

2021 ASE Correlation Chart

Light Vehicle Diesel Engines (A9)

A. GENERAL DIAGNOSIS	Text Page #	Task Page #
1. Verify the complaint, and road/dyno test vehicle; review driver/customer concerns/ expectations and vehicle service history (if available); determine further diagnosis.	68; 241	28
2. Record vehicle identification number (VIN). Identify engine model, calibration and serial numbers to research applicable vehicle and service information, service precautions, and technical service bulletins; determine needed actions.	68-69; 250- 252; 268- 272; 290- 292; 309- 312	1, 85, 86, 87, 88
3. Perform scan tool check and visual inspection for physical damage and missing, modified, or tampered components; determine needed actions.	240- 245	81
4. Check and record electronic diagnostic codes, freeze frame and/or operational data; monitor scan tool data; determine further diagnosis.	242- 245	82
5. Clear diagnostic trouble codes (DTCs) and verify the repair.	68-69; 242- 246	83
6. Inspect engine assembly and compartment for fuel, oil, coolant, exhaust, or other leaks; determine needed repairs.	69-72; 240- 242	29
7. Inspect engine compartment wiring harness, connectors, seals, and locks; check for proper routing and condition; determine needed repairs.	68-69	76
8. Listen for and isolate engine noises; determine needed repairs.	71-72	30
9. Isolate and diagnose engine related vibration problems; determine needed actions.	71-72	31
10. Check engine exhaust for abnormal odor and/or smoke color and volume; determine further diagnosis.	240- 242	32
11. Check fuel for contamination, quantity, quality, and consumption; determine needed actions.	130- 131	59, 60
12. Perform crankcase pressure test; determine further diagnosis.	72-73	2, 33, 58
13. Diagnose surging, rough operation, misfiring, low power, slow deceleration, slow acceleration, and shutdown problems; determine needed actions.	74-77	34
14. Check cooling system for freeze point, level, contamination, condition, temperature, pressure, circulation, and fan operation; determine needed repairs.	70-71	20, 22, 26, 27

A. GENERAL DIAGNOSIS	Text Page #	Task Page #
15. Check lubrication system for contamination, oil level, temperature, pressure, filtration, and oil consumption; take oil sample and obtain oil analysis if needed; determine needed repairs.	70-74	35
16. Diagnose no-cranking, cranks but fails to start, hard starting, and starts but does not continue to run problems; determine needed actions.	77-80	36
17. Diagnose engine problems caused by battery condition, connections, or excessive key-off battery drain; determine needed repairs.	77-79	37
18. Diagnose engine problems resulting from an electrical undercharge, overcharge, or a no-charge condition; determine needed action.	77-79	38
B. CYLINDER HEAD AND VALVE TRAIN DIAGNOSIS AND REPAIR	Text Page #	Task Page #
1. Remove, inspect, disassemble, and clean cylinder head assembly(s).	84-89	39
2. Inspect threaded holes, studs, and bolts for serviceability; service/replace as needed.	94	40
3. Measure cylinder head thickness, and check mating surfaces for flatness, corrosion, warpage and surface finish; inspect for cracks/damage; check condition of passages; inspect core and gallery plugs; determine serviceability and needed repairs.	90-91	41
4. Inspect valves, guides, seats, springs, retainers, rotators, locks and seals; determine serviceability and needed repairs.	28-30	42
5. Inspect and/or replace injector sleeves, glow plug sleeves, and seals; pressure test to verify repair (if applicable); measure injector tip, nozzle, or prechamber protrusion where specified by manufacturer.	36	43
6. Inspect, and/or replace valve bridges (crossheads) and guides; adjust bridges (crossheads) if applicable.	33-35; 104	12
7. Reassemble, check, and determine required cylinder head gasket thickness; install cylinder head assembly and gasket as specified by the manufacturer.	103	45
8. Inspect pushrods, rocker arms, rocker arm shafts, electronic components, wiring harness, seals; repair/replace as needed.	305	13

