Diesel Technology: Engines

NATEF Crosswalk

The following NATEF Diesel Engines tasks (rev. 2004) are covered in this publication. The chart shows where each task is located within the publication. The first column identifies the NATEF task by name and number. The second column identifies the exact location by unit number and assignment sheet or job sheet number.

NATEF Tasks	MAVCC Tasks
I. Diesel Engines	
A. General Engine Diagnosis	
I. A. 1.—Inspect fuel, oil, and coolant levels, condition and consumption; determine needed actions. P-1	Unit 1-C, Job Sheet 1—Check fuel level, quality, and consumption. Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. Unit 2-D, Job Sheet 5—Perform a daily preventive maintenance check.
I A. 2.—Diagnose causes of engine fuel, oil, coolant, air, and other leaks, determine needed action. P-1	Unit 2-D, Job Sheet 5—Perform a daily preventive maintenance check. Unit 2-D, Job Sheet 6—Perform a mileage preventive maintenance check.
I. A. 3.—Interpret engine noises; determine needed action. P-2	Unit 2-C, Job Sheet 1—Isolate, remove, test rebuild or replace, and reinstall injection nozzles. Unit 2-C, Job Sheet 2—Isolate, remove, test, and reinstall or replace mechanical unit injectors. Unit 1-D, Job Sheet 6—Locate a misfiring cylinder.
I. A. 4.—Observe engine exhaust smoke color and quantity; determine needed action. P-1	Unit 4-C, Job Sheet 1—Check vehicle for presence and operation of emission control devices.
I. A. 5.—Perform air intake system restriction and leakage tests: determine needed action. P-1	Unit 1-D, Job Sheet 1—Check air intake system for restrictions.
I. A. 6.—Perform intake manifold pressure (boost) test; determine needed action. P-1	Unit 8-B, Job Sheet 1—Inspect and test air induction system.
I. A. 7.—Perform exhaust back pressure test; determine needed action. P-2	Unit 1-D, Job Sheet 2—Check exhaust back pressure.
I. A. 8.—Perform crankcase pressure test; determine needed action. P-1	Unit 1-D, Job Sheet 3—Check crankcase pressure.
I. A. 9.—Diagnose no cranking, cranks but fails to start, hard starting, and starts but doesn't continue to run problems; determine needed action. P-1	Unit 2-D, Job Sheet 5—Perform a daily preventive maintenance check.
I. A. 10.—Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed action. P-1	Unit 2-D, Job Sheet 5—Perform a daily preventive maintenance check.
I. A. 11.—Diagnose engine vibration problems; determine needed action. P-2	Unit 2-D, Job Sheet 5—Perform a daily preventive maintenance check.
I. A. 12.—Check, record, and clear electronic diagnostic fault codes; monitor electronic data; determine needed action. P-1	Unit 3-C, Job Sheet 2—Check diagnostic trouble codes using electronic diagnostic equipment and technical information; determine needed repairs.

	MAVCC Tasks
INATER ISSS	Unit 3-B Job Sheet 1_Pressure test a cylinder
determine needed action B 2	block
B. Cylinder Head and Valve Train Diagnosis	
and Repair	
I B 1 — Remove clean inspect for visible	Unit 7-B. Job Sheet 1—Clean and inspect a
damage and replace cylinder head(s) assembly	cylinder head.
	Unit 7-B. Job Sheet 3—Install a cylinder head
	assembly and adjust valves.
L B 2 — Clean and inspect threaded holes	Unit 7-B. Job Sheet 1—Clean and inspect a
studs and bolts for serviceability Determine	cvlinder head.
needed action P-1	,
I. B. 3.—Inspect cylinder head for cracks/	Unit 3-B. Job Sheet 1—Pressure test a cylinder
damage: check mating surfaces for warpage:	block.
check condition of passages; inspect	Unit 3-B. Job Sheet 5—Clean and inspect
core/expansion and gallery plugs: determine	cvlinder bores.
needed action. P-1	Unit 7-B. Job Sheet 1—Clean and inspect a
	cvlinder head.
I. B. 4.—Disassemble head and inspect valves.	Unit 7-B, Job Sheet 2—Recondition a cylinder
quides, seats, springs, retainers, rotators, locks,	head.
and seals: determine needed action. P-3	Unit 2-D, Job Sheet 7—Perform an engine
	tune-up.
