

Product: Case Vector Tier 2 and Stage II ENGINE Service Manual

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SERVICE MANUAL

Vector Tier 2 and Stage II Engine

See the following page for engine model numbers



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Product: Case Vector Tier 2 and Stage II ENGINE Service Manual
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SERVICE MANUAL

FVAE2884X*B200

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INTRODUCTION

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Foreword

Soil, air, and water quality is important for all industries and life in general. When legislation does not yet rule the treatment of some of the substances that advanced technology requires, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

Familiarize yourself with the relative legislation applicable to your country, and make sure that you understand this legislation. Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti-freeze, cleaning agents, etc., with regard to the effect of these substances on man and nature and how to safely store, use, and dispose of these substances. Your CNH dealer can also provide assistance.

Helpful hints

- Avoid the use of cans or other inappropriate pressurized fuel delivery systems to fill tanks. Such delivery systems may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of these products contain substances that may be harmful to your health.
- Modern oils contain additives. Do not burn contaminated fuels and or waste oils in ordinary heating systems.
- Avoid spillage when you drain fluids such as used engine coolant mixtures, engine oil, hydraulic fluid, brake fluid, etc. Do not mix drained brake fluids or fuels with lubricants. Store all drained fluids safely until you can dispose of the fluids in a proper way that complies with all local legislation and available resources.
- Do not allow coolant mixtures to get into the soil. Collect and dispose of coolant mixtures properly.
- Do not open the air-conditioning system yourself. It contains gases that should not be released into the atmosphere. Your CNH dealer or air-conditioning specialist has a special extractor for this purpose and can recharge the system properly.
- Repair any leaks or defects in the engine cooling system or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.

Battery recycling

Batteries and electric accumulators contain several substances that can have a harmful effect on the environment if the batteries are not properly recycled after use. Improper disposal of batteries can contaminate the soil, groundwater, and waterways. CNH strongly recommends that you return all used batteries to a CNH dealer, who will dispose of the used batteries or recycle the used batteries properly. In some countries, this is a legal requirement.



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Mandatory battery recycling

NOTE: *The following requirements are mandatory in Brazil.*

Batteries are made of lead plates and a sulfuric acid solution. Because batteries contain heavy metals such as lead, CONAMA Resolution 401/2008 requires you to return all used batteries to the battery dealer when you replace any batteries. Do not dispose of batteries in your household garbage.

Points of sale are obliged to:

- Accept the return of your used batteries

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- Store the returned batteries in a suitable location
- Send the returned batteries to the battery manufacturer for recycling

Safety rules

Personal safety



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.

Throughout this manual and on machine decals, you will find the signal words DANGER, WARNING, and CAUTION followed by special instructions. These precautions are intended for the personal safety of you and those working with you.

Read and understand all the safety messages in this manual before you operate or service the machine.

 DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury. The color associated with DANGER is RED.

 WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury. The color associated with WARNING is ORANGE.

 CAUTION, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. The color associated with CAUTION is YELLOW.

FAILURE TO FOLLOW DANGER, WARNING, AND CAUTION MESSAGES COULD RESULT IN DEATH OR SERIOUS INJURY.

Machine safety

NOTICE: Notice indicates a situation which, if not avoided, could result in machine or property damage. The color associated with Notice is BLUE.

Throughout this manual you will find the signal word Notice followed by special instructions to prevent machine or property damage. The word Notice is used to address practices not related to personal safety.

Information

NOTE: Note indicates additional information which clarifies steps, procedures, or other information in this manual.

Throughout this manual you will find the word Note followed by additional information about a step, procedure, or other information in the manual. The word Note is not intended to address personal safety or property damage.

Basic instructions - Important notice regarding equipment servicing

All repair and maintenance work listed in this manual must be carried out only by qualified dealership personnel, strictly complying with the instructions given, and using, whenever possible, the special tools.

Anyone who performs repair and maintenance operations without complying with the procedures provided herein shall be responsible for any subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional, or local dealers, reject any responsibility for damages caused by parts and/or components not approved by the manufacturer, including those used for the servicing or repair of the product manufactured or marketed by the manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the manufacturer in case of damages caused by parts and/or components not approved by the manufacturer.

