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<td>Verify repair of coach destination signs</td>
<td>Diagnose and troubleshoot supplemental restraint systems (SRS) and components</td>
<td>Repair supplemental restraint systems (SRS) and components</td>
<td>Verify repair of supplemental restraint systems (SRS) &amp; components</td>
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**U5138.0**

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<td>Diagnose and troubleshoot diesel fuel systems and components</td>
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<td>Repair diesel fuel systems and components</td>
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### ENGINE SYSTEMS - GASOLINE AND DIESEL

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<td>Diagnose and troubleshoot gasoline and diesel engine lubricating systems and components</td>
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<td>Repair gasoline and diesel engine lubricating systems and components</td>
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<td>Diagnose and troubleshoot gasoline and diesel auxiliary coolers and components</td>
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<td>Diagnose and troubleshoot exhaust, intake, and emission control systems and components</td>
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<td>Verify repair of electronic ignition systems and components</td>
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<td>Repair clutch systems and components</td>
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<td>Verify repair of electronically-controlled exhaust, intake, and emission control systems and components</td>
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<td>Diagnose and troubleshoot electronically-controlled automatic transmission systems and components</td>
<td>Repair electronically-controlled automatic transmission systems and components</td>
<td>Verify repair of electronically-controlled automatic transmission systems and components</td>
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<th>Repair tires, wheels, rims, hubs and components</th>
<th>Verify repair of tires, wheels, rims, hubs and components</th>
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## SKILL SETS

### COMPETENCY ANALYSIS PROFILE

#### TRUCK AND COACH TECHNICIAN

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| Verify repair of anti-lock braking systems (ABS) and components | 5150.07 |
| Diagnose and troubleshoot anti-skid/traction control systems and components | 5150.08 |
| Repair anti-skid/traction control systems and components | 5150.09 |
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| Diagnose and troubleshoot heating and ventilation systems and components | 5151.05 |
| Repair heating and ventilation systems and components | 5151.06 |
| Verify repair of heating and ventilation systems and components | 5151.07 |</p>
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<th>Diagnose and troubleshoot hydraulic systems and components</th>
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**SPECIAL INSTRUCTIONS**

**NOTE ON SHADED PERFORMANCE OBJECTIVES AND SKILLS:**
Shaded performance objectives and skills are optional, that is, they do not have to be completed or signed-off for the apprentice to complete his or her apprenticeship.
PREFACE

This training document was developed by the Workplace Support Services Branch of the Ministry of Training, Colleges and Universities (MTCU) in consultation with representatives from the industry. These Training Standards are intended to be used by the apprentice, trainers and employers/sponsors as a "blueprint" for training or as a prerequisite for government accreditation/certification.

The care and maintenance of this book is the joint responsibility of the apprentice and the employer/sponsor. The Training Standards were developed specifically for documenting the apprentice's acquisition of skills.

The book becomes the only record of an apprentice's training.

Please Note: Apprenticeship Training and Curriculum Standards were developed by the Ministry of Training, Colleges and Universities (MTCU). As of April 8th, 2013, the Ontario College of Trades (College) has become responsible for the development and maintenance of these standards. The College is carrying over existing standards without any changes.

However, because the Apprenticeship Training and Curriculum Standards documents were developed under either the Trades Qualification and Apprenticeship Act (TQAA) or the Apprenticeship and Certification Act, 1998 (ACA), the definitions contained in these documents may no longer be accurate and may not be reflective of the Ontario College of Trades and Apprenticeship Act, 2009 (OCTAA) as the new trades legislation in the province. The College will update these definitions in the future.

Meanwhile, please refer to the College’s website (http://www.collegeoftrades.ca) for the most accurate and up-to-date information about the College. For information on OCTAA and its regulations, please visit: http://www.collegeoftrades.ca/about/legislation-and-regulations
IMPORTANT DIRECTIONS TO EMPLOYERS/SPONSORS AND TRAINERS

The Training Standards identify skills required for this occupation and its related training program.

These Training Standards have been written in concise statements which describe how well an apprentice must perform each skill in order to become competent. Competence means being able to do the performance to the required standard on request.

In using these Training Standards, trainers will be able to ensure that the apprentice is developing skills detailed for the occupation.

Trainers and apprentices are required to sign off and date the skills following each successful acquisition.

Employers/Sponsors participating in this training program will be designated as the Signing Authority and are required to attest to successful achievement by signing the appropriate box included at the end of each unit.
IMPORTANT DIRECTIONS TO THE APPRENTICE

1. All hours working for each employer/sponsor(s) should be recorded in the Employer/Sponsor Information section. All Performance Objectives and skills completed while working for each Employer/Sponsor(s) should be recorded.

2. The "Summary of Training" should be completed, signed and dated by both the apprentice and employer/sponsor when either all terms of the training agreement have been completed or the apprentice leaves the employer/sponsor.

3. It is the responsibility of the apprentice to inform the local Apprenticeship Client Services office regarding the following changes:
   - change of employer/sponsor address;
   - change of apprentice name or address;
   - transfer to a new employer/sponsor.

4. At the fulfilment of all terms of the Training Agreement, the Apprentice Completion Form must be completed and signed by the current employer/sponsor. Present these completed and authorized Training Standards and the Apprentice Completion Form to your local Apprenticeship Client Services office.
NOTICE OF COLLECTION OF PERSONAL INFORMATION

1. At any time during your apprenticeship training, you may be required to show this training standard to the Ministry of Training, Colleges and Universities (the Ministry). You will be required to disclose the signed Apprenticeship Completion form to the Ministry in order to complete your program. The Ministry will use your personal information to administer and finance Ontario’s apprenticeship training system, including confirming your completion and issuing your certificate of apprenticeship.

2. The Ministry will disclose information about your program completion and your certificate of apprenticeship to the Ontario College of Trades, as it is necessary for the College to carry out its responsibilities.

3. Your personal information is collected, used and disclosed by the Ministry under the authority of the Ontario College of Trades and Apprenticeship Act, 2009.

4. Questions about the collection, use and disclosure of your personal information by the Ministry may be addressed to the:

Manager, Employment Ontario Contact Centre
Ministry of Training, Colleges and Universities
33 Bloor St. E, 2nd floor, Toronto, Ontario M7A 2S3
Toll-free: 1-800-387-5656; Toronto: 416-326-5656
APPRENTICE RECORD

Apprentice Name: ________________________________

EMPLOYER/SPONSOR INFORMATION

Training Agreement Number: ____________________________

Name: _____________________________________________

Address: __________________________________________

Telephone: _________________________________________

Summary of Training:

Dates of Employment: ___________________________  ___________________________

From  ___________________________  To  ___________________________

Performance Objectives signed off:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Employer/Sponsor Signature  Date  Apprentice Signature  Date
TRUCK AND COACH TECHNICIAN

APPRENTICE RECORD

Apprentice Name: ________________________________

EMPLOYER/SPONSOR INFORMATION

Training Agreement Number: __________________________

Name: __________________________________________

Address: _________________________________________

__________________________________________________

Telephone: _________________________________________

Summary of Training:

Dates of Employment: ____________________________

From ____________________________ To ____________________________

Performance Objectives signed off:

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

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_________________________________________________________________

Employer/Sponsor Signature Date Apprentice Signature Date
APPRENTICE RECORD

Apprentice Name: ________________________________

EMPLOYER/SPONSOR INFORMATION

Training Agreement Number: __________________________

Name: ____________________________________________

Address: __________________________________________

Telephone: _________________________________________

Summary of Training:

Dates of Employment: ________________________________

From ____________ To ____________

Performance Objectives signed off:

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

Employer/Sponsor Signature __________________ Date ____________

Apprentice Signature __________________ Date ____________
TRUCK AND COACH TECHNICIAN

APPRENTICE COMPLETION FORM

Apprentice Name: ________________________________

Print

______________________________
Signature

Social Insurance Number: ________________________________

Skill Sets when completed should be signed off by the Employer/Sponsor on the following page and presented with this completion form to your local Apprenticeship Client Services office. Any supporting documentation should also be attached.

In-School Completed: Yes ( )  No ( )  Not Applicable ( )
(proof to be provided)

Hours completed as per Training Agreement:

Yes ( )  No ( )  Not Applicable ( )

Employer/Sponsor Name: ________________________________

Address: ________________________________

Telephone: ________________________________

______________________________
Signature

MTCU USE ONLY:

Recommended for Exam: Yes ( )  No ( )

______________________________  ________________________________
Signature  Consultant/Office Code

You will be required to disclose this signed form to the Ministry of Training, Colleges and Universities in order to complete your program. The Ministry will use your personal information to administer and finance Ontario’s apprenticeship training system.

For further information please see the notice/declaration for collection of personal information that is referenced in the table of contents of this training standard.
### SKILL SETS COMPLETION FORM

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### SPECIAL INSTRUCTIONS

**NOTE ON SHADED PERFORMANCE OBJECTIVES AND SKILLS:**

Shaded performance objectives and skills are optional, that is, they do not have to be completed or signed-off for the apprentice to complete his or her apprenticeship.
U5135.0 OCCUPATIONAL HEALTH AND SAFETY PROCEDURES

GENERAL PERFORMANCE OBJECTIVES

Comply with occupational health and safety procedures, by: identifying potential health and safety hazards; maintaining a safe and secure work environment; handling and storing hazardous materials; wearing and maintaining personal protective equipment; complying with workplace-related legislation; interpreting and applying service-related information; practising good housekeeping in the workplace; complying with Workplace Hazardous Materials Information (WHMIS) guidelines; according to the Occupational Health and Safety Act, government regulations, manufacturer’s recommendations and company policy.