I. B. 5.—Measure valve head height relative to	Unit 7-B, Job Sheet 2—Recondition a cylinder
deck and valve face-to-seat contact; determine	head.
needed action. P-3	Unit 2-D, Job Sheet 7—Perform an engine
	tune-up.
I. B. 6.—Inspect injector sleeves and seals;	Unit 2-C, Job Sheet 1—Isolate, remove, test,
measure injector tip or nozzle protrusion;	rebuild or replace, and reinstall injection
perform needed action. P-3	nozzles.
	Unit 3-C, Job Sheet 6—Remove, inspect,
	reinstall, and adjust electronic unit injectors;
	determine needed repairs.
	Unit 2-D, Job Sheet 7—Perform an engine
	tune-up.
I.B. 7.—Inspect and adjust valve bridges	Unit 7-B, Job Sheet 2—Recondition a cylinder
(crossheads) and guides; perform needed	head.
action. P-2	
I. B. 8.—Reassemble cylinder head. P-3	Unit 7-B, Job Sheet 3—Install a cylinder head
	assembly and adjust valves.
I. B. 9.—Inspect, measure, and replace/ reinstall	Unit 6-B, Job Sheet 1—Remove, clean, and
overhead camshaft; measure/adjust end play	inspect a camshaft.
and backlash. P-2	Unit 6-B, Job Sheet 3—Install a camshaft and
	set cam timing.
I. B. 10.—Inspect pushrods, rocker arms, rocker	Unit 6-B, Job Sheet 1—Remove, clean, and
arm shafts, electronic wiring harness, and	inspect a camshaft.
brackets for wear, bending, cracks, looseness,	
and blocked oil passages; perform needed	
action. P-2	

NATEF Tasks	MAVCC Tasks
I. B. 11.—Inspect cam followers; perform	Unit 6-B, Job Sheet 1—Remove, clean, and
needed action. P-2	inspect a camshaft.
I. B. 12.—Adjust valve clearance. P-1	Unit 7-B, Job Sheet 3—Install a cylinder head
	assembly and adjust valves.
	Unit 2-C, Job Sheet 2—Isolate, remove, test,
	and reinstall or replace mechanical unit
	injectors.
	Unit 3-C, Job Sheet 6—Remove, inspect,
	reinstall, and adjust electronic unit injectors;
	determine needed repairs.
	Unit 2-D, Job Sneet /—Perform an engine
C Engine Block Diagnosis and Benair	lune-up.
L C 1 — Remove inspect service and install	Unit 1-C. Job. Sheet 2—Inspect and service
nans covers vents caskets seals and wear	basic fuel supply components
rings. P-1	
I. C. 2.—Disassemble, clean, and inspect	Unit 3-B, Job Sheet 2—Disassemble and clean
engine block for cracks/damage; measure	a cylinder block.
mating surfaces for warpage; check condition of	Unit 3-B, Job Sheet 3—Inspect a cylinder block.
passages, core/expansion and gallery plugs;	
inspect threaded holes, studs, dowel pins, and	
bolts for serviceability; determine needed	
action. P-3	
I. C. 3.—Inspect cylinder sleeve counterbore	Unit 3-B, Job Sheet 5—Clean and inspect
and lower bore; check bore distortion;	cylinder bores.
determine needed action. P-3	
1. C. 4.—Clean, Inspect, and measure cylinder	Unit 3-B, Job Sheet 5—Clean and Inspect
needed action P-2	Unit 3-B Job Sheet 6—Install cylinder liners
	and set liner protrusion
I. C. 5.—Replace/reinstall cylinder liners and	Unit 3-B. Job Sheet 6—Install cylinder liners
seals; check and adjust liner height (protrusion).	and set liner protrusion.
P-2	
I. C. 6.—Inspect in-block camshaft bearings for	Unit 6-B, Job Sheet 2—Remove, inspect, and
wear and damage; determine needed action.	install cam bushings.
P-3	
I. C. 7.—Inspect, measure, and replace/reinstall	Unit 6-B, Job Sheet 1—Remove, clean, and
in-block camshaft; measure/adjust end play. P-3	inspect a camshaft.
