SERVICE MANUAL

NEF
Tier 4A (interim) and Stage IIIB
Engine

See the following page for engine model numbers

Part number 48076861
1st edition English
November 2016
Replaces part numbers 84392377, 84392386, 84392403, 84392428, 84392452, 84586860

Torque

Component	Size	Specification
Cylinder head and components		
Plug	¼"	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
	½"	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
	¾"	**31 - 41 Nm** (**22.9 - 30.2 lb ft**)
Grid heater	M6 Nut	**6 - 10 Nm** (**4.4 - 7.4 lb ft**)
Intake manifold	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Engine lifting bracket		
Rear	M12	**65 - 89 Nm** (**47.9 - 65.6 lb ft**)
Front	M8	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Cylinder head	**M12x1.75x130 mm**	
First phase		**30 - 40 Nm** (**22.1 - 29.5 lb ft**)
Second phase		**85 - 95 °**
Third phase		**85 - 95 °**
Cylinder head	**M12x1.75x150 mm**	
First phase		**50 - 60 Nm** (**36.9 - 44.3 lb ft**)
Second phase		**85 - 95 °**
Third phase		**85 - 95 °**
Rocker bracket		**31 - 41 Nm** (**22.9 - 30.2 lb ft**)
Rocker arm jam nuts		**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Exhaust manifold		**48 - 58 Nm** (**35.4 - 42.8 lb ft**)
Valve cover	M8 Nut	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Turbocharger		
6 Cylinder	M8 Screw	**6 - 8 Nm** (**4.4 - 5.9 lb ft**)
	M8 Nut	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
4 Cylinder	M8 Screw	**6 - 8 Nm** (**4.4 - 5.9 lb ft**)
	M8 Nut	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Front case		
Front cover	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Rear case		
Gear case	M12 Screw	**65 - 89 Nm** (**47.9 - 65.6 lb ft**)
	M10 Screw	**42 - 52 Nm** (**31.0 - 38.4 lb ft**)
	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Flywheel housing	M10	**75 - 95 Nm** (**55.3 - 70.1 lb ft**)
	M12	**44 - 54 Nm** (**32.5 - 39.8 lb ft**)
Cylinder block and crankshaft components		
Camshaft retaining plate	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Camshaft gear	M8 Screw	**32 - 40 Nm** (**23.6 - 29.5 lb ft**)
Crankcase plate	M10 Screw	**38 - 48 Nm** (**28.0 - 35.4 lb ft**)
Vibration damper and adapter	M12	
First phase		**45 - 55 Nm** (**33.2 - 40.6 lb ft**)
Second phase		**90 °**
Drive pulley	M10	**70.0 - 75.0 N·m** (**51.6 - 55.3 lb ft**)
Engine flywheel	M12	
First phase		**26 - 34 Nm** (**19.2 - 25.1 lb ft**)
Second phase		**55 - 65 °**
Main caps	M12	
First phase		**44 - 56 Nm** (**32.5 - 41.3 lb ft**)
Second phase		**74 - 86 Nm** (**54.6 - 63.4 lb ft**)
Third phase		**85 - 95 °**
Connecting rod caps		
First phase		**45.0 - 55.0 N·m** (**33.2 - 40.6 lb ft**)
Second phase		**55 - 65 °**
Lubrication system and components		

PROTECTING THE ELECTRONIC/ ELECTRICAL SYSTEMS DURING CHARGING OR WELDING

To avoid damage to the electronic/electrical systems, always observe the following:

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.
2. Never short any of the charging components to ground.
3. Always disconnect the ground cable from the battery before arc welding on the combine or on any header attached to the combine.
   - position the welder ground clamp as close to the welding area as possible
   - if welding in close proximity to a computer module, then the module should be removed from the combine
   - never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress
4. Always disconnect the negative cable from the battery when charging the battery in the combine with a battery charger.

NOTICE: *If welding must be performed on the unit, either the combine or the header (if it is attached), the battery ground cable must be disconnected from the combine battery. The electronic monitoring system and charging system will be damaged if this is not done.*

Remove the battery ground cable. Reconnect the cable when welding is completed.

⚠ WARNING ⚠

Battery acid causes severe burns. Batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Antidote - EXTERNAL: flush with water. INTERNAL: drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetables oil. Call physician immediately. EYES: flush with water for 15 minutes and get prompt medical attention.

84-110

TOOLS

The tools that CNH suggests and illustrate in this manual have been:

- specifically researched and designed for use with CNH machines
- essential for reliable repair operations
- accurately built and rigorously tested so as to offer efficient and long-lasting operation

By using these tools, repair personnel will benefit from:

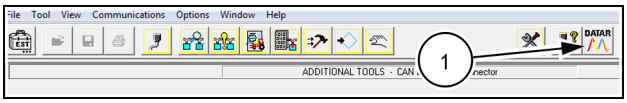
- operating in optimal technical conditions
- obtaining the best results
- saving time and effort
- working in safe conditions

NOTE: *The terms "front", "rear", "right-hand" and "left-hand" (when referred to different parts) are determined from the rear, facing in the direction of travel of the machine during operation.*

Component	Size	Specification
Oil pump		
First phase	M8	**7 - 9 Nm** (**5.2 - 6.6 lb ft**)
Second phase	M8	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Oil pressure relief valve	M22	**72 - 88 Nm** (**53.1 - 64.9 lb ft**)
Oil cooler and oil filter base	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Oil Filter		Contact + ¾ Turn
Connection on filter base for turbo oil supply	1 ⅛"	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Turbo lubrication pipe	M12 Nut	**8 - 12 Nm** (**5.9 - 8.9 lb ft**)
Turbo lubrication pipe adapter	M12	**30 - 40 Nm** (**22.1 - 29.5 lb ft**)
Oil pan		**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Piston spray nozzles	M8	**12 - 18 Nm** (**8.9 - 13.3 lb ft**)
Electrical components		
Camshaft sensor	M6 Studs	**6 - 10 Nm** (**4.4 - 7.4 lb ft**)
	M6 Nut	**8 - 12 Nm** (**5.9 - 8.9 lb ft**)
	M6 Screw	**6 - 10 Nm** (**4.4 - 7.4 lb ft**)
Wiring bulkhead	M6 Screw	**8 - 12 Nm** (**5.9 - 8.9 lb ft**)
Support bracket for injector wiring	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Injector wiring		**1.25 - 1.75 Nm** (**0.92 - 1.29 lb ft**)
ECU cooling plate	M6 Screw	**8 - 12 Nm** (**5.9 - 8.9 lb ft**)
	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Fuel outlet	M12	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
Fuel inlet	M12	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
Crankshaft speed sensor	M6 Screw	**6 - 10 Nm** (**4.4 - 7.4 lb ft**)
Coolant temperature sensor	M14 Screw	**17 - 23 Nm** (**12.5 - 17.0 lb ft**)
Oil pressure / Temperature sensor	M5 Screw	**5 - 7 Nm** (**3.7 - 5.2 lb ft**)
Fuel pressure sensor		**30 - 40 Nm** (**22.1 - 29.5 lb ft**)
Fuel temperature sensor	M14	**17 - 23 Nm** (**12.5 - 17.0 lb ft**)
Air pressure / Temperature sensor		**5 - 7 Nm** (**3.7 - 5.2 lb ft**)
Engine oil level sensor	M12	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
Alternator support bracket	M10 Screw	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Alternator tension bracket	M10 Screw	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Starter		**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Fuel system and components		
Feed pump	M8 Studs	**10 - 14 Nm** (**7.4 - 10.3 lb ft**)
High pressure pump gear	M18 Nut	**100 - 110 Nm** (**73.8 - 81.1 lb ft**)
Fuel pump	M8 Nut	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Injector		
First phase	M6 Screw	**8.15 - 8.85 Nm** (**6.0 - 6.5 lb ft**)
Second phase	M6 Screw	**70 - 80 °**
Injector feed connector		**45 - 55 Nm** (**33.2 - 40.6 lb ft**)
Common rail	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
High pressure fuel line	M14 Fitting	**18 - 22 Nm** (**13.3 - 16.2 lb ft**)
High pressure pipe connector	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Fuel filter bracket	M12 Screw	**71 - 85 Nm** (**52.4 - 62.7 lb ft**)
Fuel filter holder	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Fuel filter		Contact + ¾ Turn
Cooling system and components		
Engine coolant inlet	M10 Screw	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Fitting on coolant inlet	**90 °** Elbow	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Compressor cooling pipe		**20 - 24 Nm** (**14.8 - 17.7 lb ft**)
Engine coolant drain collector	M6 Screw	**8 - 12 Nm** (**5.9 - 8.9 lb ft**)
Water pump	M8 Screw	**20 - 28 Nm** (**14.8 - 20.7 lb ft**)
Belt tensioner	M10	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)
Idler pulleys	M10	**37 - 49 Nm** (**27.3 - 36.1 lb ft**)

