Product: Yanmar Industrial Engine 3TNM74F,3TNV74F,3TNV80F Service Repair Manual
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YANMAR

SERVICE MANUAL

INDUSTRIAL ENGINE

3TNM74F
3TNV74F
3TNV80F

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California Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects, and other reproductive harm.

California Proposition 65 Warning

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and reproductive harm.
Wash hands after handling.

Foreword:

This Service Manual has been developed for the exclusive use of service and repair professionals such as YANMAR authorized distributors and YANMAR authorized dealers. It is written with these professionals in mind and may not contain the necessary detail or safety statements that may be required for a non-professional to perform the service or repair properly and/or safely. Please contact an authorized YANMAR repair or service professional before working on your YANMAR product.

Disclaimers:

All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. Moreover, because of our continuous product improvement policy, we may modify information, illustrations and/or specifications to explain and/or exemplify a product, service or maintenance improvement. We reserve the right to make any change at any time without notice. YANMAR and YANMAR are registered trademarks of YANMAR CO., LTD. in Japan, the United States and/or other countries.

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SERVICE MANUAL	MODEL	3TNM74F, 3TNV74F, 3TNV80F
	CODE	0BTN4-EN0031

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Section 1

INTRODUCTION

This Service Manual describes the service procedures for the TNM and TNV series indirect injection engines. These engines are certified by the U.S. EPA, California ARB and/or the 97/68/EC Directive 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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Section 2

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YANMAR LIMITED WARRANTY

What is Covered by this Warranty?

YANMAR warrants to the original retail purchaser that a new YANMAR TNM and TNV series indirect injection engines 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 expressed 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.

YANMAR Limited Warranty - continued

To Locate an Authorized YANMAR Industrial Engine Dealer or Distributor:

You can locate your nearest authorized YANMAR industrial engine dealer or distributor by visiting the YANMAR CO., LTD. website at:

https://www.yanmar.com/global/ (The English language page will be displayed.)

- “Click” on “Dealer Locator” in the website heading to view the “Dealer Locator” menu.
- Choose the Country from the pull down menu.
- Choose the Product Category from the pull down menu.
- “Click” on “Search” to browse YANMAR dealer or distributor.

You may also contact YANMAR by clicking on “Contact” icon in the website heading and typing in your question or comment.

What YANMAR will Do:

YANMAR warrants to the original retail purchaser of a new YANMAR engine that YANMAR will make such repairs and/or replacements at YANMAR’s option, of any parts(s) of the YANMAR product covered by this warranty found to be defective in material and/or workmanship. Such repairs and/or replacements will be made at a location designated by YANMAR at no cost to the purchaser for parts or labor.

What is not Covered by this Warranty?

This warranty does not cover parts affected by or damaged by any reason other than defective materials or workmanship including, but not limited to, accident, misuse, abuse, “Acts of God”, neglect, improper installation, improper maintenance, improper storage, the use of unsuitable attachments or parts, the use of contaminated fuels, the use of fuels, oils, lubricants, or fluids other than those recommended in your YANMAR Operation Manual, unauthorized alterations or modifications, ordinary wear and tear, and rust or corrosion. This warranty does not cover the cost of parts and/or labor required to perform normal/scheduled maintenance on your YANMAR engine. This warranty does not cover consumable parts such as, but not limited to, filters, belts, hoses, fuel injector nozzles, lubricants and cleaning fluids. This warranty does not cover the cost of shipping the product to or from the warranty repair facility.

YANMAR Limited Warranty - continued

Warranty Limitations:

The foregoing is YANMAR's only obligation to you and your exclusive remedy for breach of warranty. Failure to follow the requirements for submitting a claim under this warranty may result in a waiver of all claims for damages and other relief. **In no event shall YANMAR or any authorized industrial engine dealer or distributor be liable for incidental, special or consequential damages.** Such consequential damages may include, but not be limited to, loss of revenue, loan payments, cost of rental of substitute equipment, insurance coverage, storage, lodging, transportation, fuel, mileage, and telephone costs. The limitations in this warranty apply regardless of whether your claims are based on breach of contract, tort (including negligence and strict liability) or any other theory. Any action arising hereunder must be brought within one (1) year after the cause of action accrues or it shall be barred. Some states and countries do not allow certain limitations on warranties or for breach of warranties. **This warranty gives you specific legal rights, and you may also have other rights which vary from state to state and country to country.** Limitations set forth in this paragraph shall not apply to the extent that they are prohibited by law.

