SERVICE MANUAL

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Cursor® 16 SST
Tier 4B (final) and Stage IV
Engine

See the following page for engine model numbers

CNH INDUSTRIAL

Part number 47609713
1st edition English
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Fuse and controller power relay - Testing Auxiliary relay

NOTE: *Use these electrical schematic frames, as needed, to perform testing:*
Wiring harnesses - Electrical schematic sheet 01 - Power and starting (engine schematics) (55.100)
Wiring harnesses - Electrical schematic sheet 02 - Engine control unit (ECU) power and vehicle inputs/outputs (engine schematics) (55.100)
Wiring harnesses - Electrical schematic sheet 04 - Engine - Controller Area Network (CAN) (engine schematics) (55.100)

Test N°1	
Test Point	**Condition** Check for Selective Catalytic Reduction (SCR) sensor control modules supply voltage. **Check** Use a multimeter to check for voltage from the circuit side of the SCR Fuse F-9109 connector **X-9149 pin 1** to chassis ground.
Expected Result	**Result** **12.0 V** **Action** There is an open circuit condition in the SCR sensors harness between the SCR Fuse F-9109 connector **X-9149 pin 1** and the harness splice (SP-9137), wire VE-193B. Locate and repair the open conductor.
Other Result (Possible Cause)	**Result** No voltage **Action** Go to test **2**

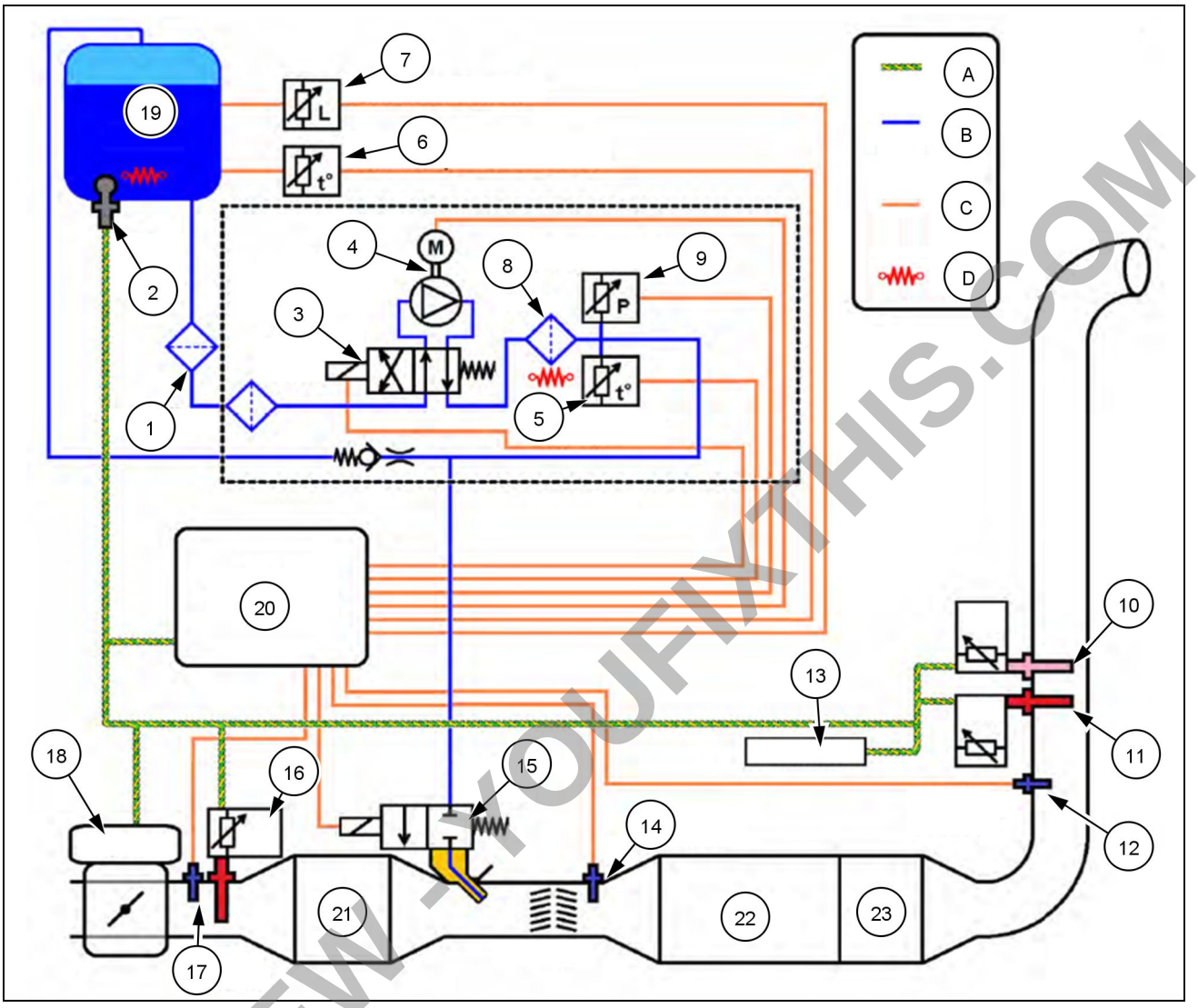
Test N°2	
Test Point	**Condition** Verify condition of the SCR sensor control modules supply voltage fuse F-9109. **Check** Use a multimeter to check for voltage from the circuit side of the SCR Fuse F-9109 connector **X-9173 pin 1** to chassis ground.
Expected Result	**Result** **12.0 V** **Action** Go to test **8**
Other Result (Possible Cause)	**Result** No voltage **Action** Go to test **3**

