

A8 Engine Performance

Grades 9-12

Refer to NATEF (National Automotive Technicians Education Foundation) standards.

A8 ENGINE PERFORMANCE

For every task in Engine Performance the following safety requirement must be strictly enforced: Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

VIII. ENGINE PERFORMANCE

Priority

AYES
Pre
Intern

AYES
YR2

AYES
Job
Sheet

A. General Engine Diagnosis

1.	Complete work order to include customer information, vehicle identifying information, customer concern, related service history, cause, and correction.	P-1	A8/U2/L1	A8A01
2.	Identify and interpret engine performance concern; determine necessary action.	P-1	A8/U2/L1	A8A01
3.	Research applicable vehicle and service information, such as engine management system operation, vehicle service history, service precautions, and technical service bulletins.	P-1	A8/U4/L4	A8A03
4.	Locate and interpret vehicle and major component identification numbers (VIN, vehicle certification labels, and calibration decals).	P-1	A8/U4/L4	A8A03
5.	Inspect engine assembly for fuel, oil, coolant, and other leaks; determine necessary action.	P-2	A8/U2/L1	A8A01
6.	Diagnose abnormal engine noise or vibration concerns; determine necessary action.	P-2	A8/U2/L2	A8A01
7.	Diagnose abnormal exhaust color, odor, and sound; determine necessary action.	P-2	A8/U2/L1	A8A01

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8.	Perform engine absolute (vacuum/boost) manifold pressure tests; determine necessary action.	P-1		A8/U2/L1	A8A08
9.	Perform cylinder power balance test; determine necessary action.	P-1		A8/U2/L1	A8A09
10.	Perform cylinder cranking compression tests; determine necessary action.	P-1		A8/U2/L1	A8A10
11.	Perform engine running compression test; determine necessary action.	P-2		A8/U2/L1	A8A11
12.	Perform cylinder leakage test; determine necessary action.	P-1		A8/U2/L1	A8A09
13.	Diagnose engine mechanical, electrical, electronic, fuel, and ignition concerns with an oscilloscope and/or engine diagnostic equipment; determine necessary action.	P-1		A8/U2/L1	A8A13
14.	Prepare 4 or 5 gas analyzer; inspect and prepare vehicle for test, and obtain exhaust readings; interpret readings, and determine necessary action.	P-1		A8/U2/L1	A8A14
15.	Verify engine operating temperature; determine necessary action.	P-1		A8/U2/L2	A8A15
16.	Perform cooling system pressure tests; check coolant condition; inspect and test radiator, pressure cap, coolant recovery tank, and hoses; perform necessary action.	P-1	A8/U2/L2		A8A15
17.	Verify correct camshaft timing.	P-2		A8/U2/L2	A8F02

VIII. ENGINE PERFORMANCE		Priority	AYES Pre Intern	AYES YR2	AYES Job Sheet
B. Computerized Engine Controls Diagnosis and Repair					
1.	Retrieve and record stored OBD I diagnostic trouble codes; clear codes.	P-3	A8/U4/L3		A8B07
2.	Retrieve and record stored OBD II diagnostic trouble codes; clear codes when applicable.	P-1	A8/U4/L3		A8B07
3.	Diagnose the causes of emissions or driveability concerns resulting from malfunctions in the computerized engine control system with stored diagnostic trouble codes.	P-1		A8/U4/L2 A8/U4/L3 A8/U4/L4	A8B08
4.	Diagnose emissions or driveability concerns resulting from malfunctions in the computerized engine control system with no stored diagnostic trouble codes; determine necessary action.	P-1		A8/U4/L2 A8/U4/L3 A8/U4/L4	A8B08
5.	Check for module communication (LAN/ CAN/ BUS) errors using a scan tool.	P-2		A8/U4/L2	A8B07
6.	Inspect and test computerized engine control system sensors, powertrain control module (PCM), actuators, and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO); perform necessary action.	P-1		A8/U4/L4	A8B06
7.	Obtain and interpret scan tool data.	P-1		A8/U4/L2 A8/U4/L3 A8/U4/L4	A8B07
8.	Access and use service information to perform step-by-step diagnosis.	P-1		A8/U4/L4	A8B08

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9.	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); determine necessary action.	P-3		A8/U4/L4	A8B08
10.	Perform active tests of actuators using scan tool; determine necessary action.	P-1		A8/U4/L3	A8B10
C. Ignition System Diagnosis and Repair					
1.	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 (distributorless) systems; determine necessary action.	P-1		A8/U5/L2	A8C01 72B 78C
2.	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 distributor ignition (DI) systems; determine necessary action.	P-1		A8/U5/L2	A8C01 72B 78C
3.	Inspect and test ignition primary circuit wiring and solid state components; perform necessary action.	P-2		A8/U5/L2	A8C03 70B 70C
4.	Inspect, test and service distributor. (NOT USED)	P-3		A8/U5/L2	A8C03
5.	Inspect and test ignition system secondary circuit wiring and components; perform necessary action.	P-2	A8/U5/L2		A8C05 78C

