




# Focus Area Level Report

Including Knowledge and Skills, and Performance Indicators



-  Career Area: **Industrial and Engineering Systems**
-  Cluster: **Automotive & Heavy Equipment Technology**
-  Focus Area: **Automotive Service Technology**

Industry-based knowledge and skill

Skill Type

**AHAS01** Perform Lube, Oil, and Filter (LOF) and preventive maintenance needed for entry level employment of the automobile service and repair field.

Performance Indicators

Delivery Level

- AHAS01.01.01 Check and replace wiper blades.
- AHAS01.01.02 Inspect, replace, and adjust drive pulleys; check pulley and belt alignment.
- AHAS01.01.03 Inspect and replace air filter.
- AHAS01.01.04 Check and adjust engine oil, coolant, power steering fluid, brake fluid, windshield washer fluid, differential/transfer case fluid, and transmission fluid levels.
- AHAS01.01.05 Determine fluid type requirements and identify fluid.

Industry-based knowledge and skill

Skill Type

**AHAS02** Perform skills and determine necessary actions needed in the automatic transmission area of automotive service and repair.

Performance Indicators

Delivery Level

- AHAS02.01.01 Service transmission; perform visual inspection of transmission; replace fluids and filters.
- AHAS02.01.02 Diagnose fluid leakage concerns.
- AHAS02.01.03 Identify and interpret transmission transaxle concern; assure proper engine operation.
- AHAS02.01.04 Perform pressure and stall tests.
- AHAS02.01.05 Perform lock up converter system tests.
- AHAS02.01.06 Diagnose mechanical and vacuum control system concerns.
- AHAS02.01.07 Diagnose noise and vibration concerns.
- AHAS02.01.08 Diagnose transmission/transaxle gear reduction/multiplication concerns using driving, driven, and held member (power flow) principles.
- AHAS02.01.09 Diagnose pressure concerns in a transmission using hydraulic principles (Pascal's Law).
- AHAS02.01.10 Diagnose electrical/electronic concerns using principles of electricity (Ohm's Law).
- AHAS02.01.11 Inspect, adjust or replace throttle valve (TV) linkages or cables; manual shift linkages or cables; transmission range sensor; check gear select indicator (as applicable).
- AHAS02.01.12 Inspect, adjust or replace (as applicable) vacuum modulator; inspect and repair or replace lines and hoses.
- AHAS02.01.13 Inspect extension housing, bushings and seals. Inspect and replace speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers.
- AHAS02.01.14 Diagnose electronic transmission control systems using a scan tool.
- AHAS02.01.15 Inspect and replace external seals and gaskets.
- AHAS02.01.16 Remove and reinstall transmission and torque converter (rear wheel drive).
- AHAS02.01.17 Remove and reinstall transaxle and torque converter assembly.
- AHAS02.01.18 Air test operation of clutch and servo assemblies.
- AHAS02.01.19 Inspect, repair, and replace governor assembly.

Industry-based knowledge and skill


Skill Type


**AHAS03** Perform skills and determine necessary actions needed in the manual drive train and axles area of automotive service and repair.