The information in this manual is up-to-date at the date of the publication. It is the policy of the manufacturer for continuous improvement. Some information could not be updated due to modifications of a technical or commercial type, or changes to the laws and regulations of different countries.

In case of questions, refer to your CNH Sales and Service Networks.

Basic instructions - Shop and assembly

Shimming

For each adjustment operation, select adjusting shims and measure individually using a micrometer, then add up the recorded values. Do not rely on measuring the entire shimming set, which may be incorrect, or the rated value indicated on each shim.

Rotating shaft seals

For correct rotating shaft seal installation, proceed as follows:

- Before assembly, allow the seal to soak in the oil it will be sealing for at least thirty minutes.
- Thoroughly clean the shaft and check that the working surface on the shaft is not damaged.
- Position the sealing lip facing the fluid; with hydrodynamic lips, take into consideration the shaft rotation direction and position the grooves so that they will deviate the fluid towards the inner side of the seal.
- Coat the sealing lip with a thin layer of lubricant (use oil rather than grease) and fill the gap between the sealing lip and the dust lip on double lip seals with grease unless instructed otherwise.
- Insert the seal in its seat and press down using a flat punch or seal installation tool. Do not tap the seal with a hammer or mallet.
- While inserting the seal, check that it is perpendicular to the seat; once settled, make sure that it makes contact with the thrust element, if required.
- To prevent damaging the seal lip on the shaft, position a protective guard during installation operations.

O-ring seals

Lubricate the O-ring seals before inserting them in the seats, this will prevent them from overturning and twisting, which would jeopardize sealing efficiency.

Sealing compounds

Apply one of the following sealing compounds on the mating surfaces when specified: SILMATE® RTV1473, or **LOCTITE® RTV 598™** or **LOCTITE® INSTANT GASKET 587™ BLUE**. Before applying the sealing compound, prepare the surfaces as directed on product container or as follows:

- Remove any incrustations using a metal brush.
- Thoroughly de-grease the surfaces using a locally approved cleaning agent such as safety solvent or brake parts cleaner.

Spare parts

Only use "CNH Original Parts" or " CNH Parts".

Only genuine spare parts guarantee the same quality, duration and safety as original parts, as they are the same parts that are assembled during standard production. Only "CNH Original Parts" or " CNH Parts" can offer this guarantee.

When ordering spare parts, always provide the following information:

- Machine model (commercial name) and serial number
- Part number of the ordered part, which can be found in the "Service Parts Catalogue", used for order processing

Protecting the electrical/electronic systems during charging or welding

⚠ WARNING

Battery acid causes burns. Batteries contain sulfuric acid.

Avoid contact with skin, eyes or clothing. Antidote (external): Flush with water. Antidote (eyes): flush with water for 15 minutes and seek medical attention immediately. Antidote (internal): Drink large quantities of water or milk. Do not induce vomiting. Seek medical attention immediately.

Failure to comply could result in death or serious injury.

W0111A

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 machine or on any attachments on the machine.
 - 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 machine
 - 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 machine with a battery charger.

NOTICE: *If welding must be performed on the unit, the battery ground cable must be disconnected from the machine 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.

Tools

The tools that CNH suggests and illustrated 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.*

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)

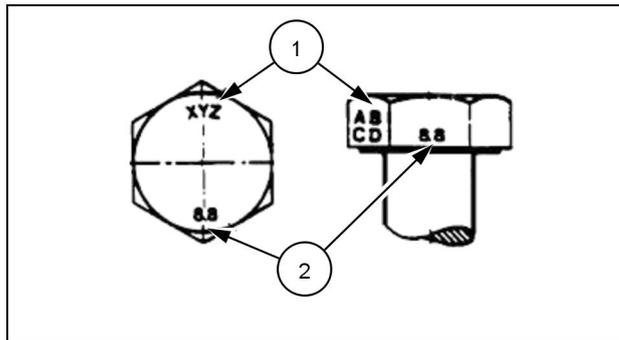
NOTE: M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.

