONTENT
• Capacities
• Operation
• Lock out
• Types of jacks
  o Mechanical
  o Hydraulic
  o Pneumatic
• Types of hoists
  o 2-post
  o 4-post
• Stands
• Engine hoists
• Inspection
• Vehicle lifting points
• Required adapters and extensions
Line (GAC): B USE TOOLS, EQUIPMENT AND DOCUMENTATION
Competency: B4 Use technical information

Objectives
To be competent in this area, the individual must be able to:
• Use technical information.

LEARNING TASKS
1. Describe technical information
   • Types
     o Electronic
     o Print

2. Use technical information
   • Navigation
   • Manufacturer’s specifications
   • Manufacturer’s recalls
   • Repair procedures
     o Estimates
     o Technical service bulletins (TSBs)
   • Safety concerns
   • Description of operations and parts
   • Diagrams
Line (GAC): C USE COMMUNICATION AND MENTORING TECHNIQUES
Competency: C1 Use communication techniques

Objectives
To be competent in this area, the individual must be able to:

- Use communication techniques

LEARNING TASKS
1. Demonstrate two-way communication

   CONTENT
   - Verbal and written instructions
   - Record keeping
     - Service/work orders
     - Technical reports
     - Parts requisition

2. Use active listening

   CONTENT
   - Attention
   - Open-ended questions
   - Clarification

3. Use digital communication technologies

   CONTENT
   - Hand-held devices
Line (GAC): H DIAGNOSE AND REPAIR DRIVELINE SYSTEMS
Competency: H1 Diagnose and repair drive shafts and axles

Objectives
To be competent in this area, the individual must be able to:
• Service drive shafts and axle shafts.

LEARNING TASKS
1. Describe drive shafts
   • Types
     o Front-wheel drive
     o Rear-wheel drive
   • Components
     o Constant velocity (CV) axles
     o Universal joints
     o Mounts and supports
   • Operation
   • Safety
   • Inspection and testing
     o Sensory
     o Run out
     o Working angle
   • Component service
     o Balancing and phasing
     o Joint replacement

2. Service drive shafts

Achievement Criteria
Performance The learner will assess driveline angle.
Conditions The learner will be given
• Vehicle
• Tools and equipment
• Access to technical information
Criteria The learner will be evaluated on
• Safety
• Tool usage
• Procedure
• Accuracy of results
Line (GAC):  I  DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS
Competency:  I1  Diagnose and repair basic wiring and electrical systems

Objectives
To be competent in this area, the individual must be able to:
- Describe the fundamentals of electrical circuits and components.
- Service and repair wiring.
- Use electrical test equipment.

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</table>
| 1. Describe electrical fundamentals | • Terminology  
| | • Theories  
| | o Ohm’s law  
| | o Magnetism  
| | o Watt’s law |
| 2. Describe electrical circuits and components | • Types of circuits  
| | • Faults  
| | o Opens  
| | o Shorts  
| | o Grounds  
| | • Components  
| | o Switches  
| | o Circuit protection  
| | o Relays |
| 3. Read and interpret wiring diagrams | • Symbols  
| | • Colours  
| | • Identification numbers  
| | • Power flows |
| 4. Service and repair wiring | • Types of wires  
| | • Repair methods |
| 5. Use electrical test equipment | • Types  
| | o Test lights  
| | o Power (logic) probes  
| | o Digital Volt Ohm meter (DVOM)  
| | • Measuring values  
| | o Voltage  
| | o Amperage  
| | o Resistance  
| | • Units of measurement |
LEARNING TASKS

6. Use scan tools

CONTENT

- Voltage drop
- Types
  - Tools
  - Codes
- On-board diagnostics
- Basic operation

Achievement Criteria

Performance  The learner will perform various electrical measurements on circuits.
Conditions  The learner will be given
- A circuit
- Multi-meter
Criteria  The learner will be evaluated on
- Safety
- Tool usage
- Procedures
- Accuracy of results
HARMONIZED PROGRAM OUTLINE  
Program Content  
Level 1

Line (GAC): I  DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS
Competency: I 2 Diagnose and repair starting and charging systems and batteries

Objectives
To be competent in this area, the individual must be able to:
  • Service and test 12-volt batteries.

LEARNING TASKS
1. Describe 12-volt batteries
   • Safety
   • Construction
   • Types
   • Ratings

2. Service 12-volt batteries
   • Inspection
   • Cleaning
   • Maintenance
   • Installation
   • Recycling

3. Test 12-volt batteries
   • Load
   • Conductance
   • Hydrometer
   • Parasitic
   • Interpret test data

4. Charge 12-volt batteries
   • Safety
   • Size, type, rate

Achievement Criteria

Performance  The learner will test a 12-volt battery.
Conditions  The learner will be given
   • A 12-volt battery
   • Test equipment
Criteria  The learner will be evaluated on
   • Safety
   • Tool usage
   • Procedure
   • Accuracy of results
Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K1 Diagnose and repair steering and control systems

Objectives
To be competent in this area, the individual must be able to:
- Service mechanical and hydraulic steering systems.
- Describe occupant restraint system safety.
- Perform wheel alignment.

LEARNING TASKS

1. Describe steering columns
   - Types
     - Tilt
     - Telescoping
   - Steering wheel lock
   - Combination switch

2. Inspect steering columns
   - Shafts, universal joints, coupling, splines
   - Collapsing function
   - Electrical connections

3. Describe occupant restraints
   - Safety
   - Types
     - Driver
     - Passenger
     - Seat belt pre-tensioner
   - Air bag wiring

4. Remove and replace steering wheel air bag inflator module
   - Safety
     - Disarm
   - Precautions
     - Handling
     - Storage

5. Describe steering linkage
   - Types
     - Parallelogram
     - Cross steer
     - Rack and pinion
   - Linkage
   - Tie rods
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<td>• Lubrication</td>
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<td>• Leaks</td>
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<td>• Bleeding procedures</td>
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13. Perform wheel alignment

- Steering geometry
  - Caster, camber, toe
  - Steering axis inclination
  - Thrust angle
- Pre-checks and road test
- Alignment procedure
  - Factory adjustments
- Steering wheel centre check
- Steering sensor re-calibration

**Achievement Criteria 1**

**Performance**  The learner will perform a steering inspection.

**Conditions**  The learner will be given
- A vehicle
- Measuring equipment
- Access to technical information

**Criteria**  The learner will be evaluated on
- Safety
- Testing procedure
- Accuracy of results

**Achievement Criteria 2**

**Performance**  The learner will perform a wheel alignment.

**Conditions**  The learner will be given
- A vehicle
- Wheel alignment equipment

**Criteria**  The learner will be evaluated on
- Safety
- Procedure
- Tool and equipment usage
- Accuracy of adjustments

**Achievement Criteria 3**

**Performance**  The learner will remove and reinstall an air bag inflator module.

**Conditions**  The learner will be given
- A vehicle
- Tools
- Access to technical information

**Criteria**  The learner will be evaluated on
- Safety
HARMONIZED PROGRAM OUTLINE
Program Content
Level 1

- Procedure
- Tool usage
- Completion of task
Line (GAC): K   DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K2 Diagnose and repair suspension and control systems

Objectives
To be competent in this area, the individual must be able to:
• Inspect and service mechanical suspension systems.

LEARNING TASKS

1. Describe frame designs
   • Unibody
     o Subframe
   • Conventional types
     o Perimeter
     o Ladder
     o Torque boxes
   • Accident crumple zones
   • Construction

2. Describe suspension systems
   • Front
     o Rigid
     o Independent
       – McPherson strut
       – Short and long arm
       – Multi-link
       – Twin I-beam
   • Rear
     o Rigid
     o Independent
       – Chapman strut
       – Short and long arm
       – Multi-link
       – Semi-rigid
   • Dynamics
     o Forces
     o Body roll
   • Faults
3. Describe suspension components
   - Springs
     - Purpose
     - Types
       - Coil
       - Leaf
       - Torsion bar
     - Ride height
     - Performance
   - Shocks and struts
     - Purpose
     - Components
     - Types
       - Conventional
       - Gas
     - Applications
       - Towing
       - Off road
       - Performance
   - Ball joints
     - Loaded
     - Follower
   - Anti-sway bar
   - Rubber bushings
   - Mounting points

4. Inspect and service suspension systems
   - Safety
   - Visual inspection
   - Road test
   - Removal and replacement
   - Measurements
   - Alignment
   - Faults
Achievement Criteria

Performance  The learner will identify and inspect suspension systems.

Conditions  The learner will be given
  • A vehicle
  • Measuring equipment
  • Access to technical information

Criteria  The learner will be evaluated on
  • Safety
  • Testing procedure
  • Accuracy of component identifications
  • Accuracy of inspection
Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K3 Diagnose and repair braking and control systems

Objectives
To be competent in this area, the individual must be able to:
• Service and repair mechanical, hydraulic brake systems.
• Service power assist systems.

