



**YANMAR**<sup>®</sup>

# ***JH4*** **series**

## **OPERATION MANUAL**

3JH4E  
4JH4AE  
4JH4-TE  
4JH4-HTE

P/N: 0AJH4-G00102

**MARINE  
ENGINES**

---

**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.

**All Rights Reserved:**

No part of this publication may be reproduced or used in any form by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems - without the written permission of Yanmar Marine International.

© 2006 Yanmar Marine International

1006

# TABLE OF CONTENTS

---

	Page
<b>Introduction</b> .....	1
Record of Ownership .....	2
<b>Safety</b> .....	3
Safety Precautions .....	4
General Information .....	4
Before You Operate .....	4
During Operation and Maintenance .....	4
Location of Safety Decals .....	8
<b>Product Overview</b> .....	13
Yanmar JH4 Features and Applications .....	13
New Engine Break-In .....	13
Component Identification .....	15
Service Side - 3JH4E .....	15
Non-Service Side - 3JH4E .....	15
Service Side - 4JH4AE .....	16
Non-Service Side - 4JH4AE .....	16
Service Side - 4JH4-TE .....	17
Non-Service Side - 4JH4-TE .....	17
Service Side - 4JH4-HTE .....	18
Non-Service Side - 4JH4-HTE .....	18
Location of Nameplates .....	19
Function of Major Components .....	20
Control Equipment .....	21
Instrument Panel (Optional) .....	21
Single Lever Remote Control Handle .....	26
<b>Before You Operate</b> .....	27
Diesel Fuel .....	27
Diesel Fuel Specifications .....	27

## TABLE OF CONTENTS

---

Filling the Fuel Tank .....	30
Bleeding the Fuel System .....	30
Engine Oil .....	32
Engine Oil Specifications .....	32
Engine Oil Viscosity .....	33
Checking the Engine Oil .....	33
Adding Engine Oil .....	33
Marine Gear or Sail Drive Oil .....	34
Marine Gear Oil Specifications .....	34
Sail Drive Oil Specifications - SD50 .....	34
Checking Marine Gear Oil .....	35
Adding Marine Gear Oil .....	35
Checking and Adding Sail Drive Oil .....	35
Engine Coolant .....	36
Engine Coolant Specifications .....	36
Coolant (Closed Cooling System) .....	36
Checking and Adding Coolant .....	36
Cranking the Engine .....	39
Daily Checks .....	40
Visual Checks .....	40
Checking Diesel Fuel, Engine Oil and Engine Coolant Levels .....	41
Checking and Refilling Marine Gear Oil .....	41
Checking the Battery Electrolyte Level .....	41
Checking the Alternator Belt .....	41
Checking the Remote Control Handle .....	41
Checking the Alarm Indicators .....	41
Preparing Fuel, Oil and Coolant in Reserve .....	41
<b>Engine Operation</b> .....	<b>43</b>
Starting the Engine .....	44
Restarting After Starting Failure .....	45
Starting at Low Temperatures .....	45
After the Engine Has Started .....	46
Remote Control Handle Operation .....	46
Acceleration and Deceleration .....	46
Shifting the Engine .....	46
Switching to Trolling (KMH4A only) .....	47
Shutting Down the Engine .....	48
Emergency Shutdown .....	48
Checking the Engine After Operation .....	49
<b>Periodic Maintenance</b> .....	<b>51</b>
Safety Precautions .....	51

## TABLE OF CONTENTS

Precautions .....	53
The Importance of Periodic Maintenance .....	53
Performing Periodic Maintenance .....	53
The Importance of Daily Checks .....	53
Keep a Log of Engine Hours and Daily Checks .....	53
Yanmar Replacement Parts .....	53
Tools Required .....	53
Ask Your Authorized Yanmar Marine Dealer or Distributor For Help .....	53
Tightening Fasteners .....	54
EPA Maintenance Requirements .....	55
EPA Requirements for USA and Other Applicable Countries .....	55
EPA Requirements .....	55
Conditions to Ensure Compliance with EPA Emission Standards .....	55
Inspection and Maintenance .....	56
Periodic Maintenance Schedule .....	57
Inspection and Maintenance of EPA Emission- Related Parts .....	60
Periodic Maintenance Procedures .....	61
After Initial 50 Hours of Operation .....	61
Every 50 Hours of Operation .....	65
Every 250 Hours of Operation .....	67
Every 500 Hours of Operation .....	73
Every 1000 Hours of Operation .....	74
<b>Troubleshooting</b> .....	77
Troubleshooting After Starting .....	77
Troubleshooting Chart .....	79
Troubleshooting Information .....	82
<b>Long-Term Storage</b> .....	83
Prepare Engine for Long-Term Storage .....	83
Drain Seawater Cooling System .....	84
<b>Specifications</b> .....	87
Principal Engine Specifications .....	87
3JH4E Engine Specifications .....	87
3JH4E Marine Gear Specifications .....	89
4JH4AE Engine Specifications .....	90
4JH4AE Marine Gear or Sail Drive Specifications .....	94
4JH4-TE Engine Specifications .....	96
4JH4-HTE Engine Specifications .....	98

## TABLE OF CONTENTS

---

4JH4-TE and 4JH4-HTE Marine Gear or Sail Drive Specifications .....	100
<b>System Diagrams</b> .....	101
Piping Diagrams .....	101
Wiring Diagrams .....	116
<b>EPA Warranty USA Only</b> .....	129
Yanmar Co., Ltd. Limited Emission Control System Warranty - USA Only .....	129
Your Warranty Rights and Obligations: .....	130
Warranty Period: .....	130
Warranty Coverage: .....	131
Exclusions: .....	131
Owner's Responsibility: .....	131
Customer Assistance: .....	132
<b>Emission System Warranty</b> .....	133
Non-Road Emission System Warranty .....	133
Yanmar Co., Ltd. Limited Emission Control System Warranty - USA Only .....	133

# INTRODUCTION

---

Welcome to the world of Yanmar Marine! Yanmar Marine offers engines, drive systems and accessories for all types of boats, from runabouts to sailboats, and from cruisers to mega yachts. In marine leisure boating, the worldwide reputation of Yanmar Marine is second to none. We design our engines to respect nature. This means quieter engines, with minimal vibrations, cleaner than ever. All of our engines meet applicable regulations, including emissions, at the time of manufacture.