PERFORMANCE OBJECTIVES

SKILLS

5135.01 Identify potential workplace health and safety hazards, including: excessive exhaust and/or explosive fumes, dust, sound levels, electrical and mechanical hazards (i.e. damaged or faulty air lines and/or inadequate ventilation); so that the potential for personal injury, damage to equipment, vehicles and the environment are minimized; according to government regulations and company policy.

Date Completed Trainer Signature Apprentice Signature

5135.02 Handle, store and dispose of hazardous workplace materials, including: cleaning solvents, anti-freeze, transmission and brake fluids, engine oil, brake dust, battery acid, refrigerants and gases, using personal protective equipment and specified handling and storage equipment; so that individuals are protected from injury, the environment from contamination and safety procedures are followed; according to government regulations and company policy.

Date Completed Trainer Signature Apprentice Signature
U5135.0  OCCUPATIONAL HEALTH AND SAFETY PROCEDURES - Contd.

5135.03  Wear and maintain personal protective equipment, including: eye, ear, hand, respiratory, body and foot protection, ensuring that correct fit and optimum protection is provided to the wearer for the specific task performed; according to government regulations, manufacturer’s specifications and company policy.

Date Completed    Trainer Signature    Apprentice Signature

5135.04  Comply with workplace-related legislation, relating to highway traffic, safety, parts warranties, occupational health/safety, environmental protection, and business and trade practices, including: Occupational Health and Safety Act, Motor Vehicle Repair Act, Highway Traffic Act, Environmental Protection Act; by: identifying the personal and legal liabilities of technicians and vehicle owners when performing vehicle safety inspections, emissions tests, providing repair estimates, and repairing/replacing defective parts; according to government regulations and company policy.

Date Completed    Trainer Signature    Apprentice Signature

5135.05  Interpret and apply service-related information, including: service bulletins, manuals and parts catalogues, by: locating and identifying the vehicle information number (VIN), accessing microfiche and computerized service information systems; so that service/repair is performed according to manufacturer’s recommendations and company policy.

Date Completed    Trainer Signature    Apprentice Signature

5135.06  Practice good housekeeping in the workplace, by applying fire hazard prevention methods, including: maintaining a clean and orderly work area; identifying, removing and disposing of potential fire hazards; cleaning up grease, oil spills and/or fluids; ensuring that the work area is free of obstructions, and safely storing tools and shop equipment and wearing personal protective equipment, to minimize accident or injury to self and others; according to government regulations and company policy.

Date Completed    Trainer Signature    Apprentice Signature
U5135.0  OCCUPATIONAL HEALTH AND SAFETY PROCEDURES - Contd.

5135.07  Comply with Workplace Hazardous Materials Information Systems (WHMIS) guidelines, including: reading and interpreting labels and Materials Data Sheets (MSDS), ensuring receipt of training in WHMIS regulations and practices; according to the *Occupational Health and Safety Act*.

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U5136.0  ELECTRICAL SYSTEMS - STARTING AND CHARGING

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair electrical systems - starting and charging, by: performing a visual inspection; diagnosing and troubleshooting batteries; servicing and boosting/charging batteries; diagnosing and troubleshooting starting systems and components; repairing starting systems and components; verifying repair of starting systems and components; diagnosing and troubleshooting charging systems and components; repairing charging systems and components, and verifying repair of starting systems and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5136.01  Perform visual inspection, identifying system types and applications, by: checking for: worn, damaged, corroded, distorted, loose, missing, or defective components, including: batteries, starters, alternating current (a/c) generators (alternators), drive mechanisms, cables, connectors, switches, relays, regulators, solenoids, sensors, modules, wiring harnesses, gauges, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5136.02  Diagnose and troubleshoot batteries, including: single- and multi-battery group, by: visually inspecting, testing, and analyzing performance and function; including: voltage, amperage, odour, colour, temperature, electrolyte level and condition, leaks, corrosion, and cleanliness, using: hand, power, specialized, precision, booster cables, chargers, pullers, special cleaning tools, heavy-duty load testers, electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
5136.03 **Service, boost and/or charge single and multi-battery group**, checking: voltage, amperage, odour, colour, temperature, electrolyte level and condition, leaks, corrosion, and cleanliness, by: exchanging, charging or servicing, using: hand, power, specialized, precision, booster cables, chargers, pullers, special cleaning tools, heavy-duty load testers, electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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5136.04 **Diagnose and troubleshoot starting systems and components**, including: starting motors, batteries, cables, hardware, wiring harnesses, solenoids, relays, switches, circuit protection devices, and fastening and mounting devices; by: visually inspecting, testing and analyzing performance and function, checking for: opens/shorts/grounds, voltage, amperage, resistance, wear, noise, odour, colour, corrosion, temperature, fractures, and distortion; using: hand, power, specialized, precision, heavy-duty load testers and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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5136.05 **Repair starting systems and components**, including: starting motors, batteries, cables, hardware, wiring harnesses, solenoids, relays, switches, circuit protection devices, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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U5136.0  ELECTRICAL SYSTEMS - STARTING AND CHARGING - Contd.

5136.06  **Verify repair of starting systems and components**, including: starting motors, batteries, cables, hardware, wiring harnesses, solenoids, relays, switches, circuit protection devices, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5136.07  **Diagnose and troubleshoot charging systems and components**, including: alternating and direct current generators, batteries, cables, connectors, switches, relays, voltage regulators, circuit protection devices, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function, checking for: opens/grounds/shorts, voltage, amperage, resistance, vibration/noise, odour, corrosion temperature, and alignment; using: hand, power, specialized, precision, AVR (ammeter, voltmeter, resistance) testers, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5136.08  **Repair charging systems and components**, including: alternating and direct current generators, batteries, cables, connectors, switches, relays, voltage regulators, circuit protection devices, wiring harnesses, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
U5136.0  ELECTRICAL SYSTEMS - STARTING AND CHARGING - Contd.

5136.09  Verify repair of charging systems and components, including: batteries, cables, hardware, wiring harnesses, voltage regulators, relays, alternating current (AC) generators, switches, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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Employer/Sponsor Name  Employer/Sponsor Signature

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U5137.0  ELECTRICAL SYSTEMS - BODY ELECTRICAL

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair electrical system - body electrical and components, by:
performing a visual inspection; diagnosing and troubleshooting body electrical
systems and components; repairing body electrical systems and components;
verifying repair of body electrical systems and components; repairing system
warning devices; verifying repair of system warning devices; diagnosing and
troubleshooting fire suppression systems and components; repairing fire
suppression systems and components; verifying repair of fire suppression system
and components; repairing coach destination signs; verifying repair of coach
destination signs; diagnosing and troubleshooting supplemental restraint systems
(SRS); repairing supplemental restraint systems (SRS); and verifying repair of
supplemental restraint systems (SRS); according to manufacturer’s
recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5137.01 Perform visual inspection, identifying system types and applications, by:
checking for: worn, loose, damaged, leaking, missing, or defective components,
including: batteries, cables, connectors, switches, relays, solenoids, sensors,
modules, wiring harnesses, lighting/illumination, terminal boards/blocks,
warning devices, circuit protection devices, electrical accessory devices, and
fastening and mounting devices; according to manufacturer’s recommendations,
specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

____________  __________________  ________________
U5137.0  ELECTRICAL SYSTEMS - BODY ELECTRICAL - Contd.

5137.02  Diagnose and troubleshoot body electrical systems and components, including: batteries, motors, cables, connectors, switches, relays, solenoids, sensors, modules wiring harnesses, lighting/illumination, terminal boards/blocks, proximity warning, circuit protection, electrical accessory, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function, checking for: opens/shorts/grounds, odour, colour, temperature, corrosion, and noise/vibration; using: hand, power, specialized, precision, soldering, heat shrink tubes, crimpers, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5137.03  Repair body electrical systems and components, including: including: batteries, motors, cables, connectors, switches, relays, solenoids, sensors, modules wiring harnesses, lighting/illumination, terminal boards/blocks, proximity warning, circuit protection, electrical accessory, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, soldering equipment, heat shrink tubes, crimpers, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5137.04  Verify repair of body electrical systems and components, including: batteries, motors, cables, connectors, switches, relays, solenoids, sensors, modules, wiring harnesses, lighting/illumination, terminal boards/blocks, proximity warning, circuit protection, electrical accessory, and fastening and mounting devices; by visually inspecting, testing, and analysing performance and function, using: hand, power, specialized, precision, soldering equipment, heat shrink tubes, crimpers, and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
U5137.0  ELECTRICAL SYSTEMS - BODY ELECTRICAL - Contd.

5137.05  Repair system warning devices, including: cables, connectors, switches, relays, solenoids, sensors, modules, wiring harnesses, annunciators/data display screens, and fastening and mounting devices, by: exchanging, or servicing; using: hand, power, specialized, precision and electronic service tools, lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5137.06  Verify repair of system warning devices, including: cables, connectors, switches, relays, solenoids, sensors, modules, wiring harnesses, annunciators/data display screens, and fastening and mounting devices, using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5137.07  Diagnose and troubleshoot fire suppression systems and components, including: sensors, activating devices, wiring harnesses, and fastening and mounting devices; by visually inspecting, testing, and analyzing performance and function; checking for: opens/shorts/grounds, corrosion, distortion, temperature and leaks; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5137.08  Repair fire suppression systems and components, including: sensors, activating devices, wiring harnesses, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
### U5137.0 ELECTRICAL SYSTEMS - BODY ELECTRICAL - Contd.

#### 5137.09 Verify repair of fire suppression systems and components, including: sensors, activating devices, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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#### 5137.10 Repair coach destination signs, including: rollers, gears, chains, motors, and display boards; by: exchanging, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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#### 5137.11 Verify repair of coach destination signs, including: rollers, gears, chains, motors, and display boards; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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#### 5137.12 Diagnose and troubleshoot supplemental restraint systems (SRS) and components, including: air bag assemblies, sensors, modules, activating devices, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; checking for: opens/shorts/grounds, corrosion, wear, and distortion; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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U5137.0  ELECTRICAL SYSTEMS - BODY ELECTRICAL  - Contd.