LEARNING TASKS

1. Describe hydraulic brake systems
   - Principles
     - Hydraulic
       - Pascal's law
     - Friction
   - Types
     - Disc
     - Drum
   - Components
     - Cylinders
     - Calipers
     - Valves
   - Faults

2. Service hydraulic brake systems
   - Road test
   - Inspection
   - Adjustment
   - Measurement
   - Machining
   - Replacement
   - Bleeding/exchange
   - Faults

3. Service brake tubing
   - Materials
   - Bending, cutting, flaring
   - Fittings

4. Describe power assist systems
   - Principles
   - Types
     - Vacuum
     - Hydraulic
   - Components
   - Faults
LEARNING TASKS
5. Service power assist systems

CONTENT
- Fluids
- Belts and hoses
- Vacuum
- Replacement
- Adjustment
  - Brake pedal free play
- Tests
  - Function test
  - Pressure test
  - Vacuum test
- Faults

Achievement Criteria

Performance
The learner will inspect front disc brakes.

Conditions
The learner will be given
- A vehicle
- Measuring equipment
- Access to technical information

Criteria
The learner will be evaluated on
- Safety
- Tool usage
- Accuracy of inspection
- Accuracy and interpretation of measurements
Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K4 Diagnose and repair tires, wheels, hubs and wheel bearings

Objectives
To be competent in this area, the individual must be able to:
• Service and repair tires and wheels.
• Service and repair hubs and bearings.

LEARNING TASKS

1. Describe tire construction
   • Side wall markings
   • Ratings
   • Tread design
   • Run flat design

2. Service tires
   • Inspection
     o Wear patterns
     o Damage
   • Rotation
   • Mounting and balancing
   • Repair
   • Types
   • Offset
   • Sizing
   • Wheel fasteners

3. Describe wheels
   • Types
   • Offset
   • Sizing
   • Wheel fasteners

4. Inspect wheels
   • Curb damage
   • Run out

5. Describe Tire Pressure Monitoring System (TPMS)
   • Types
     o Direct
     o Indirect
   • Sensor replacement
   • System service
     o Reset
     o Reprogram
     o Calibrate

6. Describe wheel bearings
   • Types
     o Ball
     o Tapered roller
     o Sealed
   • Components
LEARNING TASKS

7. Service wheel bearings

8. Describe spindles and hubs

9. Service spindles and hubs

CONTENT

- Loading principles
- Removal and installation techniques
- Lubrication
- Axial and radial play
- Adjustment

- Front-wheel drive
- Rear-wheel drive
- Bearing types

- Lubrication
- Inspection
  - Sensory
  - Measurements
- Bearing adjustment
- Removal and installation

Achievement Criteria

Performance  The learner will mount and balance a tire.

Conditions  The learner will be given

- A vehicle
- Tire mounting and balancing equipment

Criteria  The learner will be evaluated on

- Safety
- Equipment usage
- Procedure
- Accuracy of balance
Line (GAC): L  DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM

Competency: L2 Diagnose and repair wind noises, rattles and water leaks

Objectives
To be competent in this area, the individual must be able to:
- Identify common areas of concern for wind noise, rattles and water leaks.

LEARNING TASKS
1. Describe wind noise, rattles and water leaks

CONTENT
- Diagnostic tools
  - Smoke machine
  - Chassis ears
  - Water hose
Line (GAC): L  DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM

Competency: L3  Diagnose and repair interior and exterior components, accessories and trim

Objectives

To be competent in this area, the individual must be able to:
• Repair interior and exterior components and trim.

LEARNING TASKS

1. Describe interior and exterior body components and trim

   • Exterior components
     o Mirrors
     o Roof rack
   • Interior components
     o Seats
     o Dashboard
   • Accessories
     o Running boards
     o Bug shield

2. Repair interior and exterior components and trim

   • Repair parts and materials
     o Adhesives
     o Gaskets
     o Sealants
     o Fastening devices
   • Tools
     o Trim tools
     o Hand tools
   • Remove, replace and adjust
   • Verify fit, function and performance
Line (GAC): L

DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM

Competency: L4 Diagnose and repair latches, locks and movable glass

Objectives
To be competent in this area, the individual must be able to:

- Describe latches, locks and movable glass.

LEARNING TASKS
1. Describe latches, locks and movable glass.

CONTENT
- Components
  - Lock
  - Rod
  - Cable
  - Regulator
  - Sensor/switches
Line (GAC): M DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)
Competency: M1 Implement specific safety protocols for hybrid and electric vehicles (EV)

Objectives
To be competent in this area, the individual must be able to:
• Describe hybrid and electric vehicle safety.

LEARNING TASKS
1. Identify high voltage components
   • High voltage battery
   • Inverter
   • Motor/generator
   • Wiring

2. Describe hybrid and electric vehicle safety
   • Safety
     o Shop set up
       − Cones
       − Caution signs
     o Precautions
       − Pushing/ towing
       − Auto start
   • Personal protective equipment (PPE)
     o Gloves
   • High voltage disconnect procedures
     o High voltage contactor
     o Shut-down service plug
Level 2

Automotive Service Technician
Line (GAC): D  DIAGNOSE AND REPAIR ENGINE SYSTEMS
Competency: D1  Diagnose and repair cooling systems

Objectives
To be competent in this area, the individual must be able to:
• Service cooling systems.
• Diagnose cooling systems faults.

LEARNING TASKS
1. Describe cooling system
   • Operation
   • Coolant and additive properties
   • Components
     o Radiator
     o Thermostat
     o Water pump
     o Sensors and switches
   • Secondary or auxiliary cooling systems

2. Service cooling systems
   • Safety
   • Inspection
     o Sensory
   • Depressurization
   • Testing
     o Pressure
     o Air flow
     o Temperature
     o Coolant
       − Temperature
       − Additives
   • Service
     o Fluid exchange
     o Bleeding
   • Removal and installation techniques
   • Faults
Line (GAC): D  DIAGNOSE AND REPAIR ENGINE SYSTEMS
Competency: D2  Diagnose and repair lubricating systems

Objectives
To be competent in this area, the individual must be able to:
- Service lubricating systems.
- Diagnose lubricating systems.

LEARNING TASKS

1. Describe lubrication systems

   CONTENT
   - Oil
     - Grades
     - Types
     - Synthetics
   - Pumps
     - Gerotor
     - Vane
     - Gear
   - Filters
   - Sensors
   - Oil galleries
   - Crank case ventilation systems
   - Sumps and strainers
   - Coolers
   - Associated plumbing and hardware
   - Gauges
   - Valvetrain controls
     - Variable valve timing
     - Cylinder deactivation
   - Faults

2. Service lubrication systems

   - Inspection
     - Sensory
   - Testing
     - Pressure testing
     - Leak detection
   - Service
     - Filter
     - Seals and gaskets
     - Components
     - Maintenance
   - Priming
   - Faults
Line (GAC): D  DIAGNOSE AND REPAIR ENGINE SYSTEMS
Competency: D3  Diagnose and repair engine assembly

Objectives
To be competent in this area, the individual must be able to:
• Disassemble, inspect, and reassemble engine.
• Assess engine mechanical condition.

LEARNING TASKS
1. Describe gasoline internal combustion engines components
   • Short block assembly
     o Crank shaft
     o Pistons
     o Connecting rods
   • Cylinder head assembly
     o Cam shaft
     o Valves
     o Valvetrain
   • Variable valve timing
     o Cam actuators
     o Sensors

2. Describe gasoline internal combustion engines
   • Four stroke cycle
   • Construction design and materials
   • Engine configurations
     o Inline
     o V
     o Opposed
   • Engine dimensions
     o Stroke x bore
   • Engine measurements
     o Horse power
     o Torque
     o Volumetric efficiency
   • Cylinder deactivation systems

3. Describe diesel engines
   • Compare component construction and operation to gasoline internal combustion engines
     o Compression ignition
     o Compression ratio
4. Perform engine mechanical condition tests on gasoline and diesel engines
   - Sensory
   - Cylinder pressure testing
     - Spark ignition
     - Compression ignition
   - Cylinder leak down
   - Power balance
   - Leak detection
     - Dye/Black light

5. Describe engine removal and installation
   - Safety
     - Jacking and hoisting
     - Weight distribution
   - Procedures
     - Removal
     - Installation

6. Describe engine disassembly procedures
   - Disassembly procedures
   - Cleaning
     - Solvent
     - Chemical
     - Steam
   - Measuring and evaluating
   - Short block assembly
     - Boring and honing
     - Machining
       - Bearing surfaces
       - Mating surfaces
     - Piston fitting
     - Bearing installation
   - Cylinder head assembly
     - Machining
     - Crack detection and repair
     - Valve train assembly
7. Perform engine disassembly and inspection
   - Disassembly and removal
     - Cylinder head
     - Pistons
     - Crankshaft
     - Camshaft
     - Bearings
   - Cleaning
   - Measuring and evaluating
     - Piston fitting
     - Bearing installation
     - Mating surfaces
     - Crankshaft
     - Camshaft
     - Valvetrain

8. Perform engine assembly procedures
   - Preassembly cleaning
   - Assemble short block
     - Fitting parts
     - Measuring and torquing
     - Lubrication
   - Install cylinder head
   - Assemble valvetrain
     - Sprockets
     - Belt
     - Chain
     - Tensioners
     - Balance shafts
   - Mechanical engine timing
   - Assemble associated parts and fasteners
   - Gaskets and sealants
   - Seal installation
   - Start up/break in procedures
Achievement Criteria 1

Performance  The learner will perform engine mechanical assessment.

Conditions  The learner will be given
  - Vehicle
  - Test equipment
  - Access to technical information

Criteria  The learner will be evaluated on
  - Safety
  - Procedure
  - Tool usage
  - Accuracy of results

Achievement Criteria 2

Performance  The learner will perform engine component measurements.