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## Performance Indicators


Delivery Level


AHAS03.01.01	Diagnose fluid usage, level, and condition concerns.
AHAS03.01.02	Drain and fill transmission/transaxle and final drive unit.
AHAS03.01.03	Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs.
AHAS03.01.04	Inspect hydraulic clutch slave and master cylinders, lines, and hoses.
AHAS03.01.05	Bleed clutch hydraulic system.
AHAS03.01.06	Diagnose fluid leakage concerns.
AHAS03.01.07	Inspect and replace drive axle shaft wheel studs.
AHAS03.01.08	Inspect constant velocity (CV) joint boots.
AHAS03.01.09	Remove and replace rear wheel drive drive shaft.
AHAS03.01.10	Identify and interpret drive train concern.
AHAS03.01.11	Diagnose clutch noise, binding, slippage, pulsation, and chatter.
AHAS03.01.12	Inspect release (throw out) bearing, lever, and pivot.
AHAS03.01.13	Inspect engine block, clutch (bell) housing, transmission/transaxle case mating surfaces, and alignment dowels.
AHAS03.01.14	Remove and reinstall transmission/transaxle.
AHAS03.01.15	Disassemble, clean, and reassemble transmission/transaxle components.
AHAS03.01.16	Inspect transmission/transaxle case, extension housing, case mating surfaces, bores, bushings, and vents.
AHAS03.01.17	Diagnose noise, hard shifting, jumping out of gear, and fluid leakage concerns.
AHAS03.01.18	Diagnose transaxle final drive assembly noise and vibration concerns.
AHAS03.01.19	Inspect, test, and replace transmission/transaxle sensors and switches.
AHAS03.01.20	Diagnose constant velocity (CV) joint noise and vibration concerns.
AHAS03.01.21	Diagnose universal joint noise and vibration concerns.
AHAS03.01.22	Remove and replace front wheel drive (FWD) front wheel bearing.
AHAS03.01.23	Inspect, service, and replace shafts, yokes, boots, and CV joints.
AHAS03.01.24	Inspect, service, and replace shaft center support bearings.
AHAS03.01.25	Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles.
AHAS03.01.26	Diagnose noise and vibration concerns.
AHAS03.01.27	Inspect and replace companion flange and pinion seal; measure companion flange runout.
AHAS03.01.28	Inspect ring gear and measure runout.
AHAS03.01.29	Remove, inspect, and reinstall drive pinion and ring gear, spacers, sleeves, and bearings.
AHAS03.01.30	Measure and adjust drive pinion depth.
AHAS03.01.31	Measure and adjust drive pinion bearing preload.
AHAS03.01.32	Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types).
AHAS03.01.33	Check ring and pinion tooth contact patterns.
AHAS03.01.34	Disassemble, inspect, measure, and adjust or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case.
AHAS03.01.35	Reassemble and reinstall differential case assembly; measure runout.
AHAS03.01.36	Diagnose noise, slippage, and chatter concerns.
AHAS03.01.37	Clean and inspect differential housing; refill with correct lubricant.

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 Career Area: **Industrial and Engineering Systems**

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## Performance Indicators

Delivery Level

AHAS03.01.38	Inspect and reinstall clutch (cone or plate) components.
AHAS03.01.39	Measure rotating torque.
AHAS03.01.40	Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns.
AHAS03.01.41	Remove and replace drive axle shafts.
AHAS03.01.42	Inspect and replace drive axle shaft seals, bearings, and retainers.
AHAS03.01.43	Measure drive axle flange runout and shaft endplay.
AHAS03.01.44	Diagnose noise, vibration, and unusual steering concerns.
AHAS03.01.45	Inspect, adjust, and repair shifting controls (mechanical, electrical, and vacuum), bushings, mounts, levers, and brackets.
AHAS03.01.46	Remove and reinstall transfer case.
AHAS03.01.47	Inspect front wheel bearings and locking hubs.
AHAS03.01.48	Check drive assembly seals and vents; check lube level.
AHAS03.01.49	Diagnose, test, adjust, and replace electrical/electronic components of four wheel drive systems.

## Industry-based knowledge and skill

Skill Type

**AHAS04** Perform skills and determine necessary actions needed in the suspension and steering area of automotive service and repair.

## Performance Indicators


Delivery Level


AHAS04.01.01	Identify and interpret suspension and steering concern.
AHAS04.01.02	Inspect power steering fluid levels and condition, power steering fluid leakage; determine necessary flush, fill, and bleed power steering system.
AHAS04.01.03	Lubricate suspension and steering systems.
AHAS04.01.04	Inspect, remove, and replace shock absorbers.
AHAS04.01.05	Remove, inspect, and install stabilizer bar bushings, brackets, and links.
AHAS04.01.06	Remove, inspect, and install strut cartridge or assembly, coil spring, insulators (silencers), and upper strut bearing mount.
AHAS04.01.07	Perform pre-alignment inspection including measuring ride height.
AHAS04.01.08	Inspect tires; check and adjust air pressure.
AHAS04.01.09	Diagnose tire wear patterns, rotate tires according to manufacturer's recommendations.
AHAS04.01.10	Diagnose wheel/tire vibration, shimmy, and noise, balance wheel and tire assembly (static dynamic).
AHAS04.01.11	Dismount, inspect, repair tire using internal patch, and remount tire on wheel.
AHAS04.01.12	Reinstall wheel; torque lug nuts.
AHAS04.01.13	Disable and enable supplemental restraint system (SRS).
AHAS04.01.14	Remove and replace steering wheel; center supplemental restraint system (SRS) coil (clock spring).
AHAS04.01.15	Diagnose steering column noises, looseness, and binding concerns (including tilt mechanisms).
AHAS04.01.16	Diagnose power steering gear (non-rack and pinion) binding, uneven turning effort, looseness, hard steering, noise, and fluid leakage concerns.
AHAS04.01.17	Diagnose power steering gear (rack and pinion) binding, uneven turning effort, looseness, hard steering, noise, and fluid leakage concerns.
AHAS04.01.18	Inspect steering shaft universal joint(s), flexible coupling(s), collapsible column, lock cylinder mechanism, and steering wheel.