5137.13 **Repair supplemental restraint systems (SRS) and components**, including: air bag assemblies, sensors, modules, activating devices, and wiring harnesses, and fastening and mounting devices; by exchanging; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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5137.14 **Verify repair of supplemental restraint systems (SRS) and components**, including: air bag assemblies, sensors, modules, activating SRS and components, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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U5138.0  FUEL SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair fuel systems by: performing a visual inspection; diagnosing and troubleshooting gasoline fuel systems and components; repairing gasoline fuel systems and components; verifying repair of gasoline fuel systems and components; diagnosing and troubleshooting diesel fuel systems and components, repairing diesel fuel systems and components, and verifying repair of diesel fuel systems and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5138.01  **Perform visual inspection**, identifying system types and applications, by:
checking for: fuel condition, worn, loose, damaged, leaking, missing, or defective components, including: pumps, carburetors, injectors, lines, hoses, fittings, filters, vents, tanks, valves, heat exchangers, crossover pipes, heaters, sensors, modules, wiring harnesses, mechanical controls, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

5138.02  **Diagnose and troubleshoot gasoline fuel systems and components**, including: fuel, pumps, carburetors, pressure control mechanisms, accumulators, linkages, fuel injectors, throttle bodies, filters, tanks, vents, valves, switches, gauges, lines, hoses, fittings, solenoids, relays, sensors, modules, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; checking for: opens/shorts/grounds, wear, odour, temperature, corrosion, fuel level and type, noise/vibration, fractures, pressure, leaks and contamination; using: hand, power, specialized, precision and electronic service tools, vacuum and pressure gauges, lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.
U5138.0  **FUEL SYSTEMS** - Contd.

5138.03  **Repair gasoline fuel systems and components**, including: fuel, pumps, carburetors, pressure control mechanisms, accumulators, linkages, fuel injectors, throttle bodies, filters, tanks, vents, valves, switches, gauges, lines, hoses, fittings, solenoids, relays, sensors, modules, wiring harnesses, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications and safety requirements.

Date Completed  
Trainer Signature  
Apprentice Signature

5138.04  **Verify repair of gasoline fuel systems and components**, including: fuel, pumps, carburetors, pressure control mechanisms, accumulators, linkages, fuel injectors, throttle bodies, filters, tanks, vents, valves, switches, gauges, lines, hoses, fittings, solenoids, relays, sensors, modules, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications and safety requirements.

Date Completed  
Trainer Signature  
Apprentice Signature

5138.05  **Diagnose and troubleshoot diesel fuel systems and components**, including: fuel, tanks, vents, hoses, lines, filters, heaters, valves, transfer and injection pumps, linkages, cables, air throttles, hydraulic injectors, electronic unit injectors (EUI), mechanical unit injectors (MUI), hydraulically-actuated electronic unit injectors (HEUI), switches, relays, solenoids, sensors, modules, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, analyzing performance, function and programming, checking for: opens/shorts/grounds, wear, odour, temperature, smoke colour, corrosion, distortion, fractures, noise/vibration, and fuel level, type and condition; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices, refractometers, hydrometers and water-detection devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  
Trainer Signature  
Apprentice Signature
U5138.0  FUEL SYSTEMS - Contd.

5138.06  Repair diesel fuel systems and components, including: fuel, tanks, vents, hoses, lines, filters, heaters, valves, transfer and injection pumps, linkages, cables, air throttles, hydraulic injectors, electronic unit injectors (EUI), mechanical unit injectors (MUI), hydraulically-actuated electronic unit injectors (HEUI), switches, relays, solenoids, sensors, modules, wiring harnesses, and fastening and mounting devices; by: exchanging, reconditioning, servicing, or reprogramming; using: hand, power, specialized, precision and electronic service tools, lifting, rigging and blocking devices, ultrasonic baths, and torque wrenches; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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5138.07  Verify repair of diesel fuel systems and components, including: fuel, tanks, vents, hoses, lines, filters, heaters, valves, transfer and injection pumps, linkages, cables, air throttles, hydraulic injectors, electronic unit injectors (EUI), mechanical unit injectors (MUI), hydraulically-actuated electronic unit injectors (HEUI), switches, relays, solenoids, sensors, modules, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, analysing performance, function and programming; using: hand, power, specialized, precision and electronic service tools, lifting, rigging and blocking devices, ultrasonic baths, and torque wrenches; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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Employer/Sponsor Name  Employer/Sponsor Signature
GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair gasoline and diesel engines, by: performing a visual inspection; diagnosing and troubleshooting gasoline and diesel cooling systems and components; verifying repair of gasoline and diesel cooling systems and components; diagnosing and troubleshooting gasoline and diesel engine lubricating systems and components; repairing gasoline and diesel engine lubricating systems and components; verifying repair of gasoline and diesel engine lubricating systems and components; diagnosing and troubleshooting gasoline and diesel cylinder heads and components; repairing gasoline and diesel cylinder heads and components; verifying repair of gasoline and diesel cylinder heads and components; diagnosing and troubleshooting gasoline and diesel engine blocks and components; repairing gasoline and diesel engine blocks and components; verifying repair of gasoline and diesel engine blocks and components; diagnosing and troubleshooting gasoline and diesel auxiliary coolers and components, repairing gasoline and diesel auxiliary coolers and components, and verifying repair of gasoline and diesel auxiliary coolers and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5139.01 Perform visual inspection, identifying system types and applications, by:
checking for: worn, loose, damaged, leaking, missing, or defective components, including: cooling and lubrication systems, cylinder heads, engine blocks, auxiliary coolers, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed	Trainer Signature	Apprentice Signature

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Diagnose and troubleshoot gasoline and diesel cooling systems and components, including: coolant, radiators, reservoirs, surge tanks, fans, hubs and controls, water pumps, shutters, controls, actuators, belts, hoses, lines, fittings, heat exchangers, filters, gaskets, O-rings, seals, valves, switches, relays, sensors, modules, wiring harnesses, thermostats, block heaters, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function, checking for: opens/shorts/grounds, wear, odour, colour, temperature, corrosion, distortion, fractures, contamination, leaks, noise/ vibration, and coolant type and level; using: hand, power, specialized, precision and electronic service tools, lifting, rigging and blocking devices, pullers, torque wrenches, gauges, pressure/radiator cap testers, hydrometers, refractometers, and coolant analysis kits; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed: 
Trainer Signature: 
Apprentice Signature: 

Repair gasoline and diesel cooling systems and components, including: coolant, radiators, reservoirs, surge tanks, fans, hubs and controls, water pumps, shutters, controls, actuators, belts, hoses, lines, fittings, heat exchangers, filters, gaskets, O-rings, seals, valves, switches, relays, sensors, modules, wiring harnesses, thermostats, block heaters, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, lifting, rigging and blocking devices, pullers, torque wrenches, and gauges, pressure/radiator cap testers, hydrometers, refractometers, and coolant analysis kits; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed: 
Trainer Signature: 
Apprentice Signature: 

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ENGINE SYSTEMS - GASOLINE AND DIESEL - Contd.

5139.04 Verify repair of gasoline and diesel cooling systems and components, including: coolant, radiators, reservoirs, surge tanks, fans, hubs and controls, water pumps, shutters, controls, actuators, belts, hoses, lines, fittings, heat exchangers, filters, gaskets, O-rings, seals, valves, switches, relays, sensors, modules, wiring harnesses, thermostats, block heaters, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, lifting, rigging and blocking devices, pullers, torque wrenches, and gauges, pressure/radiator cap testers, hydrometers, refractometers, and coolant analysis kits; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5139.05 Diagnose and troubleshoot gasoline and diesel engine lubricating systems and components, including: oil, pumps, filters, housings, lines, hoses, fittings, seals, piston cooling jets, gaskets, O-rings, heat exchangers, bypass valves and auxiliary devices, compressors, alternating current (AC) generators, engine brakes, fuel system actuators, sensors, and wiring harnesses; by: testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, odour, temperature, corrosion, distortion, fractures, colour, noise, pressure, oil analysis and spectrographic testing of components; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5139.06 Repair gasoline and diesel engine lubricating systems and components, including: oil, pumps, filters, housings, lines, hoses, fittings, seals, piston cooling jets, gaskets, O-rings, heat exchangers, bypass valves and auxiliary devices, compressors, alternating current (AC) generators, engine brakes, fuel system actuators, sensors, and wiring harnesses; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature
Verify repair of gasoline and diesel engine lubricating systems and components, including: oil, pumps, filters, housings, lines, hoses, fittings, seals, piston cooling jets, gaskets, O-rings, heat exchangers, bypass valves and auxiliary devices, compressors, alternating current (AC) generators, engine brakes, fuel system actuators, sensors, modules, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices, according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed   Trainer Signature   Apprentice Signature

Diagnose and troubleshoot gasoline and diesel cylinder heads and components, including: cylinder heads, expansion plugs, seats, guides, seals, springs, retainers, rotators, injectors tubes, valves and actuating mechanisms, camshafts, drive mechanisms, engine brakes, gasket assemblies, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function, checking for: wear, temperature, corrosion, erosion, vibration/noise, carbon build-up, leaks, fractures, and distortion; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed   Trainer Signature   Apprentice Signature

Repair gasoline and diesel cylinder heads and components, including: cylinder heads, expansion plugs, seats, guides, seals, springs, retainers, rotators, injectors tubes, valves and actuating mechanisms, camshafts, drive mechanisms, engine brakes, gasket assemblies, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed   Trainer Signature   Apprentice Signature

U5139.0   ENGINE SYSTEMS - GASOLINE AND DIESEL - Contd.
U5139.0 **ENGINE SYSTEMS - GASOLINE AND DIESEL - Contd.**

5139.10 **Verify repair of gasoline and diesel cylinder heads and components,** including: cylinder heads, expansion plugs, seats, guides, seals, springs, retainers, rotators, injectors tubes, valves and actuating mechanisms, camshafts, drive mechanisms, engine brakes, gasket assemblies, fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5139.11 **Diagnose and troubleshoot gasoline and diesel engine blocks and components,** including: engine blocks, piston assemblies, connecting rods, bearings, liniers, counter balancers, crankshafts, flywheel assemblies, balance shafts, gear trains, camshafts and follower assemblies, harmonic balancers, pulleys, auxiliary drives, oil pans, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function, checking for: wear, temperature, corrosion, noise, carbon build-up, fractures, leaks, and distortion; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5139.12 **Repair gasoline and diesel engine blocks and components,** including: piston assemblies, connecting rods, bearings, liniers, counter balancers, crankshafts, flywheel assemblies, balance shafts, gear trains, camshafts and follower assemblies, harmonic balancers, pulleys, auxiliary drives, oil pans, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature
ENGINE SYSTEMS - GASOLINE AND DIESEL  - Contd.