Conditions  The learner will be given
  - An engine or engine components
  - Measuring equipment
  - Access to technical information

Criteria  The learner will be evaluated on
  - Safety
  - Procedure
  - Tool usage
  - Accuracy of results
Line (GAC): D  DIAGNOSE AND REPAIR ENGINE SYSTEMS
Competency: D4  Diagnose and repair accessory drive systems

Objectives
To be competent in this area, the individual must be able to:
• Service accessory drive systems.

LEARNING TASKS          CONTENT
1. Describe accessory drive components
   • Components
     o Tensioners
     o Pulleys

2. Service accessory drive systems
   • Inspection
     o Alignment
     o Tensioner
     o Belt
   • Installation
   • Faults
Line (GAC): H  DIAGNOSE AND REPAIR DRIVELINE SYSTEMS
Competency: H2  Diagnose and repair manual transmissions and transaxles

Objectives
To be competent in this area, the individual must be able to:
• Describe manual transmissions and transaxles.
• Service manual transmissions and transaxles.

LEARNING TASKS

1  Describe manual transmission and transaxle components
   • Gears and shafts
   • Synchronizers
   • Bearings and bushings
   • Linkage
     o Interlock and detents
   • Final drive
   • Switches, solenoids and sensors

2  Describe manual transmissions and transaxles
   • Power flow
   • Gear ratios
     o Torque multiplication and reduction
     o Simple and compound
   • Synchronization
   • Final drive
   • Lubricants and additives
   • System lubrication

3  Remove and install transmissions and transaxles
   • Safety
     o Jacking and hoisting
     o Weight distribution
   • Procedures
   • Inspection
     o Sensory
     o Internal component wear
   • Measurement
     o Synchronizer components
     o Shaft wear
     o Gear end play
   • Diagnose transmission and transaxle faults
   • Shifter mechanism
   • Adjustments

4  Perform manual transmission and transaxle disassembly, inspection, and reassembly
Achievement Criteria 1

Performance  The learner will inspect manual transmission and transaxle components.

Conditions  The learner will be given
  • Transmission components
  • Tools
  • Access to technical information

Criteria  The learner will be evaluated on
  • Safety
  • Tool usage
  • Procedure
  • Accuracy of results

Achievement Criteria 2

Performance  The learner will calculate gear ratios.

Conditions  The learner will be given
  • Transmission or transaxle

Criteria  The learner will be evaluated on
  • Safety
  • Tool usage
  • Procedure
  • Accuracy of results
Line (GAC): H  DIAGNOSE AND REPAIR DRIVELINE SYSTEMS
Competency: H4  Diagnose and repair clutches

Objectives
To be competent in this area, the individual must be able to:
• Describe clutch systems.
• Service clutch systems.

LEARNING TASKS
1. Describe clutch components
   • Types of clutch systems
     o Conventional
     o Dual clutch
     o Pull clutch
   • Flywheel
     o Conventional
     o Dual mass
   • Pressure plates
   • Friction discs
   • Bearings and bushings
   • Safety switches
   • Operating hardware
     o Clutch release
2. Service clutch components
   • Removal and replacement
   • Inspection
     o Sensory
   • Diagnose clutch faults
   • Maintenance and adjustments
     o Bleeding
Line (GAC): H
Competency: H7

DIAGNOSE AND REPAIR DRIVELINE SYSTEMS

Diagnose and repair final drive assemblies

Objectives
To be competent in this area, the individual must be able to:
• Describe final drive (differentials) assemblies.
• Service final drive (differentials) assemblies.

LEARNING TASKS

1. Describe final drives (differentials)
   • Housings and mounts
     o Integral
     o Removable
   • Gears, shafts and bearings
   • Axles
     o Full floating
     o Semi floating
   • Limited slip and locking differentials
     o Torque bias
   • Sensors
   • Lubricants and additives
   • Gaskets and seals
   • Power flow
   • Gear ratio

2. Service final drive assemblies (differentials)
   • Inspection and adjustments
     o Sensory
     o Gear tooth contact patterns
     o Pinion depth
     o Backlash
     o Bearing pre-load
   • Procedures
     o Disassembly and reassembly
     o Gear set up
Achievement Criteria

Performance  The learner will perform backlash measurement and adjustment.

Conditions  The learner will be given
  - Final drive assembly
  - Measuring tools
  - Access to technical information

Criteria  The learner will be evaluated on
  - Safety
  - Tool usage
  - Procedure
  - Accuracy of results
Line (GAC): I DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS

Competency: I2 Diagnose and repair starting and charging systems and batteries

Objectives
To be competent in this area, the individual must be able to:
- Service starting systems.
- Service charging systems.

**LEARNING TASKS**

1. Describe starting systems

   **CONTENT**
   - Theoretical principles
     - Magnetism
   - Components
     - Starter
       - Permanent magnet
       - Electro magnet
     - Solenoids and relays
     - Ring gear
     - Ignition switch
       - Conventional
       - Push button start
   - Operation
   - Wiring and controls
     - Computer controlled
     - Idle start stop
   - Faults

2. Service starting systems

   **CONTENT**
   - Inspection and testing
     - Sensory
     - Electrical
     - Mechanical
     - Scan tool
       - Functional test
   - Component removal and replacement
   - Faults
3. Describe charging systems

- Theoretical principles
  o Induction
- Electronics
  o Diodes and transformers
- Components
  o Alternators
    - Over-running pulleys
  o Regulators and controls
  o Gauges and indicators
  o Sensors
- Operation
- Wiring and controls
  o Computer controlled
- Faults

4. Service charging systems

- Inspection and testing
  o Sensory
  o Electrical
  o Mechanical
  o Scan tool
    - Data and functional test
- Component removal and replacement
- Faults

**Achievement Criteria 1**

**Performance** The learner will test a starting system.

**Conditions** The learner will be given
- A vehicle
- Test equipment
- Access to technical information

**Criteria** The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results
Achievement Criteria 2

Performance  The learner will test a charging system.

Conditions  The learner will be given
- A vehicle
- Test equipment
- Access to technical information

Criteria  The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results
Line (GAC): I

COMPETENCY
Diagnose and repair lighting and wiper systems

OBJECTIVES
To be competent in this area, the individual must be able to:
- Service lighting systems.
- Service wiper systems.

LEARNING TASKS

1. Describe lighting systems
   - Safety
   - Types
     - Conventional
     - High intensity discharge (HID)
     - Light emitting diode (LED)
   - Wiring and controls
   - Sensors and switches
   - Faults

2. Service lighting systems
   - Inspection and testing
     - Sensory
     - Electrical
     - Scan tools
     - Data and functional test
   - Wiring diagrams
   - Adjustments
     - Aiming
   - Faults

3. Describe wiper systems
   - Mechanical
     - Motors
     - Linkage/transmissions
   - Wiring and controls
     - Computer control
   - Sensors and switches
   - Pump and washer systems
   - Faults

4. Service wiper systems
   - Inspection and testing
     - Sensory
     - Mechanical
     - Electrical
     - Scan tools
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Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K1 Diagnose and repair steering and control systems

Objectives
To be competent in this area, the individual must be able to:
• Service electronic power steering.

LEARNING TASKS

1. Describe electronic steering systems
   • Types
     o Column
     o Rack
   • Sensors
     o Steering wheel
     o Torque
   • Voltage level
     o Low
     o High
   • Wiring and controls
   • Computer-controlled
   • Faults

2. Service electronic steering systems
   • Inspection and testing
     o Sensory
     o Mechanical
     o Electrical
     o Scan tools
       ‒ Data and functional test
   • Wiring diagrams
   • Service procedures
     o Replacement
       ‒ Rack
       ‒ Sensors
     o Alignment
       ‒ Zeroing
       ‒ Relearning
   • Faults
Achievement Criteria

Performance  The learner will reset and relearn steering sensors.

Conditions  The learner will be given
- A vehicle
- Scan tool
- Access to technical information

Criteria  The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Completion/accuracy of task
Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K2 Diagnose and repair suspension and control systems

Objectives
To be competent in this area, the individual must be able to:
• Describe servicing of electronic suspension systems.

LEARNING TASKS

1. Describe electronic suspension systems
   • Electrically controlled shocks
   • Load levelling system
   • Air springs/struts
   • Electronic/computer controlled dynamic systems
   • Sensors and actuators
   • Wiring and controls
   • Faults

2. Describe servicing of electronic suspension systems
   • Safety
   • Inspection and testing
     o Sensory
     o Mechanical
       – Air spring leak test
     o Electrical
     o Scan tools
       – Data and functional test
   • Wiring diagrams
   • Service procedures
     o Replacement
     o Relearning ride height
     o Alignment
   • Faults
Line (GAC): K DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS

Competency: K3 Diagnose and repair braking and control systems

Objectives
To be competent in this area, the individual must be able to:
- Describe anti-lock braking systems and related systems.
- Service anti-lock braking systems.

**LEARNING TASKS**

1. Describe anti-lock braking systems
   - Two and four wheel
   - Components
     - Wheel speed sensors
     - Hydraulic modulator
     - Control module
   - Wiring and controls
   - Operation
   - Faults
   - Related systems
     - Electronic brake force distribution
     - Traction control
     - Stability control

2. Service anti-lock braking systems
   - Inspection and testing
     - Sensory
     - Mechanical
     - Electrical
     - Scan tools
       - Data and functional test
   - Wiring diagrams
   - Service procedures
     - Component replacement
     - Power bleeding
   - Faults
Achievement Criteria

Performance  The learner will test a wheel-speed sensor.