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 Career Area: **Industrial and Engineering Systems**

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## Performance Indicators


Delivery Level


AHAS04.01.19	Adjust manual or power non-rack and pinion worm bearing preload and sector lash.
AHAS04.01.20	Remove and replace manual or power rack and pinion steering gear; inspect mounting bushings and brackets.
AHAS04.01.21	Inspect and replace manual or power rack and pinion steering gear inner tie rod ends (sockets) and bellows boots.
AHAS04.01.22	Diagnose power steering fluid leakage.
AHAS04.01.23	Remove, inspect, replace, and adjust power steering pump, pulley, and belt.
AHAS04.01.24	Inspect and replace power steering hoses and fittings.
AHAS04.01.25	Inspect and replace pitman arm, relay (center link) rod, idler arm and mountings, and steering linkage damper.
AHAS04.01.26	Inspect, replace, and adjust tie rod ends (sockets), tie rod sleeves, and clamps.
AHAS04.01.27	Test and diagnose components of electronically controlled steering systems using a scan tool.
AHAS04.01.28	Inspect and test non-hydraulic electric power assist steering.
AHAS04.01.29	Diagnose short and long arm suspension system noises, body sway, and uneven riding height concerns.
AHAS04.01.30	Diagnose strut suspension system noises, body sway, and uneven riding height concerns.
AHAS04.01.31	Remove, inspect, and install upper and lower control arms, bushings, shafts, and rebound bumpers.
AHAS04.01.32	Remove, inspect and install strut rods (compression/tension) and bushings.
AHAS04.01.33	Remove, inspect, and install upper and/or lower ball joints.
AHAS04.01.34	Remove, inspect, and install steering knuckle assemblies.
AHAS04.01.35	Remove, inspect, and install short and long arm suspension system coil springs and spring insulators.
AHAS04.01.36	Remove, inspect, install, and adjust suspension system torsion bars; inspect mounts.
AHAS04.01.37	Remove, inspect, and install stabilizer bar bushings, brackets, and links.
AHAS04.01.38	Lubricate suspension and steering systems.
AHAS04.01.39	Remove, inspect, and install coil springs and spring insulators.
AHAS04.01.40	Remove, inspect, and install transverse links, control arms, bushings, and mounts.
AHAS04.01.41	Remove, inspect, and install leaf springs, leaf spring insulators (silencers), shackles, brackets, bushings, and mounts.
AHAS04.01.42	Remove, inspect, and service or replace front and rear wheel bearings.
AHAS04.01.43	Test and diagnose components of electronically controlled suspension systems using a scan tool.
AHAS04.01.44	Diagnose vehicle wander, drift, pull, hard steering, bump steer, memory steer, torque steer, and steering return concerns.
AHAS04.01.45	Check and adjust front and rear wheel camber.
AHAS04.01.46	Check and adjust caster.
AHAS04.01.47	Check and adjust front wheel toe and center steering wheel.
AHAS04.01.48	Check toe out on turns (turning radius).
AHAS04.01.49	Check SAI (steering axis inclination) and included angle.
AHAS04.01.50	Check and adjust rear wheel toe.

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 Career Area: **Industrial and Engineering Systems**

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 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level

AHAS04.01.51	Check rear wheel thrust angle.
AHAS04.01.52	Check for front wheel setback.
AHAS04.01.53	Check front cradle (sub frame) alignment.
AHAS04.01.54	Measure wheel, tire, and hub runout.
AHAS04.01.55	Diagnose tire pull (lead) problem.
AHAS04.01.56	Dismount, inspect, and remount tire on wheel equipped with tire pressure sensor.
AHAS04.01.57	Inspect, diagnose, and calibrate tire pressure monitoring system.

