

## PROGRAM OUTLINE

Automotive Service Technician  
(AST)



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# **AUTOMOTIVE SERVICE TECHNICIAN (AST) HARMONIZED PROGRAM OUTLINE**

**APPROVED BY INDUSTRY  
DECEMBER 2016**

**BASED ON  
RSOS 2016**

**Developed by  
Industry Training Authority  
Province of British Columbia**



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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 journey person. 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 Insititute 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 Insititute 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.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
<b>Program Credentialing Model</b>	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
<b>OAC</b>	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
<b>Training Topics and Suggested Time Allocation</b>	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	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	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	Understand the relative weightings of various competencies of the occupation on which assessment is based
<b>Program Content</b>	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	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	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels





<b>Section</b>	<b>Training Providers</b>	<b>Employers/ Sponsors</b>	<b>Apprentices</b>	<b>Challengers</b>
<b>Training Provider Standards</b>	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	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	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	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
<b>Appendix – Glossary</b>			Defines program specific terminology and acronyms	



# **Section 2**

## **PROGRAM OVERVIEW**

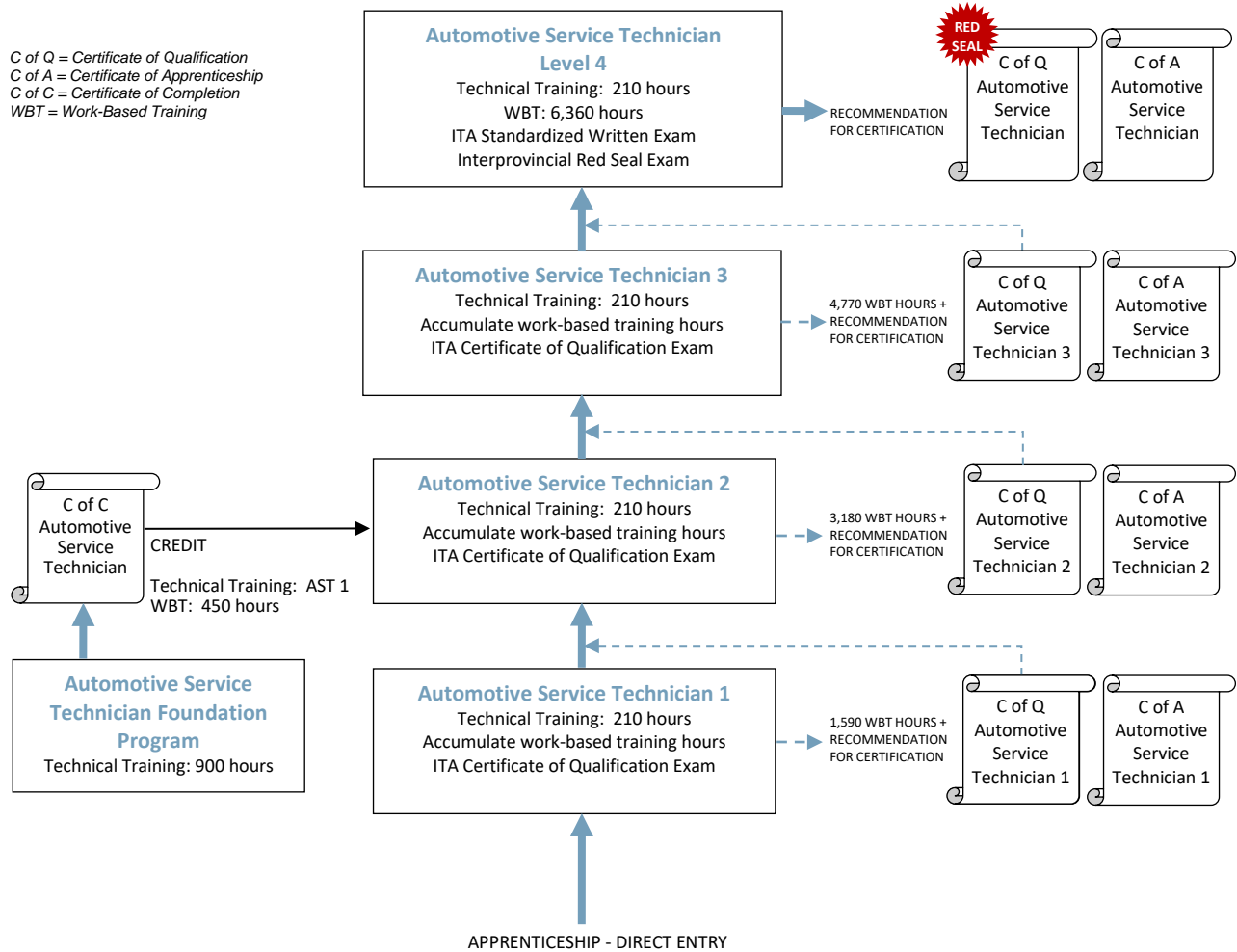
### **Automotive Service Technician (AST)**



## Program Credentialing Model

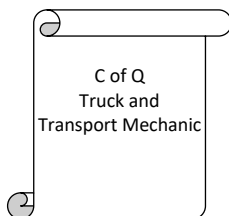
### Apprenticeship Pathway

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

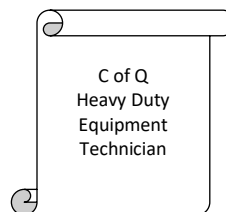


#### CROSS-PROGRAM CREDITS

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



Technical Training: None  
 Work-Based Training: 1,590 hours\*



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.