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6.	Inspect and test ignition coil(s); perform necessary action.	P-1		A8/U5/L2	A8C05 NEW
7.	Check and adjust ignition system timing and timing advance/retard (where applicable).	P-3	A8/U5/L2		92C
8.	Inspect and test ignition system pick-up sensor or triggering devices; perform necessary action	P-1		A8/U5/L2	A8C03 NEW

D. Fuel, Air Induction, and Exhaust Systems Diagnosis and Repair

1.	Diagnose hot or cold no-starting, hard starting, poor driveability, incorrect idle speed, poor idle, flooding, hesitation, surging, engine misfire, power loss, stalling, poor mileage, dieseling, and emissions problems on vehicles with injection-type fuel systems; determine necessary action.	P-1		A8/U4/L4	A8D02
2.	Check fuel for contaminants and quality; determine necessary action.	P-3		A8/U1/L2	A8D02
3.	Inspect and test fuel pumps and pump control systems for pressure, regulation, and volume; perform necessary action.	P-1	A8/U1/L2		A8D02

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	Priority	AYES Pre Intern A8/U1/L2	AYES YR2	AYES Job Sheet A8D04
4. Replace fuel filters.	P-1			
5. Inspect and test cold enrichment system and components; perform necessary action.	P-3		A8/U1/L2	N/A
6. Inspect throttle body, air induction system, intake manifold and gaskets for vacuum leaks and/or unmetered air.	P-2	A8/U1/L2		A8D06
7. Inspect and test fuel injectors.	P-2		A8/U1/L2	A8D07
8. Check idle speed .	P-2	A8/U1/L2		A8D08
9. Inspect the integrity of the exhaust manifold, exhaust pipes, muffler(s), catalytic converter(s), resonator(s), tail pipe(s), and heat shield(s); perform necessary action.	P-2		A8/U3/L2	A8D09
10. Perform exhaust system back-pressure test; determine necessary action.	P-1		A8/U3/L2	A8D09
11. Test the operation of turbocharger/supercharger systems; determine necessary action	P-3		A8/U3/L2	A8D09

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E. Emissions Control Systems Diagnosis and Repair

1. Positive Crankcase Ventilation

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| 1. | Diagnose oil leaks, emissions, and driveability problems resulting from malfunctions in the positive crankcase ventilation (PCV) system; determine necessary action. | P-2 | | A8/U3/L2 | A8E1.1
NEW |
| 2. | Inspect, test and service positive crankcase ventilation (PCV) filter/breather cap, valve, tubes, orifices, and hoses; perform necessary action. | P-2 | A8/U3/L2 | | A8E1.1 |

2. Exhaust Gas Recirculation

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| 1. | Diagnose emissions and driveability problems caused by malfunctions in the exhaust gas recirculation (EGR) system; determine necessary action. | P-1 | | A8/U3/L2 | A8E2.1 |
| 2. | Inspect, test, service and replace components of the EGR system, including EGR tubing, exhaust passages, vacuum/pressure controls, filters and hoses; perform necessary action. | P-1 | | A8/U3/L2 | A8E2.1 |
| 3. | Inspect and test electrical/electronic sensors, controls, and wiring of exhaust gas recirculation (EGR) systems; perform necessary action. | P-2 | | A8/U3/L2 | A8E2.1 |

3. Exhaust Gas Treatment

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| 1. | Diagnose emissions and driveability problems resulting from malfunctions in the secondary air injection and catalytic converter systems; determine necessary action. | P-2 | | A8/U3/L2 | A8E3.4 |
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2.	Inspect and test mechanical components of secondary air injection systems; perform necessary action.	P-3		NOT COVERED	
3.	Inspect and test electrical/electronically-operated components and circuits of air injection systems; perform necessary action.	P-3		NOT COVERED	
4.	Inspect and test catalytic converter performance.	P-1		A8/U3/L2	A8E3.4
4. Evaporative Emissions Controls					
1.	Diagnose emissions and driveability problems resulting from malfunctions in the evaporative emissions control system; determine necessary action.	P-1		A8/U4/L3	A8E4.1
2.	Inspect and test components and hoses of evaporative emissions control system; perform necessary action.	P-2		A8/U4/L3	A8E4.2
3.	Interpret evaporative emission related diagnostic trouble codes (DTCs); determine necessary action.	P-1		A8/U4/L3	A8E4.3
F. Engine Related Service					
1.	Adjust valves on engines with mechanical or hydraulic lifters.	P-1		A8/U2/L2	A8F01
2.	Remove and replace timing belt; verify correct camshaft timing.	P-1		A8/U2/L2	A8F02
3.	Remove and replace thermostat and gasket.	P-1	A8/U2/L2		A8F03

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4.	Inspect and test mechanical/electrical fans, fan clutch, fan shroud/ducting, air dams, and fan control devices; perform necessary action.	P-1		A8/U2/L2	A8F04
5.	Perform common fastener and thread repair to include, remove broken bolt, restore internal and external threads, and repair internal threads with thread insert.	P-1	A0/U8/L1		JS11
6.	Perform oil and filter changes.	P-1	A0/U10/L1		A8F06 JS16
7.	Demonstrate proficiency in using oxy-acetylene torch to heat and cut metal.	P-3		A0/U9/L3	A8F07
8.	Identify hybrid vehicle internal combustion engine service precautions.	P-3		A8/U2/L3	A8F8