To help you enjoy your Yanmar JH4 series engine for many years to come, please follow these recommendations:

- Read and understand this *Operation Manual* before you operate the machine to ensure that you follow safe operating practices and maintenance procedures.
- Keep this *Operation Manual* in a convenient place for easy access.
- If this *Operation Manual* is lost or damaged, order a new one from your authorized Yanmar marine dealer or distributor.
- Make sure this manual is transferred to subsequent owners. This manual should be considered a permanent part of the engine and remain with it.
- Constant efforts are made to improve the quality and performance of Yanmar products, so some details included in this *Operation Manual* may differ slightly from your engine. If you have any questions about these differences, please contact your authorized Yanmar marine dealer or distributor.
- The specifications and components (instrument panel, fuel tank, etc.) described in this manual may differ from ones installed on your vessel. Please refer to the manual provided by the manufacturer of these components.

## **INTRODUCTION**

---

### **RECORD OF OWNERSHIP**

Take a few moments to record the information you need when you contact Yanmar for service, parts or literature.

**Engine Model:** \_\_\_\_\_

**Engine Serial No.:** \_\_\_\_\_

**Date Purchased:** \_\_\_\_\_

**Dealer:** \_\_\_\_\_

**Dealer Phone:** \_\_\_\_\_



# SAFETY

---

Yanmar considers safety of great importance and recommends that anyone that comes into close contact with its products, such as those who install, operate, maintain or service Yanmar products exercise care, common sense and comply with the safety information in this manual and on the machine's safety decals. 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**

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

## **WARNING**

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

## **CAUTION**

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

## **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

---

### SAFETY PRECAUTIONS

#### General Information

There is no substitute for common sense and careful practices. Improper practices or carelessness can cause burns, cuts, mutilation, asphyxiation, other bodily injury or death. This information contains general safety precautions and guidelines that must be followed to reduce risk to personal safety. Special safety precautions are listed in specific procedures. Read and understand all of the safety precautions before operation or performing repairs or maintenance.

#### Before You Operate

 **DANGER**

The safety messages that follow have **WARNING** level hazards.



NEVER permit anyone to install or operate the engine without proper training.

- Read and understand this Operation Manual before you operate or service the engine to ensure that you follow safe operating practices and maintenance procedures.
- Safety signs and labels are additional reminders for safe operating and maintenance techniques.
- See your authorized Yanmar marine dealer or distributor for additional training.

#### During Operation and Maintenance

 **DANGER**

The safety message that follows has **DANGER** level hazards.



#### Crush Hazard

NEVER stand under hoisted engine. If the hoist mechanism fails, the engine will fall on you.

**⚠ WARNING**

The safety messages that follow have WARNING level hazards.

**Explosion Hazard**

Avoid serious personal injury or equipment damage. While the engine is running or the battery is charging, hydrogen gas is being produced and can be easily ignited. Keep the area around the battery well-ventilated and keep sparks, open flames and any other form of ignition out of the area.

**Fire and Explosion Hazard**

Diesel fuel is flammable and explosive under certain conditions.

NEVER use a shop rag to catch the fuel.

Wipe up all spills immediately.

NEVER refuel with the engine running.

Store any containers containing fuel in a well-ventilated area, away from any combustibles or sources of ignition.

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 shut down.

**Fire Hazard**

Avoid injury or equipment damage from fire. Undersized wiring systems can cause an electrical fire.

**Sever Hazard**

Rotating parts can cause severe injury or death. NEVER wear jewelry, unbuttoned cuffs, ties or loose fitting clothing and ALWAYS tie long hair back when working near moving / rotating parts such as the flywheel or PTO shaft. Keep hands, feet and tools away from all moving parts.

**Alcohol and Drug Hazard**

NEVER operate the engine while under the influence of alcohol or drugs or feeling ill.

**Exposure Hazard**

To avoid injury, ALWAYS wear personal protective equipment including appropriate clothing, gloves, work shoes, eye and hearing protection as required by the task at hand.

**Entanglement Hazard**

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.

Avoid personal injury. NEVER operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the warning signals.

Stop the engine before you begin to service it.

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.

## SAFETY

---

### **WARNING**

#### **Piercing Hazard**



Avoid skin contact with 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 marine dealer or distributor repair the damage.

#### **Burn Hazard**



Avoid serious injury. Some of the engine surfaces become very hot during operation and shortly after shut-down. Keep hands and other body parts away from hot engine

surfaces.

#### **Sudden Movement Hazard**

Avoid personal injury. ALWAYS stop the engine before beginning service.

#### **Exhaust Hazard**



Avoid serious injury or death. 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 and special precautions are required to avoid carbon monoxide poisoning.

### **CAUTION**

The safety messages that follow have **CAUTION** level hazards.

#### **Poor Lighting Hazard**

Avoid personal injury or equipment damage. Ensure that the work area is adequately illuminated. ALWAYS install wire cages on portable safety lamps.

#### **Tool Hazard**

Avoid personal injury or equipment damage. ALWAYS use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.

#### **Flying Object Hazard**

Avoid personal injury. ALWAYS wear eye protection when servicing the engine or when using compressed air or high-pressure water. Dust, flying debris, compressed air, pressurized water or steam may injure your eyes.

#### **Coolant Hazard**



Wear eye protection and rubber gloves when you handle Long Life engine coolant. If contact with the eyes or skin should occur, flush eyes and wash immediately with clean water.

### NOTICE

**The safety messages that follow have NOTICE level hazards.**

It is important to perform daily checks as listed in the *Operation Manual*. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor engine performance and helps extend the life of the engine.

See your authorized Yanmar marine dealer or distributor if you need to operate the engine at high altitudes. At high altitudes the engine will lose power, run rough and produce exhaust gases that exceed the design specifications.



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 by dumping them into a sewer, on the ground or into ground water or waterways.

If a Yanmar Marine Engine is installed at an angle that exceeds the specifications stated in the Yanmar Marine Installation manuals, engine oil may enter the combustion chamber causing excessive engine speed, white exhaust smoke and serious engine damage. This applies to engines that run continuously or those that run for short periods of time.

If you have an installation with two or three engines and only one engine is operating, the water pickup (thru-hull) of the non-running engine(s) should be closed. This will prevent water from being forced past the seawater pump and eventually finding its way into the engine. The result of water entering the engine could cause seizure or other serious problems.