Test N°3	
Test Point	**Condition** Check for SCR sensor control modules supply voltage. **Check** Use a multimeter to check for voltage from the harness side of the Auxiliary relay K-9107 connector **X-9124 pin 4** to chassis ground.
Expected Result	**Result** **12.0 V** **Action** There is an open circuit condition in the SCR sensors harness between the Auxiliary relay K-9107 connector **X-9124 pin 4** and the SCR Fuse F-9109 connector **X-9173 pin 1**, wire VE-219A. Locate and repair the open conductor.
Other Result (Possible Cause)	**Result** No voltage **Action** Go to test **4**

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Selective Catalytic Reduction (SCR) exhaust treatment - Overview - Hydraulic



NHPH14ENG1098HA 1

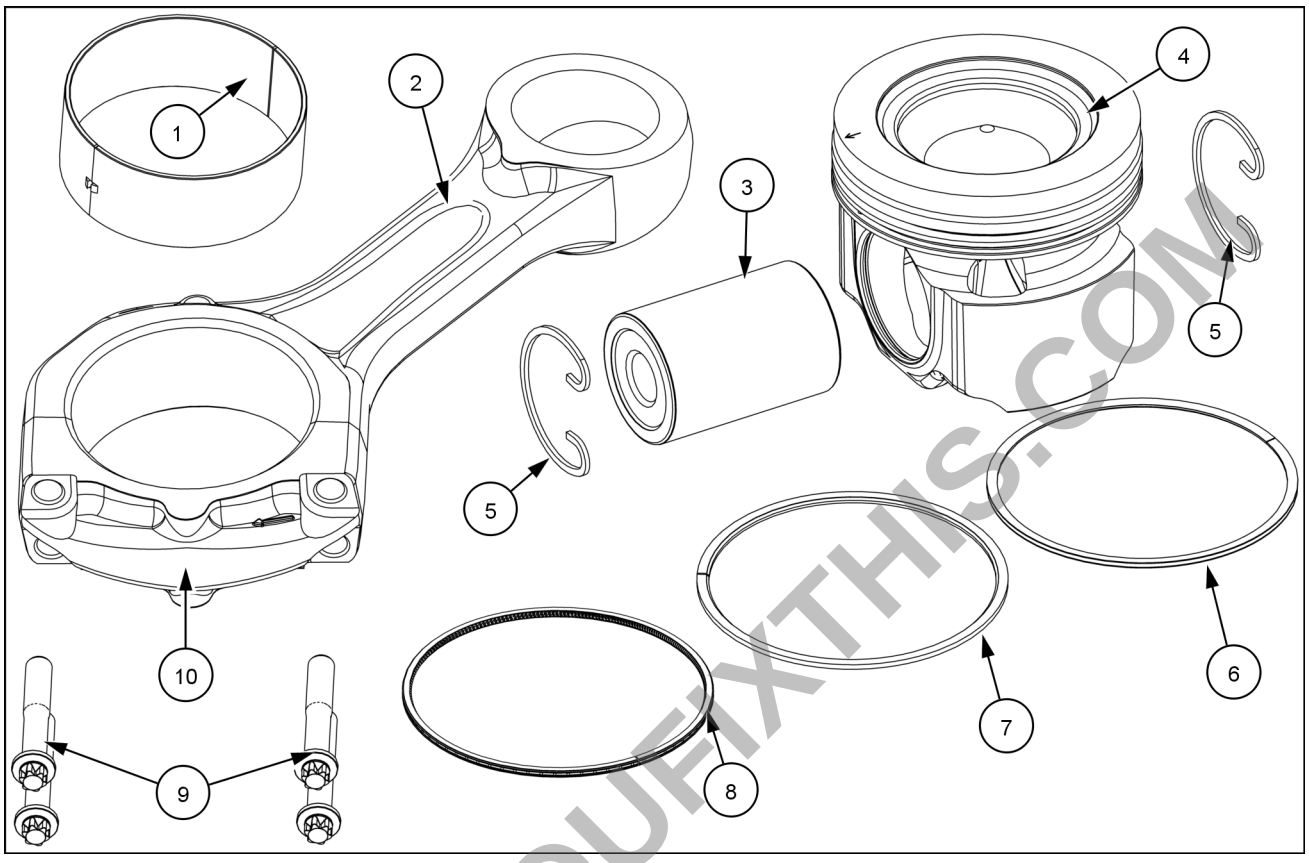
(A) Engine Controller Area Network (CAN)
(B) Diesel Exhaust Fluid (DEF)/AdBlue® plumbing
(C) Electrical wiring
(D) DEF/AdBlue® heater

