

Product: Case N843 N844 ENGINE Service Manual

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**N843H / N843L / N843 / N844LT /
N844L / N844T / N844
ISM Tier 3
Engine**

SERVICE MANUAL

Part number 47632257

2nd edition English

April 2014

Sample of manual. Download All 316 pages at:

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Replaces part number 84392585

CASE
CONSTRUCTION

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Foreword

This publication contains data, features instructions and methods for performing repair operations on the assembly and its components and is addressed to qualified, specialized personnel.

Check to make sure you have the right publication related to the component you are about to work on before you start. Make sure that you have all the necessary safety equipment: safety glasses, helmet, gloves, footwear, etc. Check that the working lifting and transport equipment is available and in working order. Make sure that vehicle is secured. Proceed by carefully observing the instructions contained in this publication and use the indicated specific tools to ensure correct repair procedures and safety of operators.

NOTE: *This manual applies to multiple applications, therefore images may not all be accurate.*

Foreword - 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.

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 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 that, if not avoided, will result in death or serious injury.

 WARNING indicates a hazardous situation that, if not avoided, could result in death or serious injury.

 CAUTION indicates a hazardous situation that, if not avoided, could result in minor or moderate injury.

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

Machine safety

NOTICE: Notice indicates a situation that, if not avoided, could result in machine or property damage.

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 that 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.

Safety rules - Ecology and the environment

Soil, air, and water are vital factors of agriculture and life in general. When legislation does not yet rule the treatment of some of the substances required by advanced technology, sound judgment should govern the use and disposal of products of a chemical and petrochemical nature.

NOTE: *The following are recommendations that may be of assistance:*

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use, and dispose of these substances.
- Agricultural consultants will, in many cases, be able to help you as well.

Helpful hints

- Avoid filling tanks using cans or inappropriate pressurized fuel delivery systems that may cause considerable spillage.
- In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them 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 draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
- Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil, but should be collected and disposed of 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 will have to recharge the system properly.
- Repair any leaks or defects in the engine cooling or hydraulic system immediately.
- Do not increase the pressure in a pressurized circuit as this may lead to a component failure.
- Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, allowing the loss of oils, coolant, etc.



SERVICE MANUAL

Engine

N843H , N843L , N843 , N844LT , N844L , N844T , N844

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Engine - 10

Engine and crankcase - 001

N843H , N843L , N843 , N844LT , N844L , N844T , N844

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Engine and crankcase - 001

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Engine - General specification

Engine model	N843	N843L
Number of cylinders	3	3
Bore x stroke	84 mm x 90 mm (3.31 in x 3.54 in)	84 mm x 100 mm (3.31 in x 3.94 in)
Displacement	1496 cm³ (91.3 in³)	1662 cm³ (101.4 in³)
Compression ratio	22:1	22.4:1
Engine speed (Low idle no load)	950 - 1050 RPM	950 - 1050 RPM
Engine speed (High idle no load)	3130 - 3180 RPM	3420 - 3500 RPM
PTO engine horsepower	28.3 kW (38.5 Hp)	26.1 kW (35.5 Hp)
Firing order	1-2-3	1-2-3
Cylinder arrangement	In-Line vertical	In-Line vertical
Valve arrangement	Overhead	Overhead
Compression pressure at 200 RPM (cylinder speed)	2944 ± 345 kPa (427 ± 50 psi)	2944 ± 345 kPa (427 ± 50 psi)
Variation between cylinders	345 kPa (50 psi)	345 kPa (50 psi)

NOTE: If bore size exceeds **85.2 mm (3.3543 in)** replace with long block.