If you have an installation with two or three engines, and only one engine is operating, please note that if the propeller shaft thru-hull (stuffing box) is lubricated by engine water pressure and the engines are interconnected, care must be taken that water from the running engine does not enter the exhaust of the non-running engine (s). This water could cause seizure of the non-running engine(s). See your authorized Yanmar marine dealer or distributor for a complete explanation of this condition.

If you have an installation with two or three engines, and only one engine is operating, it is important to limit the amount of throttle applied to the running engine. If you observe black smoke or movement of the throttle does not increase engine rpm, you are overloading the engine that is running. Immediately throttle back to approximately 2/3 throttle or to a setting where the engine performs normally. Failure to do so may cause the running engine to overheat or cause excess carbon buildup which may shorten the engine's life.

## SAFETY

### LOCATION OF SAFETY DECALS

Figure 1, Figure 2, Figure 3 and Figure 4 show the location of safety decals on Yanmar JH4 series marine engines.

#### 3JH4E Engines

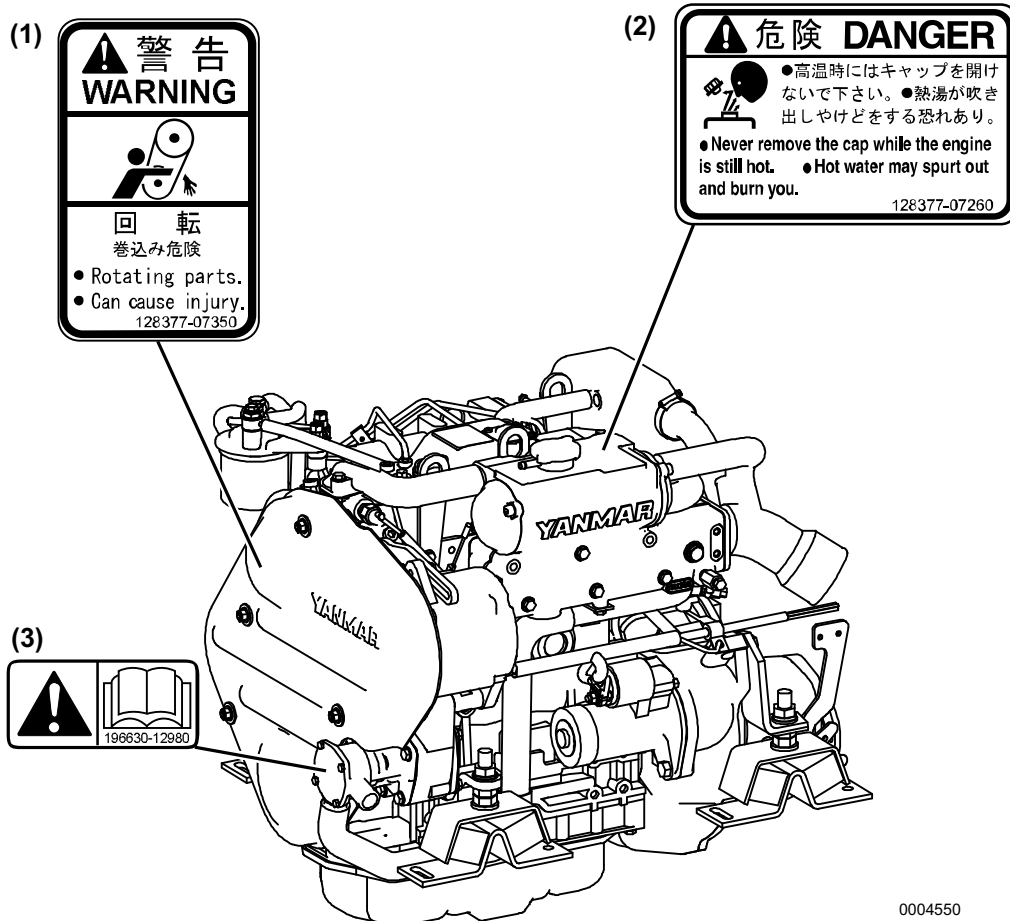


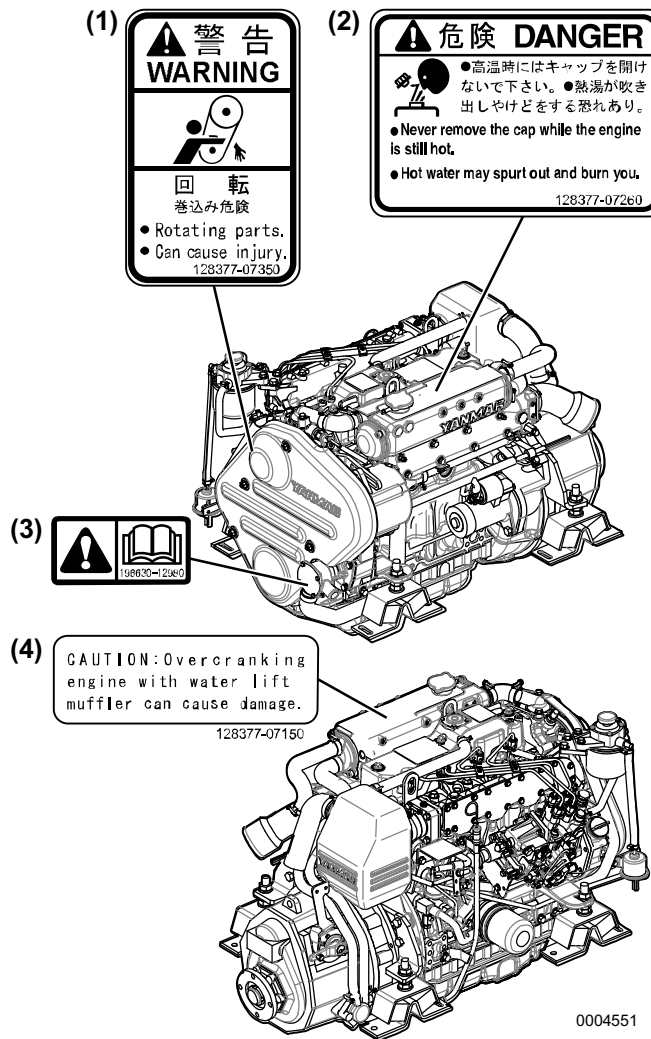
Figure 1

1 – Part Number: 128377-07350

2 – Part Number: 128377-07260

3 – Part Number: 196630-12980

**4JH4AE Engines**

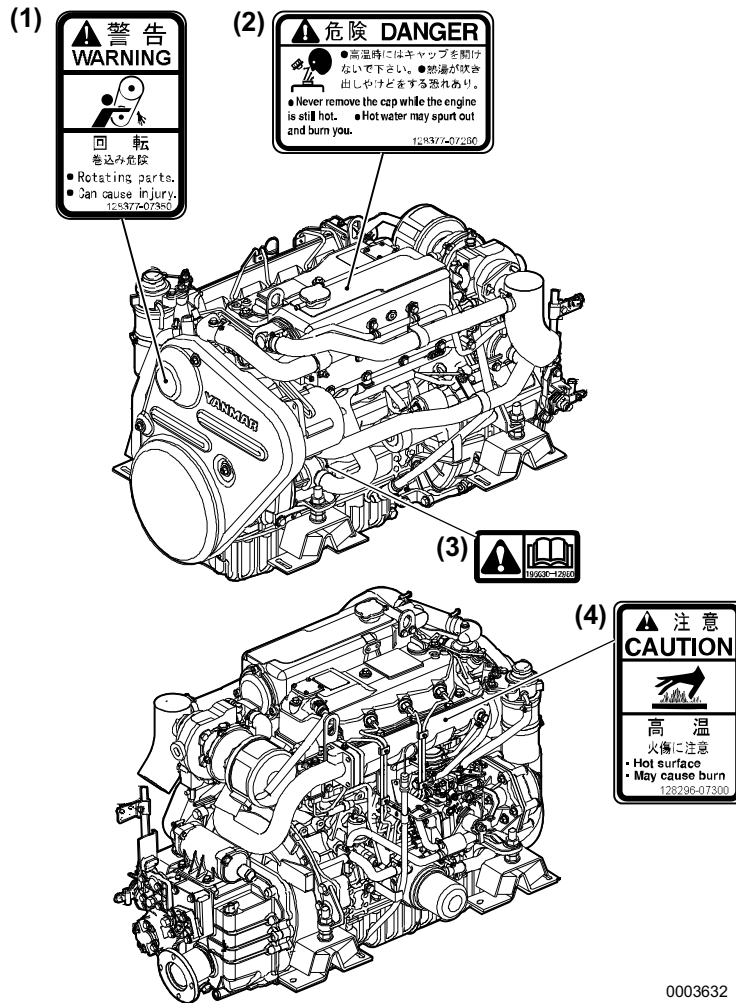


**Figure 2**

- 1 – Part Number: 128377-07350
- 2 – Part Number: 128377-07260
- 3 – Part Number: 196630-12980
- 4 – Part Number: 128377-07150

# SAFETY

## 4JH4-TE Engines



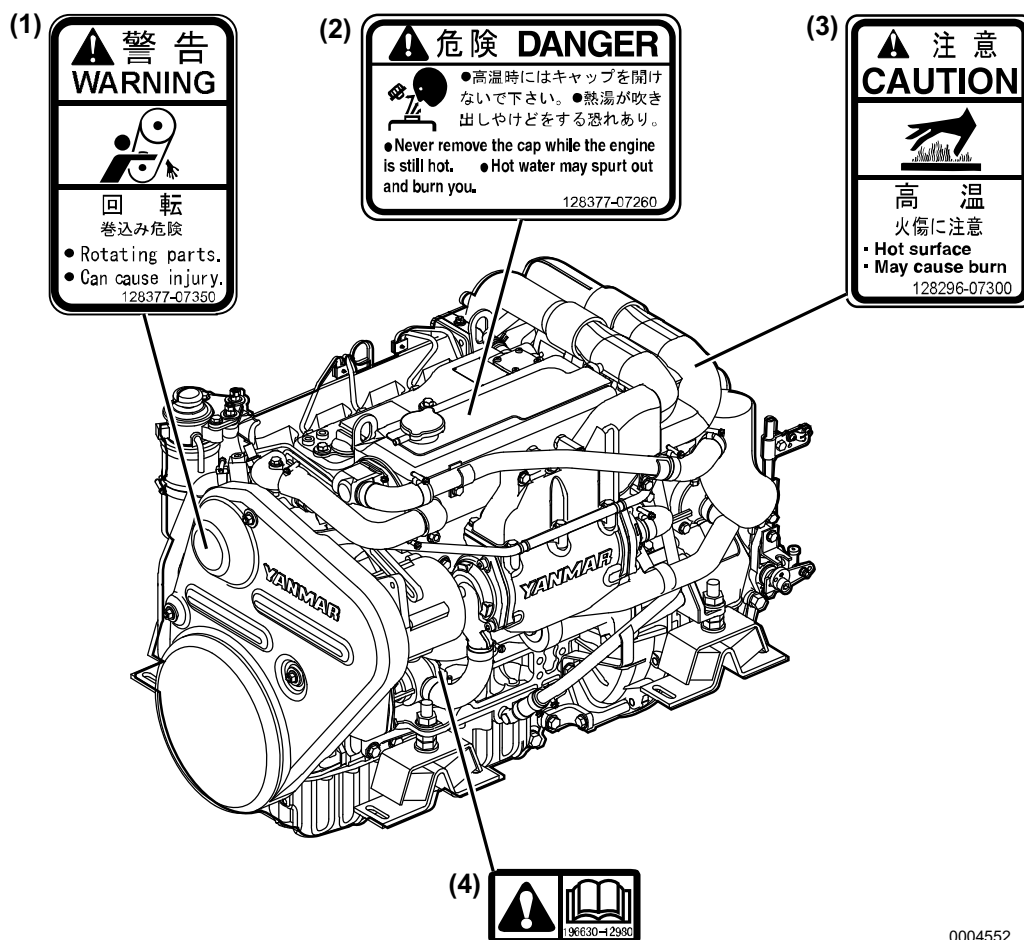
0003632

Figure 3

- 1 – Part No.: 128377-07350
- 2 – Part No.: 128377-07260
- 3 – Part No.: 196630-12980
- 4 – Part No.: 128296-07300



## 4JH4-HTE Engines



0004552

Figure 4

- 1 – Part No.: 128377-07350
- 2 – Part No.: 128377-07260
- 3 – Part No.: 128296-07300
- 4 – Part No.: 196630-12980

## **SAFETY**

---

**This Page Intentionally Left Blank**

# PRODUCT OVERVIEW

---

## YANMAR JH4 FEATURES AND APPLICATIONS

The JH4 series are four-stroke direct injection diesel engines equipped with liquid coolant systems.