METRIC 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	2.4 N·m (21 lb in)	3.2 N·m (28 lb in)	3.5 N·m (31 lb in)	4.6 N·m (41 lb in)	2.2 N·m (19 lb in)	3.1 N·m (27 lb in)
M5	4.9 N·m (43 lb in)	6.5 N·m (58 lb in)	7.0 N·m (62 lb in)	9.4 N·m (83 lb in)	4.4 N·m (39 lb in)	6.4 N·m (57 lb in)
M6	8.3 N·m (73 lb in)	11 N·m (96 lb in)	12 N·m (105 lb in)	16 N·m (141 lb in)	7.5 N·m (66 lb in)	11 N·m (96 lb in)
M8	20 N·m (179 lb in)	27 N·m (240 lb in)	29 N·m (257 lb in)	39 N·m (343 lb in)	18 N·m (163 lb in)	27 N·m (240 lb in)
M10	40 N·m (30 lb ft)	54 N·m (40 lb ft)	57 N·m (42 lb ft)	77 N·m (56 lb ft)	37 N·m (27 lb ft)	53 N·m (39 lb ft)
M12	70 N·m (52 lb ft)	93 N·m (69 lb ft)	100 N·m (74 lb ft)	134 N·m (98 lb ft)	63 N·m (47 lb ft)	91 N·m (67 lb ft)
M16	174 N·m (128 lb ft)	231 N·m (171 lb ft)	248 N·m (183 lb ft)	331 N·m (244 lb ft)	158 N·m (116 lb ft)	226 N·m (167 lb ft)
M20	350 N·m (259 lb ft)	467 N·m (345 lb ft)	484 N·m (357 lb ft)	645 N·m (476 lb ft)	318 N·m (235 lb ft)	440 N·m (325 lb ft)
M24	607 N·m (447 lb ft)	809 N·m (597 lb ft)	838 N·m (618 lb ft)	1118 N·m (824 lb ft)	552 N·m (407 lb ft)	

IDENTIFICATION

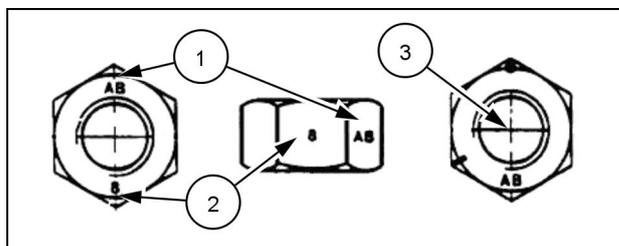
Metric Hex head and carriage bolts, classes 5.6 and up



20083680 1

1. Manufacturer's Identification
2. Property Class

Metric Hex nuts and locknuts, classes 05 and up



20083681 2

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)

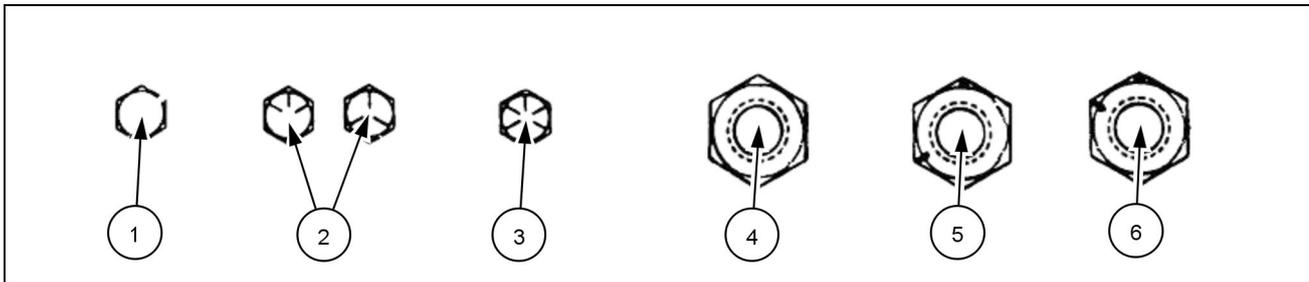
NOTE: For Imperial Units, *1/4 in* and *5/16 in* hardware torque specifications are shown in pound-inches. *3/8 in* through *1 in* hardware torque specifications are shown in pound-feet.