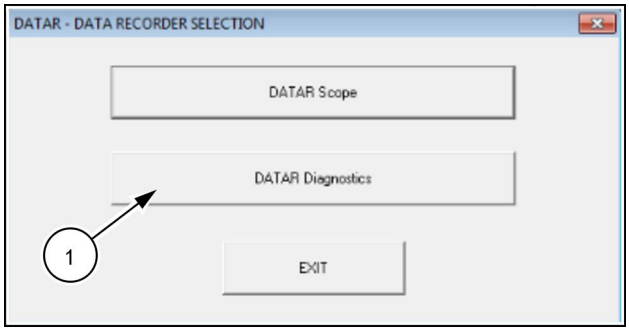
Engine - Compression test

1. Select the **DATAR** application **(1)** in the Electronic Service Tool (EST).



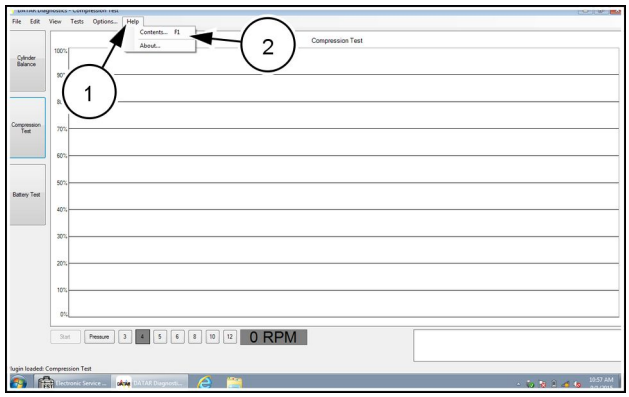
NHIL15ENG0249AA 1

2. Once the **DATAR** screen is open, select the 'Datar Diagnostics' **(1)**.



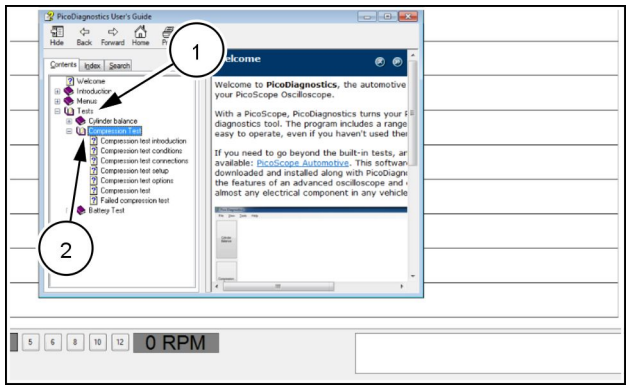
NHIL15ENG0250AA 2

3. Select 'Help' from the tool bar **(1)**.
4. Select 'Contents' or press "F1" **(2)**.



NHIL15ENG0254AA 3

5. Select 'Tests' **(1)**.
6. Select 'Compression Test' **(2)**.
7. Follow the instructions for "Relative Compression'.



NHIL15ENG0255AA 4

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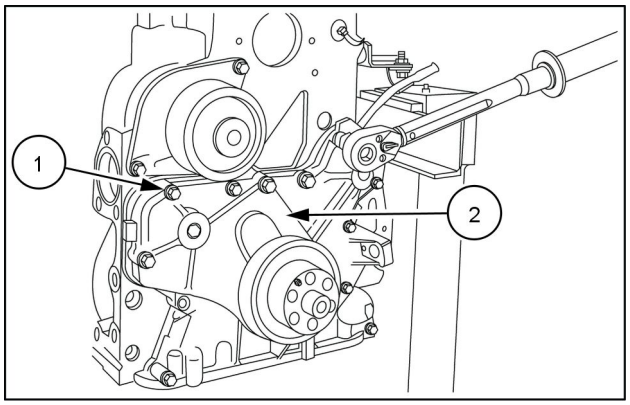
(*) See content for specific models

3. Install the front cover **(2)** onto the crankcase.
4. Torque the bolts **(1)** to **20 - 28 N·m** (**15 - 21 lb ft**).



NHIL13ENG0320AA 3

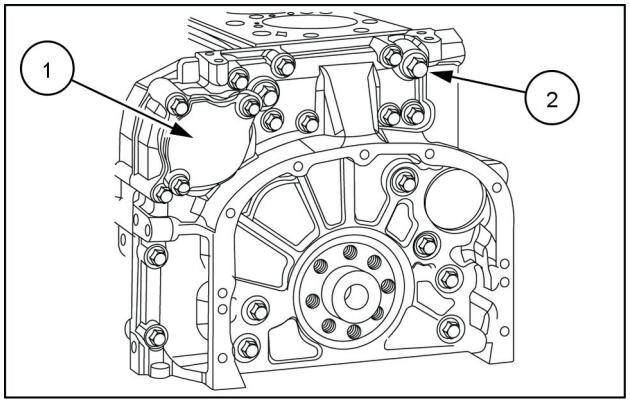
Engine block cover Rear - Install

F4DFE413A*A	
F4DFE413B*A	
F4DFE413C*A	
F4DFE413D*A	
F4DFE413E*A	
F4DFE6132*A	
F4DFE613A*A	
F4DFE613B*A	
F4DFE613C*A	
F4DFE613D*A	
F4DFE613E*A	
F4DFE613F*A	
F4DFE613G*A	
F4DFE613H*A	
F4DFE613J*A	
F4DFE613K*A	
F4DFE613L*A	

Prior operation:
Engine block cover Rear - Cleaning (10.102)

NOTICE: *Before any assembly operation always verify that the hole and bolt threads have no evidence of wear or dirt.*

1. Position the rear cover **(1)** onto the engine and install the retaining bolts **(2)** in the same position from which they have been removed.
2. Torque the bolts **(2)** as follows:
   - M12 - **85 N·m** (**63 lb ft**)
   - M16 - **200 N·m** (**148 lb ft**)

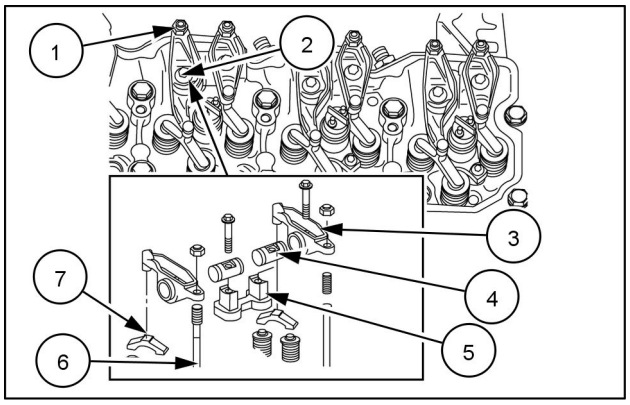


NHIL13ENG0328AA 1

Rocker arm - Disassemble

Prior operation:
Valve cover - Remove (10.101)

1. Loosen tappet adjustment jam nuts **(1)** and loosen the adjusting bolts.
2. Remove the rocker shaft mounting bolts **(2)**.
3. Remove the rocker assembly, which consists of the pedestal **(5)**, rockers **(3)**, and shaft **(4)**.
4. Remove the valve bridges **(7)**.
5. Remove the push rods **(6)**.