<b>PERFORM SAFETY-RELATED FUNCTIONS</b> <b>A</b>	Maintain safe work environment A1	Use personal protective equipment (PPE) and safety equipment A2		
	1	1		
<b>USE TOOLS, EQUIPMENT AND DOCUMENTATION</b> <b>B</b>	Use tools and equipment B1	Use fasteners, tubing, hoses and fittings B2	Use hoisting and lifting equipment B3	Use technical information B4
	1	1	1	1
<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b> <b>C</b>	Use communication techniques C1	Use mentoring techniques C2		
	1	4		
<b>DIAGNOSE AND REPAIR ENGINE SYSTEMS</b> <b>D</b>	Diagnose and repair cooling systems D1	Diagnose and repair lubricating systems D2	Diagnose and repair engine assembly D3	Diagnose and repair accessory drive systems D4
	2	2	2	2

## HARMONIZED PROGRAM OUTLINE Program Overview



<b>DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS</b> E	Diagnose and repair advanced wiring and electronics <div style="text-align: right;">E1</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair gasoline fuel delivery and injection systems <div style="text-align: right;">E2</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair gasoline ignition systems <div style="text-align: right;">E3</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair engine management systems <div style="text-align: right;">E4</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair gasoline intake and exhaust systems <div style="text-align: right;">E5</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair gasoline emissions control systems <div style="text-align: right;">E6</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3		
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<b>DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS</b> F	Diagnose and repair diesel fuel delivery and injection systems <div style="text-align: right;">F1</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>4</td><td> </td><td> </td></tr></table>			4			Diagnose and repair diesel intake and exhaust systems <div style="text-align: right;">F2</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>4</td><td> </td><td> </td></tr></table>			4			Diagnose and repair diesel emission control systems <div style="text-align: right;">F3</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>4</td><td> </td><td> </td></tr></table>			4																				
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<b>DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS</b> G	Identify type of networking system <div style="text-align: right;">G1</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair networking systems <div style="text-align: right;">G2</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3																										
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<b>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</b> H	Diagnose and repair drive shafts and axles <div style="text-align: right;">H1</div> <table border="1" style="width: 100%;"><tr><td>1</td><td> </td><td> </td><td> </td><td> </td></tr></table>	1					Diagnose and repair manual transmissions and transaxles <div style="text-align: right;">H2</div> <table border="1" style="width: 100%;"><tr><td> </td><td>2</td><td> </td><td> </td><td> </td></tr></table>		2				Diagnose and repair automatic transmissions and transaxles <div style="text-align: right;">H3</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>4</td><td> </td><td> </td></tr></table>			4			Diagnose and repair clutches <div style="text-align: right;">H4</div> <table border="1" style="width: 100%;"><tr><td> </td><td>2</td><td> </td><td> </td><td> </td></tr></table>		2				Diagnose and repair mechanical transfer cases <div style="text-align: right;">H5</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair all-wheel drive (AWD) systems <div style="text-align: right;">H6</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td> </td><td>4</td><td> </td></tr></table>				4	
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	Diagnose and repair final drive assemblies <div style="text-align: right;">H7</div> <table border="1" style="width: 100%;"><tr><td> </td><td>2</td><td> </td><td> </td><td> </td></tr></table>		2																																	
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<b>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</b> I	Diagnose and repair basic wiring and electrical systems <div style="text-align: right;">I1</div> <table border="1" style="width: 100%;"><tr><td>1</td><td> </td><td> </td><td> </td><td> </td></tr></table>	1					Diagnose and repair starting and charging systems and batteries <div style="text-align: right;">I2</div> <table border="1" style="width: 100%;"><tr><td>1</td><td>2</td><td> </td><td> </td><td> </td></tr></table>	1	2				Diagnose and repair lighting and wiper systems <div style="text-align: right;">I3</div> <table border="1" style="width: 100%;"><tr><td> </td><td>2</td><td> </td><td> </td><td> </td></tr></table>		2				Diagnose and repair electrical options and accessories <div style="text-align: right;">I4</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td>3</td><td> </td><td> </td></tr></table>			3			Diagnose and repair instrumentation, entertainment systems and displays <div style="text-align: right;">I5</div> <table border="1" style="width: 100%;"><tr><td> </td><td> </td><td> </td><td>4</td><td> </td></tr></table>				4							
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## HARMONIZED PROGRAM OUTLINE Program Overview