Conditions  The learner will be given

- A vehicle
- Test equipment
- Access to technical information

Criteria  The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results
Level 3

Automotive Service Technician
LEARNING TASKS

1. Describe advanced electrical and electronic principles
   - Components
     - Diodes
     - Transistors
     - Capacitors
     - Photonic semiconductors
   - Operation
   - Electrical signal types
     - Pulse width modulation
     - Duty cycle

2. Interpret advanced wiring diagrams
   - Symbols and components
     - Conventional
     - Computer controlled circuit
   - Types
     - North American
     - European

3. Use advanced electrical test equipment
   - Types
     - Graphing multi-meter
     - Lab scope/Digital Storage Oscilloscope (DSO)
     - Scan tool
   - Operation
     - Set up
     - Functionality
4. Describe computer control systems

- Computer fundamentals
- Operation
  - Inputs
  - Process
  - Outputs
- Memory
- Look up tables
- Adoptions
- Software
  - Programming
  - Upgrading and reflashing
- Faults

**Achievement Criteria 1**

**Performance**
The learner will use lab scope to test a component.

**Conditions**
The learner will be given
- A vehicle or simulation board
- Lab scope
- Access to technical information

**Criteria**
The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results

**Achievement Criteria 2**

**Performance**
The learner will use an advanced wiring diagram to diagnose a fault.

**Conditions**
The learner will be given
- A system fault
- Access to technical information

**Criteria**
The learner will be evaluated on
- Procedure
- Accuracy of results
Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E2 Diagnose and repair gasoline fuel delivery and injection systems

Objectives
To be competent in this area, the individual must be able to:
- Service fuel delivery and injection systems.
- Service gasoline direct injection (GDI) systems.

<table>
<thead>
<tr>
<th>LEARNING TASKS</th>
<th>CONTENT</th>
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</thead>
</table>
| 1. Identify fuel types | - Safety
- Gasoline
  - Ethanol
- Characteristics
  - Ratings
  - Properties
  - Additives
- Alternate types
  - Liquid petroleum gas
  - Compressed natural gas |
| 2. Describe fuel delivery systems | - Components
  - Fuel tank
  - Fuel pump assembly
  - Fuel pressure regulator
  - Associated lines and fittings
- Operation
- Wiring and control
  - Computer control
- Faults |
| 3. Describe fuel injection systems | - Safety
- Components
  - Fuel injectors
  - Rail and associated fittings
- Operation
- Wiring and controls
  - Computer control
  - Driver types
  - Sensors
- Faults |
4. Service fuel delivery and injection systems
   - Safety
   - Inspection and testing
     - Sensory
     - Pressure
     - Volume
     - Electrical
   - Test equipment
     - Signals, data and functional test
   - Component replacement
   - Fuel system cleaning
   - Faults

5. Describe gasoline direct injection (GDI) systems
   - Safety
   - High pressure components
     - Pump
     - Regulator
     - Injectors
       - Type
       - Timing
     - Lines and fittings
   - Operation
     - Modes
     - Homogenous
     - Stratified
   - Faults
   - Wiring and controls
     - Computer controlled
     - Sensors

6. Service GDI systems
   - Safety
     - High pressure
   - Inspection and testing
     - Sensory
     - Pressure
     - Volume
     - Electrical
   - Test equipment
     - Signals, data and functional test
   - Component replacement
   - Fuel system cleaning
   - Faults
Achievement Criteria 1

Performance  The learner will perform a fuel pressure test.
Conditions  The learner will be given
  • A vehicle
  • Test equipment
  • Access to technical information
Criteria  The learner will be evaluated on
  • Safety
  • Tool usage
  • Procedure
  • Accuracy of results

Achievement Criteria 2

Performance  The learner will test a fuel injector.
Conditions  The learner will be given
  • A vehicle
  • Test equipment
  • Access to technical information
Criteria  The learner will be evaluated on
  • Safety
  • Tool usage
  • Procedure
  • Accuracy of results
Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS
Competency: E3 Diagnose and repair gasoline ignition systems

Objectives
To be competent in this area, the individual must be able to:
• Service electronic ignition systems.

LEARNING TASKS
1. Describe electronic ignition systems
   - Theoretical principles
     - Primary/secondary circuits
     - Timing
       - Advance
       - Retard
     - Induction
   - Components
     - Ignition coils
     - Spark plugs
       - Electrode design
       - Temperature
     - Sensors
   - Types
     - Waste spark
     - Coil on plug
   - Operation
   - Faults
   - Wiring and controls
     - Computer control
     - Sensors

2. Service electronic ignition systems
   - Safety
   - Inspection and testing
     - Sensory
     - Electrical
   - Test equipment
     - Signals, data and functional test
   - Component replacement
   - Maintenance
   - Faults
HARMONIZED PROGRAM OUTLINE
Program Content
Level 3

Achievement Criteria 1

Performance   The learner will test an ignition coil.
Conditions    The learner will be given
                • A vehicle
                • Test equipment
                • Access to technical information
Criteria      The learner will be evaluated on
                • Safety
                • Tool usage
                • Procedure
                • Accuracy of results

Achievement Criteria 2

Performance   The learner will test a crank shaft position sensor.
Conditions    The learner will be given
                • A vehicle
                • Test equipment
                • Access to technical information
Criteria      The learner will be evaluated on
                • Safety
                • Tool usage
                • Procedure
                • Accuracy of results
Line (GAC): E   DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E4   Diagnose and repair engine management systems

Objectives
To be competent in this area, the individual must be able to:
• Service engine management systems.
• Access and interpret system data.

LEARNING TASKS

1. Describe engine management
   CONTENT
   • Power train control module responsibilities
     o Ignition systems
     o Fuel systems
     o Air management (induction) systems
     o Emissions systems

2. Describe engine management inputs
   CONTENT
   • Principles
     o Speed density
     o Mass air flow
     o Feedback
   • Types of sensors
     o Speed
     o Position
     o Temperature
     o Volume
     o Pressure
     o Oxygen
   • Operation
   • Faults
   • Wiring and inputs from other systems
3. Describe engine management outputs
   - Principles
     - Air management
   - Types of actuators
     - Solenoids
     - Motors
   - Operation
   - Wiring and control
     - Computer controls

4. Service engine management inputs and outputs
   - Inspection and testing
     - Sensory
     - Electrical
     - Mechanical
     - Vacuum
   - Test equipment
     - Signals, data and functional test
   - Component replacement
   - Maintenance
     - Throttle body cleaning
   - Adaptions
     - Reset
     - Re-learn
     - Fuel trim

5. Access and interpret on-board diagnostic (OBD) information
   - Factory interface
     - Data
       - Ignition
       - Fuel
       - Misfire
     - Software versions
   - OBD global interface
     - Codes
     - Freeze frame
     - Readiness monitors
   - Evaluation of data
     - Code definition and description
     - Failure parameters
Achievement Criteria

Performance  The learner will access and interpret data to diagnose a system fault.

Conditions  The learner will be given
- A vehicle
- Test equipment
- Access to technical information

Criteria  The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results
Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS

Competency: E5 Diagnose and repair gasoline intake and exhaust systems

Objectives
To be competent in this area, the individual must be able to:
• Describe air induction, forced induction and exhaust systems.
• Describe servicing air induction and exhaust systems.

LEARNING TASKS

1. Describe air induction and exhaust systems
   • Air induction components
     o Air filtration
     o Throttle body
     o Intake manifold
       − Valves, linkages and motors
   • Exhaust systems
     o Manifolds and headers
     o Catalytic converters
     o Mufflers and resonators
     o Associated pipes and hardware
   • Faults

2. Describe forced air induction
   • Types
     o Superchargers
     o Turbochargers
   • Principles of operation
     o Boost
     o Measurements
     o Calculations
     o Effects
   • Intercoolers
   • Boost control

3. Describe servicing air induction and exhaust systems
   • Inspection and testing
     o Sensory
     o Electrical
     o Mechanical
     o Vacuum
     o Scan tool data and functional tests
   • Component replacement
   • Faults
Line (GAC): E DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS
Competency: E6 Diagnose and repair gasoline emissions control systems

Objectives
To be competent in this area, the individual must be able to:
- Service gasoline emission control systems.
- Service gasoline evaporative emission control systems.

LEARNING TASKS
1. Describe vehicle emissions
   - Types
     - Hydrocarbons
     - Carbon Monoxide
     - Oxides of nitrogen (NOX)
   - Impacts of emissions
   - Regulations

2. Describe gasoline emission systems
   - Pre-combustion systems
     - Positive crankcase ventilation (PCV)
     - Exhaust gas recirculation (EGR)
   - Post-combustion systems
     - Secondary air injection
     - Catalytic convertors
   - Operation
   - Faults
   - Wiring and control
   - Sensors and actuators

3. Service gasoline emission systems
   - Safety
   - Inspection and testing
     - Sensory
     - Pressure
     - Mechanical
     - Electrical
     - Vacuum
   - Test equipment
     - Signals, data and functional test
   - Component replacement
   - Faults
4. Describe evaporative emission systems

- Types
  - Pressure
  - Vacuum

- Components
  - Fuel tank
  - Canister
  - Solenoids/valves
  - Sensors

- Operation
  - System self test
  - Readiness monitor

- Faults
- Wiring and control

5. Service evaporative emission systems

- Safety
- Inspection and testing
  - Sensory
  - Pressure
  - Vacuum
  - Electrical

- Test equipment
  - Signals, data and functional test

- Component replacement
- Faults

Achievement Criteria 1

Performance The learner will perform a catalyst efficiency test.