(1) Pre-filter
(2) DEF/AdBlue® quality sensor
(3) Reverting valve (internal to the supply module)
(4) Supply module
(5) DEF/AdBlue® temperature sensor (internal to the supply module)
(6) DEF/AdBlue® level and temperature sensor (combination sensor)
(7) DEF/AdBlue® level and temperature sensor (combination sensor)
(8) Filter
(9) DEF/AdBlue® pressure sensor (internal to the supply module)
(10) NH_3 sensor
(11) No_x sensor (downstream)
(12) SCR downstream temperature sensor
(13) Controller Area Network (CAN) terminator
(14) SCR upstream temperature sensor
(15) DEF/AdBlue® dosing module injector
(16) No_x sensor (upstream)
(17) Diesel Oxidation Catalyst (DOC) upstream temperature sensor (inlet)
(18) Exhaust flap
(19) DEF/AdBlue® tank
(20) Engine Control Unit (ECU)
(21) Diesel Oxidation Catalyst (DOC)
(22) Selective Catalytic Reduction (SCR)
(23) Clean Up Catalyst (part of the SCR)

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Connecting rod and piston - Overview



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(1) Half bearings
(2) Connecting rod
(3) Piston pin
(4) Piston
(5) Snap ring
(6) Oil control ring
(7) Bevel cut intermediate ring
(8) Trapazoidal combustion ring
(9) Cap bolts
(10) Connecting rod cap

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Torque - Minimum tightening torques for normal assembly

METRIC NON-FLANGED HARDWARE

NOM. SIZE	CLASS 8.8 BOLT and CLASS 8 NUT		CLASS 10.9 BOLT and CLASS 10 NUT		LOCKNUT CL.8 W/CL8.8 BOLT	LOCKNUT CL.10 W/CL10.9 BOLT
	UNPLATED	PLATED W/ZnCr	UNPLATED	PLATED W/ZnCr		
M4	2.2 N·m (19 lb in)	2.9 N·m (26 lb in)	3.2 N·m (28 lb in)	4.2 N·m (37 lb in)	2 N·m (18 lb in)	2.9 N·m (26 lb in)
M5	4.5 N·m (40 lb in)	5.9 N·m (52 lb in)	6.4 N·m (57 lb in)	8.5 N·m (75 lb in)	4 N·m (36 lb in)	5.8 N·m (51 lb in)
M6	7.5 N·m (66 lb in)	10 N·m (89 lb in)	11 N·m (96 lb in)	15 N·m (128 lb in)	6.8 N·m (60 lb in)	10 N·m (89 lb in)
M8	18 N·m (163 lb in)	25 N·m (217 lb in)	26 N·m (234 lb in)	35 N·m (311 lb in)	17 N·m (151 lb in)	24 N·m (212 lb in)
M10	37 N·m (27 lb ft)	49 N·m (36 lb ft)	52 N·m (38 lb ft)	70 N·m (51 lb ft)	33 N·m (25 lb ft)	48 N·m (35 lb ft)
M12	64 N·m (47 lb ft)	85 N·m (63 lb ft)	91 N·m (67 lb ft)	121 N·m (90 lb ft)	58 N·m (43 lb ft)	83 N·m (61 lb ft)
M16	158 N·m (116 lb ft)	210 N·m (155 lb ft)	225 N·m (166 lb ft)	301 N·m (222 lb ft)	143 N·m (106 lb ft)	205 N·m (151 lb ft)
M20	319 N·m (235 lb ft)	425 N·m (313 lb ft)	440 N·m (325 lb ft)	587 N·m (433 lb ft)	290 N·m (214 lb ft)	400 N·m (295 lb ft)
M24	551 N·m (410 lb ft)	735 N·m (500 lb ft)	762 N·m (560 lb ft)	1016 N·m (750 lb ft)	501 N·m (370 lb ft)	693 N·m (510 lb ft)