The 3JH4E is 3-cylinder and naturally aspirated.

The 4JH4AE is 4-cylinder and naturally aspirated.

The 4JH4-TE is 4-cylinder and turbocharged.

The 4JH4-HTE is 4-cylinder and turbocharged with an intercooler.

The engines are equipped with a marine gear or sail drive unit.

These engines are designed for pleasure craft use.

It is recommended that new vessels be propped so the engines can operate at 100 - 200 rpm above the fuel stop power rpm to allow for some added weight and hull resistance.

Failure to do so can lead to reduced vessel performance, lead to increased smoke levels and cause permanent damage to your engine.

The engine must be installed correctly with coolant lines, exhaust gas lines and electrical wiring. Any auxiliary equipment attached to the engine should be easy to use and accessible for service. To handle the drive equipment, propulsion systems (including the propeller) and other onboard equipment, always observe the instructions and cautions given in the operation manuals supplied by the shipyard and equipment manufacturers.

The JH4 series engines are designed to be operated at maximum throttle (3000 - 3200 rpm) for less than 5% of total engine time (30 minutes out of every 10 hours) and cruising speed (2800 rpm or less) for less than 90% of total engine time (9 hours out of every 10 hours).

The laws of some countries may require hull and engine inspections, depending on the use, size and cruising area of the boat. The installation, fitting and surveying of this engine all require specialized knowledge and engineering skills. See Yanmar's local subsidiary in your region or your authorized Yanmar marine dealer or distributor.

### New Engine Break-In

As with all reciprocating engines, the way your engine is operated during its first 50 hours of operation plays a very significant role in determining how long it will last and how well the engine will perform over its lifetime.

## PRODUCT OVERVIEW

---

A new Yanmar diesel engine must be operated at suitable speeds and power settings during the break in period to make the sliding parts, such as piston rings, break in properly and to stabilize engine combustion.

During the break-in period, the engine coolant temperature gauge should be monitored, temperature should be between 71° - 87°C (160° - 190°F).

During the first 10 hours of operation, the engine should be run at maximum rpm minus 400 - 500 rpm (approximately 60 - 70% of load) most of the time. This will ensure the sliding parts break-in properly. During this period, avoid operating at maximum engine speed and load to avoid damaging or scoring sliding parts.

**NOTICE:** *Do not operate at WOT (wide open throttle) for more than a minute at a time during the first 10 hours of operation.*

Do not operate the engine at low idle or at low speed and light load for more than 30 minutes at a time. Since unburned fuel and engine oil will adhere to the piston rings when operating at low speeds for long periods, this will interfere with proper movement of the rings and the lube oil consumption may increase. Low idle speed does not allow break-in of sliding parts.

If operating engine at low speed and light load, you must race the engine to clean the carbon from the cylinders and fuel injection valve.

Perform this procedure in open waters:

- With the clutch in NEUTRAL, accelerate from the low speed position to the high speed position briefly.
- Repeat this process five times.

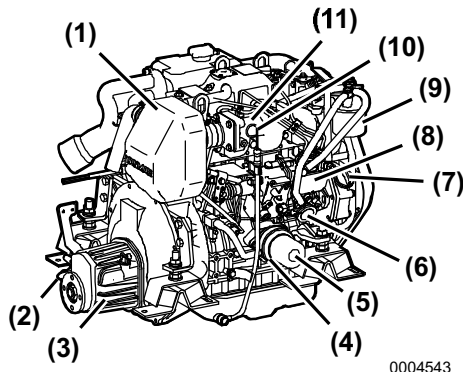
Once past the initial 10 hours until 50 hours, the engine should be used over its full operating range, with special emphasis on running at relatively high power settings. This is not the time for an extended cruise at idle or low speed. The boat should be run at maximum speed minus 400 rpm most of the time (approximately 70% load), with a 10 minute run at maximum minus 200 rpm (approximately 80% load) every 30 minutes and a 4-5 minute period of operation at WOT (wide open throttle) once each 30 minutes. During this period, be sure not to operate your engine at low speed and light load for more than 30 minutes. If operating engine at low speed and light load by necessity, just after the low idle operation, be sure to race the engine.

To complete engine break-in, perform *After Initial 50 Hours* maintenance procedures. See *Periodic Maintenance Schedule* on page 57.

**COMPONENT IDENTIFICATION**

**Service Side - 3JH4E**

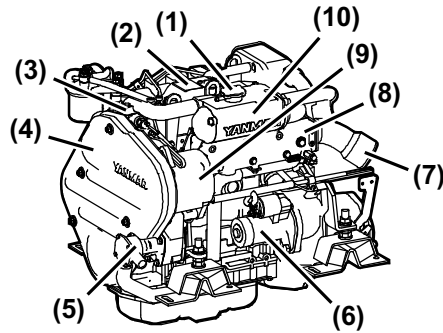
Figure 1 and Figure 2 illustrate a typical version of a 3JH4E engine. Your engine may have different equipment from that illustrated.



**Figure 1**

- 1 – Intake Silencer (Air Cleaner)
- 2 – Shift Lever
- 3 – Marine Gear
- 4 – Oil Cooler
- 5 – Engine Oil Filter
- 6 – Fuel Feed Pump
- 7 – Engine Oil Filler Cap
- 8 – Fuel Injection Pump
- 9 – Fuel Filter
- 10 – Engine Oil Dipstick
- 11 – Intake Manifold

**Non-Service Side - 3JH4E**



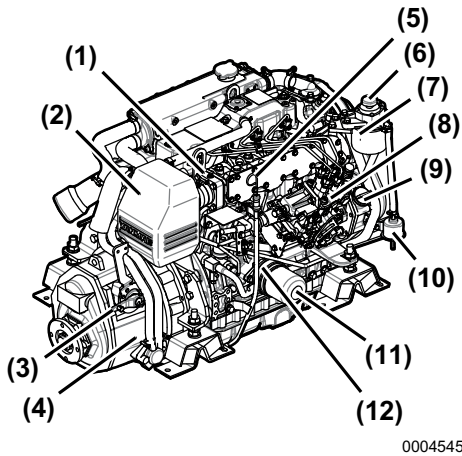
**Figure 2**

- 1 – Coolant Filler Cap
- 2 – Engine Nameplate (on rocker arm cover)
- 3 – Fresh Water Pump
- 4 – Belt Cover
- 5 – Seawater Pump
- 6 – Starter Motor
- 7 – Mixing Elbow
- 8 – Exhaust Manifold
- 9 – Alternator
- 10 – Coolant Tank / Heat Exchanger