<b>DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS</b> J	Diagnose and repair air flow control and heating systems  <div style="text-align: right;">J1</div>	Diagnose and repair refrigerant systems  <div style="text-align: right;">J2</div>																	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%; text-align: center;">4</td> </tr> </table>				4	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%; text-align: center;">4</td> </tr> </table>				4									
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<b>DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS</b> K	Diagnose and repair steering and control systems  <div style="text-align: right;">K1</div>	Diagnose and repair suspension and control systems  <div style="text-align: right;">K2</div>	Diagnose and repair braking and control systems  <div style="text-align: right;">K3</div>	Diagnose and repair tires, wheels, hubs and wheel bearings  <div style="text-align: right;">K4</div>															
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<b>DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM</b> L	Diagnose and repair restraint systems  <div style="text-align: right;">L1</div>	Diagnose and repair wind noises, rattles and water leaks  <div style="text-align: right;">L2</div>	Diagnose and repair interior and exterior components, accessories and trim  <div style="text-align: right;">L3</div>	Diagnose and repair latches, locks and movable glass  <div style="text-align: right;">L4</div>															
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%; text-align: center;">4</td> <td style="width: 25%;"></td> </tr> </table>			4		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">1</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>	1				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">1</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>	1				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">1</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>	1		
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<b>DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)</b> M	Implement specific safety protocols for hybrid and electric vehicles (EV)  <div style="text-align: right;">M1</div>	Diagnose and repair hybrid and electric vehicle (EV) systems  <div style="text-align: right;">M2</div>																	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">1</td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>	1				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%; text-align: center;">4</td> <td style="width: 25%;"></td> </tr> </table>			4										
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## Training Topics and Suggested Time Allocation: Level 1

### AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 1

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



		% of Time	% of Time Allocated to:		
			Theory	Practical	Total
<b>Line M</b>	<b>DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)</b>	<b>1%</b>	<b>100%</b>	<b>0%</b>	<b>100%</b>
M1	Implement specific safety protocols for hybrid and electric vehicles (EV)		✓		
<b>Total Percentage for AST Level 1</b>		<b>100%</b>			





## Training Topics and Suggested Time Allocation: Level 2

### AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line D</b>	<b>DIAGNOSE AND REPAIR ENGINE SYSTEMS</b>	<b>38%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
D1	Diagnose and repair cooling systems		✓		
D2	Diagnose and repair lubricating systems		✓		
D3	Diagnose and repair engine assembly		✓	✓	
D4	Diagnose and repair accessory drive systems		✓		
<b>Line H</b>	<b>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</b>	<b>31%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
H2	Diagnose and repair manual transmissions and transaxles		✓	✓	
H4	Diagnose and repair clutches		✓		
H7	Diagnose and repair final drive assemblies		✓	✓	
<b>Line I</b>	<b>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</b>	<b>17%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
I2	Diagnose and repair starting and charging systems and batteries		✓	✓	
I3	Diagnose and repair lighting and wiper systems		✓		
<b>Line K</b>	<b>DIAGNOSE AND REPAIR STEERING AND SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES, WHEELS, HUBS AND WHEEL BEARINGS</b>	<b>14%</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>
K1	Diagnose and repair steering and control systems		✓	✓	
K2	Diagnose and repair suspension and control systems		✓		
K3	Diagnose and repair braking and control systems		✓	✓	
<b>Total Percentage for AST Level 2</b>		<b>100%</b>			



## Training Topics and Suggested Time Allocation: Level 3

### AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 3

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line E</b>	<b>DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS</b>	<b>80%</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>
E1	Diagnose and repair advanced wiring and electronics		✓	✓	
E2	Diagnose and repair gasoline fuel delivery and injection systems		✓	✓	
E3	Diagnose and repair gasoline ignition systems		✓	✓	
E4	Diagnose and repair engine management systems		✓	✓	
E5	Diagnose and repair gasoline intake and exhaust systems		✓		
E6	Diagnose and repair gasoline emissions control systems		✓	✓	
<b>Line G</b>	<b>DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS</b>	<b>10%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
G1	Identify type of networking system		✓		
G2	Diagnose and repair networking systems		✓	✓	
<b>Line H</b>	<b>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</b>	<b>3%</b>	<b>100%</b>	<b>0%</b>	<b>100%</b>
H5	Diagnose and repair mechanical transfer cases		✓		
<b>Line I</b>	<b>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</b>	<b>7%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
I4	Diagnose and repair electrical options and accessories		✓	✓	
<b>Total Percentage for AST Level 3</b>		<b>100%</b>			



## Training Topics and Suggested Time Allocation: Level 4

### AUTOMOTIVE SERVICE TECHNICIAN – LEVEL 4

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line C</b>	<b>USE COMMUNICATION AND MENTORING TECHNIQUES</b>	<b>1%</b>	<b>100%</b>	<b>0%</b>	<b>100%</b>
C2	Use mentoring techniques		✓		
<b>Line F</b>	<b>DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS</b>	<b>11%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
F1	Diagnose and repair diesel fuel delivery and injection systems		✓	✓	
F2	Diagnose and repair diesel intake and exhaust systems		✓		
F3	Diagnose and repair diesel emission control systems		✓		
<b>Line H</b>	<b>DIAGNOSE AND REPAIR DRIVELINE SYSTEMS</b>	<b>54%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
H3	Diagnose and repair automatic transmissions and transaxles		✓	✓	
H6	Diagnose and repair all-wheel drive (AWD) systems		✓	✓	
<b>Line I</b>	<b>DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS</b>	<b>2%</b>	<b>80%</b>	<b>20%</b>	<b>100%</b>
I5	Diagnose and repair instrumentation, entertainment systems and displays		✓		
<b>Line J</b>	<b>DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS</b>	<b>17%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
J1	Diagnose and repair air flow control and heating systems		✓		
J2	Diagnose and repair refrigerant systems		✓	✓	
<b>Line L</b>	<b>DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM</b>	<b>5%</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>
L1	Diagnose and repair restraint systems		✓		
<b>Line M</b>	<b>DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)</b>	<b>10%</b>	<b>80%</b>	<b>20%</b>	<b>100%</b>
M2	Diagnose and repair hybrid and electric vehicle (EV) systems		✓	✓	
<b>Total Percentage for AST Level 4</b>		<b>100%</b>			