B. CYLINDER HEAD AND VALVE TRAIN DIAGNOSIS AND REPAIR	Text Page #	Task Page #
9. Inspect, install, and adjust cam followers, lash adjusters and retainers; adjust valve clearance if applicable.	33; 104	44
10. Inspect, measure, and replace/reinstall overhead camshaft and bearings; measure and adjust endplay.	31-32; 312; 320	14
11. Inspect and time drive gear train components (includes gear, chain, and belt systems).	103	15
C. ENGINE BLOCK DIAGNOSIS AND REPAIR	Text Page #	Task Page #
1. Remove, inspect, service, and install pans, covers, ventilation systems, gaskets, seals, and wear rings.	83-84	2
2. Disassemble, clean and inspect engine block for cracks; check mating surfaces and related components for damage or warpage and surface finish; check deck height; check condition of passages, core, and gallery plugs; inspect threaded holes, studs, dowel pins and bolts for serviceability; service/replace as needed.	84-85; 90-91	3
3. Inspect and measure cylinder walls for wear and damage; determine needed service.	98-100	4
4. Inspect in-block camshaft bearings for wear and damage; replace as needed.	23-24	5
5. Inspect, measure, and replace/reinstall in-block camshaft; measure and correct end play; inspect, replace/reinstall, and adjust cam followers (if applicable).	23-24; 31-33	6
6. Clean and inspect crankshaft and journals for surface finish, cracks, and damage; check condition of oil passages; check passage plugs; measure journal diameters; check mounting surfaces; determine needed service.	18-19	7
7. Determine the proper select-fit components such as pistons, connecting rod and main bearings.	98-100	8
8. Inspect and replace main bearings; check cap fit and bearing clearances; check and correct crankshaft end play.	95-96	9
9. Inspect, replace, verify, and adjust the drive gear train components (includes gear, chain, and belt systems).	103- 104	10
10. Inspect, measure, or replace pistons, pins, and retainers.	98-100	11, 48
11. Measure piston-to-cylinder wall clearance.	98-100	46
12. Identify piston, connecting rod bearing, and main bearing wear patterns that indicate connecting rod and crankshaft alignment or bearing bore problems; check bearing bore and bushing condition; determine needed repairs.	19-23	47

C. ENGINE BLOCK DIAGNOSIS AND REPAIR	Text Page #	Task Page #
13. Check ring-to-groove fit and end gaps; install rings on pistons; assemble pistons and connecting rods and install in block; check piston height/protrusion; check liner height/protrusion (if applicable); replace rod bearings and check clearances; check condition, position, and clearance of piston cooling jets (nozzles).	98-100	48
14. Inspect crankshaft vibration damper; determine needed repairs.	18	49
15. Inspect flywheel/flexplate and/or dual-mass flywheel (including ring gear) and mounting surfaces for cracks, wear, and runout; determine needed repairs.	18-19	50
D. LUBRICATION AND COOLING SYSTEMS DIAGNOSIS AND REPAIR	Text Page #	Task Page #
1. Verify base engine oil pressure and check operation of pressure sensor/switch and pressure gauge; verify engine oil temperature and check operation of temperature sensor.	73-74	16
2. Inspect, measure, repair/replace oil pump, housing, drives, pipes, and screens; check drive gear clearance.	43	17
3. Inspect, repair/replace oil pressure regulator assembly including: housing, bore, spring, regulator valve(s), oil filter by-pass valve(s), and anti-drain back valve.	40-43	18
4. Inspect, clean, test, and reinstall/replace oil cooler, by-pass valve, lines, and hoses.	43-46	19
5. Inspect turbocharger lubrication and cooling systems; repair/replace as needed.	110; 115	51
6. Change engine oil and filters using proper type, viscosity, and rating per manufacturer specifications.	178	75
7. Inspect and reinstall/replace pulleys, tensioners, and drive belts; adjust drive belts and check alignment.	57	21
8. Verify coolant temperature; check operation of temperature and level sensors, switches, and temperature gauge.	53-54	22
9. Inspect and replace thermostat(s), by-pass(es), housing(s), and seal(s).	52-54	23
10. Flush and refill cooling system; following manufacturer's specification, add proper coolant type; bleed air from system.	66	24
11. Inspect and replace water pump(s), housing(s), hoses, and idler pulley(s) or drive gear.	57-58	25
12. Inspect radiator(s), pressure cap(s), and tank(s); pressure test cooling system and radiator cap(s); determine needed repairs.	59-60	26
13. Inspect and repair/replace cooling fan, fan hub, fan clutch, controls, and shroud(s).	58-59	27

