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Section 1

INTRODUCTION

This Service Manual describes the service procedures for the TNV series direct injection engines. These engines are certified by the U.S. EPA, California ARB for industrial use.

Please use this manual for accurate, quick and safe servicing of the engine. Since the directions in this manual are for a typical engine, some specifications and components may be different from your engine. Refer to the documentation supplied by the optional equipment manufacturer for specific service instructions.

YANMAR products are continuously undergoing improvement. This Service Manual might not address possible field modifications to the equipment. Contact an authorized YANMAR industrial engine dealer or distributor for answers to any questions relating to field modifications.

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NOTICE

- Only use the engine oil specified. Other engine oils may affect warranty coverage, cause internal engine components to seize and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine oil. Carefully clean the oil cap/dipstick and the surrounding area before you remove the cap.
- Never mix different types of engine oil. This may adversely affect the lubricating properties of the engine oil.
- Never overfill. Overfilling may result in white exhaust smoke, engine overspeed or internal damage.

NOTICE

- Only use the engine coolant specified. Other engine coolants may affect warranty coverage, cause an internal buildup of rust and scale and/or shorten engine life.
- Prevent dirt and debris from contaminating the engine coolant. Carefully clean the radiator cap and the surrounding area before you remove the cap.
- Never mix different types of engine coolants. This may adversely affect the properties of the engine coolant.

NOTICE

- Never overfill the engine with engine oil.
- Always keep the oil level between the upper and lower lines on the oil cap/dipstick.

NOTICE

For maximum engine life, YANMAR recommends that when shutting the engine down, you allow the engine to idle, without load, for five minutes. This will allow the engine components that operate at high temperatures, such as the turbocharger (if equipped) and exhaust system, to cool slightly before the engine itself is shut down.

NOTICE

Never use an engine starting aid such as ether. Engine damage will result.

NOTICE



- Always be environmentally responsible.
- Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.
- Never dispose of hazardous materials irresponsibly by dumping them into a sewer, on the ground, or into ground water or waterways.
- Failure to follow these procedures may seriously harm the environment.

NOTICE

Never engage the starter motor while the engine is running. This may damage the starter motor pinion and/or ring gear.

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YANMAR LIMITED WARRANTY

What is Covered by this Warranty?

YANMAR warrants to the original retail purchaser that a new YANMAR TNV series industrial engine will be free from defects in material and/or workmanship for the duration of the warranty period.

Note: YANMAR engines may be equipped with external components including, but not limited to: wiring harnesses, electrical devices, control panels, radiators, air filters, fuel filters, and/or exhaust systems that are supplied and/or installed by manufacturers other than YANMAR. For warranty information on such external components, please contact the machine or component manufacturer directly or see your authorized YANMAR dealer or distributor.

This warranty is provided in lieu of all other warranties, express or implied. YANMAR specifically disclaims any implied warranties of merchantability or fitness for a particular purpose, except where such disclaimer is prohibited by law. If such disclaimer is prohibited by law, then implied warranties shall be limited in duration to the life of the express warranty.

How Long is the Warranty Period?

The YANMAR standard limited warranty period runs for a period of **twenty-four (24) months or two-thousand (2000) engine operation hours**, whichever occurs first. An extended limited warranty of thirty-six (36) months or three thousand (3000) engine operating hours, whichever occurs first, is provided for these specific parts only: the cylinder block, cylinder head, crankshaft forging, connecting rods, flywheel, flywheel housing, camshaft, timing gear, and gear case. The warranty period for both the standard limited warranty and the extended limited warranty (by duration or operation hours) begins on the date of delivery to the original retail purchaser and is valid only until the applicable warranted duration has passed or the operation hours are exceeded, whichever comes first.

What the Engine Owner must Do:

If you believe your YANMAR engine has experienced a failure due to a defect in material and/or workmanship, you must contact an authorized YANMAR industrial engine dealer or distributor within thirty (30) days of discovering the failure. You must provide proof of ownership of the engine, proof of the date of the engine purchase and delivery, and documentation of the engine operation hours. Acceptable forms of proof of delivery date include, but are not limited to: the original warranty registration or sales receipts or other documents maintained in the ordinary course of business by YANMAR dealers and/or distributors, indicating the date of delivery of the YANMAR product to the original retail purchaser. This information is necessary to establish whether the YANMAR product is still within the warranty period. Thus, YANMAR strongly recommends you register your engine as soon as possible after purchase in order to facilitate any future warranty matters.