Engine - General specification

Engine model	N844	N844T	N844L	N844LT
Number of cylinders	4	4	4	4
Bore x stroke	84 mm x 90 mm (3.31 in x 3.54 in)	84 mm x 90 mm (3.31 in x 3.54 in)	84 mm x 100 mm (3.31 in x 3.94 in)	84 mm x 100 mm (3.31 in x 3.94 in)
Displacement	1995 cm³ (121.7 in³)	1995 cm³ (121.7 in³)	2216 cm³ (135.2 in³)	2216 cm³ (135.2 in³)
Compression ratio	22:1	22:1	22.4:1	22.4:1
Aspiration			Indirect naturally aspirated	Indirect turbocharged with waste gate
Emissions control			N/A	Internal Exhaust Gas Recirculation (EGR)
Engine speed (Low idle no load)	900 - 1000 RPM	900 - 1000 RPM	1200 RPM +/- 50	1050 - 1150 RPM
Engine speed (Rated - full load)			2800 RPM	
Engine speed (High idle no load)	3090 - 3190 RPM	3090 - 3190 RPM	3000 RPM +/- 40	3090 - 3190 RPM
Horsepower @ 2800 RPM	29.8 kW (40.5 Hp)	38.8 kW (52.8 Hp)	35.9 kW (48.8 Hp)	44.1 kW (60.0 Hp)
Peak torque @ 1800 RPM			143 N·m (105.5 lb ft)	171 N·m (126 lb ft)
Firing order	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Cylinder arrangement	In-Line vertical	In-Line vertical	In-Line vertical	In-Line vertical
Valve arrangement	Overhead	Overhead	Overhead	Overhead
Compression pressure at 200 RPM (cylinder speed)	2944 ± 345 kPa (427 ± 50 psi)	2944 ± 345 kPa (427 ± 50 psi)	2944 ± 345 kPa (427 ± 50 psi)	2944 ± 345 kPa (427 ± 50 psi)
Variation between cylinders	345 kPa (50 psi)	345 kPa (50 psi)	345 kPa (50 psi)	345 kPa (50 psi)
Oil filtration	Replaceable full flow spin on cartridge			
Oil capacity with filter			10.4 L (11 US qt)	
Water pump (Style)			Centrifugal	
Water pump (Flow @ rated RPM)			57.5 L/min (15.2 US gpm)	
Injection pump			Bosch In-Line mechanical injection	

NOTE: If bore size exceeds **85.2 mm (3.3543 in)** replace with long block.

Engine - Torque

Connecting rod cap bolts	49 - 54 N·m (36 - 40 lb ft)
Main bearing retaining bolts	49 - 54 N·m (36 - 40 lb ft)
Relief valve assembly	59 - 69 N·m (43 - 51 lb ft)
Crankshaft rear main bearing bolts	25 - 29 N·m (18 - 22 lb ft)
Crankshaft center main bearing bolts	49 - 54 N·m (36 - 40 lb ft)
Engine rear mounting plate	12 - 17 N·m (9 - 12 lb ft)
Flywheel retaining bolts	68 - 78 N·m (51 - 58 lb ft)
Engine front plate	9 - 12 N·m (6 - 9 lb ft)
Crankshaft pulley nut	274 - 333 N·m (202 - 246 lb ft)
Cylinder head bolts	98 - 103 N·m (72.3 - 76 lb ft)
Rocker arm assembly	27 - 39 N·m (20 - 29 lb ft)
Rocker arm locknut	11 - 16 N·m (8 - 12 lb ft)
Oil tube banjo bolt	9 - 13 N·m (7 - 9 lb ft)
Oil pressure switch	14 - 20 N·m (10 - 14 lb ft)
Rocker cover bolts	7 - 12 N·m (6 - 9 lb ft)
Glow plugs	14 - 20 N·m (10 - 14 lb ft)
Cooling fan bolts	9 - 13 N·m (7 - 9 lb ft)
Balancer retaining bolts (4 cylinder models only)	49 - 53.9 N·m (36 - 39 lb ft)

Engine - 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)

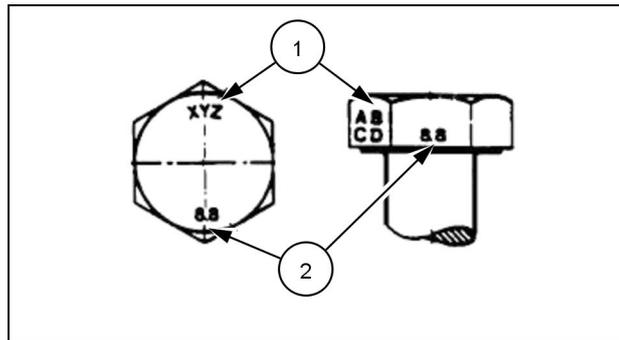
NOTE: M4 through M8 hardware torque specifications are shown in pound-inches. M10 through M24 hardware torque specifications are shown in pound-feet.