E. AIR INDUCTION AND EXHAUST SYSTEMS DIAGNOSIS AND REPAIR	Text Page #	Task Page #
1. Inspect and service/replace air induction piping, air cleaner, and element; determine needed actions.	117- 121	53
2. Perform intake manifold pressure tests; inspect, test, clean, and/or replace charge air cooler and piping system; determine needed actions.	119	54
3. Inspect, test, and replace turbocharger(s) (including variable ratio/geometry VGT), pneumatic, hydraulic, vacuum, and electronic controls and actuators; inspect, test, and replace wastegate and wastegate controls.	111- 112	52
4. Inspect, test, and replace intake manifold(s), variable intake manifold(s), gaskets, actuators, temperature and pressure sensors, and connections.	119- 120	55
5. Perform exhaust back pressure and temperature tests; determine needed actions.	115	71
6. Inspect and repair/replace exhaust manifold(s), gaskets, piping, mufflers, and mounting hardware.	124- 125	72
7. Inspect, test, and repair/replace preheater/inlet air heater and/or glow plug system and controls.	121- 124	56
8. Inspect, test, and replace exhaust aftertreatment system components and controls, including diesel oxidation catalyst (DOC), selective catalyst reduction (SCR), diesel exhaust fluid (DEF), diesel particulate filter (DPF); check regeneration system operation.	167- 173	73
9. Inspect, test, service, and replace EGR system components including EGR valve(s), EGR cooler by-pass valve(s), EGR cooler(s), piping, electronic sensors, actuators, controls, and wiring.	121- 127	74
10. Inspect, test, and replace airflow control (throttle) valve(s) and controls.	124- 125	57
11. Inspect, test, and replace crankcase ventilation system components, including sensors, filters, valves, and piping.	72-73	58
F. FUEL SYSTEM DIAGNOSIS AND REPAIR	Text Page #	Task Page #
1. Inspect, clean, test, and repair/replace fuel system tanks, vents, caps, mounts, valves, single/dual supply and return lines, and fittings.	135- 137	61
2. Inspect, clean, test, and repair/replace fuel transfer and/or supply pump, sensors, strainers, fuel/water separators/indicators, filters, heaters, coolers, ECM cooling plates (if applicable), and mounting hardware.	137- 138	62
3. Check fuel system for air; determine needed repairs; prime and bleed fuel system; check and repair/replace primer pump.	137; 279	63
4. Inspect, test, and repair/replace low fuel pressure regulator supply and return systems, including low pressure switches.	140	64

F. FUEL SYSTEM DIAGNOSIS AND REPAIR	Text Page #	Task Page #
5. Inspect and reinstall/replace high-pressure injection lines, fittings, transfer tubes, seals, and mounting hardware.	144- 146	65
6. Inspect, adjust, and repair/replace electronic throttle and PTO control devices, circuits, and sensors.	284	66
7. Perform on-engine inspections, tests, and replace high pressure common rail fuel system components and electronic controls.	151- 154	67
8. Perform on-engine inspections and tests; replace hydraulic electronic unit injector(s) (HEUI) components and electronic controls.	158- 163	70
9. Perform on-engine inspections and tests; replace pump-line-nozzle fuel system (PLN-E) components and electronic controls.	154- 155	68
10. Perform on-engine inspections and tests; replace electronic unit injector(s) (EUI) components and electronic controls.	153- 154	69
11. Inspect and replace electrical connector terminals, pins, harnesses, seals, and locks.	151	77
12. Connect diagnostic scan tool to vehicle/engine; access, verify and update software calibration settings, injector calibration codes; perform control module re-learn procedures as needed.	243- 246	84
13. Use a diagnostic scan tool to inspect and test electronic engine control system, sensors, actuators, electronic control modules, and circuits; determine further diagnosis.	230- 236	80
14. Measure and interpret voltage, voltage drop, amperage, and resistance readings using a digital multimeter (DMM) or appropriate test equipment.	188- 195	78
15. Diagnose engine problems resulting from failures of interrelated systems (for example: cruise control, security alarms/theft deterrent, transmission controls, exhaust aftertreatment systems, electronic stability control, or non-OEM installed accessories).	230- 236	79