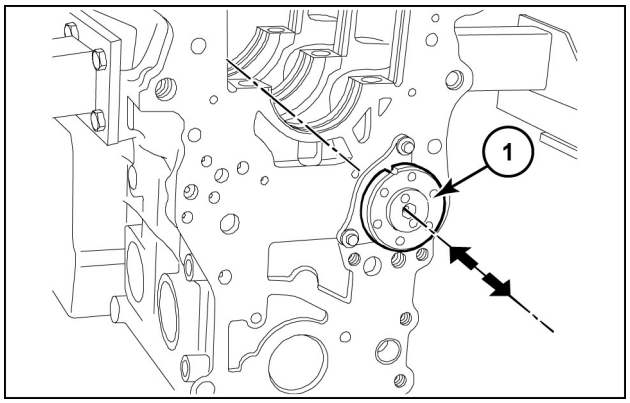


NHIL13ENG0339AA 1

Camshaft - End play

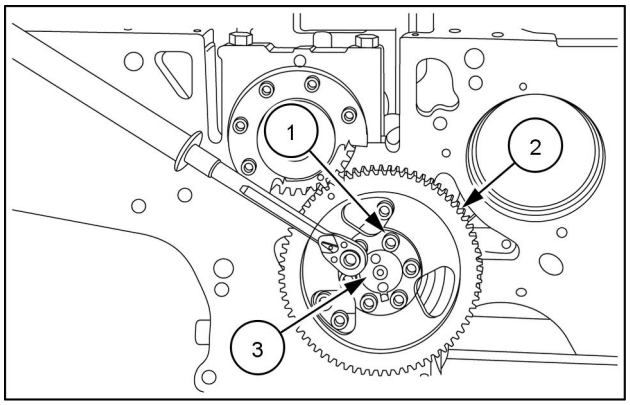
Prior operation:
Camshaft - Install (10.106)

1. Use a dial indicator **17270** to check the camshaft **(1)** end play.
   The end play should be between **0.10 - 0.36 mm** (**0.004 - 0.014 in**).



CRIL04J065A01 1

5. Torque the bolts **(1)** that secure the gear **(2)** to camshaft **(3)** to **32 - 40 N·m** (**24 - 30 lb ft**).

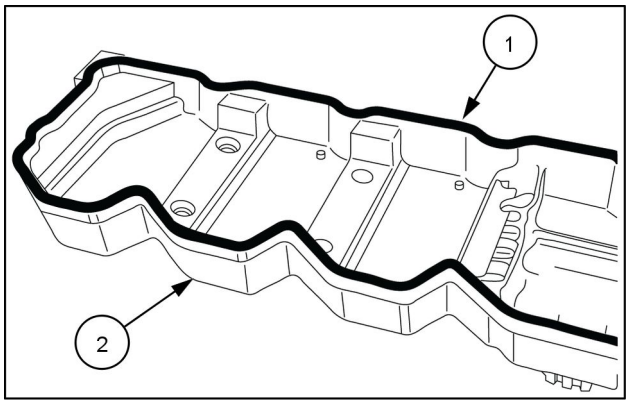


NHIL13ENG0372AA 4

Valve cover - Install

Prior operation:
Valve cover - Remove (10.101)

1. Install a new gasket **(1)** onto the valve cover **(2)**.
2. Install the valve cover **(2)** onto the cylinder head.
3. Torque the bolts to **20 - 28 N·m** (**15 - 21 lb ft**).

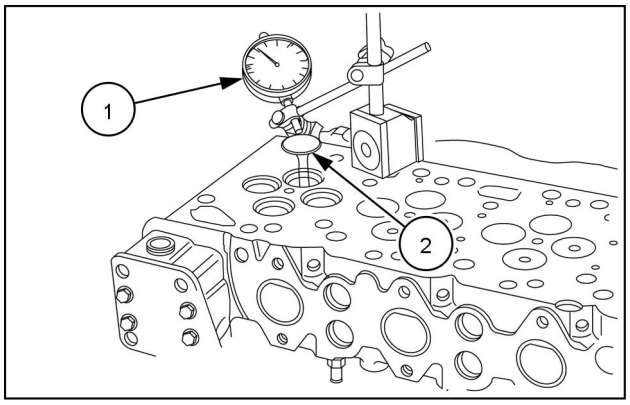


NHIL13ENG0387AA 1

Valve guide - Clearance

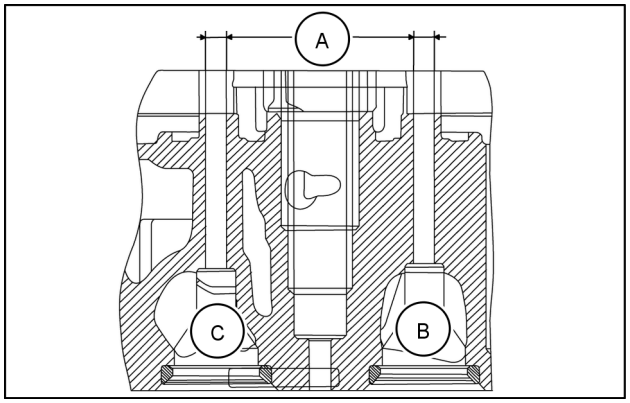
Prior operation:
Valves - Remove (10.101)

1. Use a magnetic base dial bore gauge **(1)** set as shown in the figure. The assembling clearance should be between **0.052 - 0.092 mm** (**0.002 - 0.004 in**).
2. Turn the valve **(2)** and check that the centering error is not exceeding **0.03 mm** (**0.001 in**).