Conditions The learner will be given

- A vehicle
- Test equipment
- Access to technical information

Criteria The learner will be evaluated on

- Safety
- Tool usage
- Procedure
- Accuracy of results
Achievement Criteria 2

Performance  The learner will perform evaporative emissions system leak test.

Conditions  The learner will be given
  • A vehicle
  • Test equipment
  • Access to technical information

Criteria  The learner will be evaluated on
  • Safety
  • Tool usage
  • Procedure
  • Accuracy of results
Line (GAC): G DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS

Competency: G1 Identify type of networking system

Objectives
To be competent in this area, the individual must be able to:
- Describe network computer control systems.
- Describe multiplexing.

LEARNING TASKS

1. Describe network computer control systems
   - Network fundamentals
   - Network configurations
     - Ring
     - Parallel
     - Bus
   - Components
   - Wiring and connectors
     - Single wire
     - Twisted pair
     - Fiber optic
   - Network types
     - Controller Area Network (CAN)
     - Local Interconnect Network (LIN)
     - Flexray
     - Media Oriented Systems Transport (MOST)
   - Operation
   - Faults

2. Describe multiplexing
   - Multiplexing fundamentals
     - Switch inputs
     - Control Modules
       - Body Control Module (BCM)
     - Outputs
   - Faults
Line (GAC): G DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS

Competency: G2 Diagnose and repair networking systems

Objectives
To be competent in this area, the individual must be able to:
- Service networking systems.
- Service multiplexing systems.
- Service module software.

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HARMONIZED PROGRAM OUTLINE
Program Content
Level 3

Achievement Criteria 1
Performance The learner will perform a functional test on a multiplexing system.
Criteria The learner will be evaluated on
• Safety
• Tool usage
• Procedure
• Accuracy of results

Achievement Criteria 2
Performance The learner will determine if there is an updated software version for a control module.
Criteria The learner will be evaluated on
• Safety
• Tool usage
• Procedure
• Accuracy of results
Line (GAC): H  DIAGNOSE AND REPAIR DRIVELINE SYSTEMS
Competency: H5  Diagnose and repair mechanical transfer cases

Objectives
To be competent in this area, the individual must be able to:
• Describe mechanical transfer cases and power flow.

LEARNING TASKS

1. Describe mechanical transfer cases
   • Types
     o Part-time
     o Full-time
   • Configuration
     o Chain-drive
     o Gear-drive
   • Components
   • Lubricants
   • Operation

2. Describe mechanical transfer case power flow
   • Types
     o Part-time
     o Full-time
   • Engagement types
     o Mechanical
     o Motor
   • Configuration
     o Chain-drive
     o Gear-drive
   • Modes of operation
     o Two-high (2H)
     o Four-high (4H)
     o Four-low (4L)
Line (GAC): I  DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS

Competency: I4  Diagnose and repair electrical options and accessories

Objectives
To be competent in this area, the individual must be able to:
• Service electrical options and accessories.

LEARNING TASKS

1. Describe electrical options and accessories

   • Factory options
     o Sunroof
     o Mirrors
     o Seats
     o Windows
   • Accessories
     o Remote starter
     o Theft deterrents
   • Operation
   • Faults
   • Wiring and controls

2. Service electrical options and accessories

   • Inspection and testing
     o Sensory
     o Electrical
     o Mechanical
   • Component replacement
   • Repair

3. Service electrical accessories

   • Power accessories
     o Continuity tests
     o Voltage drop
     o Identify circuit operation
     o Current flow
   • Diagnostic fault codes
Achievement Criteria 1

Performance: The learner will perform electrical tests on a power window system.

Conditions: The learner will be given
- Vehicle
- Test equipment
- Access to technical information

Criteria: The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results

Achievement Criteria 2

Performance: The learner will perform electrical tests on a power door lock system.

Conditions: The learner will be given
- Vehicle
- Test equipment
- Access to technical information

Criteria: The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results
Level 4

Automotive Service Technician
Line (GAC): C USE COMMUNICATION AND MENTORING TECHNIQUES  
Competency: C2 Use mentoring techniques

Objectives
To be competent in this area, the individual must be able to:
• Use mentoring techniques.

LEARNING TASKS
1. Describe mentoring

CONTENT
• Responsibilities
  o Sign off
  o Reporting work-based hours
• Modelling leadership
• Coaching
• Learning/teaching strategies
  o Identifying learning needs
  o Demonstrating skill
  o Assessing skills
  o Providing feedback
• Communication
• Professionalism
Line (GAC): F DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS

Competency: F1 Diagnose and repair diesel fuel delivery and injection systems

Objectives
To be competent in this area, the individual must be able to:
- Describe diesel fuel and fuel testing.
- Describe diesel high pressure electronic fuel injection systems.
- Service diesel fuel systems.

LEARNING TASKS

1. Describe diesel fuels
   - Safety
   - Characteristics
     - Ratings
     - Properties
     - Additives
   - Contamination and testing
   - Alternate types
     - Bio diesel

2. Describe diesel low pressure fuel delivery
   - Components
     - Fuel tank
     - Fuel pump assembly
     - Associated lines and fittings
     - Filteration
       - Water
       - Sensor
   - Operation
   - Wiring and control
   - Faults
3. Describe diesel high pressure electronic fuel injection systems

- Safety
- High pressure components
  - Pump
  - Regulators
  - Injectors
  - Lines and fittings
- Operation
  - Types
    - Common rail
  - Timing
  - Strategies
- Faults
- Wiring and controls
- Sensors

4. Service diesel fuel systems

- Safety
  - High pressure
- Inspection and testing
  - Sensory
  - Hydrometer
  - Pressure
  - Volume
  - Electrical
- Test equipment
  - Scan tool
    - Data and functional
- Component replacement
- Maintenance
- Repair
- Faults
Achievement Criteria 1

Performance  The learner will test diesel fuel.

Conditions  The learner will be given
  - Fuel
  - Test equipment
  - Access to technical information

Criteria  The learner will be evaluated on
  - Safety
  - Tool usage
  - Procedure
  - Accuracy of results

Achievement Criteria 2

Performance  The learner will test the low pressure fuel supply system.

Conditions  The learner will be given
  - Vehicle
  - Test equipment
  - Access to technical information

Criteria  The learner will be evaluated on
  - Safety
  - Tool usage
  - Procedure
  - Accuracy of results
Line (GAC): F  DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS

Competency: F2  Diagnose and repair diesel intake and exhaust systems

Objectives
To be competent in this area, the individual must be able to:
- Describe diesel intake and exhaust systems.
- Describe servicing diesel intake and exhaust.

LEARNING TASKS

1. Describe air induction and exhaust systems

   - Air induction components
     - Air filtration
     - Intake manifold
     - Heaters and glow plugs
   - Exhaust systems
     - Emissions components
     - Manifolds
     - Mufflers
     - Tail pipe cooler
   - Faults

2. Describe forced air induction

   - Turbochargers
     - Types
   - Principles of operation
     - Boost
     - Measurements
     - Calculations
     - Effects
   - Charged air cooler (CAC)
   - Faults

3. Describe servicing air induction and exhaust systems

   - Inspection and testing
     - Sensory
     - Electrical
     - Mechanical
     - Scan tool data and functional tests
   - Component replacement
   - Faults
HARMONIZED PROGRAM OUTLINE
Program Content
Level 4

Line (GAC):   F   DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS
Competency:   F3  Diagnose and repair diesel emission control systems

Objectives
To be competent in this area, the individual must be able to:
• Service diesel emission systems.

LEARNING TASKS

1. Describe diesel emissions
   • Types
     o Particulates
     o Oxides of nitrogen (NOX)
   • Impacts of emissions
   • Regulations

2. Describe diesel emission systems
   • Pre-combustion systems
     o Positive crankcase ventilation (PCV)
     o Exhaust gas recirculation (EGR)
   • Post-combustion systems
     o Catalytic convertors
     o Diesel particulate filter (DPF)
     o Selective catalyst reduction (SCR)
   • Operation
   • Faults
   • Wiring and control
   • Sensors and actuators
4. Service diesel emission systems

- Safety
- Inspection and testing
  - Sensory
  - Electrical
- Test equipment
  - Signals, data and functional test
- Diesel exhaust fluid (DEF)
  - Testing
- Component replacement
- Maintenance
  - Exhaust gas recirculation (EGR) decarbonization
  - Diesel particulate filter (DPF)
- Faults
HARMONIZED PROGRAM OUTLINE
Program Content
Level 4

Line (GAC): H  DIAGNOSE AND REPAIR DRIVELINE SYSTEMS
Competency: H3  Diagnose and repair automatic transmissions and transaxles

Objectives
To be competent in this area, the individual must be able to:
• Service automatic transmissions and transaxles.
• Assess automatic transmissions and transaxles condition.