	Unit 6-B, Job Sneet 3—Install a camshaft and
L C 8 — Clean and inspect grankshaft for	Set Garn unning.
surface cracks and journal damage: check	inspect a crankshaft
condition of oil passages: check passage pluge:	
measure journal diameter: determine needed	
action. P-2	
I. C. 9.—Inspect main bearings for wear	Unit 4-B, Job Sheet 1—Remove, clean, and
patterns and damage; replace as needed;	inspect a crankshaft.
check bearing clearances; check and adjust	
crankshaft end play. P-2	

NATEF Tasks	MAVCC Tasks
I. C. 10.—Inspect, install, and time gear train:	Unit 6-B. Job Sheet 3—Install a camshaft and
measure gear backlash; determine needed	set cam timing.
action. P-3	
I. C. 11.—Inspect connecting rod and bearings	Unit 5-B, Job Sheet 1—Remove, disassemble,
for wear patterns: measure pistons, pins.	and inspect a piston and connecting rod
retainers, and bushing: perform needed action.	assembly.
P-2	,
I. C. 12.—Determine piston-to-cylinder wall	Unit 5-B, Job Sheet 2—Measure
clearance; check ring-to-groove clearance and	piston-to-cylinder wall clearance and ring end
end gap; install rings on pistons. P-2	gap.
I. C. 13.—Assemble pistons and connecting	Unit 5-B, Job Sheet 3—Assemble and install
rods; install in block; replace rod bearings and	piston and connecting rod assembly.
check clearances. P-2	
I. C. 14.—Check condition of piston cooling jets	Unit 5-B, Job Sheet 3—Assemble and install
(nozzles); determine needed action. P-2	piston and connecting rod assembly.
I. C. 15.—Inspect and measure crankshaft	Unit 4-B, Job Sheet 4—Inspect viscous vibration
vibration damper; determine needed action. P-2	damper/harmonic balancer.
	Unit 4-B, Job Sheet 5—Inspect bonded vibration
	damper/harmonic balancer.
I. C. 16.—Install and align flywheel housing;	Unit 4-B, Job Sheet 6—Inspect flywheel.
inspect flywheel housing(s) to transmission	
housing/engine mating surface(s) and measure	
flywheel housing face and bore runout;	
determine needed action. P-3	
I. C. 17.—Inspect flywheel/flexplate (including	Unit 4-B, Job Sheet 1—Remove, clean, and
ring gear) and mounting surfaces for cracks and	inspect a crankshaft.
wear; measure runout; determine needed action.	
P-3	
D. Lubrication Systems Diagnosis and	
Repair	
I. D. 1.—Test engine oil pressure and check	Unit 1-D, Job Sheet 4—Check oil pressure.
operation of pressure sensor, gauge, and/or	
sending unit; determine needed action. P-1	
I. D. 2.—Check engine oil level, condition and	Unit 1-C, Job Sheet 1—Check fuel level, quality,
consumption; determine needed action. P-1	and consumption.
I. D. 3.—Inspect and measure oil pump, drives,	Unit 1-B, Job Sheet 1—Service and install oil
inlet pipes, and pick-up screens; determine	pump and oil pump drive components.
needed action. P-3	Unit 1-B, Job Sheet 2—Service and inspect
	lubrication system screens and pipes.
I. D. 4.—Inspect oil pressure regulator valve(s),	Unit 1-B, Job Sheet 3—Service and inspect oil
by-pass and pressure relief valve(s), oil	pressure regulator valve and bypass valve.
thermostat, and filters; determine needed action.	
P-3	
I. D. 5.—Inspect, clean, and test oil cooler and	Unit 1-B, Job Sheet 4—Service and inspect oil
components; determine needed action. P-3	cooler and lines.
I. D. 6.—Inspect turbocharger lubrication	Unit 8-B, Job Sheet 2—Inspect and service
system; determine needed action. P-2	turbo/supercharger and related components.
I. D. 7.—Determine proper lubricant and perform	Unit 2-D, Job Sheet 3– Take oil sample, and
oil and filter change. P-1	change oil and filter(s).