# **Section 3**

## **PROGRAM CONTENT**

### **Automotive Service Technician**



# Level 1

## Automotive Service Technician





**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









**LEARNING TASKS**

- 5. Describe oxyacetylene components
  
- 6. Demonstrate oxyacetylene procedures
  
- 7. Describe MIG (GMAW) welding components and methods
  
- 8. Demonstrate MIG (GMAW) welding procedures

**CONTENT**

- Storage
- Cleaning and maintenance
  
- Safety
- Gases
- Cylinders, regulators and hoses
- Torches
  
- Set up
- Lighting
- Heating and cutting
- Shut down
- Storage
- Inspection and maintenance
  
- Gas Metal Arc Welding (GMAW)
- Safety
- Gases
- Cylinders, regulator and hose
- Ground terminal
  
- Set up
- Welding
- Shut down
- Storage
- Inspection and maintenance

**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





5. Describe accessory drive belts

- Types
  - Serpentine
  - Stretch
  - V-belt
- Inspection and maintenance
- Installation



**Line (GAC):            B    USE TOOLS, EQUIPMENT AND DOCUMENTATION**

**Competency:        B3    Use hoisting and lifting equipment**

**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
  - Mechanical
  - Hydraulic
  - Pneumatic
- Types of hoists
  - 2-post
  - 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
  
2. Use technical information

**CONTENT**

- Types
  - Electronic
  - Print
  
- Navigation
- Manufacturer’s specifications
- Manufacturer’s recalls
- Repair procedures
  - Estimates
  - 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
  
2. Use active listening
  
3. Use digital communication technologies

**CONTENT**

- Verbal and written instructions
- Record keeping
  - Service/work orders
  - Technical reports
  - Parts requisition
- Attention
- Open-ended questions
- Clarification
- Hand-held devices







**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.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Describe electrical fundamentals</li> <br/> <li>2. Describe electrical circuits and components</li> <br/> <li>3. Read and interpret wiring diagrams</li> <br/> <li>4. Service and repair wiring</li> <br/> <li>5. Use electrical test equipment</li> </ol> | <ul style="list-style-type: none"> <li>• Terminology</li> <li>• Theories <ul style="list-style-type: none"> <li>○ Ohm's law</li> <li>○ Magnetism</li> <li>○ Watt's law</li> </ul> </li> <li>• Types of circuits</li> <li>• Faults <ul style="list-style-type: none"> <li>○ Opens</li> <li>○ Shorts</li> <li>○ Grounds</li> </ul> </li> <li>• Components <ul style="list-style-type: none"> <li>○ Switches</li> <li>○ Circuit protection</li> <li>○ Relays</li> </ul> </li> <li>• Symbols</li> <li>• Colours</li> <li>• Identification numbers</li> <li>• Power flows</li> <li>• Types of wires</li> <li>• Repair methods</li> <li>• Types <ul style="list-style-type: none"> <li>○ Test lights</li> <li>○ Power (logic) probes</li> <li>○ Digital Volt Ohm meter (DVOM)</li> </ul> </li> <li>• Measuring values <ul style="list-style-type: none"> <li>○ Voltage</li> <li>○ Amperage</li> <li>○ Resistance</li> </ul> </li> <li>• Units of measurement</li> </ul> |
|--|---|



**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



**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 and test 12-volt batteries.

**LEARNING TASKS**

1. Describe 12-volt batteries
  
2. Service 12-volt batteries
  
3. Test 12-volt batteries
  
4. Charge 12-volt batteries

**CONTENT**

- Safety
- Construction
- Types
- Ratings
  
- Inspection
- Cleaning
- Maintenance
- Installation
- Recycling
  
- Load
- Conductance
- Hydrometer
- Parasitic
- Interpret test data
  
- 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**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Describe steering columns</li> <br/> <li>2. Inspect steering columns</li> <br/> <li>3. Describe occupant restraints</li> <br/> <li>4. Remove and replace steering wheel air bag inflator module</li> <br/> <li>5. Describe steering linkage</li> </ol> | <ul style="list-style-type: none"> <li>• Types <ul style="list-style-type: none"> <li>○ Tilt</li> <li>○ Telescoping</li> </ul> </li> <li>• Steering wheel lock</li> <li>• Combination switch</li> <li>• Shafts, universal joints, coupling, splines</li> <li>• Collapsing function</li> <li>• Electrical connections</li> <li>• Safety</li> <li>• Types <ul style="list-style-type: none"> <li>○ Driver</li> <li>○ Passenger</li> <li>○ Seat belt pre-tensioner</li> </ul> </li> <li>• Air bag wiring</li> <li>• Safety <ul style="list-style-type: none"> <li>○ Disarm</li> </ul> </li> <li>• Precautions <ul style="list-style-type: none"> <li>○ Handling</li> <li>○ Storage</li> </ul> </li> <li>• Types <ul style="list-style-type: none"> <li>○ Parallelogram</li> <li>○ Cross steer</li> <li>○ Rack and pinion</li> </ul> </li> <li>• Linkage</li> <li>• Tie rods</li> </ul> |
|--|---|