You are responsible for the transportation of the engine to and from the repair location as designated by YANMAR.

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EMISSION SYSTEM WARRANTY

YANMAR CO., LTD. LIMITED EMISSION CONTROL SYSTEM WARRANTY - USA ONLY

Your Warranty Rights and Obligations:

■ **California**

The California Air Resources Board (CARB), the Environmental Protection Agency (EPA) and YANMAR Co., Ltd. hereafter referred to as YANMAR, are pleased to explain the **emission control system warranty**

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Limited emission control system warranty - USA only - continued

Exclusions:

Failures other than those arising from defects in material and/or workmanship are not covered by this warranty. The warranty does not extend to the following: malfunctions caused by abuse, misuse, improper adjustment, modification, alteration, tampering, disconnection, improper or inadequate maintenance or use of non-recommended fuels and lubricating oils; accident-caused damage, and replacement of expendable items made in connection with scheduled maintenance. YANMAR disclaims any responsibility for incidental or consequential damages such as loss of time, inconvenience, loss of use of equipment/engine or commercial loss.

Owner's Warranty Responsibilities:

As the engine owner, you are responsible for the performance of the required maintenance listed in your owner's manual. YANMAR recommends that you retain all documentation, including receipts, covering maintenance on your non-road compression-ignition engine, but YANMAR cannot deny warranty solely for the lack of receipts, or for your failure to ensure the performance of all scheduled maintenance.

YANMAR may deny your warranty coverage of your non-road compression-ignition engine if a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with applicable emissions requirements.

You are responsible for initiating the warranty process. You must present your engine to a YANMAR dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible. If you have any questions regarding your warranty rights and responsibilities, or would like information on the nearest YANMAR dealer or authorized service center, you should contact YANMAR America Corporation.

Website: www.yanmar.com
E-mail: CS support@yanmar.com
Toll free telephone number: 1-800-872-2867, 1-855-416-7091

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⚠ WARNING



To prevent possible eye injury, always wear safety glasses while servicing the engine.

⚠ WARNING

Fume/Burn Hazard!



- Always read and

⚠ WARNING

- Be sure to use the E-ECU in conjunction with the engines whose models or serial numbers are specified by YANMAR.
  Other E-ECU/engine combinations than specified will void the engine warranty.
- Improper use or misuse of the E-ECU may result in death or serious injury due to an abrupt and unexpected increase in engine speed.

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4. Add new engine oil to the engine as specified in *Adding Engine Oil on page 4-18*.

NOTICE

- Never overfill the engine with engine oil.
- Always keep the oil level between the upper and lower lines on the oil cap/dipstick.

5. Warm up the engine by running it for five minutes and check for any engine oil leaks.
6. After engine is warm, shut it off and let it sit for 10 minutes.
7. Recheck the engine oil level.
8. Add engine oil **(Figure 5-3, (5))** as needed until the level is between the upper **(Figure 5-3, (2))** and lower lines **(Figure 5-3, (3))** shown on the dipstick **(Figure 5-3, (1))**.

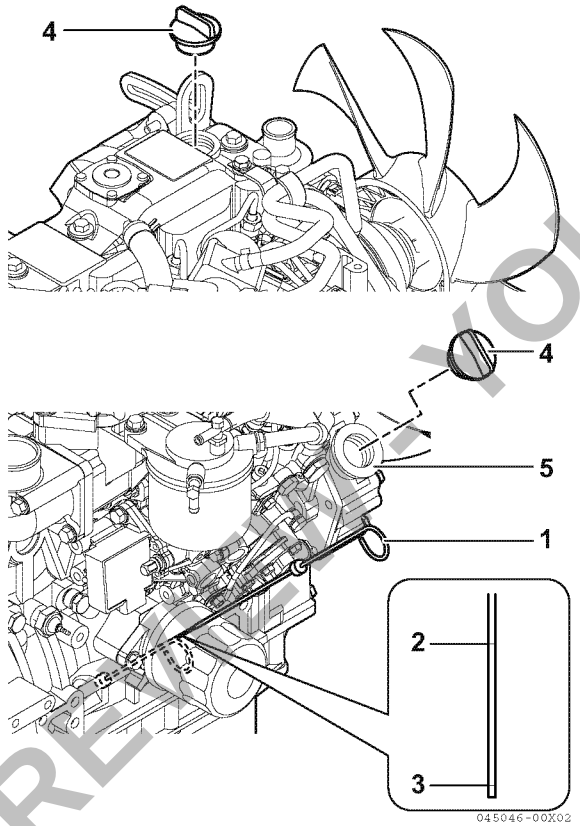


Figure 5-3

9. Reinstall the oil filler cap **(Figure 5-3, (4))**. If any engine oil is spilled, wipe it away with a clean cloth.

■ Check and adjust cooling fan V-belt

The V-belt will slip if it does not have the proper tension. This will prevent the alternator from generating sufficient power. Also, the engine will overheat due to the engine coolant pump pulley slipping.

