

	MAST - 1200 Hours	AST - 840 Hours	MLR - 540 Hours	EM-140C ALL	EM-141S-TY01	EM-145S-GM05
A. General						
1. Research vehicle service information such as fluid type, internal combustion engine operation, vehicle service history, service precautions, technical service bulletins, and recalls including xEVs and vehicles equipped with advanced driver assistance systems (ADAS).	P-1	P-1	P-1	X	X	X
2. Retrieve and record on-board diagnostics, DTCs, monitor status, and freeze frame data; clear codes and data when directed.	P-1	P-1	P-1	X	X	X
3. Verify operation of the instrument panel engine warning indicators.	P-1	P-1	P-1	X	X	X
4. Inspect engine assembly for fuel, oil, coolant, and other leaks; determine needed action.	P-1	P-1	P-1	X	X	X
5. Install engine covers using gaskets, seals, and sealers as required.	P-1	P-1	P-2		X	X
6. Verify engine mechanical timing.	P-1	P-1	P-2		X	X
7. Inspect, remove, and/or replace engine mounts.	P-2	P-2	P-2		X	X
8. Identify service precautions related to service of the internal combustion engine of an xEV.	P-1	P-1	P-2		X	X
9. Remove and reinstall engine on a vehicle equipped with OBDII; reconnect all attaching components and restore the vehicle to running condition.	P-3					X
B. Cylinder Head and Valve Train						
1. Identify cylinder head and valve train components and configurations.	P-1	P-1	P-1		X	X
2. Remove cylinder head; inspect gasket condition; install cylinder head and gasket; tighten according to manufacturer's specification and procedure.	P-1	P-1				X
3. Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition.	P-1	P-2				X
4. Inspect valve actuating mechanisms for wear, bending, cracks, looseness, and blocked oil passages (orifices); determine needed action.	P-1	P-2				X
5. Adjust valves (mechanical or hydraulic lifters).	P-2	P-2			X	X
6. Inspect and replace camshaft and drive belt/chain; includes checking drive gear wear and backlash, end play, sprocket and chain wear, overhead cam drive sprocket(s), drive belt(s), belt tension, tensioners, camshaft reluctor ring/toner-wheel, and valve timing components; verify correct camshaft timing.	P-1	P-1			X	X
7. Inspect valve springs for squareness and free height comparison; determine needed action.	P-3				X	X
8. Replace valve stem seals on an assembled engine; inspect valve spring retainers, locks/keepers, and valve lock/keeper grooves; determine needed action.	P-3				X	X
9. Inspect valve guides for wear; check valve stem-to-guide clearance; determine needed action.	P-3				X	X
10. Inspect valves and valve seats; determine needed action.	P-3				X	X
11. Check valve spring assembled height and valve stem height; determine needed action.	P-3				X	X
12. Inspect valve lifters and hydraulic lash adjusters; determine needed action.	P-2				X	X
13. Inspect and/or measure camshaft for runout, journal wear and lobe wear.	P-3					X
14. Inspect camshaft bearing surface for wear, damage, out-of-round, and alignment; determine needed action.	P-3					X
C. Engine Block Assembly						
1. Identify engine block assembly components and configurations.	P-1	P-1	P-1			X
2. Remove, inspect, and/or replace crankshaft vibration damper (harmonic balancer).	P-1	P-2			X	X
3. Disassemble engine block; clean and prepare components for inspection and reassembly.	P-2					X
4. Inspect engine block for visible cracks, passage condition, core and gallery plug condition, and surface warpage; determine needed action.	P-2					X

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5. Inspect and measure cylinder walls/sleeves for damage, wear, and ridges; determine needed action.	P-2					X
6. Perform deglazing and cleaning of cylinder walls.	P-2					X
7. Inspect and measure camshaft bearings for wear, damage, out-of-round, and alignment; determine needed action.	P-2					
8. Inspect crankshaft for straightness, journal damage, keyway damage, thrust flange and sealing surface condition, and visual surface cracks; check oil passage condition; measure end play and journal wear; check crankshaft position sensor reluctor ring (where applicable); determine needed action.	P-2					X
9. Inspect main and connecting rod bearings for damage and wear; determine needed action.	P-2					X
10. Identify piston and bearing wear patterns that indicate connecting rod alignment and main bearing bore problems; determine needed action.	P-2					X
11. Inspect and measure piston skirts and ring lands; determine needed action.	P-2					X
12. Determine piston-to-bore clearance.	P-2					X
13. Inspect, measure, and install piston rings.	P-2					X
15. Assemble engine block.	P-1					X
D. Lubrication and Cooling Systems						
1. Identify lubrication and cooling system components and configurations	P-1	P-1	P-1			X
2. Perform engine oil and filter change; use proper fluid type per manufacturer specification; reset maintenance reminder as required.	P-1	P-1	P-1		X	X
3. Perform cooling system pressure and dye tests to identify leaks; check coolant condition and level; inspect and test radiator, pressure cap, coolant recovery tank, heater core, and galley plugs; determine needed action.	P-1	P-1	P-1		X	X
4. Identify causes of engine overheating.	P-1	P-1	P-2		X	X
5. Inspect, replace, and/or adjust drive belts, tensioners, and pulleys; check pulley and belt alignment.	P-1	P-1	P-1	X	X	X
6. Inspect and test coolant; drain and recover coolant; flush and/or refill cooling system; use proper fluid type per manufacturer specification; bleed air as required.	P-1	P-1	P-1		X	X
7. Identify different types of water/coolant pumps (belt driven, chain driven, and electric).	P-1	P-1	P-2			X
8. Remove, inspect, and replace thermostat and gasket/seal.	P-1	P-1	P-1			X
9. Inspect, remove, and replace water/coolant pumps.	P-2	P-2			X	X
10. Remove and replace radiator.	P-2	P-2			X	X
11. Inspect and test fan(s), fan clutch (electrical and/or mechanical), fan shroud, and air dams/shutters; determine needed action.	P-1	P-1			X	X
13. Inspect auxiliary coolers; determine needed action.	P-2	P-2			X	X
14. Inspect, test, and replace oil temperature and pressure switches and sensors.	P-1	P-2				X