NOTE: *M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.*

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Engine - Troubleshooting

Problem	Possible Cause	Correction
Engine will not start	An engine no start is defined as an engine that will crank but will not start. The most likely causes of this failure are issues related to the battery, fuel system or low engine compression.	1. Faulty battery, voltage too low 2. Insufficient fuel level 3. Contaminated fuel (water or air) 4. Clogged fuel filter 5. Faulty fuel injectors 6. Faulty glow plugs (if equipped) 7. Faulty fuel lift pump (if equipped) 8. Faulty high pressure pump, (if equipped) 9. Faulty mechanical pump, (if equipped) 10. Low engine compression 11. Engine timing incorrect
The engine starts then stalls	This symptom is usually caused by fuel leakage or a clogged fuel filter.	Visually inspect the fuel system for external leakage. If leakage is found, repair as necessary. Check fuel system pressure for adequate pressure. If fuel pressure is lower than expected, repair as necessary.
Engine will not crank	An engine no-crank condition is defined as an engine that will not crank. Possible failures include a dead or weak battery, an open battery disconnect switch (if equipped) or a starting system failure.	1. Check battery voltage. Charge or replace the battery as necessary. 2. Verify the status of the battery disconnect switch (if equipped). The switch must be closed. 3. Check the starting system for possible failures. Check the starter relay and battery voltage at the starter. Perform a voltage drop test between the battery and the engine starter to check the starter wiring. Repair as necessary.
The engine is difficult to start	The cause of an engine hard start condition is similar to those of an engine no start condition. Failures can include inadequate fuel pressure, air supply, engine compression, faulty glow plugs or incorrect injection timing during start up.	1. Faulty battery, voltage too low. 2. Insufficient fuel level 3. Contaminated fuel (water or air) 4. Clogged fuel filter 5. Faulty fuel injectors 6. Faulty glow plugs (if equipped) 7. Faulty fuel lift pump (if equipped) 8. Faulty high pressure pump 9. Restricted air induction system 10. Low engine compression 11. Engine timing incorrect
Engine has a slow cranking condition	A slow engine crank condition can be caused by a weak battery, worn starter internal engine resistance. Extremely cold operating temperatures can also be a factor in a slow engine crank condition.	1. Load test the battery. Charge or replace the battery as necessary. 2. Perform a voltage drop test on the starting circuit. There should be a drop less than **0.5 V** on both the positive and negative circuits. If the drop is greater than **0.5 V**, repair as necessary. 3. Bench test the starter. If the starter operates slower than expected, replace the starter.

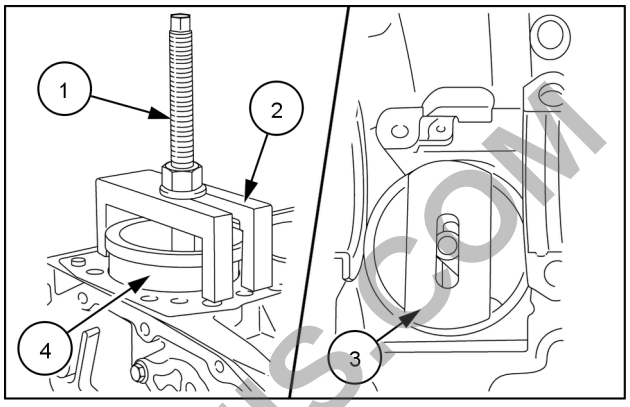
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Crankcase Liner - Remove

Prior operation:
Connecting rod and piston - Remove (10.105)

1. Use tool **380000366 (2)** in conjunction with tool **380000116 (3)** as shown in the figure.
2. Check to make sure the plate **(3)** rests on the cylinder liner correctly.
3. Tighten the nut of the screw **(1)** to extract the cylinder liner **(4)** from the crankcase.



NHIL13ENG1191AA 1

Next operation:
Crankcase Liner - Measure (10.001)