5139.13 Verify repair of gasoline and diesel engine blocks and components, including: piston assemblies, connecting rods, bearings, liners, counter balancers, crankshafts, flywheel assemblies, balance shafts, gear trains, camshafts and follower assemblies, harmonic balancers, pulleys, auxiliary drives, oil pans, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5139.14 Diagnose and troubleshoot gasoline and diesel auxiliary coolers and components, including: housings, charge air, tip turbines, oil coolers, fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function, checking for: temperature, contamination, corrosion, fractures, noise, cracks, leaks, and flow-test results; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5139.15 Repair gasoline and diesel auxiliary coolers and components, including: housings, charge air, tip turbines, oil coolers, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
### U5139.0  ENGINE SYSTEMS - GASOLINE AND DIESEL  - Contd.

**5139.16** Verify repair of gasoline and diesel auxiliary coolers and components, including: charge air, tip turbines, and oil coolers; by: testing performance and function; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

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U5140.0 ENGINE MANAGEMENT SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair engine management systems, by: performing a visual inspection; diagnosing and troubleshooting gasoline fuel control systems and components; repairing gasoline fuel control systems and components; verifying repair of gasoline fuel control systems and components; diagnosing and troubleshooting electronic ignition systems and components; repairing electronic ignition systems and components; verifying repair of electronic ignition systems and components; diagnosing and troubleshooting electronically-controlled diesel engine systems and components; repairing electronically-controlled diesel engine systems and components; verifying repair of electronically-controlled diesel engine systems and components; performing gasoline engine tune-ups; performing mechanical diesel engine tune-ups, and performing electronic diesel engine tune-ups; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5140.01 Perform visual inspection, identifying system types and applications, by: checking for: worn, loose, damaged, leaking, missing, or defective components, including: hydro-mechanical and electronically-managed diesel engines, electronically-managed fuel-injected gasoline engines, engine protection systems, electronic ignition systems, switches, relays, solenoids, sensors, electronic control modules (ECM), wiring harnesses, driver displays, and fastening and mounting devices; according to manufacturer’s recommendations, specifications and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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U5140.0 ENGINE MANAGEMENT SYSTEMS - Contd.

5140.02 Diagnose and troubleshoot gasoline fuel control systems and components, including: pumps, injectors, actuators, warning devices, switches, solenoids, relays, sensors, modules, wiring harnesses, interfaces, multiplexing, and fastening and mounting devices; by: visually inspecting, testing, analyzing performance, and function, checking for: opens/shorts/grounds, diagnostic codes, wear, odour, temperature, corrosion, colour, noise, pressure, and leaks; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5140.03 Repair gasoline fuel control systems and components, including: pumps, injectors, actuators, warning devices, switches, solenoids, relays, sensors, modules, wiring harnesses, interfaces, multiplexing, and fastening and mounting devices; by: exchanging, reconditioning, servicing, or programming; using, hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5140.04 Verify repair of gasoline fuel control systems and components, including: pumps, injectors, actuators, warning devices, switches, solenoids, relays, sensors, modules, wiring harnesses, interfaces, multiplexing, and fastening and mounting devices; by visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
U5140.0 ENGINE MANAGEMENT SYSTEMS - Contd.

5140.05 Diagnose and troubleshoot electronic ignition systems and components, including: distributor components, coils, resistors, switches, solenoids, relays, sensors, wiring harnesses, electronic ignition modules, spark plugs, high tension wires, engine lights, warning devices, electronic injectors, pumps, actuator modules, interfaces, multiplexing, and fastening and mounting devices; by: visually inspecting, testing, and analyzing performance, function and programming, checking for: opens/shorts/grounds, odour, temperature, corrosion, noise, flash codes, spark timing, system voltage and circuit resistance; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5140.06 Repair electronic ignition systems and components, including: distributor components, coils, resistors, switches, solenoids, relays, sensors, wiring harnesses, electronic ignition modules, spark plugs, high tension wires, engine lights, warning devices, electronic injectors, pumps, actuator modules, interfaces, multiplexing, and fastening and mounting devices; by: exchanging, reconditioning, reprogramming, or servicing; using, hand, power, specialized, precision and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5140.07 Verify repair of electronic ignition systems and components, including: distributor components, coils, resistors, switches, solenoids, relays, sensors, wiring harnesses, electronic ignition modules, spark plugs, high tension wires, engine lights, warning devices, electronic injectors, pumps, actuator modules, interfaces, multiplexing, and fastening and mounting devices; by visually inspecting, testing, and analysing performance, function and programming; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature
### ENGINE MANAGEMENT SYSTEMS - Contd.

**5140.08**  
**Diagnose and troubleshoot electronically-controlled diesel engine systems and components**, including: circuit protection devices, connectors, sensors, modules, drivers, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, analysing performance function and programming; checking for: opens/shorts/grounds, wear, odour, temperature, corrosion, vibration/noise, diagnostic codes, system voltage, and Society of Automotive Engineers (SAE) code identifiers; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer’s recommendations, specifications, schematic diagrams, and safety requirements.

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**5140.09**  
**Repair electronically-controlled diesel engine systems and components**, including: circuit protection devices, connectors, sensors, modules, drivers, wiring harnesses, and fastening and mounting devices; by: exchanging, reconditioning, reprogramming, or servicing; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

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**5140.10**  
**Verify repair of electronically-controlled diesel engine systems and components**, including: circuit protection devices, connectors, sensors, modules, drivers, wiring harnesses, fastening and mounting devices; by: visually inspecting, testing, analysing performance, function and programming; using, hand, power, specialized, precision and electronic service tools, and lifting, rigging and blocking devices, according to manufacturer’s recommendations, specifications, and safety requirements.

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U5140.0 ENGINE MANAGEMENT SYSTEMS - Contd.

5140.11 Perform gasoline engine tune-ups, by: testing fuel and compression/vacuum, checking, or replacing spark plugs, air filters, intake systems, exhaust systems, high tension wires, electronic distributor components, coils, resistors, fuel filters, and checking and/or adjusting ignition timing, timing control, sensors, modules, governors, idle speed, and emission control devices; using: hand, power, specialized, precision and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed: ___________________  Trainer Signature: ___________________

Apprentice Signature: ___________________

5140.12 Perform mechanical diesel engine tune-ups, by: checking for and/or replacing fuel and air filters, intake system, exhaust restriction, manifold boost pressure and controls, and valve adjustment, including: mechanical unit injectors, pressure-time injectors (PTI), common rail systems, set-up governors, engine brakes, injection pump static timing, static timing control; testing and reconditioning hydraulic injector nozzles, fuel return systems, distributor pumps, glow plugs, and pre-heat systems; using: hand, power, specialized, precision and electronic service tools, gauges, pop test units, ultrasonic baths, and chassis dynamometers; according to manufacturer's recommendations, specifications and safety requirements.

Date Completed: ___________________  Trainer Signature: ___________________

Apprentice Signature: ___________________

5140.13 Perform electronic diesel engine tune-ups, by: testing fuel and compression, checking and/or replacing fuel filters, air filters and intake system, exhaust back pressure, manifold boost pressure, electrical system, valve adjustment, electronic unit injectors (EUI), pressure-time injectors (PTI), engine brakes, and electronic unit pumps (EUP); pressure-testing crankcase, checking intake systems, exhaust restrictions, manifold boost pressures, electrical systems and overhead adjustments, and analysing engine operating parameters and vehicle data logs; using: gauges, hand, power, specialized, precision, electronic service tools, and chassis dynamometers; according to manufacturer's recommendations, specifications and safety requirements.

Date Completed: ___________________  Trainer Signature: ___________________

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U5141.0 EXHAUST, INTAKE, AND EMISSION CONTROL SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair exhaust, intake, and emission control systems and components, by: performing a visual inspection; diagnosing and troubleshooting exhaust, intake and emission control systems and components; repairing exhaust, intake and emission control systems and components; verifying the repair of exhaust, intake and emission control systems and components; diagnosing and troubleshooting turbocharger systems and components, repairing turbocharger systems and components, and verifying the repair of turbocharger systems and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5141.01 Perform visual inspection, identifying system types and applications, by: checking for: worn, loose, damaged, leaking, missing, or defective components, including: manifolds, piping, gaskets, seals, turbochargers, blowers, charge air coolers, particulate traps, catalytic converters, mufflers, heat shields, filters and indicators, pyrometers, emission control devices, exhaust brakes, sensors, modules, wiring harnesses, actuators, and fastening and mounting devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed     Trainer Signature     Apprentice Signature

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U5141.0 EXHAUST, INTAKE, AND EMISSION CONTROL SYSTEMS - Contd.