- |  |  |
|--|--|
| 6. Inspect steering linkage                | <ul style="list-style-type: none"> <li>• Tests           <ul style="list-style-type: none"> <li>○ Road test</li> <li>○ Steering wheel free play</li> <li>○ Dry park test</li> <li>○ Visual inspection</li> </ul> </li> </ul>   |
| 7. Describe conventional steering gears    | <ul style="list-style-type: none"> <li>• Recirculating ball steering box design           <ul style="list-style-type: none"> <li>○ Ball nut assembly</li> <li>○ Sector shaft</li> <li>○ Thrust bearings</li> <li>○ Seals</li> <li>○ Lubrication</li> </ul> </li> </ul>   |
| 8. Service conventional steering gears     | <ul style="list-style-type: none"> <li>• Seal leakage</li> <li>• Shaft wear</li> <li>• Adjustments           <ul style="list-style-type: none"> <li>○ Gear tooth lash</li> <li>○ Over centre adjustment</li> </ul> </li> </ul>   |
| 9. Describe rack and pinion steering gears | <ul style="list-style-type: none"> <li>• Housing and seals</li> <li>• Rack and pinion</li> <li>• Bearings</li> <li>• Tie rod ends</li> <li>• Bellows (dust boots)</li> <li>• Mounting</li> </ul>   |
| 10. Service rack and pinion steering gears | <ul style="list-style-type: none"> <li>• Tie rod ends</li> <li>• Leaks</li> <li>• Mounting</li> </ul>  |
| 11. Describe power steering                | <ul style="list-style-type: none"> <li>• Fluids</li> <li>• Pump</li> <li>• Hoses</li> <li>• Valves</li> </ul>  |
| 12. Service power steering                 | <ul style="list-style-type: none"> <li>• Fluid level and condition           <ul style="list-style-type: none"> <li>○ Leaks</li> </ul> </li> <li>• Belts</li> <li>• Tests           <ul style="list-style-type: none"> <li>○ Road test</li> <li>○ Visual inspection</li> <li>○ Pressure and volume</li> </ul> </li> <li>• Bleeding procedures</li> </ul> |



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
  - Procedure
  - Tool usage
  - Completion of task





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

**Achievement Criteria**

- |             |   |
|-------------|---|
| Performance | The learner will identify and inspect suspension systems.   |
| Conditions  | The learner will be given <ul style="list-style-type: none"> <li>• A vehicle</li> <li>• Measuring equipment</li> <li>• Access to technical information</li> </ul>   |
| Criteria    | The learner will be evaluated on <ul style="list-style-type: none"> <li>• Safety</li> <li>• Testing procedure</li> <li>• Accuracy of component identifications</li> <li>• Accuracy of inspection</li> </ul> |







**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
  
2. Service tires
  
3. Describe wheels
  
4. Inspect wheels
  
5. Describe Tire Pressure Monitoring System (TPMS)
  
6. Describe wheel bearings

**CONTENT**

- Side wall markings
- Ratings
- Tread design
- Run flat design
- Inspection
  - Wear patterns
  - Damage
- Rotation
- Mounting and balancing
- Repair
- Types
- Offset
- Sizing
- Wheel fasteners
- Curb damage
- Run out
- Types
  - Direct
  - Indirect
- Sensor replacement
- System service
  - Reset
  - Reprogram
  - Calibrate
- Types
  - Ball
  - Tapered roller
  - 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



<b>Line (GAC):</b>	<b>L</b>	<b>DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM</b>
<b>Competency:</b>	<b>L3</b>	<b>Diagnose and repair interior and exterior components, accessories and trim</b>

**Objectives**

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

- Repair interior and exterior components and trim.

**LEARNING TASKS**

**CONTENT**

<ol style="list-style-type: none"> <li>1. Describe interior and exterior body components and trim</li> </ol>	<ul style="list-style-type: none"> <li>• Exterior components               <ul style="list-style-type: none"> <li>○ Mirrors</li> <li>○ Roof rack</li> </ul> </li> <li>• Interior components               <ul style="list-style-type: none"> <li>○ Seats</li> <li>○ Dashboard</li> </ul> </li> <li>• Accessories               <ul style="list-style-type: none"> <li>○ Running boards</li> <li>○ Bug shield</li> </ul> </li> </ul>
<ol style="list-style-type: none"> <li>2. Repair interior and exterior components and trim</li> </ol>	<ul style="list-style-type: none"> <li>• Repair parts and materials               <ul style="list-style-type: none"> <li>○ Adhesives</li> <li>○ Gaskets</li> <li>○ Sealants</li> <li>○ Fastening devices</li> </ul> </li> <li>• Tools               <ul style="list-style-type: none"> <li>○ Trim tools</li> <li>○ Hand tools</li> </ul> </li> <li>• Remove, replace and adjust</li> <li>• Verify fit, function and performance</li> </ul>