E. Cooling System Diagnosis and Repair Unit 2-B, Job Sheet 1—Flush, refill, and bleed coolant system. I. E. 1.—Check engine coolant type, level, action. P-1 Unit 2-D, Job Sheet 1—Flush, refill, and bleed coolant system. I. E. 2.—Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action. P-2 Unit 2-B, Job Sheet 6—Check operation and accuracy of temperature indicating system. I. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Unit 2-B, Job Sheet 4—Test operation of thermostat (s), by-passes, housing(s), and seals; replace as needed. P-2 Unit 2-B, Job Sheet 4—Test operation of thermostat installed in engine. I. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. I. E. 6.—Recover, flush, and refill with re-commended coolant/additive package; bleed action. P-1 Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. I. E. 7.—Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. I. E. 9.—Inspect thermostatic. Coling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 Unit 2-B, Job Sheet 2—Inspect and test air induction system. I. E. 1.—Inspect turbocharger(s), wastegate, and piping system s; determine needed action. P-2 Unit 8-B, Job Sheet 1—Inspect and test air induct	NATEF Tasks	MAVCC Tasks
I. E. 1.—Check engine coolant type, level, condition, and consumption, determine needed action. P-1 Unit 2-B, Job Sheet 1—Flush, refill, and bleed coolant system. I. E. 2.—Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action. P-2 Unit 2-B, Job Sheet 1—Inspect engine coolant level and condition. I. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. I. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Unit 2-B, Job Sheet 4—Test operation of thermostat on the bench. I. E. 6.—Recover, flush, and refill with re-commended coolant/additive package; bleed coolant/additive package; bleed coolant system. Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. I. E. 7.—Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1 Unit 2-D, Job Sheet 1—Inspect water pump, belts, and hoses. I. E. 9.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 Unit 2-B, Job Sheet 3—Check operation of fan assembly and controls. I. E. 10.—Inspect turbocharger(s), wastegate, and pipe systems; determine needed action. P-2 Unit 2-B, Job Sheet 3—Check operation of fan assembly and controls. I. E. 10.—Inspect turbocharger(s), wastegate, and pipe systems; determine needed action. P-2 Unit 2-B, Job Sheet 3—Check operation of fan assembly and contro	E. Cooling System Diagnosis and Repair	
condition, and consumption; determine needed action. P-1 coolant system. 1. E. 2.—Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit; determine needed action. P-2 Unit 2-B, Job Sheet 1—Inspect engine coolant accuracy of temperature indicating system. 1. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. 1. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Unit 2-B, Job Sheet 4—Test operation of thermostat installed in engine. 1. E. 6.—Recover, flush, and refill with re-commended coolant/additive package; bleed coolant system. Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. 1. E. 7.—Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1 Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. 1. E. 9.—Inspect kaler pump and hoses; replace as needed. P-1 Unit 2-D, Job Sheet 1—Inspect and replace valiator, pressure cap, tank(s) and recovery systems; determine needed action. P-1 Unit 2-B, Job Sheet 1—Inspect water pump, belts, and hoses. 1. E. 10.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroed trubcharger(s), wastegate, and piping systems; determine needed action. P-2 Unit 2-B, Job Sheet 1—Inspect and test air induction system. 1. F. 1.—Inspect turbcharger(s), wastegate, and piping systems; determine needed action. P-2 Unit	I. E. 1.—Check engine coolant type, level.	Unit 2-B. Job Sheet 1—Flush, refill, and bleed
action. P-1 Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. I. E. 2.—Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit, determine needed action. P-2 Unit 2-B, Job Sheet 6—Check operation and accuracy of temperature indicating system. I. E. 3.—Inspect and reinstall/replace as needed. P-2 Unit 2-B, Job Sheet 4—Test operation of thermostat on the bench. I. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Unit 2-B, Job Sheet 1—Inspect are regime coolant level and condition. I. E. 6.—Recover, flush, and refill with re-commended coolant/additive package; bleed cooling system. P-1 Unit 2-B, Job Sheet 1—Inspect engine coolant level and condition. I. E. 7.—Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1 Unit 2-D, Job Sheet 1—Inspect magine coolant level and condition. I. E. 9.—Inspect water pump and hoses; replace as needed. P-1 Unit 2-D, Job Sheet 1—Inspect magine coolant level and condition. I. E. 10.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and pleessure test radiator, pressure cap, tank(s) and recovery systems; determine needed action. P-1 Unit 2-B, Job Sheet 3—Check operation of fan assembly and controls. I. F. 10.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 Unit 2-B, Job Sheet 3—Check operation of fan assembly and controls. I. F. 2.—Check air induction system; piping, hoses, clamp	condition, and consumption: determine needed	coolant system.