## Industry-based knowledge and skill

Skill Type

**AHAS05** Perform skills and determine necessary actions needed in the brakes area of automotive service and repair.

## Performance Indicators

Delivery Level


AHAS05.01.01	Inspect brake lines, flexible hoses, and fittings for leaks, dents, kinks, rust, cracks, bulging or wear; tighten loose fittings and supports.
AHAS05.01.02	Identify and inspect antilock brake system (ABS) components.
AHAS05.01.03	Remove, clean, inspect, measure, resurface drums, and replace pads and parts on drum brakes as necessary.
AHAS05.01.04	Remove, clean, inspect, measure, resurface rotors, and replace pads and parts on disc brakes as necessary.
AHAS05.01.05	Diagnose wheel bearing noises, wheel shimmy, and vibration concerns.
AHAS05.01.06	Inspect the vacuum type power booster unit for vacuum leaks; inspect the check valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum type power booster.
AHAS05.01.07	Check parking brake operation, components for wear, rusting, binding, and corrosion, and the operation of parking brake indicator light system.
AHAS05.01.08	Check operations of brake stop light system.
AHAS05.01.09	Select, handle, store, flush, bleed, and fill brake fluids to proper level.
AHAS05.01.10	Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).
AHAS05.01.11	Measure brake pedal height.
AHAS05.01.12	Check master cylinder for internal and external leaks and proper operation.
AHAS05.01.13	Remove, bench bleed, and reinstall master cylinder.
AHAS05.01.14	Diagnose poor stopping, pulling or dragging concerns caused by malfunctions in the hydraulic system.
AHAS05.01.15	Fabricate and/or install brake lines (double flare and ISO types); replace hoses, fittings, and supports as needed.
AHAS05.01.16	Inspect, test, and/or replace metering (hold off), proportioning (balance), pressure differential, and combination valves.
AHAS05.01.17	Inspect, test, and adjust height (load) sensing proportioning valve.
AHAS05.01.18	Inspect, test, and/or replace components of brake warning light system.
AHAS05.01.19	Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging or pedal pulsation concerns.
AHAS05.01.20	Remove, inspect, and install wheel cylinders.
AHAS05.01.21	Pre-adjust brake shoes and parking brake before installing brake drums or drum/hub assemblies and wheel bearings.
AHAS05.01.22	Install wheel, torque lug nuts, and make final checks and adjustments.
AHAS05.01.23	Remove caliper assembly from mountings; clean and inspect for leaks and damage to caliper housing.




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 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level

AHAS05.01.24	Clean, inspect, and measure rotor with a dial indicator and a micrometer; follow manufacturer's repair procedures.
AHAS05.01.25	Adjust calipers equipped with an integrated parking brake system.
AHAS05.01.26	Test pedal free travel with and without engine running; check power assist operation.
AHAS05.01.27	Inspect and test hydraulically assisted power brake system for leaks and proper operation.
AHAS05.01.28	Measure and adjust master cylinder pushrod length.
AHAS05.01.29	Inspect and replace wheel studs.
AHAS05.01.30	Remove and reinstall sealed wheel bearing assembly.
AHAS05.01.31	Diagnose poor stopping, wheel lock up, abnormal pedal feel or pulsation, and noise concerns caused by the antilock brake system (ABS).
AHAS05.01.32	Diagnose antilock brake system (ABS) electronic control(s) and components using self-diagnosis and/or recommended test equipment.
AHAS05.01.33	Depressurize high-pressure components of the antilock brake system (ABS).
AHAS05.01.34	Bleed the antilock brake system's (ABS) front and rear hydraulic circuits.
AHAS05.01.35	Remove and install antilock brake system (ABS) electrical/electronic and hydraulic components.
AHAS05.01.36	Test, diagnose and service ABS speed sensors, toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data).
AHAS05.01.37	Diagnose antilock brake system (ABS) braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.).
AHAS05.01.38	Identify traction control vehicle stability control system components.

## Industry-based knowledge and skill

Skill Type

**AHAS06** Perform skills and determine necessary actions needed in the electrical/electronic systems area of automotive service and repair.

## Performance Indicators


Delivery Level


AHAS06.01.01	Diagnose electrical/electronic integrity for series, parallel, and series-parallel circuits using principles of electricity (Ohm's Law).
AHAS06.01.02	Use wiring diagrams during diagnosis of electrical circuit problems.
AHAS06.01.03	Demonstrate the use of a test light during diagnosis of electrical circuit problems.
AHAS06.01.04	Check electrical circuits using fused jumper wires, locate shorts, grounds, opens, and resistance problems in electrical/electronic circuits.
AHAS06.01.05	Measure and diagnose the cause(s) of excessive key-off battery drain (parasitic draw).
AHAS06.01.06	Inspect and test fusible links, circuit breakers, fuses, switches, connectors, relays, solid state devices, and wires.
AHAS06.01.07	Repair wiring harnesses, connectors, terminal ends, and perform solder repair of electrical wiring.
AHAS06.01.08	Perform battery state-of-charge test (open circuit voltage), battery capacity test/load test; confirm proper battery capacity for vehicle application; determine necessary action while maintaining or restoring electronic memory functions.