Warranty Modifications:

Except as modified in writing and signed by the parties, this warranty is and shall remain the complete and exclusive agreement between the parties with respect to warranties, superseding all prior agreements, written and oral, and all other communications between the parties relating to warranties. **No person or entity is authorized to give any other warranty or to assume any other obligation on behalf of YANMAR, either orally or in writing.**

Questions:

If you have any questions or concerns regarding this warranty, please call or write to the nearest authorized YANMAR industrial engine dealer/distributor or other authorized facility.

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** on your industrial compression-ignition engine. In California, 2013 MY and subsequent model years off-road compression-ignition engines must be designed, built and equipped to meet the state's stringent anti-smog standards. In all states, 1998 and later non-road compression-ignition engines must be designed, built and equipped to meet the United States EPA emissions standards. YANMAR warrants the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system, Electronic Control Unit, Exhaust Gas Recirculation (EGR) system and the air induction system. Also included may be hoses, belts, connectors and other emission-related assemblies.

Where a warrantable condition exists, YANMAR will repair your non-road compression-ignition engine at no charge to you including diagnosis, parts and labor.

Manufacturer's Warranty Period:

The model year 1998 or later certified and labeled non-road compression-ignition engines are warranted for the periods listed below. If any emission-related part on your engine is found to be defective during the applicable warranty period, the part will be replaced by YANMAR.

If your engine is certified as	And its maximum power is	And its rated speed is	Then its warranty period is
Variable speed or constant speed	kW < 19	Any speed	1,500 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Constant speed	19 ≤ kW < 37	3,000 rpm or higher	1,500 hours or two (2) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.
Constant speed	19 ≤ kW < 37	Less than 3,000 rpm	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Variable speed	19 ≤ kW < 37	Any speed	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Variable speed or constant speed	kW ≥ 37	Any speed	3,000 hours or five (5) years whichever comes first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.

Limited Emission Control System Warranty - USA Only - continued

Warranty Coverage:

This warranty is transferable to each subsequent purchaser for the duration of the warranty period. YANMAR recommends that repair or replacement of any warranted part will be performed at an authorized YANMAR dealer.

Warranted parts not scheduled for replacement as required maintenance in the operation manual shall be warranted for the warranty period. Warranted parts scheduled for replacement as required maintenance in the operation manual are warranted for the period of time prior to the first scheduled replacement. Any part repaired or replaced under warranty shall be warranted for the remaining warranty period.

During the warranty period, YANMAR is liable for damages to other engine components caused by the failure of any warranted part during the warranty period.

Any replacement part which is functionally identical to the original equipment part in all respects may be used in the maintenance or repair of your engine, and shall not reduce YANMAR's warranty obligations. Add-on or modified parts that are not exempted may not be used. The use of any non-exempted add-on or modified parts shall be grounds for disallowing a warranty.

Warranted Parts:

This warranty covers engine components that are a part of the emission control system of the engine as delivered by YANMAR to the original retail purchaser. Such components may include the following:

- Fuel injection system
- Electronic control system
- Cold start enrichment system
- Intake manifold
- Turbocharger systems
- Exhaust manifold
- EGR system
- Positive crankcase ventilation system
- Hoses, belts, connectors and assemblies associated with emission control systems

Since emissions-related parts may vary slightly between models, certain models may not contain all of these parts and other models may contain the functional equivalents.