I. E. 2.—Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit, determine needed action. P-2 Unit 2-B, Job Sheet 6—Check operation and accuracy of temperature indicating system. I. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. I. E. 4.—Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed. P-2 Unit 2-B, Job Sheet 4—Test operation of thermostat installed in engine. Unit 2-B, Job Sheet 5—Test operation of thermostat on the bench. I. E. 5.—Test coolant for freeze protection and dditive package concentration; adjust as needed. P-1 Unit 2-B, Job Sheet 1—Inspect engine coolant level and condition. I. E. 5.—Test coolant conditioner/filter e-commended coolant/coditive package; bleed cooling system. P-1 Unit 2-B, Job Sheet 1—Flush, refill, and bleed coolant system. I. E. 7.—Inspect coolant conditioner/filter ass needed. P-1 Unit 2-B, Job Sheet 1—Inspect engine coolant level and condition. I. E. 8.—Inspect, clean, and pressure test radiator, pressure cap, tank(s) and recovery systems; determine needed action. P-1 Unit 2-B, Job Sheet 1—Inspect water pump, belts, and hoses. I. F. 10.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electroncio) and fan shroud; replace as needed. P-2 Unit 2-B, Job Sheet 3—Check operation of fan assembly and controls. I. F. 1.—Inspect throbocharger(s), wastegate, and piping systems; determine needed action. P-2 Unit 8-B, Job Sheet 1—Inspect and test air	action, P-1	Unit 2-D. Job Sheet 1—Inspect engine coolant
I. E. 2.—Test coolant temperature and check operation of temperature sensor, gauge, and/or sending unit, determine needed action. P-2 Unit 2-B, Job Sheet 6—Check operation and accuracy of temperature indicating system. I. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. I. E. 4.—Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed. P-2 Unit 2-B, Job Sheet 4—Test operation of thermostat installed in engine. I. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. I. E. 7.—Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1 Unit 2-B, Job Sheet 1—Inspect engine coolant level and condition. I. E. 9.—Inspect, clean, and pressure test radiator, pressure cap, tank(s) and recovery systems; determine needed action. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. I. E. 10.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 Unit 2-B, Job Sheet 3—Check operation of fan assembly and controls. I. F. 1.—Inspect thermostatic cooling fan system; determine needed action. P-2 Unit 8-B, Job Sheet 1—Inspect and test air induction system. I. F. 2.—Check air induction system; piping, hooses, clamps, ad mounting; check for air restrictions and leaks; service or replace air filiter as needed. P-1 Unit 8-B,		level and condition
In E. 1. Tool of temperature sensor, gauge, and/or sending unit, determine needed action. P-2 accuracy of temperature indicating system. I. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Unit 2-B, Job Sheet 2—Inspect water pump, belts, and hoses. I. E. 4.—Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed. P-2 Unit 2-B, Job Sheet 4—Test operation of thermostat installed in engine. I. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Unit 2-B, Job Sheet 1—Inspect engine coolant level and condition. I. E. 6.—Recover, flush, and refill with re-commended coolant/additive package; bleed cooling system. P-1 Unit 2-D, Job Sheet 1—Flush, refill, and bleed coolant system. I. E. 7.—Inspect coolant conditioner/filter assembly for leaks; inspect valves, lines, and fittings; replace as needed. P-1 Unit 2-D, Job Sheet 1—Inspect engine coolant level and condition. I. E. 9.—Inspect, clean, and pressure test radiator, pressure cap, tank(s) and recovery systems; determine needed action. P-1 Unit 2-B, Job Sheet 2—Pressure test coolant system. I. F. 1.—Inspect thermostatic cooling fan system, (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 Unit 8-B, Job Sheet 1—Inspect and test air induction system; piping, hoses, clearnine needed action. P-2 I. F. 1.—Inspect thermostatic cooling fan system, systems; determine needed action. P-2 Unit 8-B, Job Sheet 1—Inspect and test air induction system; piping, hoses, clearning needed. P-1	L F 2 — Test coolant temperature and check	Unit 2-B Job Sheet 6—Check operation and
Spending unit; determine needed action. P-2 Identify 5 (and the second seco	operation of temperature sensor gauge and/or	accuracy of temperature indicating system
 Li. E. 3.—Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment. P-1 Li. E. 4.—Inspect thermostat(s), by-passes, housing(s), and seals; replace as needed. P-2 Li. E. 5.—Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 Li. E. 6.—Recover, flush, and refill with re-commended coolant/additive package; bleed cooling system. P-1 Li. E. 8.—Inspect coolant conditioner/filter as needed. P-1 Li. E. 9.—Inspect coolant conditioner/filter adiator, pressure cap, tank(s) and recovery systems; determine needed action. P-1 Li. E. 10.—Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 F. Air Induction and Exhaust Systems biging systems; determine needed action. P-2 F. Air Induction and Exhaust Systems biging systems; determine needed action. P-2 I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2 Unit 8-B, Job Sheet 1.—Inspect and test air induction system; place as needed. P-1 Li. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2 Unit 8-B, Job Sheet 1.—Inspect and service targe index and readiator cap. 	sending unit: determine needed action P-2	