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

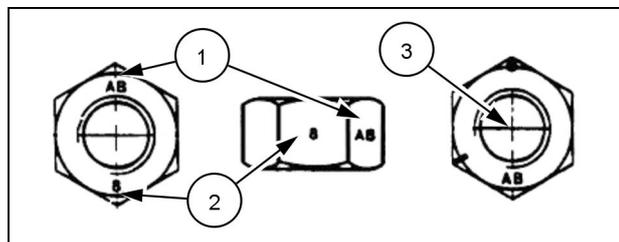


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(1) Manufacturer's Identification

(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

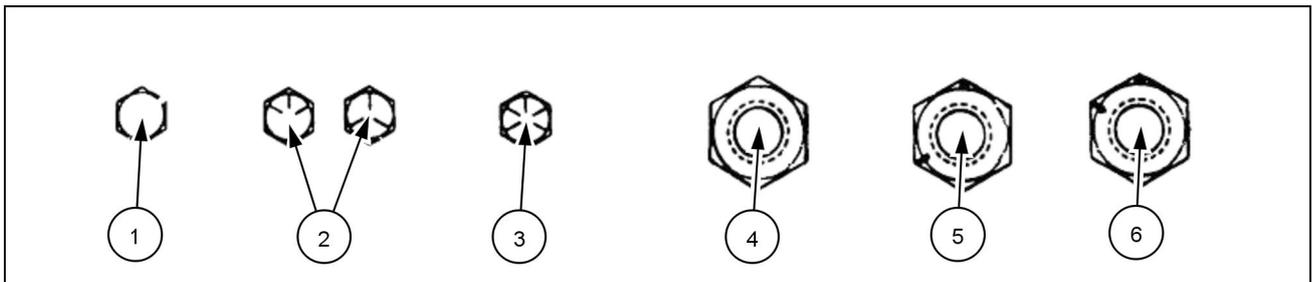
NOMINAL SIZE	SAE GRADE 5 BOLT and NUT		SAE GRADE 8 BOLT and NUT		LOCKNUT GrB W/ Gr5 BOLT	LOCKNUT GrC W/ Gr8 BOLT
	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UN-PLATED or PLATED SILVER	PLATED W/ZnCr GOLD		
1/4	8 N·m (71 lb in)	11 N·m (97 lb in)	12 N·m (106 lb in)	16 N·m (142 lb in)	8.5 N·m (75 lb in)	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)

Inch Bolts and free-spinning nuts

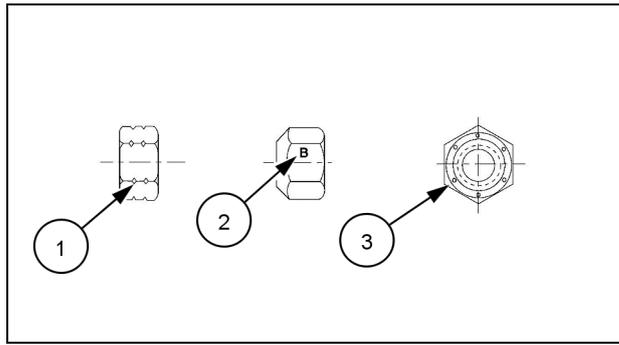


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Grade Marking Examples

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

Engine - Special tools

Tool number	Description
FNH01728	Injector tester
FNH00120	Adapter - Compression tester
FNH01728	Injector adapter set
OEM1074	Compression test gauge assembly
FNH01720	Injector cleaning kit
380002887	Port block installer
FNH11044	Port block installer pins
380002888	Port block remover
FNH00011	Oil pressure test fitting
Micrometer, outside	0 - 25 mm (0 - 1 in)
Micrometer, outside	25 - 51 mm (1 - 2 in)
Micrometer, outside	76.2 - 101.6 mm (3 - 4 in)
Small hole gauge	19 - 25 mm (0.75 - 1 in)
Cylinder bore gauge	76.2 - 101.6 mm (3 - 4 in)
Cylinder bore gauge	25 - 51 mm (1 - 2 in)

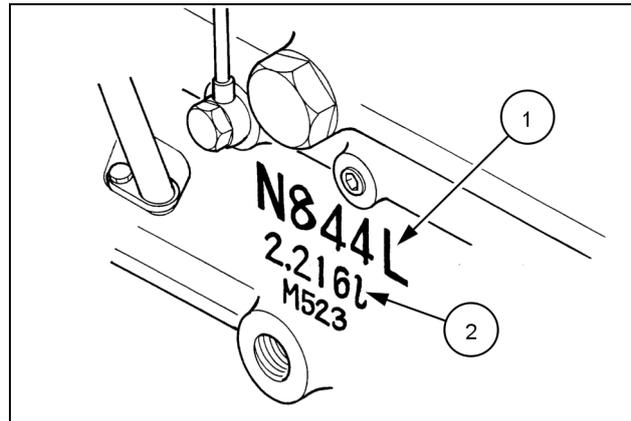
Crankcase - Dimension

Bore	
Standard	84 - 84.019 mm (3.3071 - 3.3078 in)
Head surface warp	
Standard	0.05 mm (0.002 in)
Maximum	0.12 mm (0.005 in)

Engine - Identification

This section describes the engine overhaul and repair procedures. Repair procedures are essentially the same for all models except as noted in the repair procedures.