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 are responsible for presenting your engine to an authorized YANMAR dealer or distributor 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: https://www.yanmar.com
E-mail: CS_support@yanmar.com
Toll free telephone number: 1-800-872-2867, 1-855-416-7091

What the Emergency Stationary Type Engine Owner must Do:

The engines for emergency stationary type generators certified by Federal Law (40 CFR Part60) are limited to emergency use only, and the operation for maintenance checks and verification test for functions is required. The total operating hours for maintenance and verification test for functions should not exceed 100 hours per year. However, there is no limitation on the operating hours for emergency use. Keep a log of the number of hours the engine is operated for both emergency use and non-emergency use. Also, note the reason for the operation.

Section 3

SAFETY

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SAFETY STATEMENTS

YANMAR is concerned for your safety and your machine's condition. Safety statements are one of the primary ways to call your attention to the potential hazards associated with YANMAR TNM and TNV engine operation. Follow the precautions listed throughout the manual before operation, during operation and during periodic maintenance procedures for your safety, the safety of others and to protect the performance of your engine. Keep the labels from becoming dirty or torn and replace them if they are lost or damaged. Also, if you need to replace a part that has a label attached to it, make sure you order the new part and label at the same time.

This safety alert symbol appears with most safety statements. It means attention, become alert, your safety is involved! Please read and abide by the message that follows the safety alert symbol.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, *will* result in death or serious injury.

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

NOTICE indicates a situation which can cause damage to the machine, personal property and/or the environment or cause the equipment to operate improperly.

SAFETY PRECAUTIONS

⚠ DANGER

Scald Hazard!

- Never remove the radiator cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the radiator cap.
- Tighten the radiator cap securely after you check the radiator. Steam can spurt out during engine operation if the cap is loose.
- Always check the level of the engine coolant by observing the reserve tank.
- Failure to comply will result in death or serious injury.

Explosion Hazard!

- Keep the area around the battery well-ventilated. While the engine is running or the battery is charging, hydrogen gas is produced which can be easily ignited.
- Keep sparks, open flame and any other form of ignition away while the engine is running or battery is charging.
- Never check the remaining battery charge by shorting out the terminals. This will result in a spark and may cause an explosion or fire. Use a hydrometer to check the remaining battery charge.
- If the electrolyte is frozen, slowly warm the battery before you recharge it.
- Failure to comply will result in death or serious injury.

⚠ DANGER

Fire and Explosion Hazard!

- Diesel fuel is flammable and explosive under certain conditions.
- When you remove any fuel system component to perform maintenance (such as changing the fuel filter) place an approved container under the opening to catch the fuel.
- Never use a shop rag to catch the fuel. Vapors from the rag are flammable and explosive.
- Wipe up any spills immediately.
- Wear eye protection. The fuel system is under pressure and fuel could spray out when you remove any fuel system component.
- Only use the key switch to start the engine.
- Never jump-start the engine. Sparks caused by shorting the battery to the starter terminals may cause a fire or explosion.
- If the unit has an electric fuel pump, when you prime the fuel system, turn the key switch to the ON position for 10 to 15 seconds to allow the electric fuel pump to prime the system.
- If the unit has a mechanical fuel pump, when you prime the fuel system, operate the fuel priming lever of the mechanical fuel pump several times until the fuel filter cup is filled with fuel.
- Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine.
- Never refuel with the engine running.
- Keep sparks, open flames or any other form of ignition (match, cigarette, static electric source) well away when refueling.
- Never overfill the fuel tank.
- Fill the fuel tank. Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.

⚠ DANGER (Continued)