 I. E. 5. — Inspect thermostatics), by-passes, housing(s), and seals; replace as needed. P-2 I. E. 5. — Test coolant for freeze protection and additive package concentration; adjust as needed. P-1 I. E. 6. — Recover, flush, and refill with re-commended coolant/additive package; bleed coolant system. P-1 I. E. 7. — Inspect coolant conditioner/filter as needed. P-1 I. E. 9. — Inspect water pump and hoses; replace as needed. P-1 I. E. 9. — Inspect water pump and hoses; replace as needed. P-1 I. E. 10. — Inspect thermostatic cooling fan system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2 F. Air Induction and Exhaust Systems Diagnosis and Repair I. F. 3. — Remove and reinstall turbocharger/ wastegate assembly. P-2 Unit 8-B, Job Sheet 1. — Inspect and service tast in induction system. Unit 8-B, Job Sheet 1. — Inspect and service water pump, belts, and hoses. 	L F 3 —Inspect and reinstall/replace pulleys	Linit 2-B Job Sheet 2—Inspect water nump
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system (hydraulic, pneumatic, and electronic) and fan shroud; replace as needed. P-2assembly and controls.F. Air Induction and Exhaust Systems Diagnosis and Repairassembly and controls.I. F. 1.—Inspect turbocharger(s), wastegate, and piping systems; determine needed action. P-2Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 2.—Check air induction system; piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	I. E. 10.—Inspect thermostatic cooling fan	Unit 2-B, Job Sheet 3—Check operation of fan
and fan shroud; replace as needed. P-2Image: Product of the state of th	system (hydraulic, pneumatic, and electronic)	assembly and controls.
F. Air Induction and Exhaust Systems Diagnosis and RepairUnit 8-B, Job Sheet 1—Inspect and test air induction system; determine needed action. P-2I. F. 1.—Inspect turbocharger(s), wastegate, and piping systems; determine needed action. P-2Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 2.—Check air induction system; piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	and fan shroud; replace as needed. P-2	
Diagnosis and RepairUnit 8-B, Job Sheet 1—Inspect and test air induction systems; determine needed action. P-2I. F. 2.—Check air induction system; piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	F. Air Induction and Exhaust Systems	
I. F. 1.—Inspect turbocharger(s), wastegate, and piping systems; determine needed action. P-2Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 2.—Check air induction system; piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	Diagnosis and Repair	
piping systems; determine needed action. P-2induction system.I. F. 2.—Check air induction system; piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	I. F. 1.—Inspect turbocharger(s), wastegate, and	Unit 8-B, Job Sheet 1—Inspect and test air
I. F. 2.—Check air induction system; piping, hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1Unit 8-B, Job Sheet 1—Inspect and test air induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	piping systems; determine needed action. P-2	induction system.
hoses, clamps, and mounting; check for air restrictions and leaks; service or replace air filter as needed. P-1induction system.I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	I. F. 2.—Check air induction system; piping,	Unit 8-B, Job Sheet 1—Inspect and test air
restrictions and leaks; service or replace air filter as needed. P-1 I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2 Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	hoses, clamps, and mounting; check for air	induction system.
as needed. P-1Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	restrictions and leaks: service or replace air filter	-,
I. F. 3.—Remove and reinstall turbocharger/ wastegate assembly. P-2Unit 8-B, Job Sheet 2—Inspect and service turbo/supercharter and related components.	as needed P-1	
wastegate assembly. P-2 turbo/supercharter and related components.	I. F. 3.—Remove and reinstall turbocharger/	Unit 8-B. Job Sheet 2—Inspect and service
	wastegate assembly, P-2	turbo/supercharter and related components
I. F. 4.—Inspect intake manifold, gaskets, and Unit 8-B. Job Sheet 1—Inspect and test air	L.E.4.—Inspect intake manifold gaskets and	Unit 8-B. Job Sheet 1—Inspect and test air
connections: replace as needed P-3	connections: replace as needed P-3	induction system
L E 5 —Inspect clean and test charge air Unit 8-B. Joh Sheet 3—Clean and test jacket	I F 5 —Inspect clean and test charge air	Unit 8-B Job Sheet 3-Clean and test jacket
cooler assemblies: replace as needed P-2 water intercooler	cooler assemblies: replace as needed P-2	water intercooler
Unit 8-R. Joh Sheet 4Clean and test air-to-air		Unit 8-B Job Sheet 4—Clean and test air-to-air
		intercooler

NATEF Tasks	MAVCC Tasks
I. F. 6.—Inspect exhaust manifold, piping.	Unit 8-B. Job Sheet 5—Inspect and test exhaust
mufflers, exhaust after-treatment device(s), and	system.