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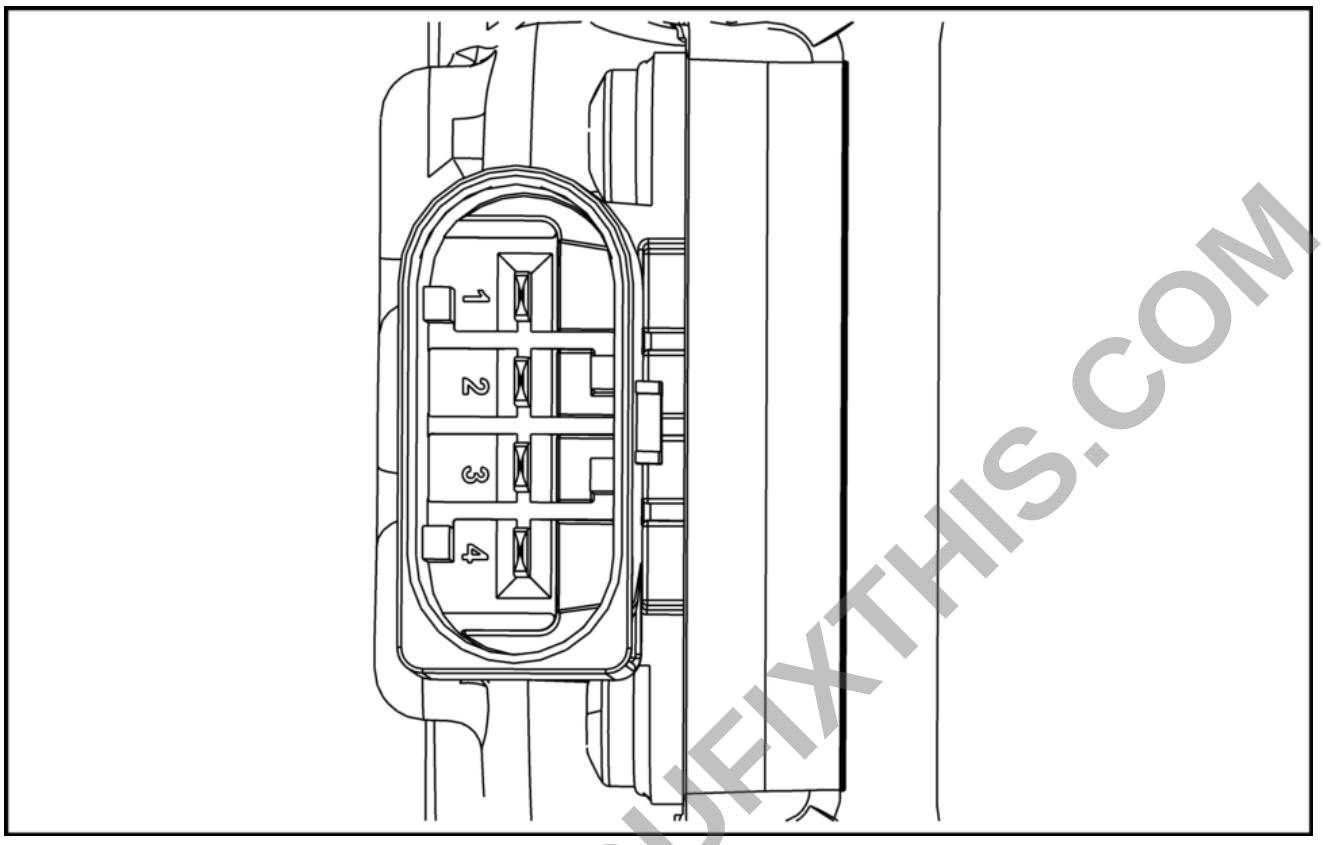
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Engine - Service limits

Engine specifications	
Compression ratio	16.5 : 1
Bore	**141 mm** (**5.55 in**)
Stroke	**170 mm** (**6.69 in**)
Displacement	**15927 cm³**
Turbocharging	Inter-cooled, Direct injection
Turbocharger type	HTT GT 50
Lubrication	Forced by gear pump, relief valve single action
Oil pressure (Warm engine) - Idling - Peak RPM	 **2 bar** (**29 psi**) **4.5 bar** (**65.3 psi**)
Cooling	Liquid cooled
Water pump control	Belt driven
Thermostat (Start of opening)	**83 °C** (**181 °F**)
Intake valve timing - Opens before TDC - Closes after BDC Exhaust valve timing - Opens before BDC - Closes after TDC	 **17 °** **6 °** **50 °** **9 °**
Valve lash setting (when engine is cold) - Intake - Exhaust	 **0.35 mm** (**0.014 in**) **0.55 mm** (**0.022 in**)
Valve lash setting (when engine is warm)	
- Intake	**0.45 mm** (**0.018 in**)
- Exhaust	**0.65 mm** (**0.026 in**)
Firing order	1 - 4 - 2 - 6 - 3 - 5
Injection pressure	**2000 bar** (**29000 psi**)
Injector calibration	**290 - 302 bar** (**4205 - 4379 psi**)
Cylinder block and piston	
Bores for cylinder liners: - Upper - Lower	 **155.85 - 156.15 mm** (**6.14 - 6.15 in**) **154.48 - 154.50 mm** (**6.08 - 6.08 in**)
Cylinder liners external diameter: - Upper - Lower	 **156 mm** (**6.142 in**) **151.890 - 151.915 mm** (**5.980 - 5.981 in**)
Clearance between the OD of liners and ID of bores - Upper - Lower	 **0.014 - 0.039 mm** (**0.001 - 0.002 in**) **0.085 - 0.135 mm** (**0.003 - 0.005 in**)
Cylinder liner - ID - Protrusion	 **141 mm** (**5.551 in**) **0.080 - 0.140 mm** (**0.003 - 0.006 in**)
Pistons - Measuring dimension - External diameter (supplied as spares - External diameter (production only) - Pin bore	 **58 mm** (**2 in**) **136.800 - 138.800 mm** (**5.386 - 5.465 in**) **136.800 - 138.800 mm** (**5.386 - 5.465 in**) **62 - 62.008 mm** (**2.44094 - 2.44126 in**)
OD of piston - ID of cylinder liner	**0.127 - 0.151 mm** (**0.005 - 0.006 in**)
Piston protrusion	**0.12 - 0.42 mm** (**0.005 - 0.017 in**)
Piston pin diameter	**62 mm** (**2.441 in**)
Piston pin OD - pin bore	**0.010 - 0.024 mm** (**0.0004 - 0.0009 in**)
Piston ring grooves - Top	 **2.480 - 2.510 mm** (**0.098 - 0.099 in**)