LEARNING TASKS

1. Describe automatic transmissions and transaxles components
   • Torque convertors
   • Planetary gear train
   • Clutches and bands
   • Control valve body
   • Chains and sprockets
   • Coolers
   • Pumps
   • Fluid types
   • Sensors and actuators
   • Types
     o Dual clutch transmission (DCT)
     o Constant velocity transmission (CVT)
     o Conventional planetary
   • Operation
   • Fundamentals
     o Gear ratios
     o Power flow
     o Hydraulics
     o Electronics
   • Faults
     o Mechanical
     o Electrical (Control-side)

2. Describe automatic transmissions and transaxles
   • Procedures
   • Testing and inspection
     o Air check
     o Leak test
   • Wiring and controls
   • Hydraulics and electronics
   • Lubrication

3. Disassemble, inspect and re-assemble automatic transmissions and transaxles
4. Service automatic transmissions and transaxles
   • Inspection and testing
     o Signals
     o Data
     o Functional test
   • Test equipment
   • Adjustments
     o Shift adaptations
   • Service procedures
     o Relearn
     o Software update
   • Maintenance
     o Filtration
     o Fluid exchange

Achievement Criteria

Performance The learner will perform an automatic transmission/transaxle assessment.

Conditions The learner will be given
   • A vehicle or transmission
   • Test equipment
   • Access to technical information

Criteria The learner will be evaluated on
   • Safety
   • Tool usage
   • Procedure
   • Accuracy of results
Line (GAC): H  DIAGNOSE AND REPAIR DRIVELINE SYSTEMS
Competency: H6  Diagnose and repair all-wheel (AWD) systems

Objectives
To be competent in this area, the individual must be able to:
- Service all-wheel (AWD) drive systems.
- Service four-wheel drive (4WD) systems.

LEARNING TASKS
1. Describe AWD systems
   - Principles of operation
     - Power flow
     - Torque vectoring
   - Components
     - Power transfer unit (PTU)
     - Couplings
     - Torque splitting device
   - Sensors and actuators
   - Related systems
     - Stability control
     - Traction control
   - Lubrication and fluids
   - Wiring and controls
   - Faults

2. Describe 4WD systems
   - Modes of operation
     - Selective
     - Automatic
   - Components
     - Transfer cases
     - Axle disconnects
     - Hubs
       - Manual
       - Auto
   - Sensors and actuators
   - Related systems
     - Stability control
     - Traction control
   - Lubrication and fluids
   - Wiring and controls
   - Faults
LEARNING TASKS
3. Service AWD and 4WD systems

CONTENT
- Disassembly, inspection, reassembly
- Inspection and testing
  - Mechanical
  - Electrical
  - Vacuum
  - Signals
  - Data
  - Functional test
- Test equipment
- Service procedures
  - Relearn
  - Software update
- Component replacement
- Maintenance
  - Fluid
- Faults

Achievement Criteria
Performance The learner will disassemble, inspect and reassemble a transfer case.
Conditions The learner will be given
- A transfer case
- Tools and equipment
- Access to technical information
Criteria The learner will be evaluated on
- Safety
- Tool usage
- Procedure
- Accuracy of results
Line (GAC): I

Diagnose and repair electrical systems and components

Competency: I5

Diagnose and repair instrumentation, entertainment systems and displays

Objectives

To be competent in this area, the individual must be able to:
- Describe instrumentation, entertainment systems and displays.
- Describe servicing instrumentation, entertainment systems and displays.

### LEARNING TASKS

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</tr>
<tr>
<td><strong>3. Describe displays</strong></td>
</tr>
<tr>
<td>• Information center</td>
</tr>
<tr>
<td>o Navigation</td>
</tr>
<tr>
<td>o Collision avoidance</td>
</tr>
<tr>
<td>o Parking assist</td>
</tr>
<tr>
<td>o Back up camera</td>
</tr>
<tr>
<td>• Warning lights</td>
</tr>
<tr>
<td><strong>4. Describe servicing instrumentation, entertainment systems and displays</strong></td>
</tr>
<tr>
<td>• Inspection and testing</td>
</tr>
<tr>
<td>o Signals</td>
</tr>
<tr>
<td>o Data</td>
</tr>
<tr>
<td>o Functional tests</td>
</tr>
<tr>
<td>• Replacement</td>
</tr>
<tr>
<td>• Repair</td>
</tr>
<tr>
<td>• Software updates</td>
</tr>
</tbody>
</table>
LEARNING TASKS

CONTENT
• Personalization
• Faults
HARMONIZED PROGRAM OUTLINE
Program Content
Level 4

Line (GAC): J
DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR
CONDITIONING (HVAC) AND COMFORT CONTROL
SYSTEMS

Competency: J1 Diagnose and repair air flow control and heating systems

Objectives
To be competent in this area, the individual must be able to:
• Service air flow systems.
• Service heating systems.

LEARNING TASKS

1. Describe air flow systems

   CONTENT
   • Components
     o Actuators
     o Sensors
     o Doors
     o Linkage
   • Wiring and control
     o Computer controlled
   • Operation
     o Modes
       − Blend
       − Defrost
     o Zones
   • Faults

2. Describe heating systems

   CONTENT
   • Components
     o Cooling system
     o Heater cores
     o Secondary heater
       − Electric
   • Wiring and control
     o Computer controlled
   • Operation
     o Modes
       − Blend
       − Defrost
     o Zones
   • Faults
3. Service air flow and heating systems
   - Inspection and testing
     - Sensory
     - Mechanical
     - Electrical
   - Test equipment
     - Signal
     - Data
     - Functional test
   - Component replacement
   - Repair
   - Maintenance
     - Filters
   - Relearn procedures
Line (GAC): J DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS

Competency: J2 Diagnose and repair refrigerant systems

Objectives
To be competent in this area, the individual must be able to:
• Service refrigerant systems.

LEARNING TASKS
1. Describe refrigerant systems

   CONTENT
   • Safety
   • Principles of operation
     o Fundamentals
     o Strategies
   • Types
     o Refrigerants
     o Lubricants
     o Systems
   • Components
     o Types of compressors
       – High voltage
       – Clutchless
     o Condensor
     o Evaporator core
   • Wiring and control
     o Computer controlled
     o Sensors and actuators
   • Faults
   • Safety
   • Inspection and testing
     o Sensory
     o Mechanical
     o Electrical
     o Temperature
     o Pressure
     o Leak detection
   • Test equipment
     o Signal
     o Data
     o Functional test
   • Component replacement

2. Service refrigerant systems

   CONTENT
   • Safety
   • Inspection and testing
     o Sensory
     o Mechanical
     o Electrical
     o Temperature
     o Pressure
     o Leak detection
   • Test equipment
     o Signal
     o Data
     o Functional test
   • Component replacement
LEARNING TASKS

CONTENT

• Procedures
  o Maintenance
  o Repair
  o Evacuate
  o Recharge
• Faults

Achievement Criteria 1

Performance  The learner will assess refrigerant operating pressures.

Conditions  The learner will be given
• A vehicle
• Test equipment
• Access to technical information

Criteria  The learner will be evaluated on
• Safety
• Tool usage
• Procedure
• Accuracy of results

Achievement Criteria 2

Performance  The learner will perform a refrigerant system performance test.

Conditions  The learner will be given
• A vehicle
• Test equipment
• Access to technical information

Criteria  The learner will be evaluated on
• Safety
• Tool usage
• Procedure
• Accuracy of results

Achievement Criteria 3

Performance  The learner will perform an evacuation and recharge of a refrigerant system.

Conditions  The learner will be given
• A vehicle
• Test equipment
• Access to technical information

Criteria  The learner will be evaluated on
• Safety
HARMONIZED PROGRAM OUTLINE
Program Content
Level 4

- Tool usage
- Procedure
- Accuracy of results
Objectives
To be competent in this area, the individual must be able to:
• Describe restraint systems.
• Describe servicing restraint systems.

LEARNING TASKS
1. Describe restraint systems
   • Principles of operation
     o Deployment strategies
   • Types
   • Components
     o Clock spring
     o Sensors
       – Impact
       – Occupancy detection
     o Modules
   • Wiring and controls
   • Safety
     o Handling
     o Disposal
   • Inspection and testing
     o Sensory
     o Mechanical
     o Electrical
     o Data
     o Signals
   • Component replacement
   • Repair
   • Programming/calibration

2. Describe servicing restraint systems
Line (GAC): M DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)

Competency: M2 Diagnose and repair hybrid and electric vehicle (EV) systems

Objectives
To be competent in this area, the individual must be able to:
• Service hybrid and electric vehicles (EV).

LEARNING TASKS
1. Describe hybrid and electric vehicles (EV)

   CONTENT
   • Fundamentals of operation
     o Hybrid Electric Vehicle (HEV)
       - Series-parallel
       - Parallel
       - Plug in
     o Electric Vehicle (EV)
   • Components
     o High voltage battery
     o Motor generators
     o Inverters and converters
   • Modes of operation
     o Regenerative braking
     o Idle shut off
   • Wiring and control
   • Driveline systems
     o Lubricants
   • Safety protocols
   • Inspection and testing
     o Sensory
     o Electrical
     o Data
     o Functional tests
   • Test equipment
     o Category III
   • Component replacement
   • Maintenance
     o Filtration
     o Lubricants
     o Cooling system
   • Repair
   • Battery charging

2. Service hybrid and electric vehicles (EV)
Achievement Criteria

Performance  The learner will perform a high voltage battery disconnect.