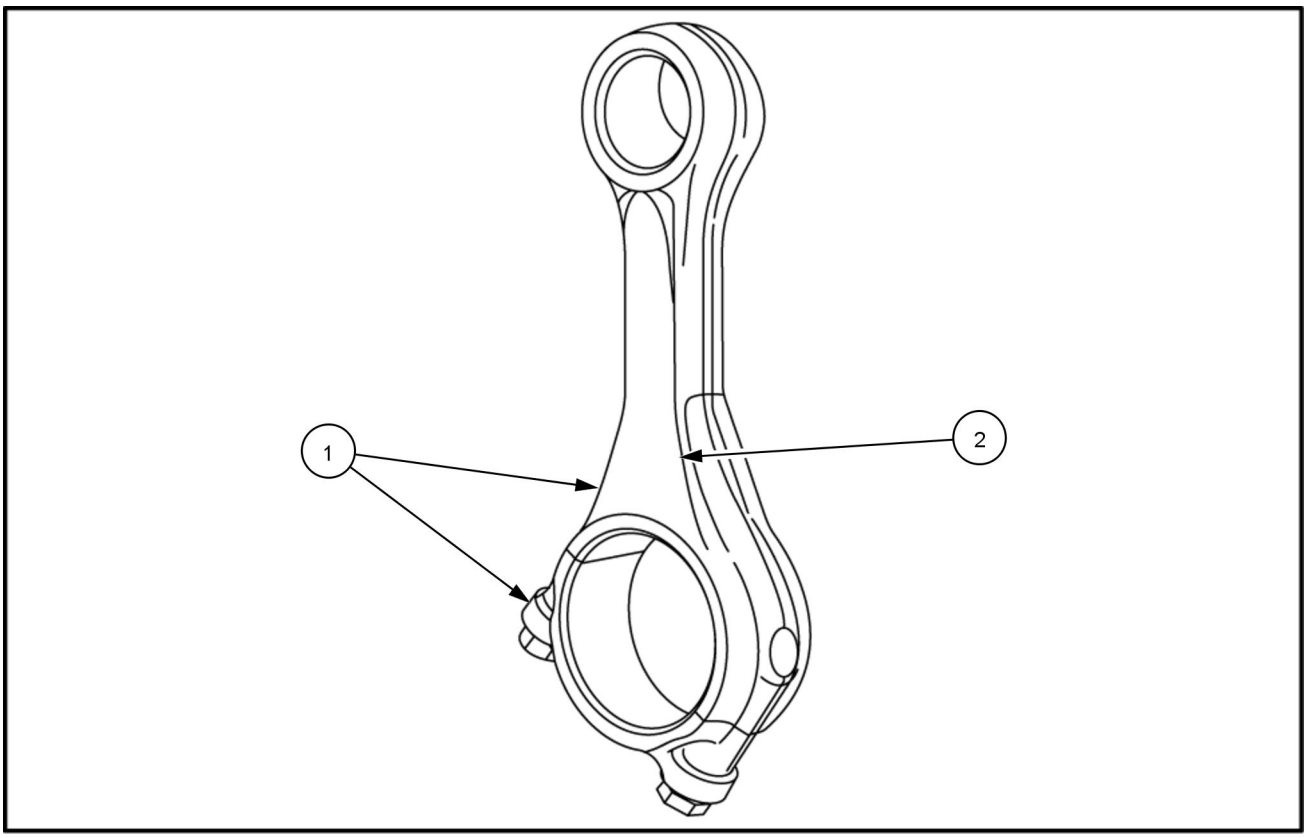


NHIL13ENG0442AA 1

3. Use a bore dial gauge to measure the inside bore diameter of the valve guides. The values for both intake **(C)** and exhaust **(B)** valve guides should be within **7.042 - 7.062 mm** (**0.277 - 0.278 in**) **(A)**.



NHIL13ENG0443AA 2



NHIL13ENG0457AA 2

NOTE: *Every connecting rod is marked as follows:*

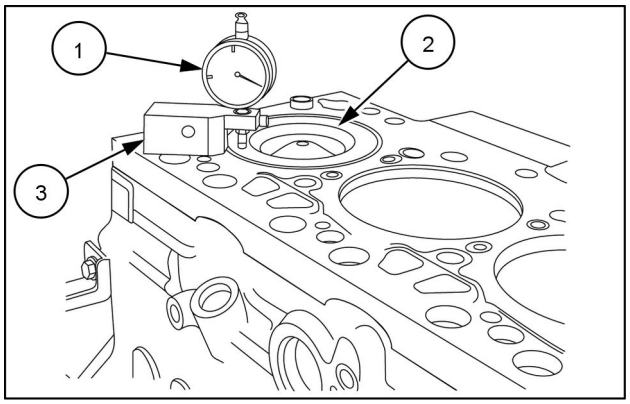
(1) *- On the body and cap with a number showing their coupling and the corresponding cylinder. In case of replacement, it is therefore necessary to mark the new connecting rod with the same numbers of the replaced one.*

(2) *- On the body with a letter showing the weight of the connecting rod assembled at production:*
- V - ***1820 - 1860 g*** *(****64.2 - 65.6 oz****) (yellow marking)*
- W - ***1861 - 1900 g*** *(****65.6 - 67.0 oz****) (green marking)*
- X - ***1901 - 1940 g*** *(****67.1 - 68.4 oz****) (blue marking)*

Spare connecting rods are of the - W - class with a green marking. Material removal is not allowed.

Piston - Check

1. Once piston and connecting rod assemblies installation is completed, use the dial bore gauge **380000228 (1)** equipped with the base **380000364 (3)** to check piston **(2)** protrusion at Top Dead Center (TDC) with respect to the top of the engine block.
   Protrusion should be between **0.28 - 0.52 mm** (**0.011 - 0.020 in**).



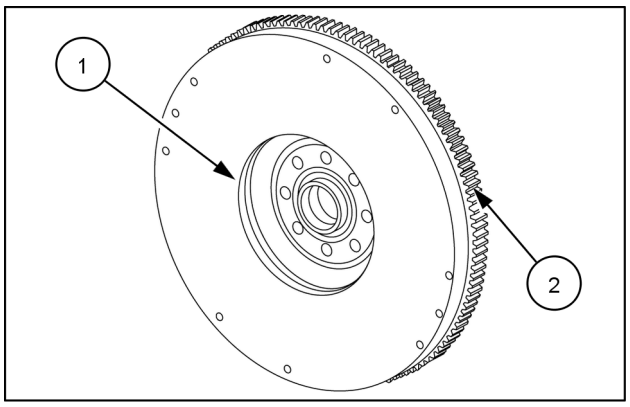
NHIL13ENG0474AA 1

Engine flywheel - Check

F4HFE413A*A005	
F4HFE413C*A	
F4HFE413D*A008	
F4HFE413H*A	
F4HFE413J*A	
F4HFE413L*A007	
F4HFE413M*A005	
F4HFE413P*A001	
F4HFE6131*A	
F4HFE6132*A004	
F4HFE6138*A002	
F4HFE613F*A002	
F4HFE613G*A	
F4HFE613H*A	
F4HFE613J*A007	
F4HFE613J*A	
F4HFE613K*A	
F4HFE613P*A	
F4HFE613R*A	
F4HFE613T*A004	
F4HFE613T*A005	
F4HFE613U*A005	
F4HFE613U*A006	
F4HFE613V*A003	
F4HFE613X*A	
F4HFE613Y*A	
F4HFE613Z*A005	
F4HFE613Z*A006	
F4HFE614E*A001	

Prior operation:
Engine flywheel - Remove (10.103)

1. Check the clutch supporting side of the engine flywheel **(1)** for any scoring or scratching. If any scratching is found, the flywheel should be resurfaced.
2. Check the flywheel ring gear teeth **(2)** for breakage or excessive wear. If wear is found, remove the ring gear from the engine flywheel with a suitable hammer.
3. Heat the new ring gear to **150 °C** (**302 °F**) for 15 to 20 minutes.
4. Install the new ring gear with the chamfering on the inside diameter facing the flywheel.

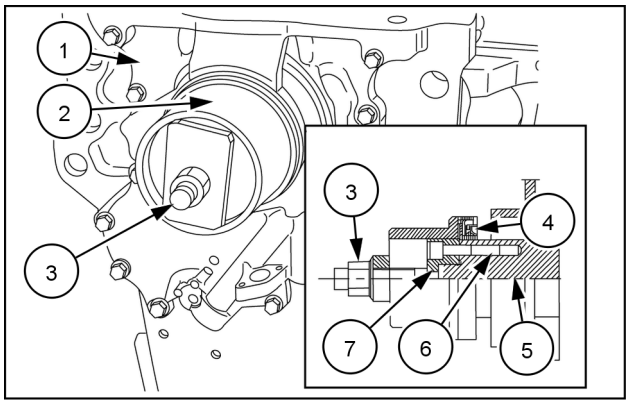


NHIL13ENG0483AA 1

Crankshaft oil seal Front seal - Install

Prior operation:
Crankshaft oil seal Front seal - Remove (10.103)

1. Apply tool **380000666 (7)** to the front crankshaft tang **(5)** and secure it with bolts **(6)**.
2. Install the new sealing ring **(4)**.
3. Position part **(2)** on part **(7)**, tighten nut **(3)** until completing installation of the sealing ring **(4)** into the front cover **(1)**.