mounting hardware: repair or replace as	o, o o o o o o o o o o o o o o o o o o
needed. P-2	
I. F. 7.—Inspect and test preheater/inlet air	Unit 8-B, Job Sheet 6—Inspect starting
heater, or glow plug system and controls;	preheater controls.
perform needed action. P-2	Unit 8-B, Job Sheet 7—Test starting fluid system
	and controls.
I. F. 8—Inspect and test exhaust gas	Not covered.
recirculation (EGR) system; determine needed	
action. P-3	
G. Fuel System Diagnosis and Repair	
1. Fuel Supply System Diagnosis and Repair	
I. G. 1. 1.—Check fuel level and quality and	Unit 1-C, Job Sheet 1—Check fuel level, quality,
consumption; determine needed action. P-1	and consumption.
I. G. 1. 2.—Inspect fuel tanks, vents, caps,	Unit 1-C, Job Sheet 2—Inspect and service
mounts, valves, screens, crossover system,	basic fuel supply components.
supply and return lines and fittings; determine	
needed action. P-1	
I. G. 1. 3.—Inspect, clean, and test fuel transfer	Unit 3-C, Job Sheet 5—Remove, inspect, and
(lift) pump, pump drives, screens, fuel/water	rebuild or replace a fuel transfer pump.
Separators/indicators, filters, neaters, coolers,	
Lechi cooling plates, and mounting hardware;	
L G 1 4 Ipapagt and tost low procesure	Lipit 1 C. Joh Chaot 9. Increationd convice
regulator systems (check valves, pressure	basic fuel supply components
regulator values, and restrictive fittings):	basic luer supply components.
determine needed action P-1	
L G 1 5 — Check fuel system for air: determine	Unit 1-C. Job Sheet 2—Inspect and service
needed action: prime and bleed fuel system:	basic fuel supply components
check primer pump. P-1	
2. Mechanical Fuel Injection Diagnosis and	
Repair	
I. G. 2. 1.—Perform on-engine inspections,	Unit 2-C, Job Sheet 3-Inspect, test, adjust, and
tests, and adjustments; check and adjust timing	time a distributor-type (rotary) injection pump;
or replace and time a distributor (rotary) type	determine needed repairs.
injection pump; determine needed action. P-3	
I. G. 2. 2.—Perform on-engine inspections,	Unit 2-C, Job Sheet 4—Inspect, test, adjust, and
tests, and adjustments; check and adjust timing	time an in-line injection pump; determine
or replace and time an in-line type injection	needed repairs.
pump; determine needed action. P-3	
I.G. 2. 3.—Inspect and adjust throttle control	Unit 2-C, Job Sheet 3—Inspect, test, adjust, and
linkage; determine needed action. P-3	time a distributor-type (rotary) injection pump;
	determine needed repairs.
I. G. 2. 4.—Inspect air/fuel ratio control systems;	Unit 2-C, Job Sheet 1—Isolate, remove, test,
determine needed action. P-3	rebuild or replace, and reinstall injection
	nozzles.
1. G. 2. 5.—Inspect, test, and adjust engine fuel	Not covered.
sinu-uowii devices and controls; determine	
needed action. P-3	

NATEF Tasks	MAVCC Tasks
I. G. 2. 6.—Inspect high pressure injection lines,	Unit 2-C, Job Sheet 5—Inspect, test, and adjust
hold downs, fittings and seals; replace as	a PT injection pump and time the injectors;
needed. P-3	determine needed repairs.
	Unit 2-D, Job Sheet 5—Perform a daily
	preventive maintenance check.