Numeric value **(2)** under the engine code **(1)** indicates displacement of the engine in liters.

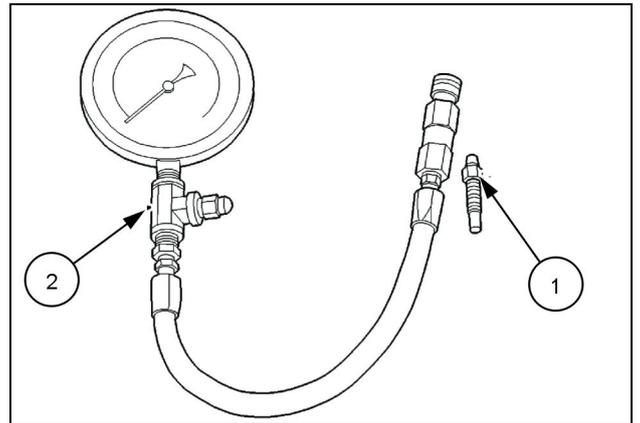


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Engine - Compression test

Compression test is performed through the glow plug ports. The test adapter tool (1), is equipped with quick coupler ends for easy installation of the hose and gauge.

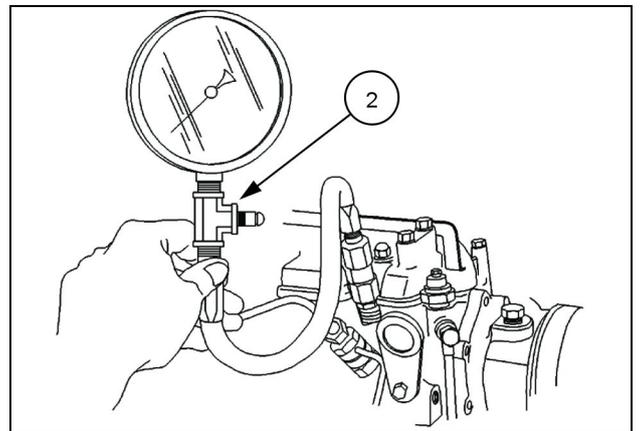
1. Remove the two pin connector from the fuel injection pump solenoid.
2. Remove the glow plug electrical wire and wire connector from top of the glow plugs. Refer to **Cold start aid - Remove - Glow plug (55.202)**.
3. Remove all of the glow plugs.



SECT10C01PG17_1 1

NOTE: Be sure all the glow plugs are removed before starting the compression tests.

4. Install the adapter Tool No. **FNH00120**, hose and gauge assembly **OEM1074 (2)**, in each port and crank the engine until pressure stabilizes. The gauge should read **2944.1 kPa (427 psi)** plus or minus **344.7 kPa (50 psi)**.



SECT10C01PG17_2 2

NOTE: It may be necessary to remove some injector fuel lines to install the adapter tool.

NOTE: There should not be more than **344.7 kPa (50 psi)** variation between the cylinders.

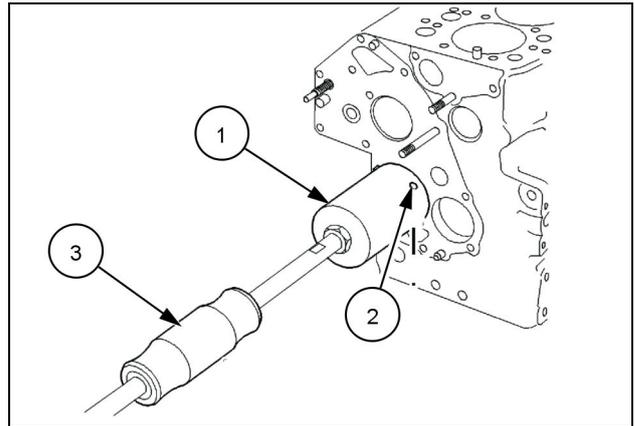
5. Install the glow plugs and electrical connections. Refer to **Cold start aid - Install - Glow plug (55.202)**.