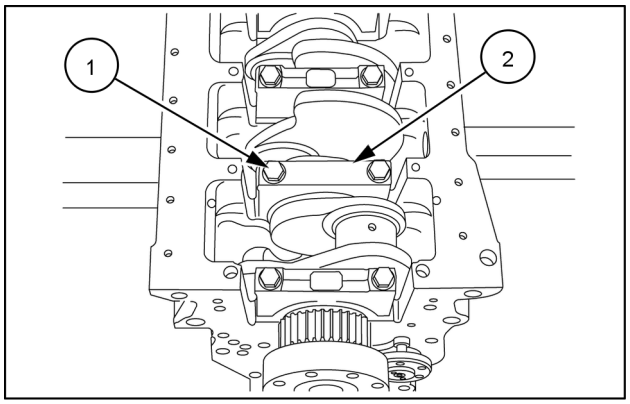


NHIL13ENG0528AA 1

Main bearings - Remove

Prior operation:
Engine oil pan - Remove (10.102)

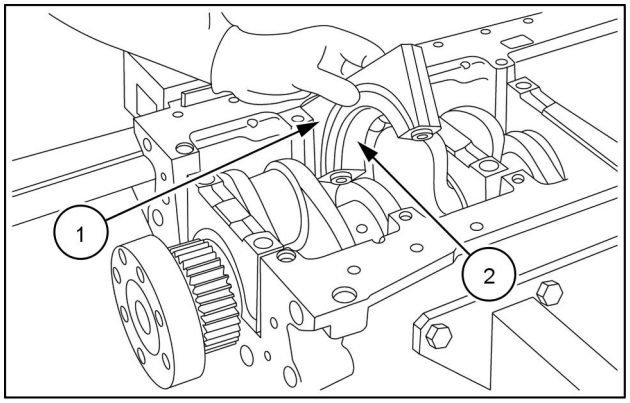
1. Remove the retaining bolts **(1)** and the main bearing caps **(2)**.



NHIL13ENG0544AA 1

2. The second to last main bearing cap **(1)** and the it's support are fitted with a shouldered half-bearing **(2)**.

NOTE: *Take note of the lower and upper half-bearing assembling positions since in case of reuse they should be fitted in the same position found at removal.*



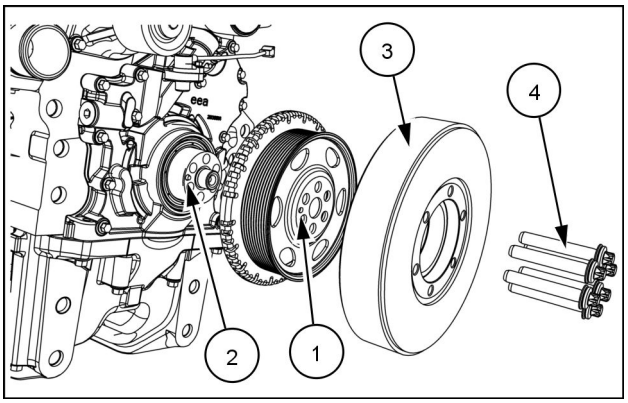
NHIL13ENG0545AA 2

Crankshaft damper - Install

F4DFE413A*A	
F4DFE413B*A	
F4DFE413C*A	
F4DFE413D*A	
F4DFE413E*A	
F4DFE6132*A	
F4DFE613A*A	
F4DFE613B*A	
F4DFE613C*A	
F4DFE613D*A	
F4DFE613E*A	
F4DFE613F*A	
F4DFE613G*A	
F4DFE613H*A	
F4DFE613J*A	
F4DFE613K*A	
F4DFE613L*A	

Prior operation:
Crankshaft damper - Remove (10.110)

1. Align the small hole **(1)** in the crankshaft pulley with the locating dowel **(2)** in the crankshaft.
2. Install the vibration damper **(3)** onto the crankshaft.
3. Torque the mounting bolts **(4)** to **105 - 115 N·m** (**77 - 85 lb ft**).



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High pressure pump - External view

F4DFE413A*A	
F4DFE413B*A	
F4DFE413C*A	
F4DFE413D*A	
F4DFE413E*A	
F4DFE6132*A	
F4DFE613A*A	
F4DFE613B*A	
F4DFE613C*A	
F4DFE613D*A	
F4DFE613E*A	
F4DFE613F*A	
F4DFE613G*A	
F4DFE613H*A	
F4DFE613J*A	
F4DFE613K*A	
F4DFE613L*A	

Introduction

Extremely high injection pressures are necessary in order to reduce particulate emissions. The common rail system makes it possible to inject fuel at pressures of up to **1450 - 1600 bar** (**21025 - 23200 psi**), while the injection precision obtained by electronic control of the system serves to optimize operation of the engine while limiting emissions and fuel consumption.

For engines more powerful than **152 kW** (**207 Hp**), the CRIN2 injectors have DLLA nozzles that work up to a pressure of **1600 bar** (**23200 psi**), for engines less powerful than **152 kW** (**207 Hp**), DSLA nozzles are fitted which work at pressures up to **1450 bar** (**21025 psi**).

Description of system

The injection system is composed of an electrical part and a hydraulic part.

Electrical system

The electronic control unit monitors engine control parameters by means of the various sensors on the engine.

Air pressure/temperature system

It is a component integrating a temperature sensor and a pressure sensor. Fitted on the intake manifold, it measures the maximum inlet air capacity to calculate precisely the fuel quantity to inject at every cycle. The outlet voltage is proportional to the pressure or temperature obtained by the sensor.

Engine oil temperature and pressure sensor

Same as the air pressure/temperature sensor, it is fitted on the engine oil filter base, in a horizontal position. It measures engine oil temperature and pressure.

Fuel pressure sensor

Assembled on a rail end, it measures the fuel pressure in the rail in order to determine the injection pressure. The injection pressure value is used to control the pressure and to determine the electric injection control length.

Coolant temperature sensor

It is a variable resistance sensor suitable to measure the coolant temperature to provide the control unit with an index of the engine thermal state.

Output shaft sensor

It is an inductive sensor placed on the engine rear left part. It generates signals obtained from magnetic flow lines that are closed through holes obtained on the keyed gear on the camshaft. The signal generated by this sensor is

Fuel injectors - Overview

F4HFE413A*A005	
F4HFE413C*A	
F4HFE413D*A008	
F4HFE413H*A	
F4HFE413J*A	
F4HFE413L*A007	
F4HFE413M*A005	
F4HFE413P*A001	
F4HFE6131*A	
F4HFE6132*A004	
F4HFE6138*A002	
F4HFE613F*A002	
F4HFE613G*A	
F4HFE613H*A	
F4HFE613J*A007	
F4HFE613J*A	
F4HFE613K*A	
F4HFE613P*A	
F4HFE613R*A	
F4HFE613T*A004	
F4HFE613T*A005	
F4HFE613U*A005	
F4HFE613U*A006	
F4HFE613V*A003	
F4HFE613X*A	
F4HFE613Y*A	
F4HFE613Z*A005	
F4HFE613Z*A006	
F4HFE614E*A001	

On NEF TIER IV engines, BOSCH - CRIN2 electro-injectors with 8 hole DLLA type jets with a flow rate of 550 CCM / 30 SEC **@ 100 bar** (**1450 psi**).