**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
  
  
  
  
  
  
  
  
  
  
2. Describe hybrid and electric vehicle safety

**CONTENT**

- High voltage battery
- Inverter
- Motor/generator
- Wiring
  
- Safety
  - Shop set up
    - Cones
    - Caution signs
  - Precautions
    - Pushing/ towing
    - Auto start
- Personal protective equipment (PPE)
  - Gloves
- High voltage disconnect procedures
  - High voltage contactor
  - Shut-down service plug





# Level 2

## Automotive Service Technician









- 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**

1. Describe accessory drive components
  
  
  
2. Service accessory drive systems

**CONTENT**

- Components
  - Tensioners
  - Pulleys
  
- Inspection
  - Alignment
  - Tensioner
  - Belt
- Installation
- Faults







**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







**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





3. Describe charging systems

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

4. Service charging systems

- Faults
- Inspection and testing
  - Sensory
  - Electrical
  - Mechanical
  - 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):**        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

**CONTENT**

- Types
  - Column
  - Rack
- Sensors
  - Steering wheel
  - Torque
- Voltage level
  - Low
  - High
- Wiring and controls
- Computer-controlled
- Faults
- Inspection and testing
  - Sensory
  - Mechanical
  - Electrical
  - Scan tools
    - Data and functional test
- Wiring diagrams
- Service procedures
  - Replacement
    - Rack
    - Sensors
  - Alignment
    - Zeroing
    - Relearning
- Faults

2. Service electronic steering systems



**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:**     **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

**CONTENT**

- 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
- Inspection and testing
  - Sensory
  - Mechanical
  - Electrical
  - Scan tools
    - Data and functional test
- Wiring diagrams
- Service procedures
  - Component replacement
  - Power bleeding
- Faults

2. Service anti-lock braking systems



**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



**Line (GAC):**        **E    DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS**

**Competency:**     **E1   Diagnose and repair advanced wiring and electronics**

**Objectives**

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

- Apply advanced electrical and electronic principles.
- Use advanced wiring diagrams.
- Use advanced electrical test equipment.

**LEARNING TASKS**

1. Describe advanced electrical and electronic principles
  
2. Interpret advanced wiring diagrams
  
3. Use advanced electrical test equipment

**CONTENT**

- Components
  - Diodes
  - Transistors
  - Capacitors
  - Photonic semiconductors
- Operation
- Electrical signal types
  - Pulse width modulation
  - Duty cycle
- Symbols and components
  - Conventional
  - Computer controlled circuit
- Types
  - North American
  - European
- 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
  - Adaptions
  - 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





- 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

2. Service electronic ignition systems

**CONTENT**

- 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
- Safety
- Inspection and testing
  - Sensory
  - Electrical
- Test equipment
  - Signals, data and functional test
- Component replacement
- Maintenance
- Faults



**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





- 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







- 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

2. Describe multiplexing

**CONTENT**

- 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
- Multiplexing fundamentals
  - Switch inputs
  - Control Modules
    - Body Control Module (BCM)
  - Outputs
- Faults





**Achievement Criteria 1**

- Performance The learner will perform a functional test on a multiplexing 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 determine if there is an updated software version for a control module.
- 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 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
  - Sign off
  - Reporting work-based hours
- Modelling leadership
- Coaching
- Learning/teaching strategies
  - Identifying learning needs
  - Demonstrating skill
  - Assessing skills
  - Providing feedback
- Communication
- Professionalism





- 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:**        **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**

**CONTENT**

1. Describe diesel emissions

- Types
  - Particulates
  - Oxides of nitrogen (NOX)

2. Describe diesel emission systems

- Impacts of emissions
- Regulations
- Pre-combustion systems
  - Positive crankcase ventilation (PCV)
  - Exhaust gas recirculation (EGR)
- Post-combustion systems
  - Catalytic convertors
  - Diesel particulate filter (DPF)
  - Selective catalyst reduction (SCR)
- Operation
- Faults
- Wiring and control
- Sensors and actuators

3. 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) de-carbonization
  - Diesel particulate filter (DPF)
- Faults



**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.

<b>LEARNING TASKS</b>	<b>CONTENT</b>
<p>1. Describe automatic transmissions and transaxles components</p>	<ul style="list-style-type: none"> <li>• Torque convertors</li> <li>• Planetary gear train</li> <li>• Clutches and bands</li> <li>• Control valve body</li> <li>• Chains and sprockets</li> <li>• Coolers</li> <li>• Pumps</li> <li>• Fluid types</li> <li>• Sensors and actuators</li> </ul>
<p>2. Describe automatic transmissions and transaxles</p>	<ul style="list-style-type: none"> <li>• Types               <ul style="list-style-type: none"> <li>○ Dual clutch transmission (DCT)</li> <li>○ Constant velocity transmission (CVT)</li> <li>○ Conventional planetary</li> </ul> </li> <li>• Operation</li> <li>• Fundamentals               <ul style="list-style-type: none"> <li>○ Gear ratios</li> <li>○ Power flow</li> <li>○ Hydraulics</li> <li>○ Electronics</li> </ul> </li> <li>• Faults               <ul style="list-style-type: none"> <li>○ Mechanical</li> <li>○ Electrical (Control-side)</li> </ul> </li> </ul>
<p>3. Disassemble, inspect and re-assemble automatic transmissions and transaxles</p>	<ul style="list-style-type: none"> <li>• Procedures</li> <li>• Testing and inspection               <ul style="list-style-type: none"> <li>○ Air check</li> <li>○ Leak test</li> </ul> </li> <li>• Wiring and controls</li> <li>• Hydraulics and electronics</li> <li>• Lubrication</li> </ul>