INCH FLANGED HARDWARE

NOM- INAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrF W/ Gr5 BOLT	LOCKNUT GrG W/ Gr8 BOLT
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	9 N·m (80 lb in)	12 N·m (106 lb in)	13 N·m (115 lb in)	17 N·m (150 lb in)	8 N·m (71 lb in)	12 N·m (106 lb in)
5/16	19 N·m (168 lb in)	25 N·m (221 lb in)	26 N·m (230 lb in)	35 N·m (310 lb in)	17 N·m (150 lb in)	24 N·m (212 lb in)
3/8	33 N·m (25 lb ft)	44 N·m (33 lb ft)	47 N·m (35 lb ft)	63 N·m (46 lb ft)	30 N·m (22 lb ft)	43 N·m (32 lb ft)
7/16	53 N·m (39 lb ft)	71 N·m (52 lb ft)	75 N·m (55 lb ft)	100 N·m (74 lb ft)	48 N·m (35 lb ft)	68 N·m (50 lb ft)
1/2	81 N·m (60 lb ft)	108 N·m (80 lb ft)	115 N·m (85 lb ft)	153 N·m (113 lb ft)	74 N·m (55 lb ft)	104 N·m (77 lb ft)
9/16	117 N·m (86 lb ft)	156 N·m (115 lb ft)	165 N·m (122 lb ft)	221 N·m (163 lb ft)	106 N·m (78 lb ft)	157 N·m (116 lb ft)
5/8	162 N·m (119 lb ft)	216 N·m (159 lb ft)	228 N·m (168 lb ft)	304 N·m (225 lb ft)	147 N·m (108 lb ft)	207 N·m (153 lb ft)
3/4	287 N·m (212 lb ft)	383 N·m (282 lb ft)	405 N·m (299 lb ft)	541 N·m (399 lb ft)	261 N·m (193 lb ft)	369 N·m (272 lb ft)
7/8	462 N·m (341 lb ft)	617 N·m (455 lb ft)	653 N·m (482 lb ft)	871 N·m (642 lb ft)	421 N·m (311 lb ft)	594 N·m (438 lb ft)
1	693 N·m (512 lb ft)	925 N·m (682 lb ft)	979 N·m (722 lb ft)	1305 N·m (963 lb ft)	631 N·m (465 lb ft)	890 N·m (656 lb ft)

IDENTIFICATION

Inch Bolts and free-spinning nuts

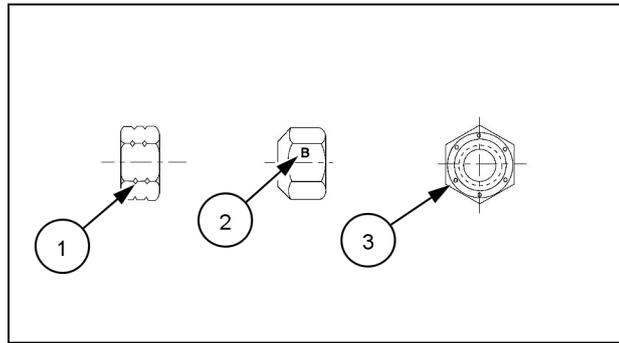


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Grade Marking Examples

SAE Grade Identification			
1	Grade 2 - No Marks	4	Grade 2 Nut - No Marks
2	Grade 5 - Three Marks	5	Grade 5 Nut - Marks 120 ° Apart
3	Grade 8 - Five Marks	6	Grade 8 Nut - Marks 60 ° Apart

Inch Lock Nuts, All Metal (Three optional methods)



20090268 4

Grade Identification

Grade	Corner Marking Method (1)	Flats Marking Method (2)	Clock Marking Method (3)
Grade A	No Notches	No Mark	No Marks
Grade B	One Circumferential Notch	Letter B	Three Marks
Grade C	Two Circumferential Notches	Letter C	Six Marks