5141.02 Diagnose and troubleshoot exhaust, intake, and emission control systems and components, including: manifolds, piping, gaskets, seals, turbochargers, blowers, charge air coolers, particulate traps, catalytic converters, mufflers, heat shields, filters, indicators, pyrometers, emission control devices, exhaust brakes, sensors, modules, wiring harnesses, actuators, fastening and mounting devices; by visually inspecting, testing, and analyzing performance and function, checking for: opens/shorts/grounds, odour, noise/vibration, pressures, smoke colour, temperature, and leaks; using: hand, power, specialized, precision, and electronic service tools, pyrometers, gauges, exhaust gas analysers, opacimeters (smoke meters), manometers, vacuum gauges, stethoscopes, and infrared thermometers; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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5141.03 Repair exhaust, intake, and emission control systems and components, including: manifolds, piping, gaskets, seals, turbochargers, blowers, charge air coolers, particulate traps, catalytic converters, mufflers, heat shields, filters, indicators, pyrometers, emission control devices, exhaust brakes, sensors, modules, wiring harnesses, actuators, fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, and electronic service tools, heating, welding and cutting equipment, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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5141.04 Verify repair of exhaust, intake, and emission control systems and components, including: manifolds, piping, gaskets, seals, turbochargers, blowers, charge air coolers, particulate traps, catalytic converters, mufflers, heat shields, filters, indicators, pyrometers, emission control devices, exhaust brakes, sensors, modules, wiring harnesses, actuators, fastening and mounting devices; by: visually inspecting, testing, and analyzing performance and function; using: hand, power, specialized, precision, and electronic service tools, welding/heating equipment, and lifting, rigging and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

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U5141.0  EXHAUST, INTAKE, AND EMISSION CONTROL SYSTEMS - Contd.

5141.05  Diagnose and troubleshoot turbocharger systems and components, including: housings, waste gates, variable volume controls, manifold boost control devices, turbochargers, boost pressure sensors, piping, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: pressure, temperature, corrosion, wear, leaks, and noise/vibration, using: hand, power, specialized, precision, and electronic service tools, welding/heating equipment, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5141.06  Repair turbocharger systems and components, including: housings, waste gates, variable volume controls, manifold boost control devices, turbochargers, boost pressure sensors, piping, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using hand, power, specialized, precision, and electronic service tools, dynamic balancing equipment, gauges, stethoscopes, and precision measuring instruments; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5141.07  Verify repair of turbocharger systems and components, including: including: waste gates, variable volume controls, manifold boost control devices, turbochargers, boost pressure sensors, piping, and fastening and mounting devices, by: testing, and analysing performance and function; using: hand, power, specialized, precision, and electronic service tools, dynamic balancing equipment, gauges, stethoscopes, and precision measuring instruments; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

Employer/Sponsor Name  Employer/Sponsor Signature
U5142.0  TRANSMISSION SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair transmission systems, by: performing a visual inspection; diagnosing and troubleshooting clutch systems and components; repairing clutch systems and components; verifying the repair of clutch systems and components; diagnosing and troubleshooting manual transmissions and components; repairing manual transmissions and components; verifying the repair of manual transmissions and components; diagnosing and troubleshooting automatic transmissions and components; repairing automatic transmissions and components; verifying the repair of automatic transmissions and components; diagnosing and troubleshooting electronically-controlled systems and components, repairing electronically-controlled systems and components, verifying repair of electronically-controlled systems and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5142.01 Perform visual inspection, identifying system types and applications, by:
checking for: worn, loose, damaged, defective, leaking, or missing components, including: housings, clutch and pressure plates, friction materials, clutch brakes, flywheels, ring gears, linkages, cables, controls, actuators, cylinders, reservoirs, lines, fittings, shafts, bearings, seals, bushings, gear sets, sensors, modules, wiring harnesses, fluids/lubricants, coolers, pumps and filters, auxiliary devices, dipsticks, tubes, yokes, flanges, driver display screens, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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Diagnose and troubleshoot clutch systems and components, including: pressure plates, cover assemblies, discs, intermediate plates and drive mechanisms, clutch brakes, linkages, cables, controls, actuators, input (pilot) shafts, cross shafts, release bearings, pilot bearings, flywheel assemblies, wet clutch systems, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: odour, temperature, corrosion, fractures, contamination, vibration/noise, colour, fluid level, leaks, pressure, free play, internal adjustment, clutch brake squeeze, slippage, disengagement, dragging, and alignment; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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Repair clutch systems and components, including: pressure plates, cover assemblies, discs, intermediate plates and drive mechanisms, clutch brakes, linkages, cables, controls, actuators, input (pilot) shafts, cross shafts, release bearings, pilot bearings, flywheel assemblies, wet clutch systems, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using hand, power, specialized, precision, and electronic service tools, heating, welding and cutting equipment, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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Verify repair of clutch systems and components, including: pressure plates, cover assemblies, discs, intermediate plates and drive mechanisms, clutch brakes, linkages, cables, controls, actuators, input (pilot) shafts, cross shafts, release bearings, pilot bearings, flywheel assemblies, wet clutch systems, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

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5142.05 Diagnose and troubleshoot manual transmissions and components, including: transfer cases, housings, linkages, gears, shafts, synchronizers, bearings, thrust washers, seals, fluids, filters, power take-off (PTO) units, speedometer drives, auxiliary drives, input, main, and counter shafts, shift collars, gear shift levers, cover assemblies, auxiliary sections, pneumatic controls, yokes, flanges, switches, solenoids, sensors, modules, wiring harness, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, odour, temperature, corrosion, colour, noise, vibration, wear, gear clash, oil level and condition, leaks, contamination, timing, and alignment, using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5142.06 Repair manual transmissions and components, including: transfer cases, housings, linkages, gears, shafts, synchronizers, bearings, thrust washers, seals, fluids, filters, power take-off (PTO) units, speedometer drives, auxiliary drives, input, main, and counter shafts, shift collars, gear shift levers, cover assemblies, auxiliary sections, pneumatic controls, yokes, flanges, switches, solenoids, sensors, modules, wiring harness, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, and electronic service tools, heating, welding, and cutting equipment, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5142.07 Verify repair of manual transmissions and components, including: transfer cases, housings, linkages, gears, shafts, synchronizers, bearings, thrust washers, seals, fluids, filters, power take-off (PTO) units, speedometer drives, auxiliary drives, input, main, and counter shafts, shift collars, gear shift levers, cover assemblies, auxiliary sections, pneumatic controls, yokes, flanges, switches, solenoids, sensors, modules, wiring harness, and fastening and mounting devices; by visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed

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U5142.0 TRANSMISSION SYSTEMS - Contd.

5142.08 Diagnose and troubleshoot non electronically-controlled automatic transmissions and components, including: fluids, transfer cases, housings, gear train, shafts, bearings, seals, springs, clutch packs, one-way clutches, band and servo assemblies, pumps, valve bodies, governors, modulators, power take-off (PTO) units, torque converters, flex plates, modulator/throttle devices, governor assemblies, retarding devices, lines, hoses, fittings, linkages, cables, switches, relays, solenoids, wiring harnesses, driver display screens, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, odour, temperature, vibration/noise, corrosion, colour, contamination, leaks, fractures, pressure, slippage, oil level/condition and shift points; using: hand, power, specialized, precision, and electronic service tools; and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5142.09 Repair non electronically-controlled automatic transmissions and components, including: fluids, transfer cases, housings, gear train, shafts, bearings, seals, springs, clutch packs, one-way clutches, band and servo assemblies, pumps, valve bodies, governors, modulators, power take-off (PTO) units, torque converters, flex plates, modulator/throttle devices, governor assemblies, retarding devices, lines, hoses, fittings, linkages, cables, switches, relays, solenoids, wiring harnesses, driver display screens, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, and electronic service tools, heating, welding and cutting equipment, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature
### U5142.0 TRANSMISSIONS SYSTEMS - Contd.

#### 5142.10 Verify repair of non electronically-controlled automatic transmissions and components, including: fluids, transfer cases, housings, gear train, shafts, bearings, seals, springs, clutch packs, one-way clutches, band and servo assemblies, pumps, valve bodies, governors, modulators, power take-off (PTO) units, torque converters, flex plates, modulator/throttle devices, governor assemblies, retarding devices, lines, hoses, fittings, linkages, cables, switches, relays, solenoids, wiring harnesses, driver display screens, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

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#### 5142.11 Diagnose and troubleshoot electronically-controlled automatic transmission systems and components, including: fluids, transfer cases, housings, gear train, shafts, bearings, seals, springs, clutch packs, one-way clutches, band and servo assemblies, pumps, valve bodies, governors, modulators, power take-off (PTO) units, torque converters, flex plates, modulator/throttle devices, governor assemblies, retarding devices, hoses, lines, fittings, linkages, cables, switches, relays, solenoids sensors, modules, wiring harnesses, interface, driver display screens, diagnostic lights, and fastening and mounting devices, by: visually inspecting, testing, and analyzing performance and function, checking for: opens/shorts/grounds, odour, temperature, leaks, colour, vibration/noise, corrosion malfunctioning indicator lights; using: hand, power, specialized, precision, and electronic service tools and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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5142.12 Repair electronically-controlled automatic transmission systems and components, including: fluids, transfer cases, housings, gear train, shafts, bearings, seals, springs, clutch packs, one-way clutches, band and servo assemblies, pumps, valve bodies, governors, modulators, power take-off (PTO) units, torque converters, flex plates, modulator/throttle devices, governor assemblies, retarding device, hoses, lines, fittings, linkages, cables, switches, relays, solenoids, sensors, modules, wiring harnesses, interface, driver display screens, diagnostic lights, and fastening and mounting devices, by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, and electronic service tools; heating, welding and cutting equipment, and lifting, rigging, and blocking devices, according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed
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Apprentice Signature