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Exhaust flap actuator - General specification



NHIL14ENG1189AA 1

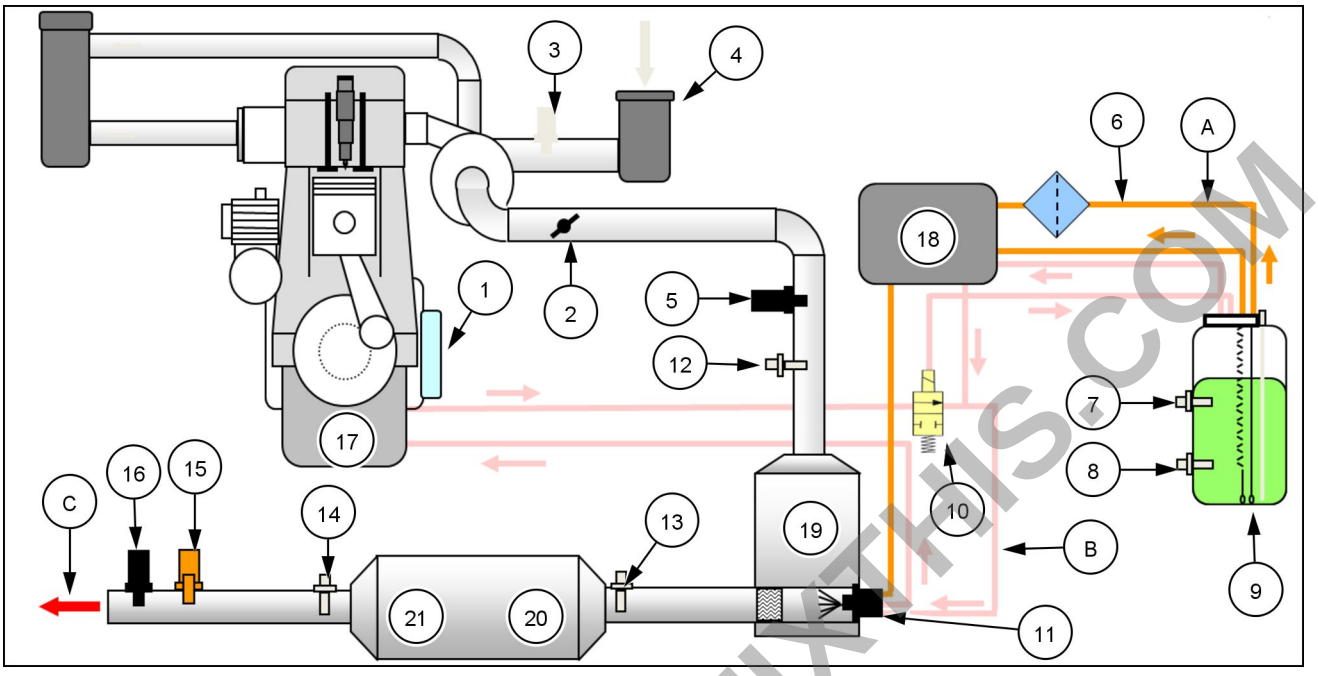
Pin	Description
1	+ Battery
2	Ground
3	CAN Low
4	CAN High

For more information on the exhaust flap, see **Exhaust flap - Overview (10.254)**.

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Selective Catalytic Reduction (SCR) exhaust treatment - Component identification



NHPH14ENG1262FA 1

(A) Diesel Exhaust Fluid (DEF)/AdBlue® flow	**(B)** Coolant line flow	**(C)** Exhaust gas flow

(1) Electronic Control Unit (ECU)
(2) Exhaust flap
(3) Intake air humidity and temperature sensor
(4) Air filter
(5) NOx sensor
(6) DEF/AdBlue® pipes
(7) DEF/AdBlue® level and temperature sensor
(8) DEF/AdBlue® quality sensor
(9) Tank
(10) Coolant control valve
(11) DEF/AdBlue® dosing module
(12) Diesel Oxidation Catalyst (DOC) upstream temperature sensor
(13) Selective Catalytic Reduction (SCR) upstream temperature sensor
(14) SCR downstream temperature sensor
(15) NH3 sensor
(16) NOx sensor
(17) Engine
(18) Supply module
(19) DOC
(20) SCR muffler
(21) Clean-up Catalyst (CUC), internal to the SCR muffler

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[55.640] Electronic modules 55.8
[55.988] Selective Catalytic Reduction (SCR) electrical system 55.9