- Be sure to place the diesel fuel container on the ground when transferring the diesel fuel from the pump to the container. Hold the hose nozzle firmly against the side of the container while filling it. This prevents static electricity buildup which could cause sparks and ignite fuel vapors.
- Never place diesel fuel or other flammable material such as oil, hay or dried grass close to the engine during engine operation or shortly after shutdown.
- Before you operate the engine, check for fuel leaks. Replace rubberized fuel hoses every two years or every 2000 hours of engine operation, whichever comes first, even if the engine has been out of service. Rubberized fuel lines tend to dry out and become brittle after two years or 2000 hours of engine operation, whichever comes first.
- Never remove the fuel cap with the engine running.
- Never use diesel fuel as a cleaning agent.
- Place an approved container under the air bleed port when you prime the fuel system. Never use a shop rag to catch the fuel. Wipe up any spills immediately. Always close the air bleed port after you complete priming the system.
- Wear eye protection. The fuel system is under pressure and fuel could spray out when you open the air bleed port.
- If the unit has an electric fuel pump, turn the key switch to the ON position for 10 to 15 seconds, or until the fuel coming out of the air bleed port is free of bubbles, to allow the electric fuel pump to prime the system.
- If the unit has a mechanical fuel pump, operate the fuel priming pump several times until the fuel coming out of the air bleed port is free of bubbles.
- Failure to comply will result in death or serious injury.

⚠ DANGER

Crush Hazard!

- When you need to transport an engine for repair, have a helper assist you to attach it to a hoist and load it on a truck.
- Never stand under a hoisted engine. If the hoist mechanism fails, the engine will fall on you, causing death or serious injury.
- Failure to comply will result in death or serious injury.

⚠ WARNING

Sever Hazard!

- Keep hands and other body parts away from moving/rotating parts such as the cooling fan, flywheel or PTO shaft.
- Wear tight-fitting clothing and keep your hair short or tie it back while the engine is running.
- Remove all jewelry before you operate or service the machine.
- Never start the engine in gear. Sudden movement of the engine and/or machine could cause death or serious personal injury.
- Never operate the engine without the guards in place.
- Before you start the engine make sure that all bystanders are clear of the area.
- Keep children and pets away while the engine is operating.
- Check before starting the engine that any tools or shop rags used during maintenance have been removed from the area.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Exhaust Hazard!

- Never operate the engine in an enclosed area such as a garage, tunnel, underground room, manhole or ship's hold without proper ventilation.
- Never block windows, vents, or other means of ventilation if the engine is operating in an enclosed area. All internal combustion engines create carbon monoxide gas during operation. Accumulation of this gas within an enclosure could cause illness or even death.
- Make sure that all connections are tightened to specifications after repair is made to the exhaust system.
- Failure to comply could result in death or serious injury.

Alcohol and Drug Hazard!

- Never operate the engine while you are under the influence of alcohol or drugs.
- Never operate the engine when you are feeling ill.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Exposure Hazard!

- Wear personal protective equipment such as gloves, work shoes, eye and hearing protection as required by the task at hand.
- Never wear jewelry, unbuttoned cuffs, ties or loose-fitting clothing when you are working near moving/rotating parts such as the cooling fan, flywheel or PTO shaft.
- Always tie back long hair when you are working near moving/rotating parts such as a cooling fan, flywheel, or PTO shaft.
- Never operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the alert signals.
- Failure to comply could result in death or serious injury.

Burn Hazard!

- If you must drain the engine oil while it is still hot, stay clear of the hot engine oil to avoid being burned.
- Always wear eye protection.
- Wait until the engine cools before you drain the engine coolant. Hot engine coolant may splash and burn you.
- Keep your hands and other body parts away from hot engine surfaces such as the muffler, exhaust pipe and engine block during operation and shortly after you shut the engine down. These surfaces are extremely hot while the engine is operating and could seriously burn you.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Burn Hazard!

- Batteries contain sulfuric acid. Never allow battery fluid to come in contact with clothing, skin or eyes. Severe burns could result. Always wear safety goggles and protective clothing when servicing the battery. If battery fluid contacts the eyes and/or skin, immediately flush the affected area with a large amount of clean water and obtain prompt medical treatment.
- Failure to comply could result in death or serious injury.

High-Pressure Hazard!

- Avoid skin contact with the high-pressure diesel fuel spray caused by a fuel system leak such as a broken fuel injection line. High-pressure fuel can penetrate your skin and result in serious injury. If you are exposed to high-pressure fuel spray, obtain prompt medical treatment.
- Never check for a fuel leak with your hands. Always use a piece of wood or cardboard. Have your authorized YANMAR industrial engine dealer or distributor repair the damage.
- Failure to comply could result in death or serious injury.