Conditions  The learner will be given
- A hybrid vehicle or EV
- Tools and equipment
- Access to technical information

Criteria  The learner will be evaluated on
- Safety
- Tool and equipment usage
- Procedure
- Accuracy of results
Section 4

TRAINING PROVIDER STANDARDS
Facility Requirements

Classroom Area

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/air conditioning for comfort all year round
- In-room temperature regulation and ventilation to ensure comfortable room temperature
- Acoustics in the room must allow the instructor to be heard
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

Shop Area

- Compliance with all local and national fire code and occupational safety requirements
- Ventilation and vehicle exhaust extraction as per WorkSafeBC Standards
- Compliance with Municipal and Provincial bylaws
- Ceiling shall be a minimum height of 16' or as varied by good engineering practices and code
- Appropriate lifting devices (hoists) used in industry
- Adequate hoist to student ratio
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Refuse and recycling bins for used shop materials
- First-aid facilities
- Computer terminals

Lab Requirements

- This section does not apply.

Student Facilities

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal storage lockers

Instructor's Office Space

- Desk and filing space
- Computer
Other
  • WiFi
Tools and Equipment: Common to All Levels

Required Shop Equipment

- Acetylene torches
- Air compressor – hoses – inline filter and water separators
- Battery charger/boosting equipment
- Bench grinders
- Bench vises
- Bottle jacks (2)
- Brake pedal depressor
- Computer stations or terminals
- Drill press
- Floor jack
- Grease gun and fluid suction pump
- Heat gun
- High voltage safety gloves (0 rated 1000v)
- Hydraulic press
- Infrared thermometer
- Jack stands and supports
- Oil drain barrels and disposal system
- Parts washers
- Seal drivers and extractors
- Spreaders (tire)
- Smoke machine
- Spring compressors – coil spring and strut
- Tire balancer equipment (road-force type recommended)
- Tire changing machine (preferred run-flat capable)
- Tire repair equipment
- TPMS system service tools
- Vehicle lifts
- Vehicle service information system
- Water hose
- Welding equipment – GMAW welder and oxy fuelled
- Work benches

Required Electronic Service Equipment

- Lab scope – 4-8 per class of 16 (2-channel, digital, cursor function with time capture capability)
- Lab scope accessories (shielded cables and back probes)
- Logic (power) probe
- Low amp probe
- Scan tools (various factory and generic)

Required Shop (Facility) Tools

- Air drills/tools
- Air hammer/chisel
- Air ratchet
- Antifreeze tester
- Blow gun
- Bolt extractor set (easy outs)
- Centre punch
- Chisels, punches
- Creeper/fender covers
- Crowfoot wrenches (flare and std, SAE and metric)
- Drill and bits
- Drill gauge
- Feeler gauges – SAE and metric
- Files – bastard cut/half round/mill cut/square and thread file
- Filter wrenches
- Flare nut wrenches – SAE and metric
- Flash lights
HARMONIZED PROGRAM OUTLINE
Program Content
Section 4

- Hacksaw
- Hammers – ball peen/dead blow/rubber
- Hex keys – SAE and metric
- Impact driver and bits
- Impact wrench and impact socket set – SAE and metric
- Inspection mirror
- Jumper lead
- Magnetic pick up tool
- Mallet/soft face
- Mechanic’s pick set
- Pliers – slip joint, needle nose, adjustable, wheel weight, side cutter, snap ring, locking, hog ring and battery types
- Pry bar
- Ratchet and sockets – 1/4, 3/8 and 1/2 drive – SAE and metric, swivel, spark plug, extensions and adapters
- Scraper (gasket and carbon)
- Screwdriver set
- Steel rule
- Stethoscope
- Straight edge
- Stud extractor
- Tap and die set – SAE and metric
- Tap extractor
- Tape and ruler
- Thread files
- Thread pitch gauge
- Tin snips – centre, left and right cut
- Tire pressure gauge
- Tool box
- Torque wrenches – 3/8 and 1/2
- Vise grips
- Wire brush
- Wire stripper/crimping tool
- Wrench set – SAE and metric/various designs

Student Tools and Equipment

During attendance and completion of the technical training sessions, apprentices may be responsible for having specific equipment and tools. If equipment and tools are required, a list will be given to each apprentice at the beginning of the technical training session.
Tools and Equipment: Level 1

Required Shop Equipment

- Air buffer
- Airbag removal tools
- Airbag simulators
- Alignment lift and equipment - 4 wheel
- Angle grinder
- Arbor press
- Axle boot clamp tool
- Ball joint press and adapters
- Battery hydrometer
- Battery tester (electronic)
- Battery tester/alternator and starter tester (AVR)
- Bearing remover
- Belt tension gauge
- Brake adjustment calipers
- Brake bleeder wrenches
- Brake cylinder hone
- Brake drum gauge (for brake shoe adjusting)
- Brake drum micrometer
- Brake fluid moisture tester
- Brake lathe
- Brake pressure tester
- Brake rotor gauge/micrometer
- Brake system bleeder
- Brake washer system (for 2 and 4 post hoists)
- Caliper tools for rear-wheel disc
- Chassis ears
- Dial indicator set (flare and std, SAE and metric)
- Door trim tools
- Electrical short detector
- Flaring tool (SAE, metric and ISO)
- Heli-coil kits
- Hub service kit
- Leak detection tank (tires)
- Pickle-fork tool set
- Pitman arm pullers
- Power-steering pressure tester
- Pullers – gear, pulley and steering wheel
- Rivet gun
- Slide hammer
- Smoke machine
- Steering wheel holder
- Steering wheel puller set
- Stretch belt removal and installation tool
- Tie-rod end puller
- Tie-rod sleeve tools
- Transmission fixtures
- Tube bending tool
- Tube cutters
- U-joint press
- Upholstery tools – trim panel tools
- Vacuum gauge
- Wheel stud installer
Required Shop (Facility) Tools

- Battery post service and reshape tool
- Belt tension release tool
- Brake bleeder wrenches
- Brake service tools (adjusters, spring removal, installation and caliper tools)
- Die grinder
- Multi-meter (DVOM)
- Nut driver set – SAE and metric
- Soldering tools
- Standard test leads and probes
- Tamper-proof torx set

- Terminal remover tools
- Test lamp – electronics safe (powered and non-powered)
- Torque angle meter/indicator
- Torx bits
- Tread depth gauge (for tires and brakes)
- Trouble light
- Utility knife
- Vacuum pump/gauge
- Vernier caliper – SAE and metric
Tools and Equipment: Level 2

Required Shop (Facility) Tools and Equipment
- Alternator pulley remover
- Antifreeze tester
- Black light
- Bore scope
- Chassis ears
- Compression tester
- Coolant drain barrels and disposal system
- Coolant vacuum filler
- Cooling system pressure tester
- Cylinder hones
- Cylinder leak down tester
- Dial bore gauge
- Engine lift
- Engine oil pressure test kit
- Engine supports
- Headlight aiming equipment
- Micrometers
- Oil drain barrels and disposal system
- Pyrometer
- Reamers
- Transmission fixtures

Tools and Equipment: Level 3

Required Shop (Facility) Tools and Equipment
- Fuel line disconnect set
- Fuel testing equipment
- Vacuum/pressure gauge
- Module reprogramming equipment

Tools and Equipment: Level 4

Required Shop (Facility) Tools and Equipment
- Air bag load tool
- Air conditioning recovery equipment
- Automatic transmission oil pressure test kit
- Diesel fuel hydrometer
- Fuel pressure gauges
- Leak detection equipment (refrigerants)
Reference Materials

Recommended Reference Materials

Level One

Level Two

Level Three
  OR

Level Four

Suggested Reference Material
Instructor Requirements

Occupation Qualification
The instructor must possess:

- Automotive Service Technician with an Interprovincial “Red Seal” endorsement

Work Experience

- Must have a minimum of five years’ experience as a journeyperson
- Must have diverse industry experience covering all the competencies in this program

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Instructor’s Certificate (minimum 30-hour course)
- Instructors must have or be registered in an Instructor’s Diploma Program, to be completed within a five year period
- Hold a Bachelor’s or Master’s Degree in Education
Appendices
APPENDIX A

Assessment Guidelines
Appendix A: Assessment Guidelines

Program: Automotive Service Technician

Training providers delivering Automotive Service Technician apprenticeship in-school technical training are required to enter the following information in ITA Direct Access for each apprentice:

- An in-school mark in the form of a percentage
  (Minimum 70% is required for a pass)

Training Provider Component: In-School Technical Training

The in-school mark for each level is derived from a combination of theory and practical assessments.

Calculation tables showing the subject competencies, theory and practical percentage weightings for each competency are shown in the Grading Sheet: “Subject Competencies and Weightings” section of this document.

Automotive Service Technician:

- The theory competency result is calculated based on 100% on accumulated competencies;
- The practical competency result is calculated based on 100% on accumulated competencies;
- The final in-school result is calculated by applying a weighting of 70% to the final theory result and a weighting of 30% to the practical result and then adding the two results together.

Successful completion of the in-school training for each level is defined as an in-school mark of 70% or greater.

ITA Certificate of Qualification (C of Q) Exam: Level 1-3

Apprentices registered in the Automotive Service Technician program are required to write a C of Q exam after completing the in-school technical training. A score of 70% or higher is required for a pass.

ITA Certificate of Qualification exams should be requested by training providers via the usual ITA procedure.

ITA will administer and invigilate ITA Certificate of Qualification exams and score and record exam results in ITA Direct Access.
ITA Component:  ITA Standardized Level Examinations Level 4

AST 4 apprentices are required to write the ITA AST 4 standardized level examination after completing their in-school training, in order to acquire a final mark for AST 4. The ITA standardized level exam is not a C of Q exam and the percentage mark will be blended with the in-school mark to determine a final AST 4 level mark.