- 4. Service automatic transmissions and transaxles
  - Inspection and testing
    - Signals
    - Data
    - Functional test
  - Test equipment
  - Adjustments
    - Shift adaptations
  - Service procedures
    - Relearn
    - Software update
  - Maintenance
    - Filtration
    - 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

2. Describe 4WD systems

**CONTENT**

- 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
- 
- 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):**        **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

2. Describe heating systems

**CONTENT**

- Components
  - Actuators
  - Sensors
  - Doors
  - Linkage
- Wiring and control
  - Computer controlled
- Operation
  - Modes
    - Blend
    - Defrost
  - Zones
- Faults
- Components
  - Cooling system
  - Heater cores
  - Secondary heater
    - Electric
- Wiring and control
  - Computer controlled
- Operation
  - Modes
    - Blend
    - Defrost
  - 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
  - Fundamentals
  - Strategies
- Types
  - Refrigerants
  - Lubricants
  - Systems
- Components
  - Types of compressors
    - High voltage
    - Clutchless
  - Condensor
  - Evaporator core
- Wiring and control
  - Computer controlled
  - Sensors and actuators

2. Service refrigerant systems

- Faults
- Safety
- Inspection and testing
  - Sensory
  - Mechanical
  - Electrical
  - Temperature
  - Pressure
  - Leak detection
- Test equipment
  - Signal
  - Data
  - Functional test
- Component replacement



**LEARNING TASKS**

**CONTENT**

- Procedures
  - Maintenance
  - Repair
  - Evacuate
  - 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
  - Tool usage
  - Procedure
  - Accuracy of results





**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)

2. Service hybrid and electric vehicles (EV)

**CONTENT**

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



**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, curser 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



- 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

- Erjavec, J. (2014/2015). *Automotive technology: A systems approach*.
- Halderman, J. D. (2014/2017). *Automotive Electrical and Electronics*.
- Trade Secrets Alberta, *Individual Learning Modules* (first period). For a list of modules, see [https://www.crownpub.bc.ca/Product/Details/7850000004\\_S#/?statesave=true](https://www.crownpub.bc.ca/Product/Details/7850000004_S#/?statesave=true)

#### Level Two

- Erjavec, J. (2014/2015). *Automotive technology: A systems approach*.
- Halderman, J. D. (2014/2017). *Automotive Electrical and Electronics*.
- Trade Secrets Alberta, *Individual Learning Modules* (second period). For a list of modules, see [https://www.crownpub.bc.ca/Product/Details/7850000005\\_S#/?statesave=true](https://www.crownpub.bc.ca/Product/Details/7850000005_S#/?statesave=true)

#### Level Three

- Erjavec, J. (2014/2015). *Automotive technology: A systems approach*.
- Halderman, J. D. (2014/2017). *Automotive Electrical and Electronics*.
- Trade Secrets Alberta, *Individual Learning Modules* (third period). For a list of modules, see [https://www.crownpub.bc.ca/Product/Details/7850000006\\_S#/?statesave=true](https://www.crownpub.bc.ca/Product/Details/7850000006_S#/?statesave=true)

- Halderman, J. D. (2016). *Automotive Fuel and Emissions Control Systems*.

OR

- Halderman, J. D. (2016). *Advanced Engine Performance Diagnosis*.

#### Level Four

- Erjavec, J. (2014/2015). *Automotive technology: A systems approach*.
- Halderman, J. D. (2014/2017). *Automotive Electrical and Electronics*.
- Trade Secrets Alberta, *Individual Learning Modules* (fourth period). For a list of modules, see [https://www.crownpub.bc.ca/Product/Details/7850000007\\_S#/?statesave=true](https://www.crownpub.bc.ca/Product/Details/7850000007_S#/?statesave=true)
- Halderman, J. D. and T. Birch. (2016). *Automatic Transmissions and Transaxles*.

### Suggested Reference Material

- Halderman, J. D. (2016). *Automotive Technology: Principles, Diagnosis, and Service*.
- Wright, G. (2013). *Automotive Diesel Technology*.