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Including Knowledge and Skills, and Performance Indicators



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 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level

AHAS06.01.09	Inspect, clean, fill, and replace battery; inspect and clean battery cables, connectors, clamps, and hold-downs; repair or replace as needed, perform slow/fast battery charge.
AHAS06.01.10	Start a vehicle using jumper cables and a battery or auxiliary power supply.
AHAS06.01.11	Perform starter current draw tests, starter circuit voltage drop tests, inspect and test starter relays and solenoids.
AHAS06.01.12	Demonstrate the proper use of a DMM (digital multimeter), including source voltage, voltage drop, current flow, and continuity.
AHAS06.01.13	Identify and interpret electrical/electronic system concern.
AHAS06.01.14	Identify location of hybrid vehicle high voltage circuit disconnect (service plug) location and safety procedures.
AHAS06.01.15	Identify high voltage circuits of electric or hybrid electric vehicle and related safety precautions.
AHAS06.01.16	Identify electronic modules, security systems and/or radios that require reinitialization or code entry following battery disconnect.
AHAS06.01.17	Identify hybrid vehicle auxiliary (12v) battery service, repair and test procedures.
AHAS06.01.18	Remove and install starter in a vehicle.
AHAS06.01.19	Remove, inspect, and install generator (alternator).
AHAS06.01.20	Identify system voltage and safety precautions associated with high intensity discharge headlights.
AHAS06.01.21	Inspect and test gauges and gauge sending units for cause of intermittent, high, low, or no gauge readings.
AHAS06.01.22	Inspect and test connectors, wires, and printed circuit boards of gauge circuits.
AHAS06.01.23	Diagnose the cause of incorrect operation of warning devices and other driver information systems.
AHAS06.01.24	Diagnose radio static and weak, intermittent, or no radio reception.
AHAS06.01.25	Remove and reinstall door panel.
AHAS06.01.26	Diagnose body electronic system circuits using a scan tool.
AHAS06.01.27	Check for module communication (including CANBUS systems) errors using a scan tool.
AHAS06.01.28	Diagnose the cause of false, intermittent, or no operation of anti-theft systems.

## Industry-based knowledge and skill

Skill Type

**AHAS07** Perform skills and determine necessary actions needed in the engine performance area of automotive service and repair.

## Performance Indicators


Delivery Level


AHAS07.01.01	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).
AHAS07.01.02	Perform engine absolute and relative (vacuum/boost) manifold pressure tests.
AHAS07.01.03	Perform cylinder power balance test, cylinder compression test, cylinder leakage test.
AHAS07.01.04	Verify engine-operating temperature.
AHAS07.01.05	Prepare 4- or 5-gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings.
AHAS07.01.06	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses.

# Focus Area Level Report

Including Knowledge and Skills, and Performance Indicators



 Career Area: **Industrial and Engineering Systems**

 Cluster: **Automotive & Heavy Equipment Technology**

 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level


AHAS07.01.07	Obtain and interpret scan tool data, retrieve and record stored OBD I and OBD II (Onboard Diagnostic) diagnostic trouble codes; clear codes.
AHAS07.01.08	Replace fuel filters.
AHAS07.01.09	Remove and replace thermostat and gasket
AHAS07.01.10	Identify and interpret engine performance concern.
AHAS07.01.11	Perform engine running compression test.
AHAS07.01.12	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and/or engine diagnostic equipment.
AHAS07.01.13	Verify correct camshaft timing.
AHAS07.01.14	Diagnose the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes.
AHAS07.01.15	Diagnose emissions or driveability concerns resulting from malfunctions in the computerized engine control system with no stored diagnostic trouble codes.
AHAS07.01.16	Check for module communication (including CAN/BUS systems) errors using a scan tool.
AHAS07.01.17	Inspect and test computerized engine control system sensors, power train control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO).
AHAS07.01.18	Diagnose driveability and emissions problems resulting from malfunctions of interrelated systems (cruise control, security alarms, suspension controls, traction controls, A/C, automatic transmissions, non-OEM-installed accessories, or similar systems).
AHAS07.01.19	Perform active tests of actuators using scan tool.
AHAS07.01.20	Diagnose ignition system related problems such as no-starting, hard starting, engine misfire, poor driveability, spark knock, power loss, poor mileage, and emissions concerns on vehicles with electronic ignition systems.
AHAS07.01.21	Inspect, test and service distributor.
AHAS07.01.22	Inspect and test ignition system primary and secondary circuit wiring and components.
AHAS07.01.23	Inspect and test ignition coil(s).
AHAS07.01.24	Check and adjust ignition system timing and timing advance/retard (where applicable).
AHAS07.01.25	Inspect and test ignition system pick-up sensor or triggering devices.
AHAS07.01.26	Diagnose hot or cold no-starting, hard starting, poor driveability, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems.
AHAS07.01.27	Check fuel for contaminants and quality.
AHAS07.01.28	Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume.
AHAS07.01.29	Inspect and test cold enrichment system and components.
AHAS07.01.30	Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.
AHAS07.01.31	Inspect and test fuel injectors.
AHAS07.01.32	Check idle speed.
AHAS07.01.33	Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s).
AHAS07.01.34	Perform exhaust system back-pressure test.