5142.13 Verify repair of electronically-controlled automatic transmission systems and components, including: fluids, transfer cases, housings, gear train, shafts, bearings, seals, springs, clutch packs, one-way clutches, band and servo assemblies, pumps, valve bodies, governors, modulators, power take-off (PTO) units, torque converters, flex plates, modulator/throttle devices, governor assemblies, retarding devices, hoses, lines, fittings, linkages, cables, switches, relays, solenoids, sensors, modules, wiring harnesses, interfaces, driver display screens, diagnostic lights, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, and electronic service tools, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed
Trainer Signature
Apprentice Signature

Employer/Sponsor Name
Employer/Sponsor Signature
U5143.0  DRIVE SHAFTS AND DRIVE AXLE ASSEMBLIES

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair drive shafts and drive axle assemblies, by performing a visual inspection; diagnosing and troubleshooting drive shafts, drive axle assemblies and components; repairing drive shafts, drive axle assemblies and components; verifying repair of drive shafts, drive axle assemblies and components; according to manufacturer’s specifications, recommendations, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5143.01  Perform visual inspection, identifying system types and applications, by: checking for: worn, loose, damaged, leaking, missing or defective components, including: drive shafts, universal joint and hanger bearing assemblies, lubrication, flanges, yokes, housings, carriers, differentials, power dividers (inter-axle differentials), drop boxes, axle shafts, gear sets, bearings, seals, wheel end assemblies, controls, actuators, switches, sensors, wiring harnesses, coolers, pumps, and fastening and mounting devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5143.02  Diagnose and troubleshoot drive shafts, drive axle assemblies and components, including: housings, carriers, differentials, power dividers (inter-axle differentials), drop boxes, drive shafts, universal joint and hanger bearing assemblies, fluids, lubricants, flanges, yokes, axle shafts, gear sets, bearings, seals, wheel end assemblies, controls and actuators, switches, solenoids, sensors, wiring harnesses, coolers, pumps, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, temperature, odour, colour, tolerances, vibration/noise, corrosion, distortion, fractures, alignment, and phasing; using: hand, power, specialized, precision, and electronic service tools; and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
Repair drive shafts, drive axle assemblies and components, including: housings, carriers, differentials, power dividers (inter-axle differentials), drop boxes, drive shafts, universal joint and hanger bearing assemblies, fluids, lubricants, flanges, yokes, axle shafts, gear sets, bearings, seals, wheel end assemblies, controls and actuators, switches, solenoids, sensors, wiring harnesses, coolers, pumps, and fastening and mounting devices; by: reconditioning, exchanging, or servicing; using hand, power, specialized, electronic service, and precision measuring tools, lifting, rigging and blocking devices, heating, welding and cutting equipment, pullers, and presses; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

Verify repair of drive shafts, drive axle assemblies and components, including: housings, carriers, differentials, power dividers (inter-axle differentials), drop boxes, drive shafts, universal joint assemblies, hanger bearing assemblies, fluids, lubricants, flanges, yokes, axle shafts, gear sets, bearings, seals, wheel end assemblies, controls and actuators, switches, solenoids, sensors, wiring harnesses, coolers, pumps, fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using hand, power, specialized, electronic service, and precision measuring tools, lifting, rigging and blocking devices, pullers, and presses; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

Employer/Sponsor Name  Employer/Sponsor Signature
U5144.0 FRAMES AND HITCHING/COUPLING SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair hitching/coupling systems, by performing a visual inspection; diagnosing and troubleshooting frames and hitching systems and components, repairing frames and hitching systems and components, and verifying repair of frames, hitching systems and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5144.01 Perform visual inspection, identifying system types and applications, by:
checking for: worn, loose, damaged, missing or defective components, including:
frames, fifth-wheels, upper coupler assemblies, pintle hooks, ball hitches,
lubrication, locking mechanisms, converter dollies, trailer configurations,
controls, actuators, welds, and fastening and mounting devices; according to
manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5144.02 Diagnose and troubleshoot frames and hitching systems and components,
including: frames, fifth-wheels, upper coupler assemblies, pintle hooks, ball
hitches, lubricant, locking mechanisms, converter dollies, trailer configurations,
controls, actuators, welds, and fastening and mounting devices, by:
visually inspecting, testing, and analysing performance and function,
checking for:
lubrication, noise/vibration, corrosion, alignment, bends, twists and fractures;
using hand, power, specialized, electronic service, and precision measuring tools,
lifting, rigging and blocking devices, heating, welding and cutting equipment,
pullers, and presses; according to manufacturer’s recommendations,
specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature
5144.03 Repair frames and hitching systems and components, including: lubrication, frames, fifth-wheels, upper coupler assemblies, pintle hooks, ball hitches, locking mechanisms, converter dollies, trailer configurations, controls, actuators, welds, and fastening and mounting devices, by: exchanging, reconditioning, servicing, reinforcing, or modifying; using: hand, power, specialized, electronic service, and precision measuring tools, lifting, rigging and blocking devices, heating, welding and cutting equipment, pullers, and presses; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5144.04 Verify repair of frames and hitching systems and components, including: lubrication, frames, fifth-wheels, upper coupler assemblies, pintle hooks, ball hitches, locking mechanisms, converter dollies, trailer configurations, controls and actuators, welds, fastening and mounting devices, by: visually inspecting, testing and analysing performance and function; using: hand, power, specialized, electronic service, and precision measuring tools, lifting, rigging and blocking devices, pullers, and presses; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

Employer/Sponsor Name Employer/Sponsor Signature
U5145.0  BODY AND TRIM

GENERAL PERFORMANCE OBJECTIVES

Service and repair body and trim, by performing a visual inspection; diagnosing and troubleshooting body and trim, repairing body and trim, and verifying repair of body and trim; according to manufacturer’s specifications, recommendations, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5145.01  Perform visual inspection, identifying system types and applications, by:
checking for: worn, loose, damaged, leaking, missing, or defective components, including: cabs, bodies, doors, sleeper units, van or dump bodies, unitized construction (monocoque), vessels/tanks, catwalks, rails, ladders, roll-over protection, vapour recovery and loading systems, trim, seats, restraint systems, emergency exits, glazing material, conspicuity (reflective) materials, lifts, steps, lights, ramps, switches, relays, sensors, wiring harnesses, controls, actuators, and fastening and mounting devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5145.02  Diagnose and troubleshoot body and trim, including: cabs, bodies, doors, and sleeper units, van or dump bodies, unitized construction (monocoque), vessels/tanks, catwalks, rails, ladders, roll-over protection, vapour recovery and loading systems, trim, seats, restraint systems, emergency exits, glass, glazing material, conspicuity (reflective) materials, lifts, steps, ramp sensors, lights, wiring harnesses, controls, actuators, and fastening and mounting devices, by:
visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, temperature, corrosion, pressure, vibration/noise, leaks, cracks, and defective latching mechanisms; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
5145.03 **Repair body and trim**, including: cabs, bodies, doors, and sleeper units, van or dump bodies, unitized construction (monocoque), vessels/tanks, catwalks, rails, ladders, roll-over protection, vapour recovery, loading systems, trim, seats, restraint systems, emergency exits, glass, glazing material, conspicuity (reflective) materials, lifts, steps, ramp sensors, lights, wiring harnesses, controls and actuators, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices, and heating, welding and cutting equipment; according to manufacturer’s recommendations, specifications, and safety requirements.

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5145.04 **Verify repair body and trim**, including: cabs, bodies, doors, and sleeper units, van or dump bodies, unitized construction (monocoque), vessels/tanks, catwalks, rails, ladders, roll-over protection, vapour recovery, loading systems, trim, seats, restraint systems, emergency exits, glass, glazing material, conspicuity (reflective) materials, lifts, steps, ramp sensors, lights, wiring harnesses, controls, actuators, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

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Employer/Sponsor Name

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U5146.0  SUSPENSION SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Service and repair suspension systems by: performing a visual inspection; diagnosing and troubleshooting suspension systems and components, repairing suspension systems and components and verifying repair of suspension systems and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5146.01  Perform visual inspection, identifying system types and applications, by:
checking for worn, loose, damaged, leaking, missing, or defective components, including: shock absorbers, springs (leaf, rubber block, air, and torsion bar), equalizers, shackles, bushings, walking beams, struts, sway bars, rubber blocks, hangers, lines, fittings, gauges, valves, controls, radius/torque rods, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5146.02  Diagnose and troubleshoot suspension systems and components, including:
air beams, shock absorbers, springs (leaf, rubber block, air, and torsion bar), equalizers, shackles, bushings, walking beams, struts, sway bars, rubber blocks, hangers, lines, fittings, gauges, valves, controls, and radius/torque rods, and fastening and mounting devices, by: visually inspecting, testing, and analysing performance and function, checking for: vibration/noise, corrosion, distortion, fractures, leaks, pressure, colour, alignment, stability, ride height, load distribution and controls, and lift, or kneeling applications; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
U5146.0 SUSPENSION SYSTEMS - Contd.

5146.03 **Repair suspension systems and components**, including: air beams, shock absorbers, springs (leaf, rubber block, air, and torsion bar), equalizers, shackles, bushings, walking beams, struts, sway bars, rubber blocks, hangers, lines, fittings, gauges, valves, controls, and radius/torque rods, and fastening and mounting devices; by: exchanging, reconditioning, aligning, or servicing; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices, and heating, welding and cutting equipment; according to manufacturer’s recommendations, specifications, and safety requirements.

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5146.04 **Verify repair of suspension systems and components**, including: air beams, shock absorbers, springs (leaf, rubber block, air, and torsion bar), equalizers, shackles, bushings, fasteners, walking beams, struts, sway bars, rubber blocks, hangers, lines, gauges, valves, controls, and radius/torque rods; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, and safety requirements.