⚠ WARNING

Shock Hazard!

- Turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the electrical system.
- Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors. Always keep the connectors and terminals clean.
- Failure to comply could result in death or serious injury.

Entanglement Hazard!

- Stop the engine before you begin to service it.
- Never leave the key in the key switch when you are servicing the engine. Someone may accidentally start the engine and not realize you are servicing it. This could result in a serious injury.
- If you must service the engine while it is operating, remove all jewelry, tie back long hair, and keep your hands, other body parts and clothing away from moving/rotating parts.
- Failure to comply could result in death or serious injury.

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

⚠ WARNING

Fume/Burn Hazard!

- **Always read and follow safety related precautions found on containers of hazardous substances like parts cleaners, primers, sealants and sealant removers.**

- **Failure to comply could result in death or serious injury.**

⚠ CAUTION

Coolant Hazard!

- **Wear eye protection and rubber gloves when you handle long life or extended life engine coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.**

- **Failure to comply may result in minor or moderate injury.**

Flying Object Hazard!

- **Always wear eye protection when servicing the engine and when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.**

- **Failure to comply may result in minor or moderate injury.**

⚠ CAUTION

Be sure to secure the engine solidly to prevent injury or damage to parts due to the engine falling during work on the engine.

Pinch Hazard!

Carefully rotate the alternator toward the cylinder block while loosening the V-belt. Failure to comply may result in minor or moderate injury.

If any oil pump component clearance exceeds its limit, the oil pump must be replaced as an assembly.

NOTICE

- Only use diesel fuels recommended by YANMAR for the best engine performance, to prevent engine damage and to comply with EPA/ARB warranty requirements.
- Only use clean diesel fuel.
- Never remove the primary strainer (if equipped) from the fuel tank filler port. If removed, dirt and debris could get into the fuel system causing it to clog.

If any problem is noted during the visual check, the necessary corrective action should be taken before you operate the engine.

Never hold the key in the START position for longer than 15 seconds or the starter motor will overheat.

NOTICE

Make sure the engine is installed on a level surface. If a continuously running engine is installed at an angle greater than (25°) in any direction or if an engine runs for short periods of time (less than three minutes) at an angle greater than (30°) in any direction, engine oil may enter the combustion chamber causing excessive engine speed and white exhaust smoke. This may cause serious engine damage.

Observe the following environmental operating conditions to maintain engine performance and avoid premature engine wear:

- Avoid operating in extremely dusty conditions.
- Avoid operating in the presence of chemical gases or fumes.
- Avoid operating in a corrosive atmosphere such as salt water spray.
- Never install the engine in a floodplain unless proper precautions are taken to avoid being subject to a flood.
- Never expose the engine to the rain.

Observe the following environmental operating conditions to maintain engine performance and avoid premature engine wear:

- The standard range of ambient temperatures for the normal operation of YANMAR engines is from +5 °F (-15 °C) to +113 °F (+45 °C).
- If the ambient temperature exceeds +113 °F (+45 °C) the engine may overheat and cause the engine oil to break down.
- If the ambient temperature is below +5 °F (-15 °C) the engine will be hard to start and the engine oil may not flow easily.
- Contact your authorized YANMAR industrial engine dealer or distributor if the engine will be operated outside of this standard temperature range.

NOTICE

If any indicator illuminates during engine operation, stop the engine immediately. Determine the cause and repair the problem before you continue to operate the engine.

- 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.

- 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.

- 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.

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

- 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.

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

NOTICE

New engine break-in:

- On the initial engine start-up, allow the engine to idle for approximately 15 minutes while you check for proper engine oil pressure, diesel fuel leaks, engine oil leaks, coolant leaks, and for proper operation of the indicators and/or gauges.
- During the first hour of operation, vary the engine speed and the load on the engine. Short periods of maximum engine speed and load are desirable. Avoid prolonged operation at minimum or maximum engine speeds and loads for the next four to five hours.
- During the break-in period, carefully observe the engine oil pressure and engine temperature.
- During the break-in period, check the engine oil and coolant levels frequently.