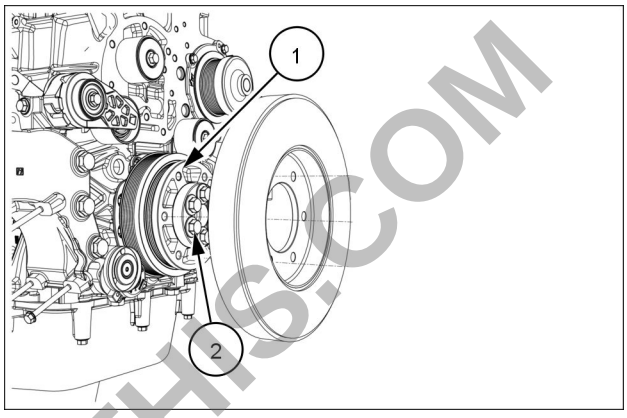
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Crankshaft pulley - Install

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

1. Install the crankshaft pulley **(1)**.
2. Install the bolts **(2)**.
   - Torque to **120.0 N·m** (**88.5 lb ft**).
   - Tighten the screws an additional **60 °**.



NHIL14ENG0352FA 1

Next operation:
Belt - Install (10.414)
Next operation:
Crankshaft damper - Install (10.110)

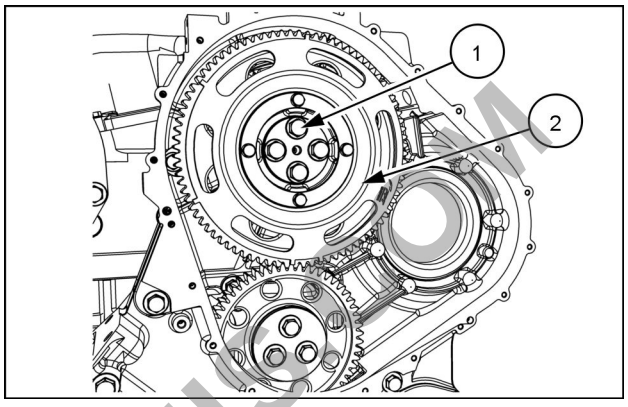
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Camshaft gear - Remove

Prior operation:
Crankcase ventilation system - Remove (10.304)

1. Remove the bolts **(1)** from the camshaft gear **(2)**.
2. Remove the camshaft gear **(2)** fitted with the phonic wheel.



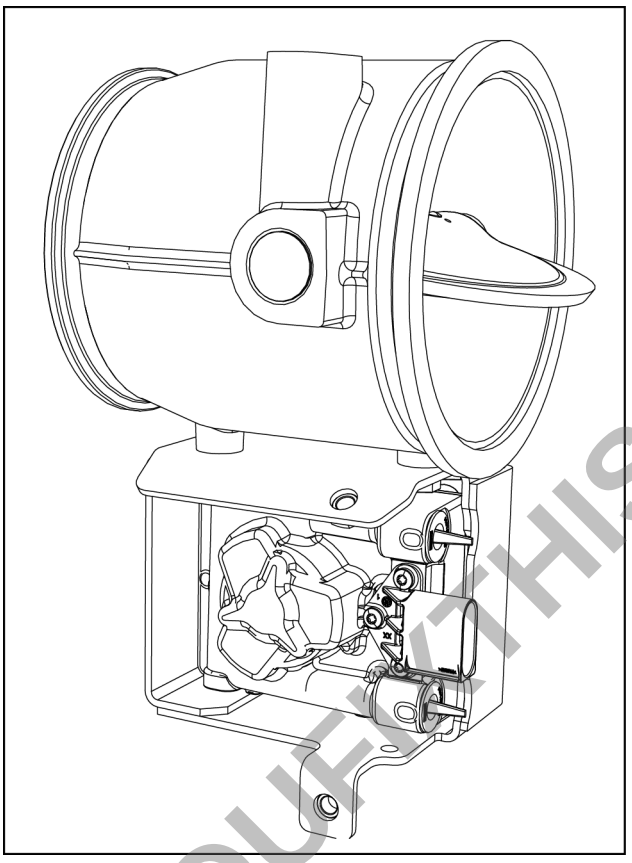
NHIL14ENG0465AA 1

Next operation:
Camshaft - Timing adjust (10.106)

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Exhaust flap - Overview



NHIL14ENG0491BA 1

The exhaust flap is an electrically controlled throttling valve located in the exhaust plumbing at the outlet of the turbocharger. This valve is opened or closed by the Engine Control Unit (ECU) based upon the temperature in the exhaust stream at the Diesel Oxidation Catalyst (DOC) and the Selective Catalytic Reduction (SCR). Data between the exhaust flap and the ECU is transmitted via the engine CAN data bus.