## PRODUCT OVERVIEW

### Service Side - 4JH4AE

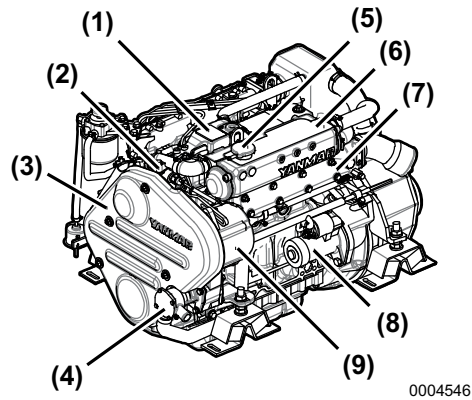
Figure 3 and Figure 4 illustrate a typical version of a 4JH4AE engine. Your engine may have different equipment from that illustrated.



**Figure 3**

- 1 – Air Heater
- 2 – Intake Silencer
- 3 – Shift Lever
- 4 – Marine Gear
- 5 – Engine Oil Dipstick
- 6 – Fuel Priming Pump
- 7 – Fuel Filter
- 8 – Fuel Injection Pump
- 9 – Engine Oil Filler Cap
- 10 – Electric Fuel Feed Pump
- 11 – Engine Oil Filter
- 12 – Oil Cooler

### Non-Service Side - 4JH4AE



**Figure 4**

- 1 – Engine Nameplate (on rocker arm cover)
- 2 – Fresh Water Pump
- 3 – Belt Cover
- 4 – Seawater Pump
- 5 – Coolant Filler Cap
- 6 – Coolant Tank / Heat Exchanger
- 7 – Exhaust Manifold
- 8 – Starter Motor
- 9 – Alternator

## PRODUCT OVERVIEW

### Service Side - 4JH4-TE

Figure 5 and Figure 6 illustrate a typical version of a 4JH4-TE engine. Your engine may have different equipment from that illustrated.

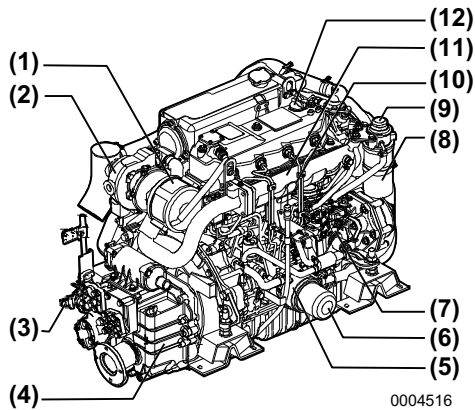


Figure 5

- 1 – Intake Silencer (Air Cleaner)
- 2 – Turbocharger
- 3 – Shift Lever
- 4 – Marine Gear (KMH4A shown)
- 5 – Engine Oil Cooler
- 6 – Engine Oil Filter
- 7 – Fuel Injection Pump
- 8 – Fuel Filter
- 9 – Fuel Priming Pump
- 10 – Engine Oil Dipstick
- 11 – Intake Manifold
- 12 – Engine Oil Filler Cap

### Non-Service Side - 4JH4-TE

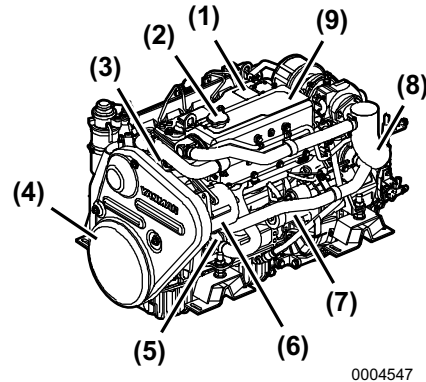


Figure 6

- 1 – Engine Nameplate (on rocker arm cover)
- 2 – Coolant Filler Cap
- 3 – Fresh Water Pump
- 4 – Belt Cover
- 5 – Seawater Pump
- 6 – Alternator
- 7 – Starter Motor
- 8 – Exhaust / Water Mixing Elbow
- 9 – Coolant Tank / Heat Exchanger

## PRODUCT OVERVIEW

### Service Side - 4JH4-HTE

Figure 7 and Figure 8 illustrate a typical version of a 4JH4-HTE engine. Your engine may have different equipment from that illustrated.

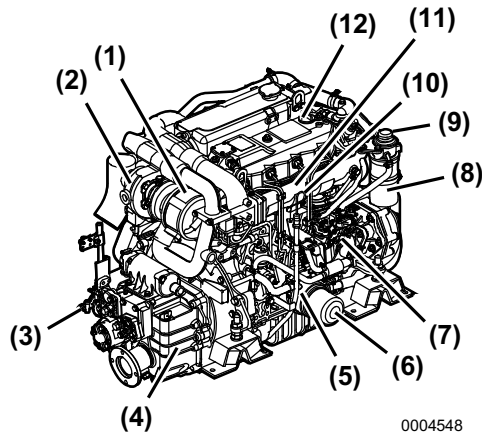


Figure 7

- 1 – Intake Silencer
- 2 – Turbocharger
- 3 – Shift Lever (KMH4A)
- 4 – Marine Gear (KMH4A)
- 5 – Engine Oil Cooler
- 6 – Engine Oil Filter
- 7 – Fuel Injection Pump
- 8 – Fuel Filter
- 9 – Fuel Priming Pump
- 10 – Engine Oil Dipstick
- 11 – Intake Manifold
- 12 – Engine Oil Filler Cap

### Non-Service Side - 4JH4-HTE

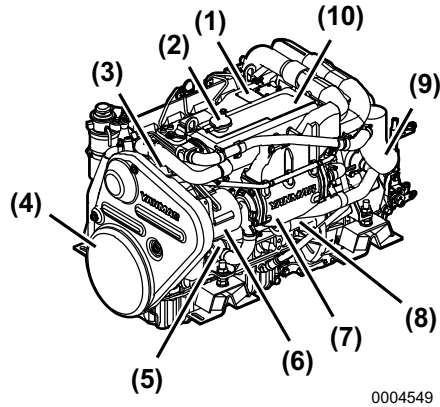


Figure 8

- 1 – Engine Nameplate (on rocker arm cover)
- 2 – Coolant Filler Cap
- 3 – Fresh Water Pump
- 4 – Belt Cover
- 5 – Seawater Pump
- 6 – Alternator
- 7 – Intercooler
- 8 – Starter Motor
- 9 – Exhaust Mixing Elbow
- 10 – Coolant Tank / Heat Exchanger