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Engine

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Engine and crankcase - 001

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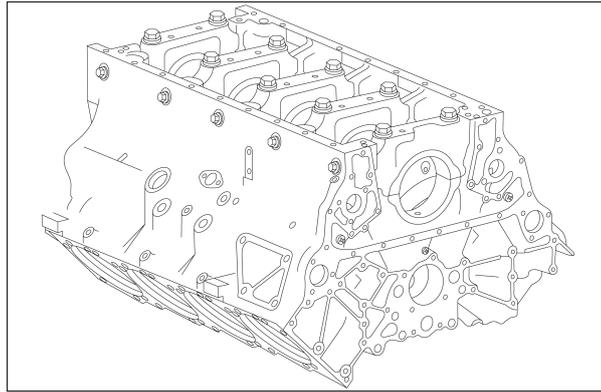
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Engine and crankcase - Service limits



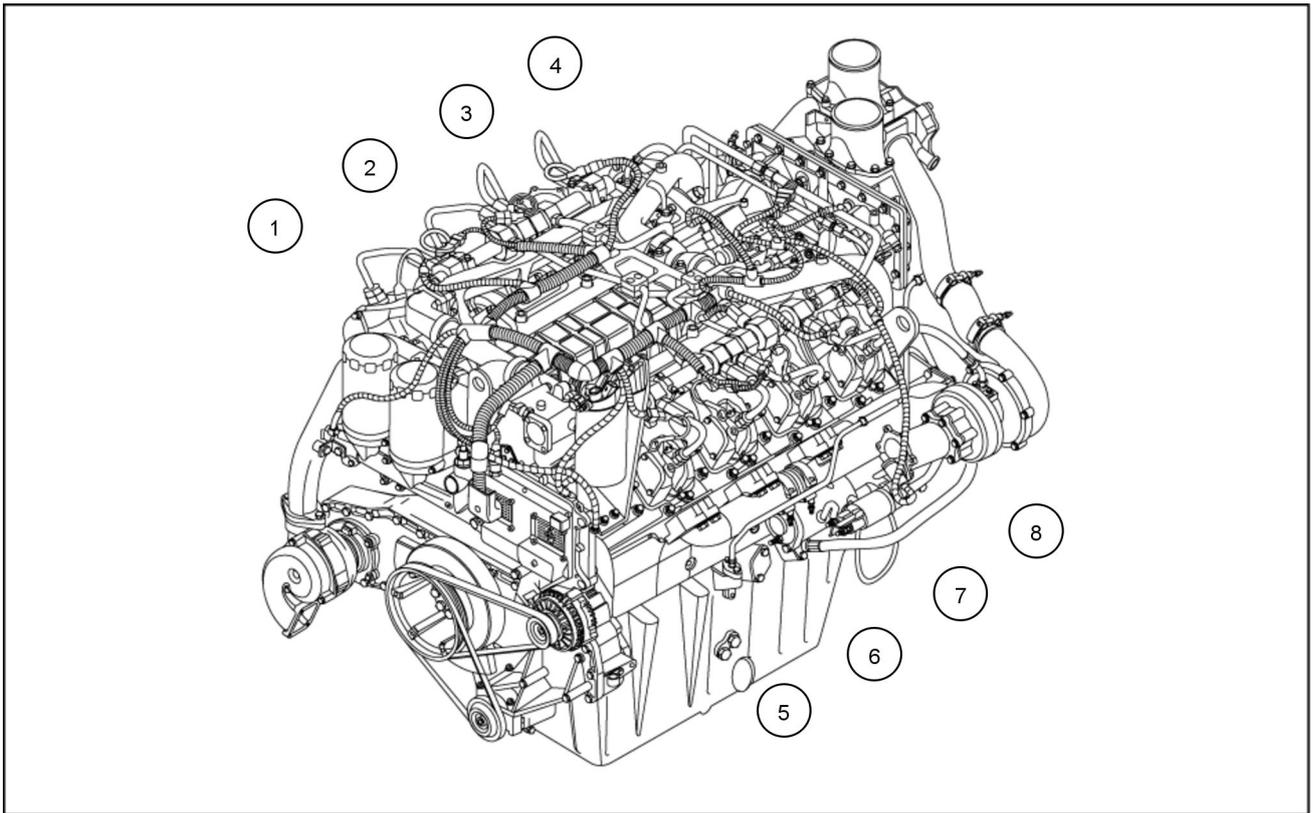
NHIL13ENG0847FA 1

Cylinder liners	
- Inside Diameter (ID)	164.000 - 164.025 mm (6.457 - 6.458 in)
- Outside Diameter (OD)	164.003 - 164.028 mm (6.457 - 6.458 in)
- Length	266.5 - 267.5 mm (10.49 - 10.53 in)
- Protrusion	0.025 - 0.095 mm (0.001 - 0.004 in)
Interference between cylinder liner and crankcase bore	0.028 - 0.022 mm (0.0011 - 0.0009 in)
Clearance between cylinder liner and piston	0.261 - 0.309 mm (0.0103 - 0.0122 in)
Camshaft bushing bore Inside Diameter (ID) for journals 1 and 5	86.000 - 86.030 mm (3.3858 - 3.3870 in)
Camshaft bore Inside Diameter (ID) for journals 2, 3 and 4	-
Interference between camshaft bushings and crankcase bore	0.163 - 0.130 mm (0.006 - 0.005 in)
Tappet bore Inside Diameter (ID)	34.025 - 34.000 mm (1.3396 - 1.3386 in)

Engine - General specification

<p>Engine</p> <ul style="list-style-type: none"> - Cycle - Aspiration - Injection - Compression ratio - Maximum output - Maximum torque - Engine idle (no load) - Peak engine idle (no load) - Bore x stroke - Displacement 	<p>Four stroke diesel Twin turbocharged with intercooler Direct 16:1 565 kW (768 Hp) @ 2100 RPM 3531.9 N·m (2605.0 lb ft) @ 1500 RPM 600 RPM 2100 RPM 145 mm x 152 mm (5.7 in x 6.0 in) 20080 cm³ (1225 in³)</p>