- Never attempt to modify the engine's design or safety features such as defeating the engine speed limit control or the fuel injection quantity control.
- Failure to comply may impair the engine's safety and performance characteristics and shorten the engine's life. Any alterations to this engine may affect the warranty coverage of your engine. *YANMAR Limited Warranty on page 2-3.*

Protect the air cleaner and electric components from damage when you use steam or high-pressure water to clean the engine.

Never use high-pressure water or compressed air at greater than 28 psi (193 kPa; 19686 mmAq) or a wire brush to clean the radiator fins. Radiator fins damage easily.

NOTICE

Never attempt to adjust the low or high idle speed limit screw. This may impair the safety and performance of the machine and shorten its life. If the idle speed limit screws require adjustment, see your authorized YANMAR industrial engine dealer or distributor.

The tightening torque in the *Standard Torque Chart (see General Service Information section)* should be applied only to the bolts with a "7" head. (JIS strength classification: 7T)

- Apply 60 % torque to bolts that are not listed.
- Apply 80 % torque when tightened to aluminum alloy.

Establish a periodic maintenance plan according to the engine application and make sure you perform the required periodic maintenance at intervals indicated. Failure to follow these guidelines will impair the engine's safety and performance characteristics, shorten the engine's life and may affect the warranty coverage on your engine.

See YANMAR Limited Warranty in warranty section.

Consult your authorized YANMAR dealer or distributor for assistance when checking items marked with a ●.

If the fuel filter/water separator is positioned higher than the fuel level in the fuel tank, water may not drip out when the fuel filter/water separator drain cock is opened. If this happens, turn the air vent screw on the top of the fuel filter/water separator 2 - 3 turns counterclockwise.

Be sure to tighten the air vent screw after the water has drained out.

NOTICE

- When the engine is operated in dusty conditions, clean the air cleaner element more frequently.
- Never operate the engine with the air cleaner element(s) removed. This may allow foreign material to enter the engine and damage it.

The maximum air intake restriction, in terms of differential pressure measurement, must not exceed 0.90 psi (6.23 kPa; 635 mmAq). Clean or replace the air cleaner element if the air intake restriction exceeds the above mentioned value.

It is important to perform daily checks.

Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor machine performance and helps extend the life of the engine.

If the oil pump must be replaced, replace it as an assembly only. Do not replace individual components.

Do not loosen or remove the four bolts retaining the fuel injection pump drive gear to the fuel injection pump hub. Do not disassemble the fuel injection pump drive gear from the hub. Correct fuel injection timing will be very difficult or impossible to achieve.

The starter motor can be damaged if operated continuously longer than 10 seconds while performing the no-load test.

Do not short-circuit the charging system between alternator terminals IG and L. Damage to the alternator will result.

Do not connect a load between alternator terminals L and E. Damage to the alternator will result.

NOTICE

Do not remove the positive (+) battery cable from alternator terminal B while the engine is operating. Damage to the alternator will result.

Do not turn the battery switch OFF while the engine is operating. Damage to the alternator will result.

Do not operate the engine if the alternator is producing unusual sounds. Damage to the alternator will result.

If the engine coolant pump must be replaced, replace the engine coolant pump as an assembly only. Do not attempt to repair the engine coolant pump or replace individual components.

Use a new special O-ring between the engine coolant pump and the joint. Be sure to use the special O-ring for each engine model. Although the O-ring dimensions are the same as a commercially available O-ring, the material is different.

Remove or install the high-pressure fuel injection lines as an assembly whenever possible. Disassembling the high-pressure fuel injection lines from the retainers or bending any of the fuel lines will make it difficult to reinstall the fuel lines.

After marking the position of the pump drive gear, do not rotate the engine crankshaft. Rotating the crankshaft will cause the fuel injection pump to become misaligned.

Do not use a high-pressure wash directly on the alternator. Water will damage the alternator and result in inadequate charging.