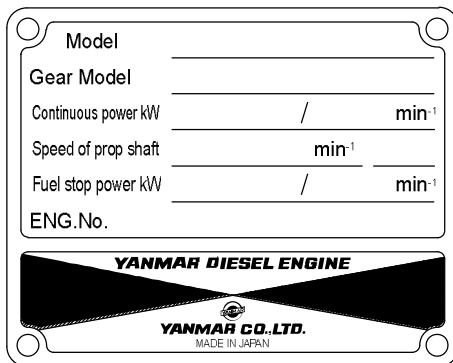


## PRODUCT OVERVIEW

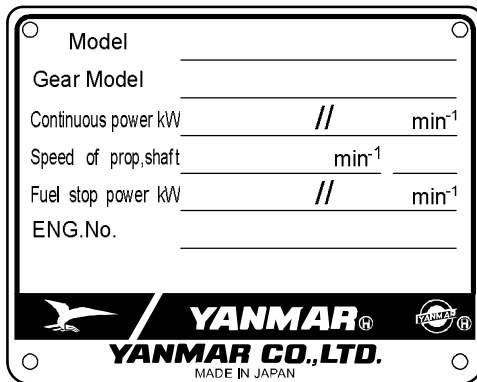
### LOCATION OF NAMEPLATES

The nameplates of Yanmar JH4 series engines are shown in **Figure 9** and **Figure 10**. Check the engine's model, output, rpm and serial number on the nameplate. Please replace if damaged or lost.

The engine nameplate is attached to the engine rocker arm cover.



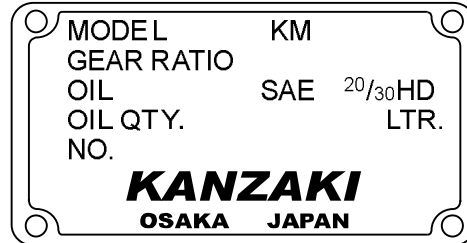
**Figure 9**



0004574

**Figure 10**

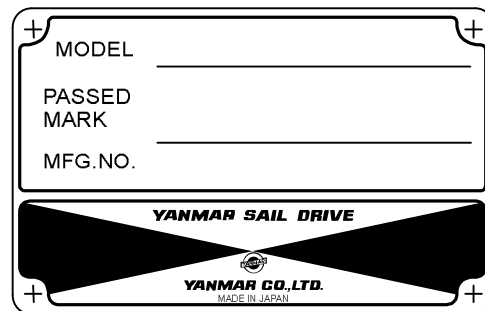
The marine gear nameplate (**Figure 11**) is attached to the marine gear. Check the marine gear's model, gear ratio, oil used, oil quantity and serial number



0004529

**Figure 11**

The sail drive nameplate (**Figure 12**) is attached to the sail drive. Check the sail drive model and serial number.



0004575

**Figure 12**

## PRODUCT OVERVIEW

### FUNCTION OF MAJOR COMPONENTS

Name of Component	Function
Fuel Filter	Removes dirt and water from the fuel. Drain the filter periodically. The filter element should be replaced periodically. The water separator (if equipped) should be drained periodically. <i>See Draining Fuel Filter / Water Separator on page 65.</i>
Fuel Feed Pump	Pumps fuel from the tank to the fuel injection system.
Fuel Priming Pump (if equipped)	This is a manual fuel pump. Pushing the knob on the top of the fuel filter feeds the fuel. The pump is also used to bleed air from the fuel system.
Engine Oil Filler Port	Filler port for engine oil.
Engine Oil Filter	Filters fine metal fragments and carbon from the engine oil. Filtered engine oil is distributed to the engine's moving parts. The filter is a cartridge type and the element should be replaced periodically. <i>See Changing the Engine Oil and Replacing the Engine Oil Filter Element on page 69.</i>
Marine Gear Filler Port	Filler port for marine gear lube oil. Located on top of the marine gear case.
Cooling System	There are two cooling systems: closed cooling with coolant (fresh water) and seawater. The engine is cooled by the closed cooling circuit. The closed circuit is cooled by seawater using a heat exchanger. The seawater also cools the engine / marine gear oil and intake air (depending on model) through the cooler(s) in an open circuit.
Closed Cooling Circulation Pump	The centrifugal water pump circulates coolant inside the engine. The circulating pump is driven by a V-belt.
Seawater Pump	Pumps seawater from outside vessel to the engine. The seawater pump is gear-driven and has a replaceable rubber impeller. Do not operate it without seawater, as this will damage the impeller.
Coolant Filler Cap	When the coolant temperature rises, the pressure inside the fresh water tank increases and opens the pressure valve in the filler cap. When the pressure valve in the filler cap is opened, hot water and steam pass through a rubber hose to the coolant recovery tank. When the engine cools and the pressure inside the coolant recovery tank drops, the vacuum valve in the filler cap opens and the coolant in the coolant recovery tank returns to the water tank through the pipe and filler cap. This minimizes coolant consumption.
Coolant Recovery Tank	The pressure valve in the filler cap releases vapor and hot water overflow to the coolant recovery tank. When the engine stops and the coolant cools, the pressure in the coolant tank drops. The filler cap vacuum valve then opens to send water back from the coolant recovery tank. This minimizes coolant consumptions. The closed cooling system coolant level can easily be checked and refilled in this tank.
Oil Cooler - Engine	A heat exchanger that cools high temperature engine oil using coolant.
Oil Cooler - Marine Gear (Optional)	This heat exchanger that cools the marine gear (KMH4A) oil using seawater.
Turbocharger (if equipped)	The turbocharger pressurizes the air coming into the engine. It is driven by a turbine that is energized by exhaust gases.
Intercooler (if equipped)	This heat exchanger cools the pressurized charging air from the turbocharger with seawater to increase the charging air quantity.
Intake Silencer (Air Cleaner)	The intake silencer guards against dirt in the air and reduces the noise of air intake.
Nameplates	Nameplates are provided on the engine and the marine gear and have the model, serial number and other data.
Starter	Starter motor for the engine. Powered by the battery.
Alternator	Driven by belt and generates electricity and charges the battery.
Engine Oil Dipstick	Gauge stick for checking the engine oil level.