The injector is composed of two main parts:

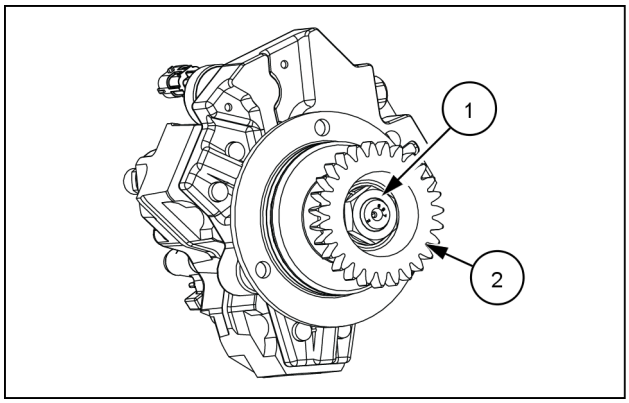
- Actuator - spray nozzle composed of a pressure rod, plunger, and nozzle.
- Control solenoid valve composed of a coil, and pilot valve.

The solenoid valve controls spray nozzle plunger lift.

High pressure pump - Install

Prior operation:
High pressure pump - Remove (10.218)

1. Install the high pressure pump gear **(2)** onto the high pressure pump shaft.
2. Install the shaft nut **(1)** on the high pressure pump shaft.
3. Torque the shaft nut **(1)** to **100 - 110 N·m** (**74 - 81 lb ft**).



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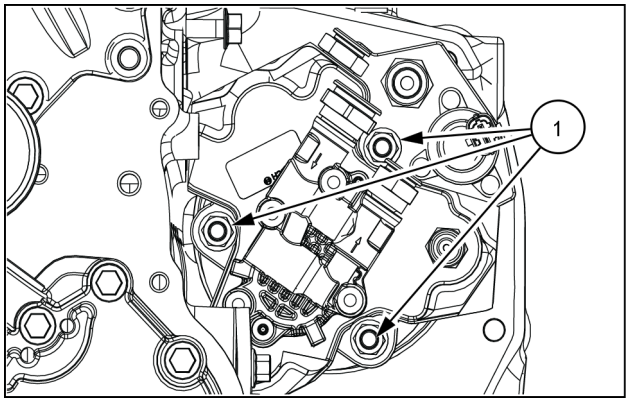
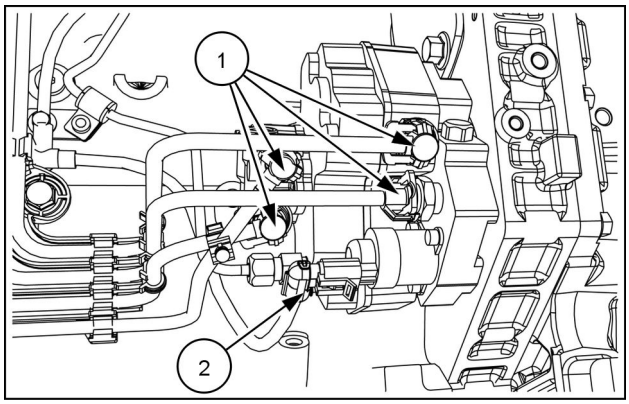
4. Position the high pressure pump with the feed pump together, into place on the rear cover.
5. Secure the pump to the rear cover with the three mounting nuts **(1)**.
6. Torque the mounting nuts **(1)** to **20.0 - 28.0 N·m** (**14.8 - 20.7 lb ft**).



NHIL15ENG0136AA 2

7. Connect all fuel lines **(1)** to the high pressure pump.
8. Torque the fuel lines to **18 - 22 N·m** (**13 - 16 lb ft**).
9. Connect the electrical connection **(2)**.



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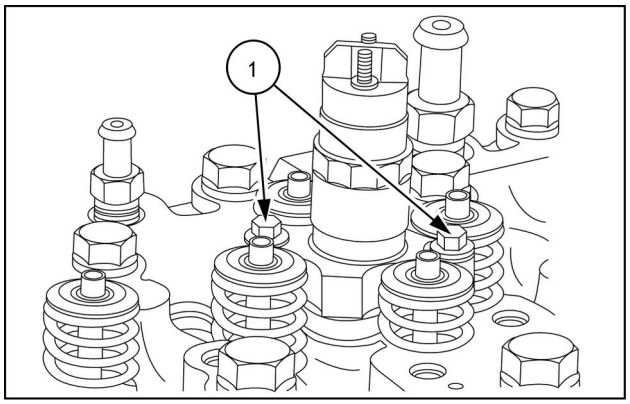
Fuel injectors - Remove

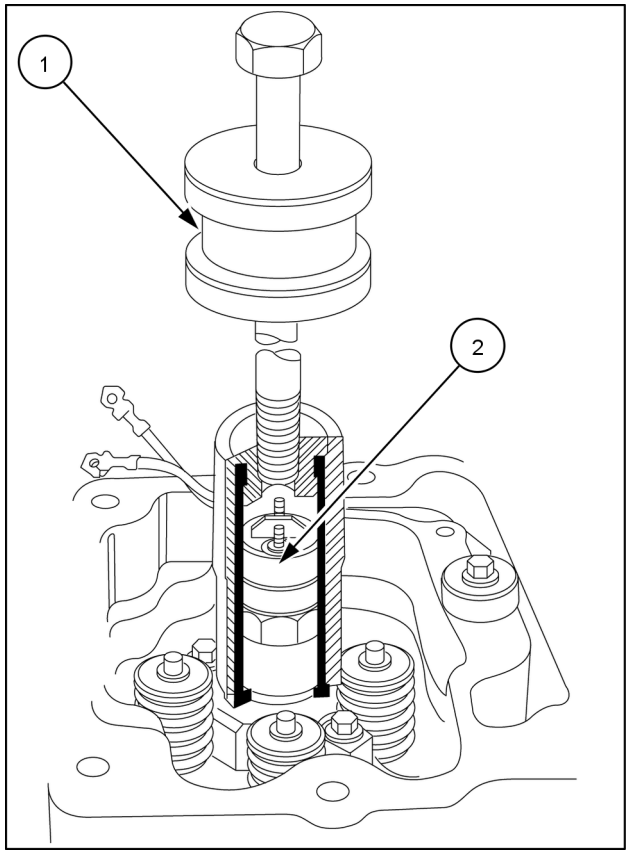
Prior operation:
Fuel injectors Cross tube - Remove (10.218)