<p>Intake valve timing</p> <ul style="list-style-type: none"> - Start before Top Dead Center (TDC) - End after Bottom Dead Center (BDC) - Valve clearance 	<p>16 ° 25 ° 0.5 mm (0.020 in)</p>
<p>Exhaust valve timing</p> <ul style="list-style-type: none"> - Start before BDC - End after TDC - Valve clearance 	<p>66 ° 15 ° 0.5 mm (0.020 in)</p>
<p>Fuel system</p> <ul style="list-style-type: none"> - Injection type - Electronic control - Firing order 	<p>Bosch High Pressure Common Rail (HPCR) ADEM III 1-3-7-2-6-5-4-8</p>

Engine - Overview Cylinder locations



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Cylinder locations

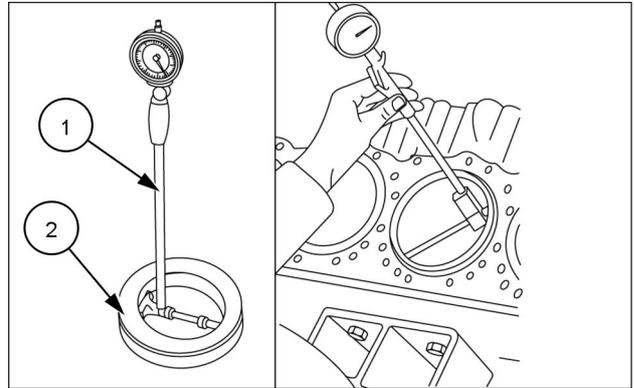
Left side engine cylinders	Right side engine cylinders
5	1
6	2
7	3
8	4

NOTE: The engine cylinder locations are identified as viewed from the flywheel.

Crankcase - Inspect Engine cylinder liner

1. Thoroughly clean the crankcase.
2. Check the crankcase for cracks or defects.
3. Inspect the freeze out plugs for any signs of damage. If they are rusted, or you are unsure that there is a good seal, replace the questionable plug.
4. Inspect cylinder liner surfaces for seizing, scores, out of round, taper, or excessive wear.
5. Measure the cylinder bore using a bore dial gauge (1).

