F4HFA413A*E002
F4HFA613B*E002
F4HFA613C*E002
F4HFA613D*E002
F4HFA613F*E003

Tier 2

Engine

SERVICE MANUAL

Part number 47441606
1st edition English
October 2012

CASE CONSTRUCTION

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1. Manufacturer's Identification
2. Property Class
3. Clock Marking of Property Class and Manufacturer's Identification (Optional), i.e. marks **60 °** apart indicate Class 10 properties, and marks **120 °** apart indicate Class 8.

INCH NON-FLANGED HARDWARE

NOMINAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrB W/ Gr5 BOLT	LOCKNUT GrC W/ Gr8 BOLT
	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	8 N·m (71 lb in)	11 N·m (97 lb in)	12 N·m (106 lb in)	16 N·m (142 lb in)	8.5 N·m (75 lb in)	12.2 N·m (109 lb in)
5/16	17 N·m (150 lb in)	23 N·m (204 lb in)	24 N·m (212 lb in)	32 N·m (283 lb in)	17.5 N·m (155 lb in)	25 N·m (220 lb in)
3/8	30 N·m (22 lb ft)	40 N·m (30 lb ft)	43 N·m (31 lb ft)	57 N·m (42 lb ft)	31 N·m (23 lb ft)	44 N·m (33 lb ft)
7/16	48 N·m (36 lb ft)	65 N·m (48 lb ft)	68 N·m (50 lb ft)	91 N·m (67 lb ft)	50 N·m (37 lb ft)	71 N·m (53 lb ft)
1/2	74 N·m (54 lb ft)	98 N·m (73 lb ft)	104 N·m (77 lb ft)	139 N·m (103 lb ft)	76 N·m (56 lb ft)	108 N·m (80 lb ft)
9/16	107 N·m (79 lb ft)	142 N·m (105 lb ft)	150 N·m (111 lb ft)	201 N·m (148 lb ft)	111 N·m (82 lb ft)	156 N·m (115 lb ft)
5/8	147 N·m (108 lb ft)	196 N·m (145 lb ft)	208 N·m (153 lb ft)	277 N·m (204 lb ft)	153 N·m (113 lb ft)	215 N·m (159 lb ft)
3/4	261 N·m (193 lb ft)	348 N·m (257 lb ft)	369 N·m (272 lb ft)	491 N·m (362 lb ft)	271 N·m (200 lb ft)	383 N·m (282 lb ft)
7/8	420 N·m (310 lb ft)	561 N·m (413 lb ft)	594 N·m (438 lb ft)	791 N·m (584 lb ft)	437 N·m (323 lb ft)	617 N·m (455 lb ft)
1	630 N·m (465 lb ft)	841 N·m (620 lb ft)	890 N·m (656 lb ft)	1187 N·m (875 lb ft)	654 N·m (483 lb ft)	924 N·m (681 lb ft)

NOTE: *For Imperial Units,* ***1/4 in*** *and* ***5/16 in*** *hardware torque specifications are shown in pound-inches.* ***3/8 in*** *through* ***1 in*** *hardware torque specifications are shown in pound-feet.*