Crankcase - Remove - Port block

1. Use **380002888 (1)** to place the collars in the grooves of the port block assembly.
2. Align the set screws **(2)** of the puller **(1)** with the counter bores in the collars and tighten.
3. Use a slide hammer **(3)** to remove the port block.

NOTE: The oil pump shaft and port block assembly is a press fit in the block.

NOTE: The camshaft gear and the back plate have to be removed from the engine, to provide clearance for the port block removal tool installation.

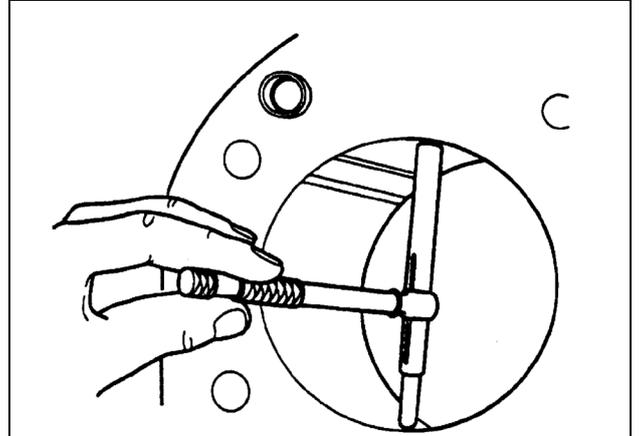


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Crankcase - Inspect

1. Inspect the cylinder block top face for cracks, damage, and warping in the same way as for the cylinder head. Replace the cylinder block if warp is greater than **0.12 mm (0.005 in)**.
2. Visually inspect the cylinder bore. There should be no scoring, rust, or corrosion.
3. Use a telescoping gauge in line with the crankshaft to measure the inside diameter of the top of the bore (approximately **15 mm (0.59 in)** below the top of the block) on the N844L and N844LT. For all other models, measure **10 mm (0.39 in)**.
4. Repeat this measurement at right angles to the crankshaft at the same distance.
5. In line with the crankshaft at the bottom of the bore, measure (approximately **117 mm (4.6 in)** N844L, and **127 mm (5 in)** N844LT) from the top of the cylinder. For all other models, measure **100 mm (3.9 in)**.
6. Repeat this measurement at right angles to the crankshaft at the same distance.
7. If any of the measurements taken indicate worn or damaged cylinder bores, replace engine block with a long block assembly.

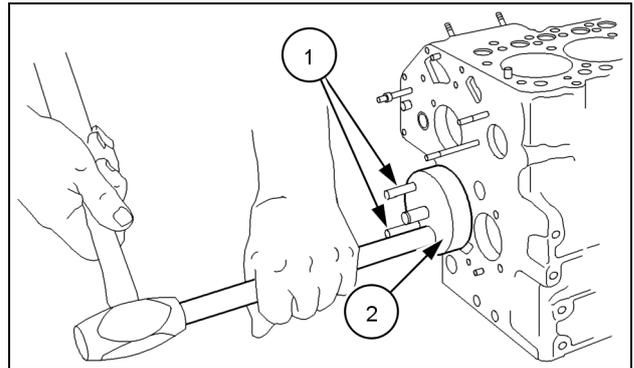
NOTE: If the cylinder bore measures **84.2 mm (3.315 in)**, replace the block assembly.



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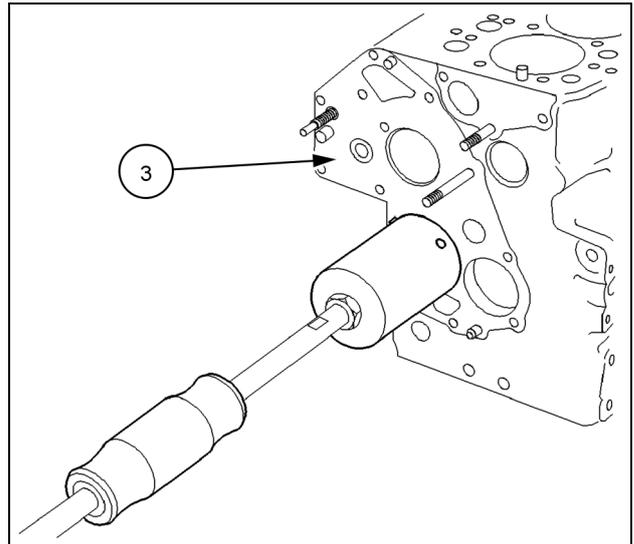
Crankcase - Install - Port block

1. Use **380002887 (2)** to insert the threaded guide pins **(1)** into the cylinder block.
2. Assemble the oil pump shaft to the port block using nut and washer.
3. Insert the port block assembly into the installer and place on the guide pins.
4. Use a suitable driver to install the port block assembly. The installer must bottom against the engine block when fully positioned.