Check and adjust the V-belt tension (deflection) as follows:

1. Press the V-belt down with your thumb with a force of approximately 22 ft·lb (98 N·m; 10 kgf) to check the deflection.

   There are three positions to check for V-belt tension **(Figure 5-4, (A)**, **(B)** and **(C))**. You can check the tension at whichever position is the most accessible. The proper deflection of a used V-belt at each position is:

Used V-belt tension		
A	**B**	**C**
3/8 - 1/2 in. (10 - 14 mm)	1/4 - 3/8 in. (7 - 10 mm)	5/16 - 1/2 in. (9 - 13 mm)

Note: A "Used V-Belt" refers to a V-belt which has been used on a running engine for five minutes or more.

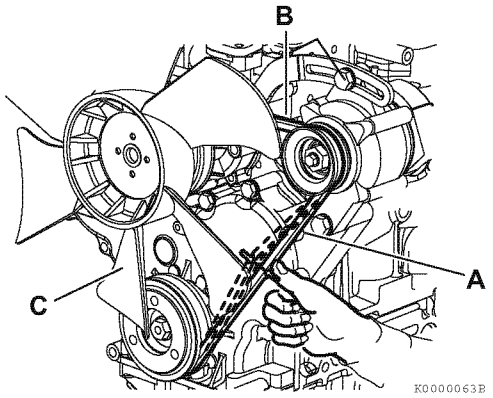
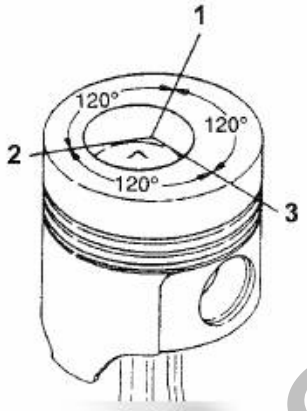


Figure 5-4

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6. Reinstall the oil ring expander **(Figure 6-87, (4))**. Reinstall the oil ring **(Figure 6-87, (3))** with the end gap at 180° from the expander end gap.
7. Reinstall the second compression ring **(Figure 6-87, (2))**. This ring is identified by its dark color and tapered face profile.
8. Reinstall the top compression ring **(Figure 6-87, (1))**. This ring is identified by its silver color and barrel-shaped face profile.



NOTICE

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Reassembly of Oil Pump

1. Apply clean lubricating oil to the lubricating oil pump body and inner rotor assembly as well as to the outer rotor.
2. Insert the outer rotor into the lubricating oil pump body and inner rotor assembly and install the cover.
3. Replace the packing with new one.
4. Install the lubricating oil pump assembly to the gear case flange by tightening the bolts with the specified torque.
5. Install the gear case cover. For more information, *See Installation of gear case cover on page 6-54*.
6. Install the crank shaft pulley.
7. Install the cooling water pump V-pulley **(Figure 9-10, (1))**, spacer **(Figure 9-10, (2))**, cooling water fan **(Figure 9-10, (3))**, and fan guard (if equipped).

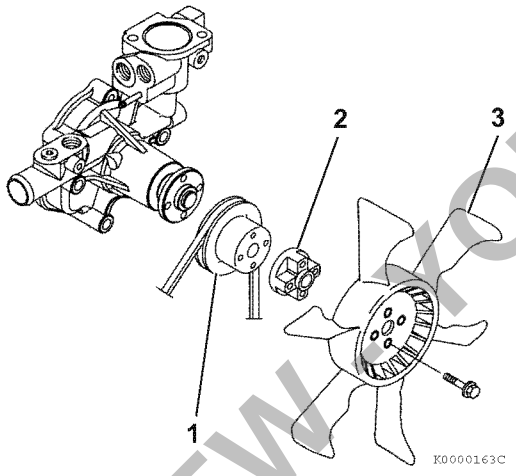


Figure 9-10

8. Install the V-belt. Adjust the belt to uniform tensile strength in accordance with the instructions given in *Check and adjust cooling fan V-belt on page 5-9*.

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