NOTE: The bore dial gauge must be calibrated using a ring gauge (2) or a micrometer that is set to the same diameter as the cylinder bore.



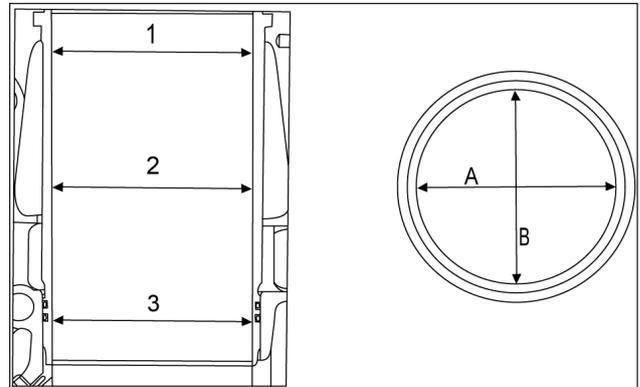
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6. Measurements should be taken at 6 different points of the cylinder bore as shown in the figure.

NOTE: Typical wear occurs on plane (B).

7. Replace the cylinder liner if the measured values exceed **145.000 - 145.030 mm (5.709 - 5.710 in)**.

NOTICE: The internal surface of the cylinder liners are treated with liquid nitride. Grinding, lapping or facing is not permissible.



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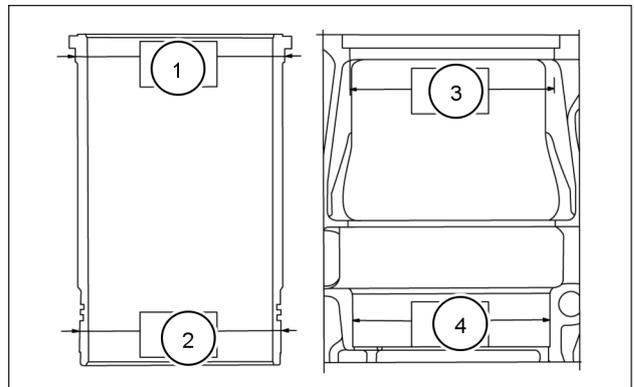
8. Measure the outside diameter of the cylinder liner and the inside diameter of the crankcase bore at the points shown in the figure prior to moving a cylinder liner to a different crankcase bore. Measure values should be as follows:

(1) **164.003 - 164.028 mm (6.4568 - 6.4578 in)**

(2) **161.961 - 161.986 mm (6.3764 - 6.3774 in)**

(3) **164.000 - 164.025 mm (6.4567 - 6.4577 in)**

(4) **162.000 - 162.040 mm (6.3780 - 6.3795 in)**

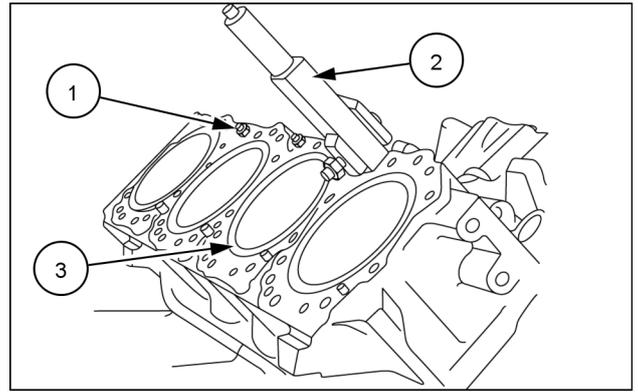


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9. Check the flatness of the crankcase cylinder head mating surface with a straight edge and feeler gauges.
10. Measure the piston protrusion. Refer to **Piston - Measure - Protrusion (10.105)** for the proper procedure.
11. Determine the amount of material that can be removed based on the maximum allowable piston protrusion.

NOTE: Piston protrusion should be between **0.19 - 0.59 mm (0.007 - 0.023 in)**.

12. Remove the cylinder liners (3) and cylinder head locating dowels (1). Use tool (2) prior to machining the surface of the crankcase. Refer to **Crankcase Liner - Remove (10.001)** for the proper procedure.



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