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 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level

AHAS07.01.35	Test the operation of turbocharger/supercharger systems.
AHAS07.01.36	Diagnose oil leaks, emissions, and driveability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system.
AHAS07.01.37	Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses.
AHAS07.01.38	Diagnose emissions and driveability problems caused by malfunctions in the exhaust gas recirculation (EGR) system.
AHAS07.01.39	Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses.
AHAS07.01.40	Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems.
AHAS07.01.41	Diagnose emissions and driveability problems resulting from malfunctions in the secondary air injection and catalytic converter systems.
AHAS07.01.42	Inspect and test mechanical components of secondary air injection systems.
AHAS07.01.43	Inspect and test electrical/electronically-operated components and circuits of air injection systems.
AHAS07.01.44	Inspect and test catalytic converter performance.
AHAS07.01.45	Diagnose emissions and driveability problems resulting from malfunctions in the evaporative emissions control system.
AHAS07.01.46	Inspect and test components and hoses of evaporative emissions control system.
AHAS07.01.47	Interpret evaporative emission related diagnostic trouble codes (DTCs).
AHAS07.01.48	Adjust valves on engines with mechanical or hydraulic lifters.
AHAS07.01.49	Remove and replace timing belt; verify correct camshaft timing.
AHAS07.01.50	Remove and replace thermostat and gasket.
AHAS07.01.51	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices.
AHAS07.01.52	Identify hybrid vehicle internal combustion engine service precautions.

## Industry-based knowledge and skill

Skill Type

**AHAS09** Perform skills and determine necessary actions needed in the engine repair area of automotive service and repair.

## Performance Indicators


Delivery Level


AHAS09.01.01	Inspect engine assembly for fuel, oil, coolant, and other leaks.
AHAS09.01.02	Test coolant; drain and recover coolant; flush and refill cooling system with recommended coolant; bleed air as required.
AHAS09.01.03	Remove and replace radiator.
AHAS09.01.04	Perform common fastener and thread repair to include, remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.
AHAS09.01.05	Inspect power train mounts.
AHAS09.01.06	Diagnose engine noises and vibrations.
AHAS09.01.07	Diagnose the cause of excessive oil consumption, unusual engine exhaust color, odor, and sound.
AHAS09.01.08	Identify and interpret engine concern.
AHAS09.01.09	Remove and reinstall engine in a front-wheel or rear wheel drive vehicle (OBDII or newer); reconnect all attaching components and restore the vehicle to running condition.

# Focus Area Level Report

Including Knowledge and Skills, and Performance Indicators



 Career Area: **Industrial and Engineering Systems**

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 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level

AHAS09.01.10	Install engine covers using gaskets, seals and sealers as required.
AHAS09.01.11	Inspect oil pump gears or rotors, housing, pressure relief devices, and pump drive.
AHAS09.01.12	Inspect and replace engine cooling and heater system hoses.
AHAS09.01.13	Inspect, test, remove, and replace water pump.
AHAS09.01.14	Inspect auxiliary oil coolers.

## Industry-based knowledge and skill

Skill Type

**AHAS10** Perform skills and determine necessary actions needed in the heating and air conditioning area of automotive service and repair.