3. Electronic Fuel Management System	
Diagnosis and Repair	
I. G. 3. 1.—Inspect and test power and ground	Unit 3-C, Job Sheet 1—Inspect and test power
circuits and connections; measure and interpret	and ground circuits and connections; determine
voltage, voltage drop, amperage, and resistance	needed repairs.
readings using a digital multimeter (DIVIN);	
determine needed action. P-1	Linit 0. O. Joh Ohaat 0. Ohaali diamaatia
1. G. 3. 2.—Intenace with vehicle's on-board	Unit 3-C, Job Sneet 2—Check diagnostic
computer, perform diagnostic procedures using	trouble codes using electronic diagnostic
and tools (to include PC based software and/or	equipment and technical information, determine
data scan tools); determine needed action P-1	needed repairs.
G 3 3 - 1 ocate and use relevant service	Throughout publication
information (to include diagnostic procedures	
flow charts and wiring diagrams) P-1	
I. G. 3. 4.—Inspect and replace electrical	Unit 3-C. Job Sheet 3—Inspect and replace
connector terminals, seals, and locks, P-1	electrical connectors, terminals, seals, and
	locks.
I. G. 3. 5.—Inspect and test switches, sensors,	Unit 3-C, Job Sheet 2—Check diagnostic
controls, actuator components, and circuits;	trouble codes using electronic diagnostic
adjust or replace as needed. P-1	equipment and technical information; determine
	needed repairs.
	Unit 2-D, Job Sheet 4—Inspect and test
	indicator system components.
I. G. 3. 6.—Using recommended electronic	Unit 3-C, Job Sheet 4—Access engine
diagnostic tools (to include PC base software	parameters; monitor or change as requested by
and/or data scan tools), access and change	customer.
customer parameters. P-1	
I. G. 3. 7.—Inspect, test, and adjust electronic	Unit 3-C, Job Sheet 6—Remove, inspect,
unit injectors (EUI); determine needed action.	reinstall, and adjust electronic unit injectors;
	determine needed repairs.
I. G. 3. 8.—Remove and install electronic unit	Unit 3-C, Job Sneet 6—Remove, Inspect,
Injectors (EUI) and related components;	reinstall, and adjust electronic unit injectors;
recalibrate ECIVI (II applicable). P-2	determine needed repairs.
utilizing recommended electropic discretion	Drink 3-0, JUD Sheet 4—Access engine
	parameters, mornior of change as requested by
I G 3 10 — Perform engine timing sensor	Unit 3-C. Joh Sheet 4-Access engine
calibration (if applicable) P-3	parameters: monitor or change as requested by
	customer
L. G. 3. 11.—Perform on-engine inspections and	Unit 3-C. Job Sheet 6—Remove inspect
tests on hydraulic electronic unit injectors and	reinstall, and adjust electronic unit injectors:
system electronic controls: determine needed	determine needed repairs.
action. P-2	

NATEF Tasks	MAVCC Tasks
I. G. 3. 12.—Perform on-engine inspections and	Unit 3-C, Job Sheet 6—Remove, inspect,
tests on hydraulic electronic unit injector high	reinstall, and adjust electronic unit injectors;
pressure oil supply and control systems;	determine needed repairs.
determine needed action. P-2	
I. G. 3. 13.—Perform on-engine inspections and	Unit 2-C, Job Sheet 3—Inspect, test, adjust, and
tests on distributor-type injection pump	time a distributor-type (rotary) injection pump;
electronic controls; determine needed action.	determine needed repairs.
P-2	
I. G. 3. 14.—Perform on-engine inspections and	Unit 2-C, Job Sheet 5—Inspect, test, and adjust
tests on in-line type injection pump electronic	a PT injection pump and time the injectors;
controls; determine needed action. P-2	determine needed repairs.
I. G. 3. 15—Perform on-engine inspections and	Not covered.
tests on common rail type injection systems;	
determine needed action. P-3	
H. Engine Brakes	
I. H. 1.—Inspect and adjust engine	Unit 9-B, Job Sheet 1—Remove, inspect, install,
compression/exhaust brakes; determine needed	and adjust a Jacobs engine brake.
action. P-2	
I. H. 2.—Inspect, test, and adjust engine	Unit 9-B, Job Sheet 1—Remove, inspect, install,
compression/exhaust brake control circuits,	and adjust a Jacobs engine brake.
switches, and solenoids; repair or replace as	
needed. P-3	
I. H. 3.—Inspect engine compression/exhaust	Unit 9-B, Job Sheet 1—Remove, inspect, install,
brake housing, valves, seals, screens, lines, and	and adjust a Jacobs engine brake.
fittings; repair or replace as needed. P-3	