The AST 4 standardized level exam may be requested by training providers via the usual ITA procedure. The ITA will administer and invigilate the AST 4 standardized level exam and score and record exam results in ITA Direct Access. ITA Direct Access (ITADA) will automatically calculate the final level mark for AST 4 once the in-school training and standardized level exam marks are entered into the system.

In-school technical training (combined theory & practical) is weighted at 80% and the ITA standardized exam is weighted at 20%. These two scores are combined to determine the final level mark. This result is the final mark that is recorded in ITA Direct Access.

- A mark of 70% or greater is required to pass the level when combining the final in-school percentage score and the final ITA standardized level exam percentage score.

Interprovincial Red Seal Exam

In order to achieve certification with the Red Seal Endorsement, Automotive Service Technician (AST 4) apprentices are required to write the Automotive Service Technician (AST 4) Interprovincial Red Seal exam after completing all levels of in-school technical training. Apprentices must have passed all levels of in-school technical training or be approved challengers to sit the exam. A score of 70% or greater is required for a pass.

Interprovincial Red Seal exams should be requested by training providers via the usual ITA procedure.

The ITA will administer and invigilate Interprovincial Red Seal exams and score and record exam results in ITA Direct Access.
## Level 1 Grading Sheet: Subject Competency and Weightings

<table>
<thead>
<tr>
<th>PROGRAM: IN-SCHOOL TRAINING:</th>
<th>AUTOMOTIVE SERVICE TECHNICIAN LEVEL 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE</td>
<td>SUBJECT COMPETENCIES</td>
</tr>
<tr>
<td>A</td>
<td>PERFORM SAFETY-RELATED FUNCTIONS</td>
</tr>
<tr>
<td>B</td>
<td>USE TOOLS, EQUIPMENT AND DOCUMENTATION</td>
</tr>
<tr>
<td>C</td>
<td>USE COMMUNICATION AND MENTORING TECHNIQUES</td>
</tr>
<tr>
<td>H</td>
<td>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</td>
</tr>
<tr>
<td>I</td>
<td>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</td>
</tr>
<tr>
<td>K</td>
<td>DIAGNOSE AND REPAIR STEERING, SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES WHEELS, HUBS AND WHEEL BEARINGS</td>
</tr>
<tr>
<td>L</td>
<td>DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM</td>
</tr>
<tr>
<td>M</td>
<td>DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

### In-school theory / practical subject competency weighting

- **Theory** 70%
- **Practical** 30%

### Final in-school mark

Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Automotive Service Technician 1 Certificate of Qualification exam.

### C of Q Exam Mark

A score of 70% or higher is required for a pass.

All apprentices who complete the Automotive Service Technician 1 program with a FINAL level mark of 70% or greater will write the Automotive Service Technician 1 Certificate of Qualification examination as their final assessment.
### Level 2 Grading Sheet: Subject Competency and Weightings

<table>
<thead>
<tr>
<th>PROGRAM: IN-SCHOOL TRAINING:</th>
<th>AUTOMOTIVE SERVICE TECHNICIAN LEVEL 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>LINE</td>
<td>SUBJECT COMPETENCIES</td>
</tr>
<tr>
<td>D</td>
<td>DIAGNOSE AND REPAIR ENGINE SYSTEMS</td>
</tr>
<tr>
<td>H</td>
<td>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</td>
</tr>
<tr>
<td>I</td>
<td>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</td>
</tr>
<tr>
<td>K</td>
<td>DIAGNOSE AND REPAIR STEERING, SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES WHEELS, HUBS AND WHEEL BEARINGS</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

**In-school theory & practical subject competency weighting**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>70%</td>
<td>30%</td>
</tr>
</tbody>
</table>

**Final in-school mark**

Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Automotive Service Technician 2 Certificate of Qualification exam.

**C of Q Exam Mark**

A score of 70% or higher is required for a pass.

All apprentices who complete the Automotive Service Technician 2 program with a FINAL level mark of 70% or greater will write the Automotive Service Technician 2 Certificate of Qualification examination as their final assessment.
# Level 3 Grading Sheet: Subject Competency and Weightings

<table>
<thead>
<tr>
<th>PROGRAM: IN-SCHOOL TRAINING:</th>
<th>AUTOMOTIVE SERVICE TECHNICIAN LEVEL 3</th>
<th>THEORY WEIGHTING</th>
<th>PRACTICAL WEIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>E</strong> DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS</td>
<td></td>
<td>64</td>
<td>65</td>
</tr>
<tr>
<td><strong>G</strong> DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS</td>
<td></td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td><strong>H</strong> DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</td>
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<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>I</strong> DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</td>
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<td>19</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**In-school theory / practical subject competency weighting**

<table>
<thead>
<tr>
<th>Final in-school mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Automotive Service Technician 3 Certificate of Qualification exam.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C of Q Exam Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>A score of 70% or higher is required for a pass.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXAM%</th>
</tr>
</thead>
</table>

All apprentices who complete the Automotive Service Technician 3 program with a FINAL level mark of 70% or greater will write the Automotive Service Technician 3 Certificate of Qualification examination as their final assessment.
## Level 4 Grading Sheet: Subject Competency and Weightings

<table>
<thead>
<tr>
<th>PROGRAM: IN-SCHOOL TRAINING:</th>
<th>AUTOMOTIVE SERVICE TECHNICIAN LEVEL 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LINE</strong></td>
<td><strong>SUBJECT COMPETENCIES</strong></td>
</tr>
<tr>
<td>C</td>
<td>USE COMMUNICATION AND MENTORING TECHNIQUES</td>
</tr>
<tr>
<td>F</td>
<td>DIAGNOSE AND REPAIR DIESEL ENGINE</td>
</tr>
<tr>
<td>H</td>
<td>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</td>
</tr>
<tr>
<td>I</td>
<td>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</td>
</tr>
<tr>
<td>J</td>
<td>DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS</td>
</tr>
<tr>
<td>L</td>
<td>DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM</td>
</tr>
<tr>
<td>M</td>
<td>DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
</tr>
</tbody>
</table>

### In-school theory / practical subject competency weighting

| **In-school theory / practical subject competency weighting** | **70%** | **30%** |

### Final in-school mark

Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Automotive Service Technician 4 Standardized Level exam.

### In-school Mark

Combined theory and practical subject competency multiplied by 80%

### Standardized Level Exam Mark

The exam score is multiplied by 20%

### Final Level Mark

Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Automotive Service Technician Interprovincial Red Seal exam.

### FINAL %
APPENDIX B

Glossary
## Appendix B: Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessories</td>
<td>Features that are not originally equipped by the manufacturer</td>
</tr>
<tr>
<td>Adjustment</td>
<td>A minor change so that something works better, such as changing park position of a wiper.</td>
</tr>
<tr>
<td>CAN</td>
<td>Controller area network; a protocol for communication between electronic/computer modules.</td>
</tr>
<tr>
<td>Describe</td>
<td>To explain or give an account of an item or concept. This means an introduction to a topic area that will include terminology, safety as it pertains to the topic, types and uses of the item. For example, describing steering columns will include types, such as tilt and telescoping, steering wheel locks and combination switches.</td>
</tr>
<tr>
<td>DVOM</td>
<td>Digital voltage ohmmeter; meter for measuring voltage, amperage, resistance (ohms) and is digital in its operation.</td>
</tr>
<tr>
<td>Identify</td>
<td>Establish or indicate what something is. This is the most basic level of learning and typically precedes all others, including describing. In the case of a lengthy learning period (such as an apprenticeship), it is often adequate to identify a tool or procedure well in advance of actually describing and using the tool.</td>
</tr>
<tr>
<td>Interpret</td>
<td>To explain or understand the meaning of something. This primarily refers to using wiring diagrams and data.</td>
</tr>
<tr>
<td>Maintain</td>
<td>To keep a tool in good condition by performing regular maintenance such as lubrication or cleaning, as well as making repairs and correcting problems.</td>
</tr>
<tr>
<td>Micrometer</td>
<td>A precision measuring device for small distances.</td>
</tr>
<tr>
<td>OBD</td>
<td>On board diagnostics; part of a vehicle’s engine management software used to monitor system performance.</td>
</tr>
<tr>
<td>Ohm’s law</td>
<td>The relationship between current, resistance and voltage in any electrical circuit.</td>
</tr>
<tr>
<td>Options</td>
<td>Features that are originally equipped at time of manufacture.</td>
</tr>
<tr>
<td>Pascal’s law</td>
<td>Fluid pressure exerted in a sealed vessel is equal and undiminished in all directions.</td>
</tr>
<tr>
<td>Pneumatic</td>
<td>Operated by compressed air.</td>
</tr>
<tr>
<td>Sensory inspection</td>
<td>Using one or more of the five senses to perform an inspection.</td>
</tr>
<tr>
<td>Systems</td>
<td>A set of components working together as parts of a mechanism or an interconnecting network.</td>
</tr>
<tr>
<td>Use</td>
<td>The act of using something. This typically involves the safe and proper operation of a tool or system.</td>
</tr>
</tbody>
</table>
APPENDIX C

Previous Contributors
Appendix C: Previous Contributors

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by the Automotive Training Standards Organization (ATSO). Members include:

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