## Performance Indicators


Delivery Level


AHAS10.01.01	Identify and interpret heating and air conditioning concern.
AHAS10.01.02	Performance test A/C system; diagnose A/C system malfunctions using principles of refrigeration.
AHAS10.01.03	Diagnose abnormal operating noises in the A/C system. Identify refrigerant type; select and connect proper gauge set; record pressure readings.
AHAS10.01.04	Leak test A/C system.
AHAS10.01.05	Inspect the condition of discharged oil.
AHAS10.01.06	Determine recommended oil for system application.
AHAS10.01.07	Using scan tool, observe and record related HVAC data and trouble codes.
AHAS10.01.08	Diagnose A/C system conditions that cause the protection devices (pressure, thermal, and PCM) to interrupt system operation.
AHAS10.01.09	Inspect and replace A/C compressor drive belts.
AHAS10.01.10	Inspect, test, and/or replace A/C compressor clutch components and/or assembly.
AHAS10.01.11	Remove, inspect, and reinstall A/C compressor and mountings; determine required oil quantity.
AHAS10.01.12	Identify hybrid vehicle A/C system electrical circuits, service and safety precautions.
AHAS10.01.13	Determine need for an additional A/C system filter.
AHAS10.01.14	Remove and inspect A/C system mufflers, hoses, lines, fittings, O-rings, seals, and service valves.
AHAS10.01.15	Inspect A/C condenser for airflow restrictions.
AHAS10.01.16	Remove, inspect, and reinstall receiver/drier or accumulator/drier; determine
AHAS10.01.17	required oil quantity.
AHAS10.01.18	Remove and install expansion valve or orifice (expansion) tube.
AHAS10.01.19	Inspect evaporator housing water drain.
AHAS10.01.20	Remove, inspect, and reinstall evaporator; determine required oil quantity.
AHAS10.01.21	Remove, inspect, and reinstall condenser; determine required oil quantity.
AHAS10.01.22	Diagnose temperature control problems in the heater/ventilation system.
AHAS10.01.23	Remove, inspect, and reinstall heater core.
AHAS10.01.24	Diagnose malfunctions in the vacuum, mechanical, and electrical components and controls of the heating, ventilation, and A/C (HVAC) system.
AHAS10.01.25	Inspect and test A/C-heater control panel assembly.

# Focus Area Level Report

Including Knowledge and Skills, and Performance Indicators



 Career Area: **Industrial and Engineering Systems**

 Cluster: **Automotive & Heavy Equipment Technology**

 Focus Area: **Automotive Service Technology**

## Performance Indicators

Delivery Level

AHAS10.01.26	Inspect and test A/C-heater control cables, motors, and linkages.
AHAS10.01.27	Inspect A/C-heater ducts, doors, hoses, cabin filters and outlets.
AHAS10.01.28	Check operation of automatic and semi-automatic heating, ventilation, and air-conditioning (HVAC) control systems.
AHAS10.01.29	Perform correct use and maintenance of refrigerant handling equipment.
AHAS10.01.30	Identify (by label application or use of a refrigerant identifier) and recover A/C system refrigerant.
AHAS10.01.31	Recycle refrigerant.
AHAS10.01.32	Label and store refrigerant.
AHAS10.01.33	Test recycled refrigerant for non-condensable gases.
AHAS10.01.34	Evacuate and charge A/C system.

## Industry-based knowledge and skill

Skill Type

**AHAS11** Perform specialized skills and determine necessary actions needed in the automatic transmission area of automotive service and repair.

## Performance Indicators

Delivery Level

AHAS11.01.01	Disassemble, clean, and inspect transmission/transaxle.
AHAS11.01.02	Inspect, measure, clean, and replace valve body (includes surfaces, bores, springs, valves, sleeves, retainers, brackets, check-balls, screens, spacers, and gaskets).
AHAS11.01.03	Inspect servo bore, piston, seals, pin, spring, and retainers.
AHAS11.01.04	Inspect accumulator bore, piston, seals, spring, and retainer.
AHAS11.01.05	Assemble transmission/transaxle.
AHAS11.01.06	Inspect, leak test, and flush cooler, lines, and fittings.
AHAS11.01.07	Inspect converter flex plate, attaching parts, pilot, pump drive, and seal areas.
AHAS11.01.08	Measure torque converter endplay and check for interference; check clutch.
AHAS11.01.09	Inspect, measure, and reseal oil pump assembly and components.
AHAS11.01.10	Measure endplay or preload.
AHAS11.01.11	Inspect, measure, and replace thrust washers and bearings.
AHAS11.01.12	Inspect oil delivery seal rings, ring grooves, and sealing surface areas.
AHAS11.01.13	Inspect bushings.
AHAS11.01.14	Inspect and measure planetary gear assembly (includes sun, ring gear, thrust washers, planetary gears, and carrier assembly).
AHAS11.01.15	Inspect case bores, passages, bushings, vents, and mating surfaces.
AHAS11.01.16	Inspect transaxle drive, link chains, sprockets, gears, bearings, and bushings.
AHAS11.01.17	Inspect, measure, repair, adjust or replace transaxle final drive components.
AHAS11.01.18	Inspect and reinstall parking pawl, shaft, spring, and retainer.
AHAS11.01.19	Inspect clutch drum, piston, check-balls, springs, retainers, seals, and friction and pressure plates.
AHAS11.01.20	Measure clutch pack clearance.
AHAS11.01.21	Inspect roller and sprag clutch, races, rollers, sprags, springs, cages, and retainers.
AHAS11.01.22	Inspect bands and drums.