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Employer/Sponsor Name

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U5147.0 STEERING SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair steering systems, by: performing a visual inspection; diagnosing and troubleshooting steering systems and components, repairing steering system and components, verifying repair of steering systems and components, and aligning steering and axles; according to manufacturer’s specifications, recommendations, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5147.01 Perform visual inspection, identifying system types and applications, checking for: worn, loose, damaged, leaking, missing, or defective components, including: steering boxes, pumps, drive mechanisms, cylinders, reservoirs, valves, controls, lines, hoses, fittings, linkages, columns, ball joints, king pins, universal joints, transfer boxes, switches, relays, sensors, modules, wiring harnesses, multiplexing, and fastening and mounting devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5147.02 Diagnose and troubleshoot steering systems and components, including: fluids, steering boxes, pumps, drive mechanisms, cylinders, reservoirs, valves, controls, lines, hoses, fittings, linkages, columns, ball joints, king pins, universal joints, transfer boxes, switches, relays, sensors, modules, wiring harnesses, multiplexing, and fastening and mounting devices; by visually inspecting, testing, and analysing performance and function; checking for: opens/shorts/grounds, wear, odour, temperature, colour, vibration/noise, corrosion, distortion, fractures, alignment, contamination, pressure, leaks, flow, oil level and condition; using: hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices; according to manufacturer’s recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

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5147.03 Repair steering systems and components, including: fluids, steering boxes, pumps, drive mechanisms, cylinders, reservoirs, valves, controls, lines, hoses, fittings, linkages, and columns, ball joints, king pins, universal joints, transfer boxes, switches, relays, sensors, modules, wiring harnesses, multiplexing, fastening and mounting devices; by visually inspecting, testing, and analysing performance and function; by: exchanging, reconditioning, servicing, adjusting, or aligning; using hand, power, specialized, precision, electronic service tools, lifting, rigging and blocking devices, heating, cutting and welding equipment and alignment equipment; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5147.04 Verify repair of steering systems and components, including: fluids, steering boxes, pumps, drive mechanisms, cylinders, reservoirs, valves, controls, lines, hoses, fittings, linkages, columns, ball joints, king pins, universal joints, transfer boxes, switches, relays, sensors, modules, wiring harnesses, multiplexing, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices and alignment equipment; according to manufacturer’s recommendations, specifications, and safety requirements.

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5147.05 Align steering and axles, by: adjusting alignment and verifying; using: alignment equipment, hand, power, specialized precision measuring and electronic service tools, torque wrenches, gauges, and shims; according to manufacturer’s recommendations, specifications, and safety requirements.

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Employer/Sponsor Name

Employer/Sponsor Signature
U5148.0   TIRES, WHEELS, RIMS, AND HUBS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair tires, wheels, rims, and hubs: by: performing a visual inspection; diagnosing and troubleshooting tires, wheels, rims, hubs and components, repairing tires, wheels, rims, hubs, and components, verifying repair of tires, wheels, rims, and hubs, balancing tires, wheels, rims, hubs, assemblies and components; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5148.01   Perform visual inspection, identifying system types and applications, by: checking for: worn loose, damaged, leaking, overheated, missing, or defective components, including: tires, tubes, rims, hubs, bearings, spacers, seals, valves, caps, tire ratings, mounting arrangements, locking channels, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

5148.02   Diagnose and troubleshoot tires, wheels, rims, hubs, and components, including: tires, tubes, valves, stems, caps, mounting arrangements, rims, hubs, locking channels, bearings, seals, wear rings, spacers, sensors, wiring harnesses, hubdometers, lock wedges, cones, washers, flanges, tab locks, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: tire matching and condition, corrosion, odour, contamination, pressure, leaks, colour, temperature, vibration/noise, fractures, lubrication, and runout, using hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, gauges, stethoscopes, wheel balancers, and torque wrenches; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed   Trainer Signature   Apprentice Signature
5148.03  **Repair tires, wheels, rims, hubs and components**, including: tires, tubes, valves, stems, caps, mounting arrangements, rims, hubs, locking channels, bearings, seals, wear rings, spacers, sensors, wiring harnesses, and hubdometers, lock wedges, cones, washers, flanges, tab locks, and fastening and mounting devices; by: exchanging, reconditioning, servicing or balancing; using: hand, power, specialized, precision, electronic service tools, safety cages, balancing equipment, lifting, rigging and blocking devices, gauges, stethoscopes, wheel balancers, torque wrenches, gauges, seal installers, patches, plugs, sections, and heating, cutting and welding equipment; according to manufacturer's recommendations, specifications, and safety requirements.

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5148.04  **Verify repair of tires, wheels, rims, hubs and components**, including: tires, tubes, valves, stems, caps, mounting arrangements, rims, hubs, locking channels, bearings, seals, wear rings, spacers, sensors, wiring harnesses, and hubdometers, lock wedges, cones, washers, flanges, tab locks, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using hand, power, specialized, precision, electronic service tools, safety cages, balancing equipment, lifting, rigging, and blocking devices, torque wrenches and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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U5149.0 AIR SUPPLY SYSTEM

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair air supply system and components, by: performing a visual inspection; diagnosing and troubleshooting air supply system and components; repairing air supply system and components, verifying repair of air supply system and components; diagnosing and troubleshooting auxiliary air components, repairing auxiliary air components, and verifying repair of auxiliary air components; according to manufacturer’s specifications, recommendations and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5149.01 Performs visual inspection, identifying system types and applications, by:
checking for: worn, loose, damaged, leaking, missing or defective components, including: compressors, lubrication system, fans, drive mechanisms, governors, air dryers, air filters, reservoirs, after coolers, reservoirs, lines, hoses, fittings, valves, unloader mechanisms, gauges, warning devices, and fastening and mounting devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5149.02 Diagnose and troubleshoot air supply systems and components, including:
compressors, lubrication systems, fans, drive mechanisms, governors, air dryers, air filters, reservoirs, after cooler, reservoirs, lines, hoses, fittings, valves, unloader mechanisms, gauges, warning devices, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: wear, odour, colour, corrosion, fractures, temperature, pressure, flow, vibration/ noise, contamination, and leaks, using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature
U5149.0 AIR SUPPLY SYSTEM - Contd.

5149.03 Repair air supply systems and components, including: compressors, lubrication system, fans, drive mechanisms, governors, air dryers, air filters, reservoirs, after coolers, reservoirs, lines, hoses, fittings, valves, unloader mechanisms, gauges, warning devices, and fastening and mounting devices, by: reconditioning, exchanging, servicing, or calibrating; using: hand, power, specialized, precision, electronic service tools, and lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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5149.04 Verify repair of air supply systems and components, including: compressors, lubrication system, fans, drive mechanisms, governors, air dryers, air filters, reservoirs, after coolers, reservoirs, lines, hoses, fittings, valves, unloader mechanisms, gauges, warning devices, and fastening and mounting devices, by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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5149.05 Diagnose and troubleshoot auxiliary air components, including: air ride seats, wipers, door systems, valves, regulators, cylinders, dash controls, horns, tarpaulin systems, air starters, tail gate locks, switches, relays, sensors, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; checking for: opens/shorts/grounds, wear, odour, colour, temperature, pressure, leaks, vibration/noise, corrosion, and contamination, using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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**U5149.0 AIR SUPPLY SYSTEM - Contd.**

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<tr>
<td>5149.06</td>
<td>Repair auxiliary air components, including: air ride seats, wipers, door systems, valves, regulators, cylinders, dash controls, horns, tarpaulin systems, air starters, tail gate locks, switches, relays, sensors, wiring harnesses, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.</td>
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<tr>
<td>5149.07</td>
<td>Verify repair of auxiliary air components, including: air ride seats, wipers, door systems, valves, regulators, cylinders, dash controls, horns, tarpaulin systems, air starters, tail gate locks, switches, relays, sensors, wiring harnesses, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.</td>
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Employer/Sponsor Name

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U5150.0 BRAKING SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair braking systems, by: performing a visual inspection; diagnosing and troubleshooting hydraulic braking systems and components; repairing hydraulic brake systems and components; diagnosing and troubleshooting anti-lock braking systems (ABS) and components; repairing anti-lock braking systems (ABS) and components; verifying repair of anti-lock braking systems (ABS) and components; diagnosing and troubleshooting air brake systems and components; repairing air brake system and components, verifying repair of air brake system and components, diagnosing and troubleshooting anti-skid/traction control systems and components; repairing anti-skid/traction control systems and components; verifying repair of anti-skid/traction control systems and components; and measuring and resurfacing brake drums, linings, and rotors; according to manufacturer’s recommendations, specifications, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5150.01 **Perform visual inspection**, identifying system types and applications, by: checking for: worn, loose, damaged, leaking, missing, or defective components, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, hydraulic fluid, wheel and master cylinders, boosters, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, anti-lock braking systems (ABS), anti-skid/traction control systems, driver display screens, multiplexing, and fastening and mounting devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed              Trainer Signature              Apprentice Signature

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U5150.0  BRAKING SYSTEMS - Contd.