## **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

PROGRAM: IN-SCHOOL TRAINING:		AUTOMOTIVE SERVICE TECHNICIAN LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM SAFETY-RELATED FUNCTIONS	7%	7%
B	USE TOOLS, EQUIPMENT AND DOCUMENTATION	10%	10%
C	USE COMMUNICATION AND MENTORING TECHNIQUES	1%	0%
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	3%	5%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	25%	33%
K	DIAGNOSE AND REPAIR STEERING, SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES WHEELS, HUBS AND WHEEL BEARINGS	45%	45%
L	DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM	5%	0%
M	DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)	4%	0%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		70%	30%
<b>Final in-school mark</b> 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.		<b>IN-SCHOOL%</b>	

<b>C of Q Exam Mark</b> A score of 70% or higher is required for a pass.	<b>EXAM%</b>
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**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

PROGRAM: IN-SCHOOL TRAINING:		AUTOMOTIVE SERVICE TECHNICIAN LEVEL 2	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
D	DIAGNOSE AND REPAIR ENGINE SYSTEMS	30%	30%
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	30%	30%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	20%	20%
K	DIAGNOSE AND REPAIR STEERING, SUSPENSION, BRAKING, CONTROL SYSTEMS, TIRES WHEELS, HUBS AND WHEEL BEARINGS	20%	20%
	Total	100%	100%
<b>In-school theory &amp; practical subject competency weighting</b>		70%	30%
<b>Final in-school mark</b> 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.		<b>IN-SCHOOL%</b>	

<b>C of Q Exam Mark</b> A score of 70% or higher is required for a pass.	<b>EXAM%</b>
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**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

PROGRAM: IN-SCHOOL TRAINING:		AUTOMOTIVE SERVICE TECHNICIAN LEVEL 3	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
E	DIAGNOSE AND REPAIR GASOLINE ENGINE SUPPORT SYSTEMS	64	65
G	DIAGNOSE AND REPAIR VEHICLE NETWORKING SYSTEMS	15	10
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	2	0
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	19	25
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		70%	30%
<b>Final in-school mark</b> 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.		<b>IN-SCHOOL%</b>	

<b>C of Q Exam Mark</b> A score of 70% or higher is required for a pass.	<b>EXAM%</b>
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**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

LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
<b>PROGRAM: IN-SCHOOL TRAINING:</b>		<b>AUTOMOTIVE SERVICE TECHNICIAN LEVEL 4</b>	
C	USE COMMUNICATION AND MENTORING TECHNIQUES	1%	0%
F	DIAGNOSE AND REPAIR DIESEL ENGINE SUPPORT SYSTEMS	22%	20%
H	DIAGNOSE AND REPAIR DRIVELINE SYSTEMS	25%	40%
I	DIAGNOSE AND REPAIR ELECTRICAL SYSTEMS AND COMPONENTS	10%	0%
J	DIAGNOSE AND REPAIR HEATING, VENTILATION AND AIR CONDITIONING (HVAC) AND COMFORT CONTROL SYSTEMS	22%	30%
L	DIAGNOSE AND REPAIR RESTRAINT SYSTEMS, BODY COMPONENTS, ACCESSORIES AND TRIM	8%	0%
M	DIAGNOSE AND REPAIR HYBRID AND ELECTRIC VEHICLES (EV)	12%	10%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		70%	30%
<b>Final in-school mark</b> 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.		<b>IN-SCHOOL%</b>	

<b>In-school Mark</b> Combined theory and practical subject competency multiplied by	80%
<b>Standardized Level Exam Mark</b> The exam score is multiplied by	20%
<b>Final Level Mark</b> 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.	<b>FINAL %</b>



# **APPENDIX B**

## **Glossary**





## **Appendix B: Glossary**

<b>Accessories</b>	Features that are not originally equipped by the manufacturer
<b>Adjustment</b>	A minor change so that something works better, such as changing park position of a wiper.
<b>CAN</b>	Controller area network; a protocol for communication between electronic/computer modules.
<b>Describe</b>	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.
<b>DVOM</b>	Digital voltage ohmmeter; meter for measuring voltage, amperage, resistance (ohms) and is digital in its operation.
<b>Identify</b>	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.
<b>Interpret</b>	To explain or understand the meaning of something. This primarily refers to using wiring diagrams and data.
<b>Maintain</b>	To keep a tool in good condition by performing regular maintenance such as lubrication or cleaning, as well as making repairs and correcting problems.
<b>Micrometer</b>	A precision measuring device for small distances.
<b>OBD</b>	On board diagnostics; part of a vehicle's engine management software used to monitor system performance.
<b>Ohm's law</b>	The relationship between current, resistance and voltage in any electrical circuit.
<b>Options</b>	Features that are originally equipped at time of manufacture.
<b>Pascal's law</b>	Fluid pressure exerted in a sealed vessel is equal and undiminished in all directions.
<b>Pneumatic</b>	Operated by compressed air.
<b>Sensory inspection</b>	Using one or more of the five senses to perform an inspection.
<b>Systems</b>	A set of components working together as parts of a mechanism or an interconnecting network.
<b>Use</b>	The act of using something. This typically involves the safe and proper operation of a tool or system.



# 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:

- Jeff Summers      Automotive Service Technician
- Loi Truong        Automotive Service Technician
- Matthew Wilkie    Automotive Service Technician

**Subject Matter Experts retained to assist in the development of the Program Outline content:**

- Corey Bransfield    Instructor, Okanagan College
- Dean Cadieux        Instructor, Vancouver Island University
- Jeff Hoff             Manager, Napa Autopro, Prince George
- Russ Hunter         Instructor, BC Institute of Technology
- Jeff Summers        Automotive Service Technician
- Loi Truong            Automotive Service Technician
- Matthew Wilkie     Automotive Service Technician
- Brian Yanda         Service Manager, Harris Mazda and Instructor, Malaspina College