20093399 1

NOTE: Plate **(3)** must be removed from engine block for proper installation of the port block.



20093398 2

Engine - Troubleshooting

Problem	Possible Cause	Correction
Engine does not develop full power	Clogged air cleaner	Inspect and replace air cleaner if necessary
	Fuel line obstructed	Check for crimped fuel line. Inspect fuel lifter for cleanliness
	Improper injection timing	Repair/replace components as required
	Improper nozzle injection pressure and angle	Check injection timing, inspect for proper injection pressure and angle
	Low cylinder compression	Check engine compression
	Insufficient fuel injection	Repair at authorized shop
	Improper valve lash adjustment	Adjust valves to correct tolerances
	Burned, worn or sticking valves	Inspect and replace as necessary
	Blown head gasket	Replace head gasket
	Worn or sticking piston rings	Overhaul as necessary
	Faulty engine stop solenoid	Replace stop solenoid
Low oil pressure	Engine oil level low	Fill to proper level
	Wrong grade of oil	Replace with correct grade oil
	Clogged oil pump filter	Change oil and filter
	Faulty oil pressure relief valve	Replace relief valve
	Worn oil pump drive shaft gears, or broken oil pipe	Inspect oil system and components. Replace defective components
	Excessive main or connecting rod bearing clearances	Replace bearings or shaft if necessary
	Oil pump axial clearance not properly set	Check pump clearance and shim as needed to proper tolerance.
Engine will not stop	Faulty engine stop solenoid	Replace the stop solenoid
	Faulty starter switch	Replace starter switch
Low cylinder compression	Burned, worn or sticking valves	Replace valves
	Bent valve stem	Replace valves
	Broken or weak valve spring	Replace valve spring
	Blown cylinder head gasket	Replace head gasket
	Worn or sticking piston rings	Replace piston rings
	Scored piston	Replace piston
Poor engine idling	Improper injection timing	Correct the injection timing
	Air in injection pump	Purge air from the system
	Improper governor adjustment	Adjust the governor
Oil pressure warning light fails to operate	Bulb burnt out	Replace the bulb
	Oil pressure sensor is faulty	Replace oil pressure sensor
	Warning light circuit faulty	Replace warning light circuit
Engine knocks	Diluted or thin oil	Change engine oil and filter
	Insufficient oil supply	Check engine oil level
	Low oil pressure	Inspect lube system for restrictions
	Worn crankshaft thrust bearing	Replace thrust bearing
	Excessive flywheel runout	Replace flywheel
	Excessive connecting rod or main bearing clearance	Replace bearings
	Seized bearing	Replace bearing and affected component if necessary
	Clogged oil passage	Clean out oil passages
	Bent or twisted connecting rod	Replace connecting rod
	Crankshaft journals out of round	Rework or replace crankshaft
	Excessive piston to cylinder bore clearance	Replace piston with correct oversized piston
	Excessive piston ring side clearance	Replace piston rings
	Broken or damaged ring	Replace piston ring
	Excessive piston pin clearance	Replace piston pin or bushing

Engine - Engine and crankcase

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
Excessive Exhaust Smoke	Burned out fuse	Replace fuse
	Air cleaner dirty or restricted	Replace air cleaner
Engine stops while operating	Excessive fuel delivery	Adjust fuel delivery
	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
Undesirable exhaust color (black or light grey)	Burned out fuse	Replace fuse
	Unsuitable fuel	Replace fuel
	Excess injection	Replace injection pump
	Faulty engine component	Replace as required

Engine - Engine and crankcase

Problem	Possible Cause	Correction
	Over loading	Decrease load
	Clogged air filter	Replace filter
Undesirable exhaust smoke (white or pale)	Excess engine oil	Drain oil to proper oil level
	Improper lubricating oil viscosity	Replace oil with specified viscosity
	Faulty injection timing	Replace injection pump

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