5150.02  **Diagnose and troubleshoot hydraulic braking systems and components**, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, hydraulic fluid, wheel and master cylinders, boosters, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, anti-lock braking systems (ABS), anti-skid/traction control systems, driver display screens, multiplexing, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: wear, vibration/noise, pressure, corrosion, odour, colour, contamination, fractures, distortion, temperature, hydraulic fluid level and condition; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature

5150.03  **Repair hydraulic braking systems and components**, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, hydraulic fluid, wheel and master cylinders, boosters, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, anti-lock braking systems (ABS), anti-skid/traction control systems, driver display screens, multiplexing, and fastening and mounting devices; by: exchanging, reconditioning, servicing, or adjusting; using hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  Trainer Signature  Apprentice Signature
Verify repair of hydraulic braking system and components, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, hydraulic fluid, wheel and master cylinders, boosters, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, anti-lock braking systems (ABS), anti-skid/traction control systems, driver display screens, multiplexing, fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

Diagnose and troubleshoot anti-lock braking systems (ABS) and components, including: drums, calipers, rotors, backing plates, friction materials, hoses, lines, valves, master and wheel cylinders, boosters, rotor sensors, switches, solenoids, accumulators, motors, pumps, actuators, reservoirs, reluctors, relays, sensors, modules, wiring harnesses, information/warning displays, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, colour, vibration/noise, pressure, fractures, distortion, corrosion, leaks, contamination, fluid type and temperature; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.
TRUCK AND COACH TECHNICIAN

U5150.0 BRAKING SYSTEMS - Contd.

5150.06 Repair anti-lock braking systems (ABS) and components, including: drums, calipers, rotors, backing plates, friction materials, hoses, lines, valves, master and wheel cylinders, boosters, rotor sensors, switches, solenoids, accumulators, motors, pumps, actuators, reservoirs, relactors, relays, sensors, modules, wiring harnesses, information/warning displays, and fastening and mounting devices; by: exchanging, reconditioning, servicing or adjusting; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  
Trainer Signature  
Apprentice Signature

5150.07 Verify repair of anti-lock braking systems (ABS) and components, including: drums, calipers, rotors, backing plates, friction materials, hoses, lines, valves, master and wheel cylinders, boosters, rotor sensors, switches, solenoids, accumulators, motors, pumps, actuators, reservoirs, relactors, relays, sensors, modules, wiring harnesses, information/warning displays, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed  
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5150.08 Diagnose and troubleshoot air braking systems and components, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, driver display screens, multiplexing, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, vibration/noise, pressure, corrosion, odour, colour, contamination, leaks, fractures, distortion, and temperature; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed  
Trainer Signature  
Apprentice Signature
5150.09 **Repair air braking systems and components**, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, driver display screens, multiplexing, and fastening and mounting devices; by: exchanging, reconditioning, servicing, or adjusting; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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5150.10 **Verify repair of air braking systems and components**, including: drums, calipers, rotors, backing plates, dust shields, spiders, friction material, hoses, lines, fittings, S-cams, bushings, slack adjusters, valves, brake chambers, switches, relays, sensors, modules, wiring harnesses, safety and warning devices, driver display screens, multiplexing, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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5150.11 **Diagnose and troubleshoot anti-skid/traction control systems and components**, including: drums, calipers, rotors, backing plates, friction materials, hoses, lines, valves, master and wheel cylinders, boosters, rotor sensors, accumulators, motors, pumps, actuators, reservoirs, relactors, switches, solenoids, relays, sensors, modules, wiring harnesses, information/warning displays, and fastening and monitoring devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, vibration/noise, pressure, corrosion, colour, leaks, contamination, fluid type and temperature; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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**5150.12**  
**Repair anti-skid/traction control systems and components**, including: drums, calipers, rotors, backing plates, friction materials, hoses, lines, valves, master and wheel cylinders, boosters, rotor sensors, accumulators, motors, pumps, actuators, reservoirs, relactors, switches, solenoids, relays, sensors, modules, wiring harnesses, information/warning displays, and fastening and mounting devices; by exchanging, reconditioning and servicing; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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**5150.13**  
**Verify repair of anti-skid/traction control systems and components**, including: drums, calipers, rotors, backing plates, friction materials, hoses, lines, valves, master and wheel cylinders, boosters, rotor sensors, accumulators, motors, pumps, actuators, reservoirs, relactors, switches, solenoids, relays, sensors, modules, wiring harnesses, information/warning displays, and fastening and mounting devices; by visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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**5150.14**  
**Measure and resurface brake drums and rotors**, using drums, rotors, and shoe gauges, specialized resurfacing equipment, and lifting devices; according to manufacturer's recommendations, specifications, and safety requirements.

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Employer/Sponsor Name

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U5151.0 HEATING, VENTILATION, AIR-CONDITIONING AND REFRIGERATION SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair heating, ventilation, air-conditioning and refrigeration systems, by: performing a visual inspection; diagnosing and troubleshooting air-conditioning and refrigeration systems and components; repairing air-conditioning and refrigeration systems and components; verifying repair of air-conditioning and refrigeration systems and components; diagnosing and troubleshooting heating and ventilation systems and components; repairing heating and ventilation systems and components; and verifying repairs of heating and ventilation systems and components; according to manufacturer’s specifications, recommendations, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5151.01 Perform visual inspection, identifying system types and applications, by: checking for: fluid levels and condition, and refrigerant levels, worn, loose, damaged, leaking, missing or defective components, including: hoses, lines, fittings, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, compressors and drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, receiver/dryers, accumulators, ducting, and fastening and mounting devices; according to manufacturer’s recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

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U5151.0 HEATING, VENTILATION, AIR-CONDITIONING AND REFRIGERATION SYSTEMS - Contd.

5151.02 Diagnose and troubleshoot air-conditioning and refrigeration systems and components, including: refrigerant, hoses, lines, fittings, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, compressors, drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, receiver/dryers, accumulators, ducting, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, odour, colour, corrosion, temperature, contamination, vibration/noise, pressure, leaks, fluid levels and condition, and refrigerant levels; using: hand, power, specialized, precision, electronic service tools, leak detection devices, vacuum pumps, recovery and charging equipment, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

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5151.03 Repair air-conditioning and refrigeration systems and components, including: refrigerant, hoses, lines, fittings, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, compressors, drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, receiver/dryers, accumulators, ducting, and fastening and mounting devices; by: exchanging, reconditioning, or servicing, using: hand, power, specialized, precision, electronic service tools, leak detection devices, vacuum pumps, recovery and charging equipment, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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5151.04 Verify repair of air-conditioning and refrigeration systems and components, including: refrigerant, hoses, lines, fittings, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, compressors, drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, receiver/dryers, accumulators, ducting, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, leak detection devices, vacuum pumps, recovery and charging equipment, lifting, rigging, and blocking devices, torque wrenches, and gauges; according to manufacturer's recommendations, specifications, and safety requirements.

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U5151.0 HEATING, VENTILATION, AIR-CONDITIONING AND REFRIGERATION SYSTEMS - Contd.

5151.05 Diagnose and troubleshoot heating and ventilation systems and components, including: coolants, hoses, lines, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, ducting, fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, odour, colour, corrosion, fractures, temperature, contamination, fluid levels and condition, vibration/noise, pressure and leaks; using: hand, power, specialized, precision, electronic service tools, vacuum pumps, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5151.06 Repair heating and ventilation systems and components, including: coolants, hoses, lines, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, ducting, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, electronic service tools, vacuum pumps, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

5151.07 Verify repair of heating and ventilation systems and components, including: coolants, hoses, lines, controls, actuators, cables, valves, switches, relays, sensors, modules, wiring harnesses, warning devices, drive mechanisms, motors, pumps, filters, heat exchangers, auxiliary heaters, ducting, and fastening and mounting devices; by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, vacuum pumps, and lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed Trainer Signature Apprentice Signature

Employer/Sponsor Name Employer/Sponsor Signature
U5152.0 HYDRAULIC SYSTEMS

GENERAL PERFORMANCE OBJECTIVES

Diagnose and repair hydraulic systems and components, by: performing a visual inspection; diagnosing and troubleshooting hydraulic systems and components, repairing hydraulic systems and components, and verifying repair of hydraulic systems and components; according to manufacturer’s specifications, recommendations, and safety requirements.

PERFORMANCE OBJECTIVES

SKILLS

5152.01 Perform visual inspection, identifying system types and applications, by: checking for: worn, loose, damaged, leaking, missing or defective components, including: pumps, drive mechanisms, cylinders, reservoirs, valves, seals, controls, gauges, screens, filters, coolers, power take-off (PTO) units, lines, hoses, fittings, oil level and condition, switches, relays sensors, modules, wiring harnesses, driver display screens, and fastening and mounting devices; according to manufacturer's recommendations, specifications and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5152.02 Diagnose and troubleshoot hydraulic systems and components, including: fluid, pumps, drive mechanisms, cylinders, reservoirs, valves, seals, controls, gauges, screens, filters, coolers, power take-off (PTO) units, lines, hoses, fittings, switches, relays, sensors, modules, wiring harnesses, driver display screens, and fastening and mounting devices, by: visually inspecting, testing, and analysing performance and function, checking for: opens/shorts/grounds, wear, fluid level and condition, odour, colour, corrosion, vibration/noise, cavitation, contamination, pressure, flow, and temperature, using: hand, power, specialized, precision, electronic service tools, flow meters, lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, schematic diagrams, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature
5152.03 Repair hydraulic systems and components, including: fluid, pumps, drive mechanisms, cylinders, reservoirs, valves, seals, controls, gauges, screens, filters, coolers, power take-off (PTO) units, lines, hoses, fittings, switches, relays, sensors, modules, wiring harnesses, driver display screens, and fastening and mounting devices; by: exchanging, reconditioning, or servicing; using: hand, power, specialized, precision, electronic service tools, flow meters, lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

5152.04 Verify repair of hydraulic systems and components, including: fluid, pumps, drive mechanisms, cylinders, reservoirs, valves, seals, controls, gauges, screens, filters, coolers, power take-off (PTO) unit, lines, hoses, fittings, switches, relays, sensors, modules, wiring harnesses, driver display screens, and fastening and mounting devices, by: visually inspecting, testing, and analysing performance and function; using: hand, power, specialized, precision, electronic service tools, flow meters, lifting, rigging, and blocking devices; according to manufacturer's recommendations, specifications, and safety requirements.

Date Completed

Trainer Signature

Apprentice Signature

Employer/Sponsor Name

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