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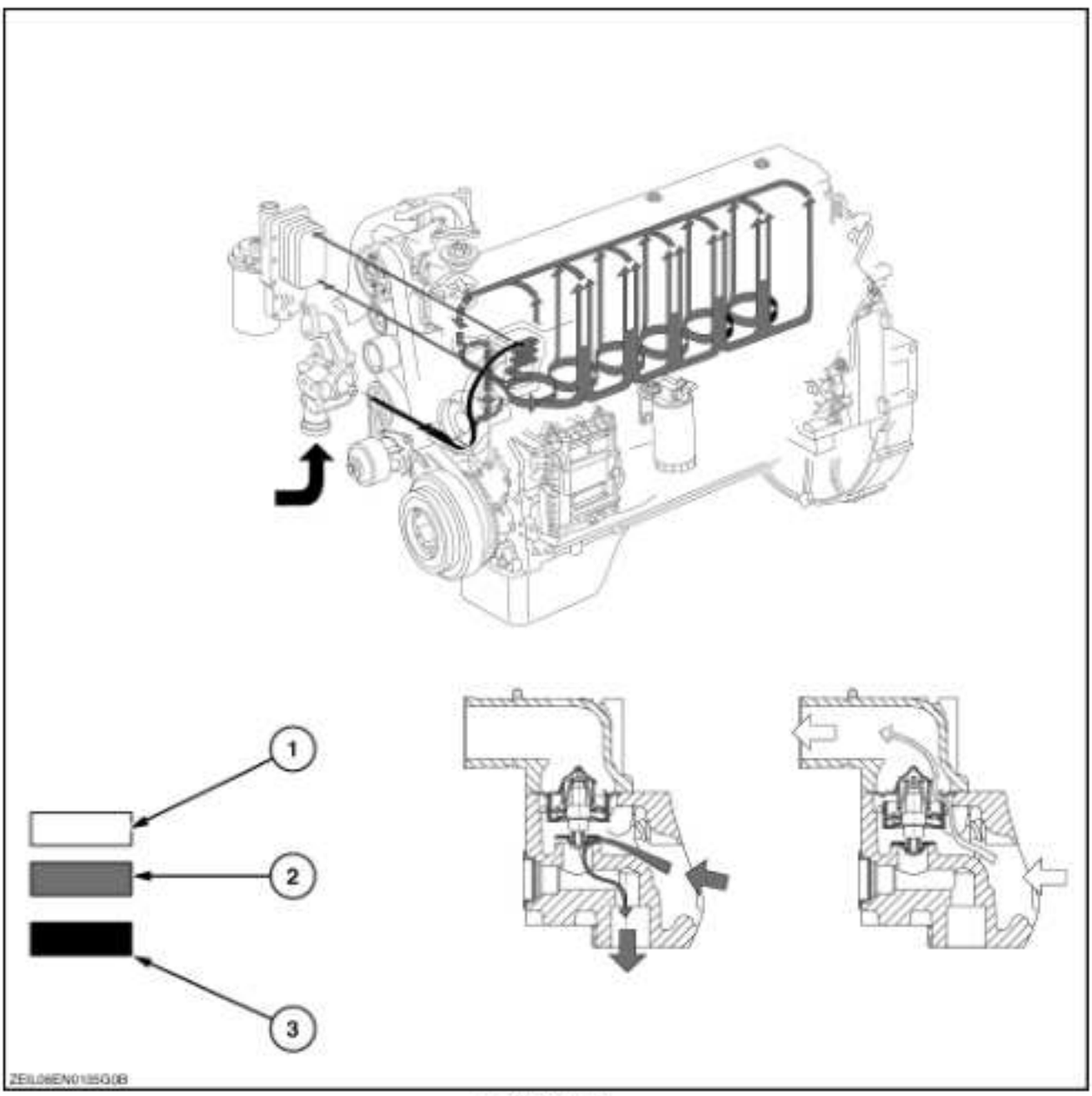
Problem	Possible Cause	Correction
	Seized piston	Replace piston and, if necessary, engine block
	Piston pin retainer loose or missing	Replace retainer
	Improper valve lash adjustment	Adjust valve lash to specification
	Worn valve lifter	Replace valve lifter
	Excessive timing gear backlash	Replace all timing gears
Excessive oil consumption	Engine oil level too high	Remove excess oil
	Leakage in cylinder head gasket	Replace head gasket
	Oil loss past the pistons and rings	Replace piston rings
	Worn, broken, or sticking piston rings	Replace piston rings
	Clogged return hole of oil ring	Unclog return oil hole and replace rings
	Worn valves, guides, or seals	Replace valves, guides, or seals
	Leakage past oil seals and gaskets	Replace leaking seals and gaskets
	External oil leaks from engine	Locate leaks and repair
Engine overheats	Insufficient amount of coolant in the radiator	Fill coolant to proper level
	Hose connection leaking or collapsed hose	Tighten hose connection or replace hose
	Radiator leakage	Locate leak and repair or replace radiator
	Loose, worn, or broken V-belt	Adjust V-belt tension or replace belt
	Radiator fins bent or clogged	Straighten out and clean fins
	Radiator cap not sealing	Replace radiator cap
	Thermostat operating improperly	Replace thermostat cap
	Insufficient amount of oil	Fill to proper level
	Water pump operating improperly	Replace water pump
	Improper valve clearance	Adjust valve clearance to specification
	Restriction in exhaust system	Remove restriction
	Improperly installed cylinder head gasket	Reinstall head gasket in proper position
	Rust and/or scale clogged water ports	Backflush cooling system
	Extended engine idling	Shutdown engine during extended idling periods
Temperature gauge fails to reach normal operating temperature	Faulty temperature sender	Replace temperature switch
	Faulty thermostat	Replace thermostat
	Faulty temperature gauge	Replace temperature gauge
Engine does not start	Faulty starter switch	Replace switch
	Insufficient charging or complete discharge of battery	Check battery and charging system
	Lack of fuel	Fill fuel tank
	Air mixed in fuel system	Inspect fuel system for tightness
	Clogged fuel filter	Replace fuel filter
	Irregular or faulty fuel supply	Replace fuel supply
	Glow plug not heating	Replace glow plug
	Improper lubricating oil viscosity	Replace lube oil
	Clogged air cleaner	Replace air cleaner
	Faulty engine stop solenoid	Replace solenoid
	Burned out fuse	Replace fuse
Excessive Exhaust Smoke	Air cleaner dirty or restricted	Replace air cleaner
	Excessive fuel delivery	Adjust fuel delivery
Engine stops while operating	Lack of fuel in fuel tank	Fill fuel tank
	Clogged fuel filter	Replace filter
	Air mixed in fuel system	Inspect for air leaks
	Faulty engine stop solenoid	Replace solenoid
	Burned out fuse	Replace fuse
Undesirable exhaust color (black or light grey)	Unsuitable fuel	Replace fuel
	Excess injection	Replace injection pump
	Faulty engine component	Replace as required

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Engine cooling system - Dynamic description

The engine cooling system, closed circuit forced circulation type, generally incorporates the following components:

- Expansion Tank - Placement, shape and dimension are subject to change according to the engine's equipment.
- Radiator - Has the duty to dissipate the heat produced by the engine. The heat is conducted to the cooling liquid which is then ran through the radiator. Application determines placement and dimensions.
- Viscous Fan - Increases the heat dissipating power of the radiator by pulling fresh air over the fins of the radiator. Also moves ambient air over the engine itself to increase cooling power. This item is also dependant on application.
- Heat Exchanger - Cools the lubrication oil. Also application specific.
- Centrifugal Water Pump - Used to circulate the cooling liquid. Usually belt driven.
- Thermostat - regulates the circulation of the cooling liquid.
- If applicable, the circuit may be extended to the compressor.



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6 cylinder version

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