Do not reverse the positive (+) and negative (-) ends of the battery cable. The alternator diode and stator coil will be damaged.

NOTICE

When the battery indicator goes out, it should not come on again. The battery indicator only comes on during operation if the alternator fails. However, if an LED is used in the battery indicator, the LED will shine faintly during normal operation.

Using a non-specified V-belt will cause inadequate charging and shorten the belt life. Use the specified belt.

Agricultural or other chemicals, especially those with a high sulfur content, can adhere to the IC regulator. This will corrode the conductor and result in battery over-charging (boiling) and charging malfunctions. Consult YANMAR before using the equipment in such an environment or the warranty is voided.

Make sure that the combined total resistance of the battery cable in both directions between the starter motor and the battery is within the value indicated on the wiring diagram. The starter motor will malfunction or break down if the resistance is higher than the specified value.

The starter motor is water-proofed according to JIS D 0203, R2 which protects the motor from rain or general cleaning. Do not use high-pressure wash or submerse the starter motor in water.

Use a specialized battery charger to recharge a battery with a voltage of 8 V or less. Booster starting a battery with a voltage of 8 V or less will generate an abnormally high voltage and destroy electrical equipment.

NOTICE

Make sure that the combined total resistance of the battery cable in both directions between the starter motor and the battery is within the value indicated in the *Battery Cable Resistance chart* in the *Electric Wiring Section* of this manual. The starter motor will malfunction and fail if the resistance is higher than the specified value.

Removing the battery cables or the battery while the engine is operating may cause damage to the current limiter depending on the electrical equipment being used. This situation could cause loss of control of output voltage. The continuous high voltage of 23 - 24 V (for 5000 min^{-1} (rpm) dynamo) will damage the current limiter and other electrical equipment.

Reversing the battery cable connections at the battery or on the engine will destroy the SCR diode in the current limiter. This will cause the charging system to malfunction and may cause damage to the electrical harnesses.

- Never attempt to modify the engine's design or safety features such as defeating the engine speed limit control or the diesel fuel injection quantity control.
- Modifications may impair the engine's safety and performance characteristics and shorten the engine's life. Any alterations to this engine may void its warranty. Be sure to use YANMAR genuine replacement parts.

Identify all parts and their location using an appropriate method. It is important that all parts are returned to the same position during the reassembly process.

Do not rotate the crankshaft with the injection pump removed.

NOTICE

Keep the piston pin parts, piston assemblies, and connecting rod assemblies together to be returned to the same position during the reassembly process. Label the parts using an appropriate method.

Do not allow the honing tool to operate in one position for any length of time. Damage to the cylinder wall will occur. Keep the tool in constant up-and-down motion.

Any part which is found defective as a result of inspection or any part whose measured value does not satisfy the standard or limit must be replaced.

Any part determined to not meet the service standard or limit before the next service, as determined from the state of current rate of wear, should be replaced even though the part currently meets the service standard limit.

- Never remove or attempt to remove the tamper-proof devices from the full-load fuel adjusting screw or the high-speed throttle limit screw on the fuel injection pump and governor assembly. These adjustments have been made at the factory to meet all applicable emissions regulations and then sealed.
- Never attempt to make any adjustments to these sealed adjustment screws. If adjustments are required, they can be made only by a qualified fuel injection shop that will ensure the injection pump continues to meet all applicable emissions regulations and then replace the tamper-proof seals.
- Tampering with or removing these devices may void the "YANMAR Limited Warranty."

The fuel return line is a one-piece assembly. Use care not to bend or twist the fuel return line.

NOTICE

Never use a steel wire brush to clean fuel injectors. Damage to the nozzle and other components is likely to result.

- Never permit anyone to operate the engine or driven machine without proper training.

- Read and understand this Service Manual before you operate or service the machine to ensure that you follow safe operating practices and maintenance procedures.
- Machine safety signs and labels are additional reminders for safe operating and maintenance techniques.
- See your authorized YANMAR industrial engine dealer or distributor for additional training.

Section 4

GENERAL SERVICE INFORMATION

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