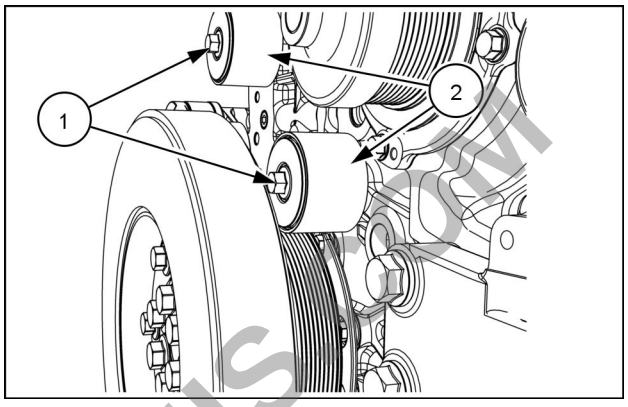
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Idler pulley - Remove

Prior operation:
Belt - Remove (10.414)

1. Remove the M12 x 70 bolts **(1)** from the idler pulleys **(2)**.
2. Remove the idler pulleys **(2)** from the engine block.



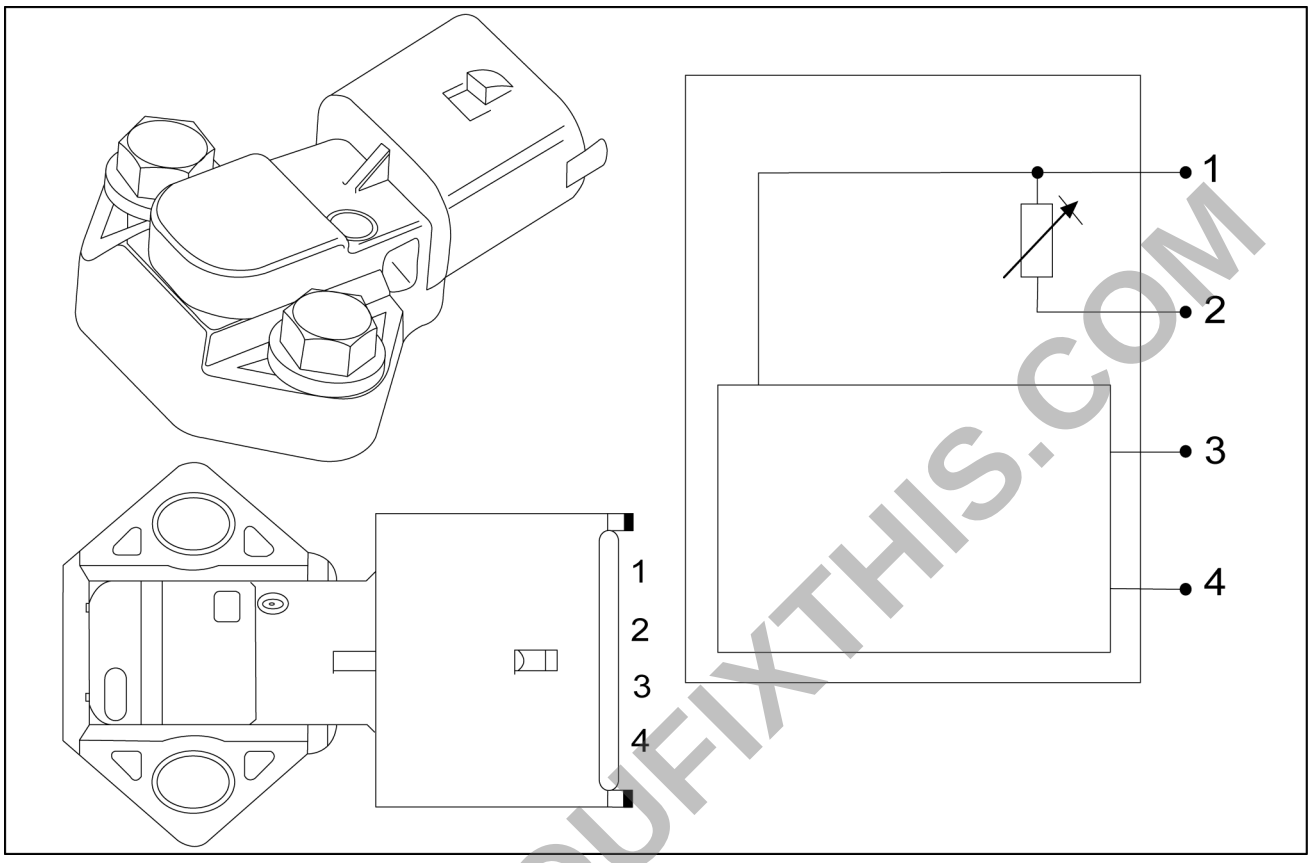
NHIL14ENG0388AA 1

Next operation:
Idler pulley - Install (10.414)

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Intake air pressure and temperature sensor - Overview



NHIL13ENG1325FA 1

This component incorporates a temperature and a pressure sensor.
It is mounted on the intake manifold and measures the maximum supplied air flow rate used to accurately calculate the amount of fuel to be injected at every cycle.
The sensor has a **5 V** supply.
The output voltage is proportional to the pressure or temperature measured by the sensor.

Pin number	Location	Description
25	Sensor connector C	Ground
33	Sensor connector C	Power supply
36	Sensor connector C	Temperature signal
34	Sensor connector C	Pressure signal

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