1. Disconnect the wires from the injector solenoid.
2. Remove the injector hold-down bolts **(1)**.



NHIL13ENG0600AA 1

3. Install tool **380001099 (1)** around the injector body.
4. Remove the injector **(2)** from the cylinder head.



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Turbocharger
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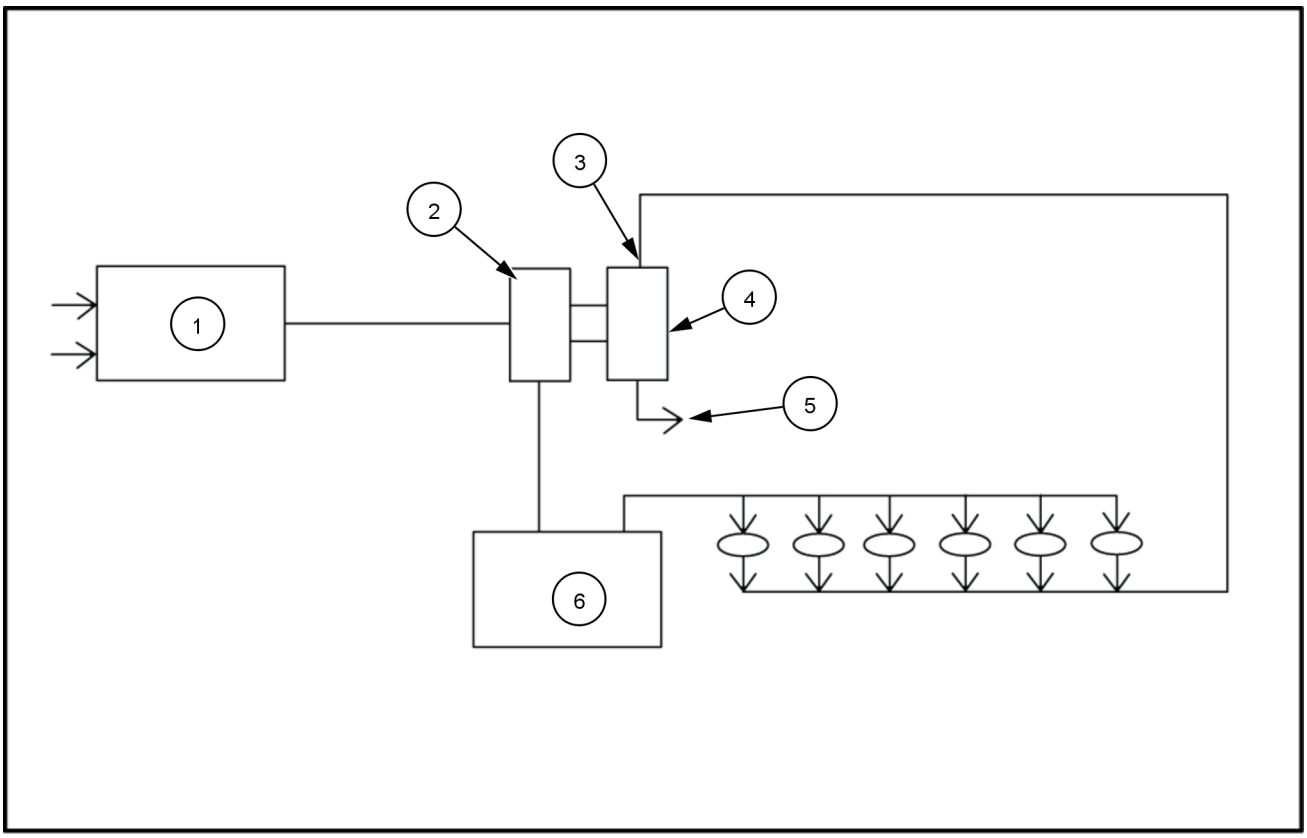
Intake and exhaust manifolds and muffler - Overview



NHIL13ENG0620AA 1

(1) Air filter
(2) Turbocharger compressor
(3) Exhaust gas inlet to the turbocharger
(4) Turbocharger turbine
(5) Muffler (Turbocharger exhaust gas outlet)
(6) Intercooler

During the engine working process, the exhaust flow **(3)** to the turbocharger will actuate the turbine **(4)**. The turbine will the start to turn the compressor **(2)** wheel. The intake system will to draw in air. As the air passes through the air filter **(1)** housing, it is then directed into the compressor housing. The compressed air will exit the turbocharger, and to the intercooler **(6)**. The cooled air is then directed into the intake manifold. The cooler the intake air is, the more dense the air will be entering the cylinder. More air in the cylinder allows for more fuel to be added. This will generate increased power during the combustion process.

After the combustion process, the exhaust manifold will collect the fuel gases from the cylinder. A wastegate is installed before the turbine which diverts exhaust flow from the turbine to the muffler **(5)**. This prevents excessive boost pressure which could lead to mechanical failure.

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Selective Catalytic Reduction (SCR) exhaust treatment
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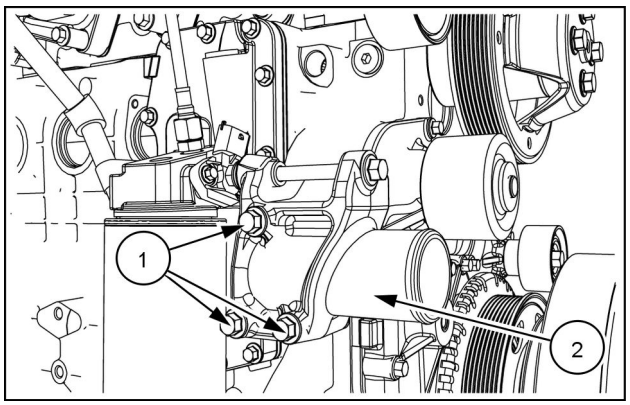
Water pump Water manifold - Remove

F4HFE413A*A005	
F4HFE413C*A	
F4HFE413D*A008	
F4HFE413H*A	
F4HFE413J*A	
F4HFE413L*A007	
F4HFE413M*A005	
F4HFE413P*A001	
F4HFE6131*A	
F4HFE6132*A004	
F4HFE6138*A002	
F4HFE613F*A002	
F4HFE613G*A	
F4HFE613H*A	
F4HFE613J*A007	
F4HFE613J*A	
F4HFE613K*A	
F4HFE613P*A	
F4HFE613R*A	
F4HFE613T*A004	
F4HFE613T*A005	
F4HFE613U*A005	
F4HFE613U*A006	
F4HFE613V*A003	
F4HFE613X*A	
F4HFE613Y*A	
F4HFE613Z*A005	
F4HFE613Z*A006	
F4HFE614E*A001	

Prior operation:
Alternator - Remove (55.301)

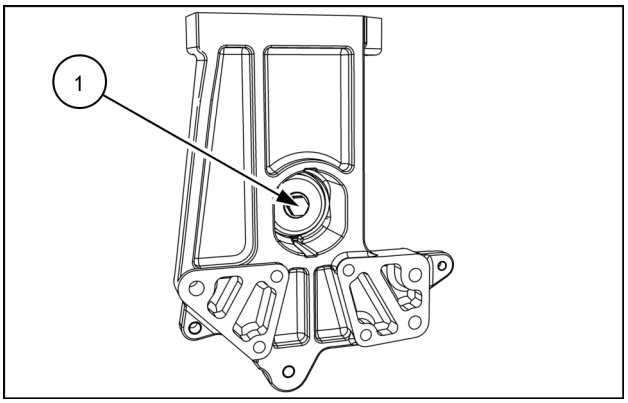
1. Remove the retaining bolts **(1)**.
2. Remove the water manifold **(2)**.



NHIL13ENG1350AA 1

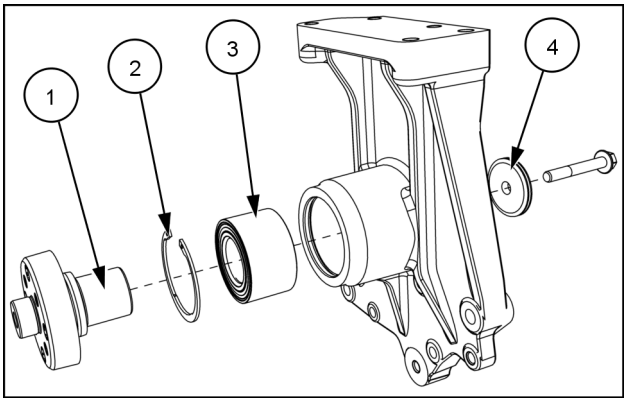
Fan and drive - Disassemble - Fan support

1. Remove the bolt **(1)**.



NHVM14ENG0342AA 1

2. Remove the retainer plate **(4)** and hub **(1)**.
3. Remove the snap ring **(2)**.
4. Remove the ball bearing **(3)**.