## Industry-based knowledge and skill


Skill Type


**AHAS12**

# Focus Area Level Report

Including Knowledge and Skills, and Performance Indicators



 Career Area: **Industrial and Engineering Systems**

 Cluster: **Automotive & Heavy Equipment Technology**

 Focus Area: **Automotive Service Technology**

Perform specialized skills and determine necessary actions needed in the manual drive train and axles area of automotive service and repair.

## Performance Indicators

Delivery Level

AHAS12.01.01	Inspect and replace clutch pressure plate assembly and clutch disc.
AHAS12.01.02	Inspect, remove or replace pilot bearing or bushing (as applicable).
AHAS12.01.03	Inspect flywheel and ring gear for wear and cracks.
AHAS12.01.04	Measure flywheel runout and crankshaft endplay.
AHAS12.01.05	Inspect, adjust, and reinstall shift linkages, brackets, bushings, cables, pivots, and levers.
AHAS12.01.06	Inspect and replace gaskets, seals, and sealants; inspect sealing surfaces.
AHAS12.01.07	Remove and replace transaxle final drive.
AHAS12.01.08	Inspect, adjust, and reinstall shift cover, forks, levers, grommets, shafts, sleeves, detent mechanism, interlocks, and springs.
AHAS12.01.09	Measure endplay or preload (shim or spacer selection procedure) on Transmission/transaxle shafts.
AHAS12.01.10	Inspect and reinstall synchronizer hub, sleeve, keys (inserts), springs, and blocking rings.
AHAS12.01.11	Inspect and reinstall speedometer drive gear, driven gear, vehicle speed sensor (VSS), and retainers.
AHAS12.01.12	Remove, inspect, measure, adjust, and reinstall transaxle final drive pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case assembly.
AHAS12.01.13	Inspect lubrication devices (oil pump or slingers).
AHAS12.01.14	Disassemble, service, and reassemble transfer case and components.
AHAS12.01.15	Remove and reinstall cylinder heads and gaskets; tighten according to manufacturer's specifications and procedures.
AHAS12.01.16	Visually inspect cylinder head(s) for cracks; check gasket surface areas for warpage and leakage; check passage condition.

## Industry-based knowledge and skill

Skill Type

**AHAS13** Perform specialized skills and determine necessary actions needed in the engine repair area of automotive service and repair.

## Performance Indicators


Delivery Level


AHAS13.01.01	Inspect valve springs for squareness and free height comparison.
AHAS13.01.02	Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks, and valve grooves.
AHAS13.01.03	Inspect valve guides for wear; check valve stem to guide clearance.
AHAS13.01.04	Inspect valves and valve seats.
AHAS13.01.05	Check valve face to seat contact and valve seat concentricity (runout).
AHAS13.01.06	Check valve spring assembled height and valve stem height.
AHAS13.01.07	Inspect pushrods, rocker arms, rocker arm pivots and shafts for wear, bending, cracks, looseness, and blocked oil passages (orifices).
AHAS13.01.08	Inspect hydraulic or mechanical lifters.
AHAS13.01.09	Inspect camshaft drives (including gear wear and backlash, sprocket and chain wear).
AHAS13.01.10	Inspect camshaft for runout, journal wear and lobe wear.
AHAS13.01.11	Inspect camshaft bearing surface for wear, damage, out of round, and alignment.
AHAS13.01.12	Disassemble engine block; clean and prepare components for inspection and reassembly.

# Focus Area Level Report

Including Knowledge and Skills, and Performance Indicators



 Career Area: **Industrial and Engineering Systems**

 Cluster: **Automotive & Heavy Equipment Technology**

 Focus Area: **Automotive Service Technology**

Performance Indicators

Delivery Level

AHAS13.01.13	Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage.
AHAS13.01.14	Inspect and measure cylinder walls/sleeves for damage, wear, and ridges.
AHAS13.01.15	Deglaze and clean cylinder walls.
AHAS13.01.16	Inspect and measure camshaft bearings for wear, damage, out of round, and alignment.
AHAS13.01.17	Inspect crankshaft for end play, straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure journal wear; check crankshaft sensor reluctor ring.
AHAS13.01.18	Inspect main and connecting rod bearings for damage and wear.
AHAS13.01.19	Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems.
AHAS13.01.20	Inspect and measure pistons.
AHAS13.01.21	Remove and replace piston pin.
AHAS13.01.22	Inspect, measure, and install piston rings.
AHAS13.01.23	Inspect auxiliary (balance, intermediate, idler, counterbalance or silencer) shaft(s); inspect shaft(s) and support bearings for damage and wear; reinstall and time.
AHAS13.01.24	Inspect or replace crankshaft vibration damper (harmonic balancer).
AHAS13.01.25	Assemble engine block assembly.