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- Spray nozzle - Install . . . 20

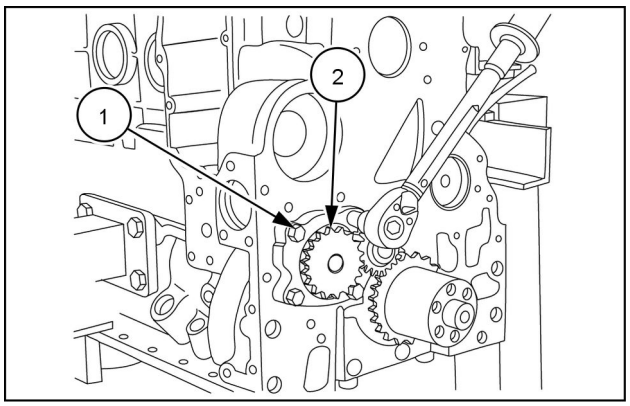
(*) See content for specific models

Engine oil pump Gear driven - Install

F4HFE413A*A005	
F4HFE413C*A	
F4HFE413D*A008	
F4HFE413H*A	
F4HFE413J*A	
F4HFE413L*A007	
F4HFE413M*A005	
F4HFE413P*A001	
F4HFE6131*A	
F4HFE6132*A004	
F4HFE6138*A002	
F4HFE613F*A002	
F4HFE613G*A	
F4HFE613H*A	
F4HFE613J*A007	
F4HFE613J*A	
F4HFE613K*A	
F4HFE613P*A	
F4HFE613R*A	
F4HFE613T*A004	
F4HFE613T*A005	
F4HFE613U*A005	
F4HFE613U*A006	
F4HFE613V*A003	
F4HFE613X*A	
F4HFE613Y*A	
F4HFE613Z*A005	
F4HFE613Z*A006	
F4HFE614E*A001	

Prior operation:
Engine oil pump Gear driven - Remove (10.304)

1. Install the oil pump **(2)** onto the engine block.
2. Torque the bolts **(1)** in two stages:
   - Stage 1: **7 - 9 N·m** (**62 - 80 lb in**)
   - Stage 2: **20 - 28 N·m** (**15 - 21 lb ft**)



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[55.012] Engine cooling system 55.8

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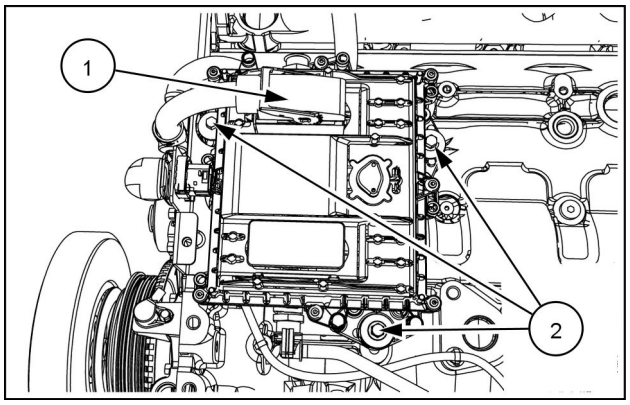
Engine Control Unit (ECU) - Install

Prior operation:
Engine Control Unit (ECU) - Remove (55.015)

1. Install the Engine Control Unit (ECU) and cooling plate on the side of the engine block.
2. Install the retaining bolts **(2)** and rubber isolators.

NOTE: *If the rubber isolators are cracked or excessively deformed, replace them before installation.*

3. Torque the bolts to **8 - 12 N·m** (**71 - 106 lb in**).
4. Connect the main wiring harness **(1)** to the ECU.



NHIL13ENG1411AA 1

1. Disconnect the engine cable from the following connectors:
   - Electro-injector connector **(1)**
   - Air pressure/temperature sensor **(3)**
   - Fuel pressure sensor **(10)**
   - Engine control module **(7)**
   - High pressure pump sensor **(6)**
   - Timing system sensor **(4)**
   - Coolant temperature sensor **(11)**
   - Driving shaft sensor **(8)**
2. Remove the engine wire harness from the engine block by removing the holding clamps.

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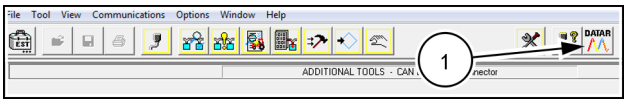
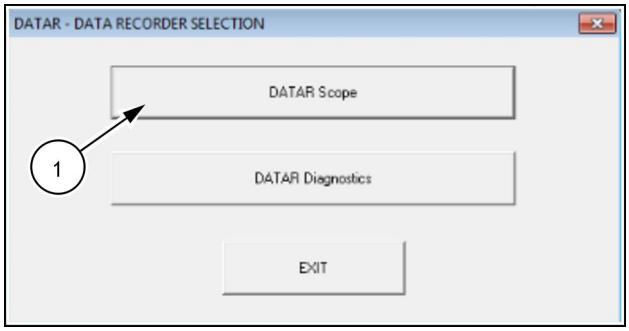
Fuel injection system - Test using DATAR

1. Select the **DATAR** application **(1)** in the Electronic Service Tool (EST).



NHIL15ENG0249AA 1

2. Once the **DATAR** screen is open, select the 'Datar Scope' **(1)**.



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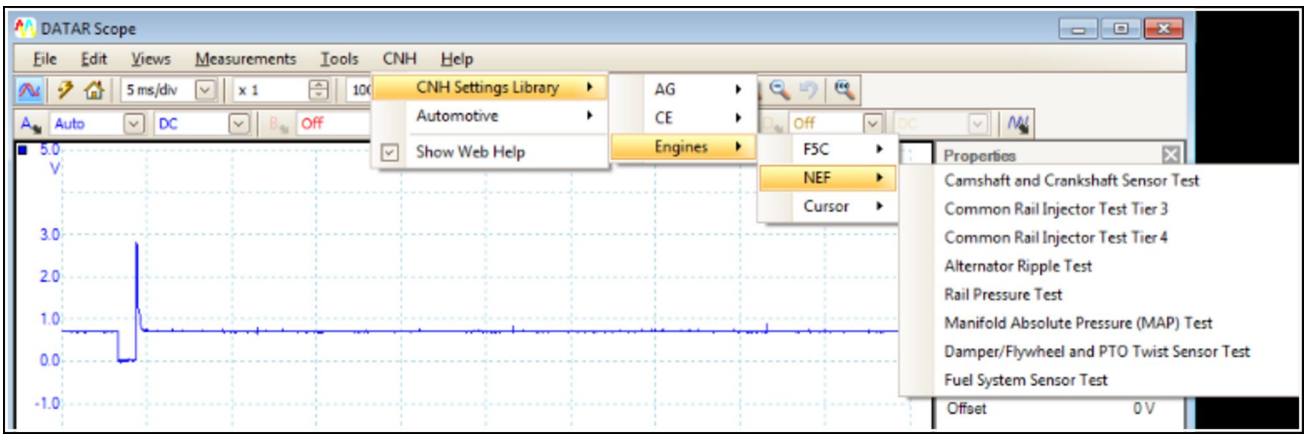
3.
   - Select 'CNH' from the tool bar.
   - Select 'CNH Settings Library'.
   - Select 'Engines'.
   - Select 'NEF'.



NHIL15ENG0251AA 3

4. **DATAR** can perform the following fuel system component tests:
   - 'Common Rail Injector Test'
   - 'Rail Pressure Test'
   - 'Fuel System Sensor Test'
5. When the test is selected, follow the on-screen instructions.

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