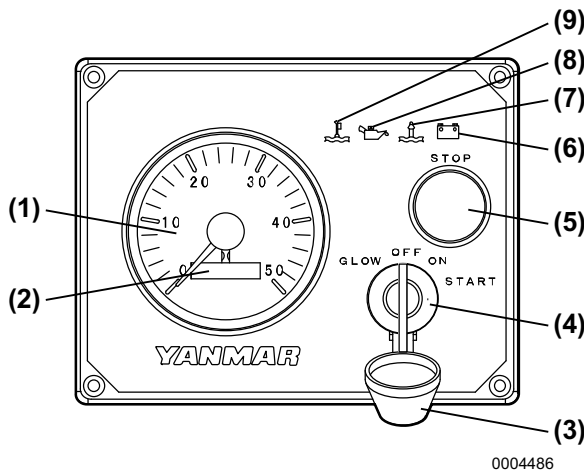
**CONTROL EQUIPMENT**

The equipment in the control room makes remote control operation possible. It consists of the instrument panel, which is connected to the engine by a wire harness, and the remote control handle, which is connected by control cables to the engine control lever and marine gear.

**Instrument Panel (Optional)  
Equipment and Functions**

The instrument panel is located in the cockpit. The following instruments enable you to start or stop the engine and to monitor its condition during operation.

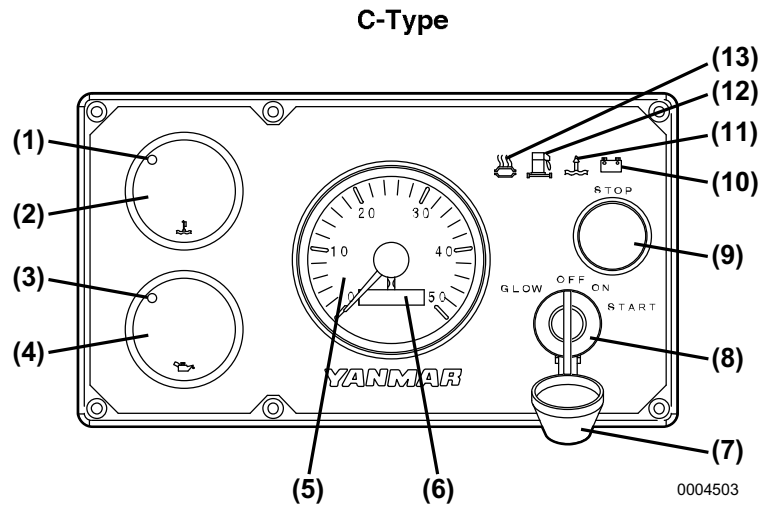
**B-Type**



**Figure 13**

- 1 – Tachometer
- 2 – Hourmeter
- 3 – Moisture Cap for Key Switch
- 4 – Key Switch
- 5 – Stop Button
- 6 – Battery Low Charge Indicator
- 7 – Water in Sail Drive Seal Indicator
- 8 – Engine Oil Low Pressure Indicator
- 9 – Coolant High Temperature Indicator

## PRODUCT OVERVIEW



**Figure 14**

- |  |   |
|--|---|
| 1 – Coolant High Temperature Indicator | 8 – Key Switch                                    |
| 2 – Coolant Temperature Gauge          | 9 – Stop Button                                   |
| 3 – Engine Oil Low Pressure Indicator  | 10 – Battery Low Charge Indicator                 |
| 4 – Engine Oil Pressure Gauge          | 11 – Water in Sail Drive Seal Indicator           |
| 5 – Tachometer                         | 12 – Water in Fuel Filter Indicator (if equipped) |
| 6 – Hourmeter                          | 13 – Insufficient Seawater Flow Indicator         |
| 7 – Moisture Cap for Key Switch        |   |

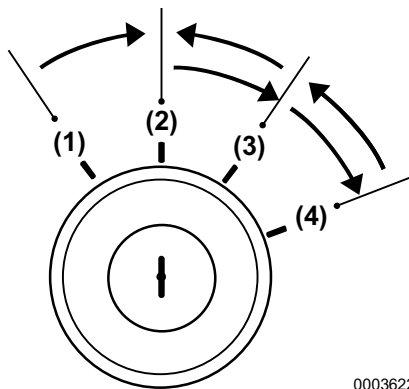
## PRODUCT OVERVIEW

### Meters

B-Type and C-Type panels use analog electric gauges with needle indicators.

Instrument	Function
Tachometer	Shows engine rotation speed.
Hourmeter	Shows number of operating hours. Can be used as a guide for periodic maintenance checks. The hourmeter is located at the bottom of the tachometer.
Coolant Temperature Gauge (C-Type only)	Shows the coolant temperature.
Engine Oil Pressure Gauge (C-Type only)	Shows the engine oil pressure.
Panel Lights	When turning the key switch to ON, the gauges will illuminate for easier viewing.

### Key Switch



**Figure 15**

The GLOW position (**Figure 15, (1)**) is the start aid position. Electric current to the glow plug or air heater (if equipped) is turned on. The air heaters is standard on the 4JH4AE and optional on the 3JH4E, 4JH4-TE and 4JH4-HTE models. When the key is released, the switch will automatically move to the ON position.

The START position (**Figure 15, (4)**) allows current to the starting motor. When starting the engine, move the key to the START position and release. The key will automatically move to the ON position.

When the key is in the OFF position (**Figure 15, (2)**) the electric current is off. The key can be inserted or removed in this position.

The ON position (**Figure 15, (3)**) allows electrical current to the controls and equipment and allows the engine to keep running. To stop the engine, keep the key switch in the ON position and push the stop button. After stopping the engine, turn key to OFF position.

### Indicators and Alarms (Optional)

When a sensor detects a problem during operation, the indicator on the instrument panel will light and an alarm will sound. Indicators are located on the instrument panel, the alarm is located on the back of the panel. Under normal operating conditions, the indicators are off.

## PRODUCT OVERVIEW

---



**Figure 16**

Battery Low Charge Indicator (**Figure 16**) - When the alternator output is too low, the indicator will light. When charging begins, the indicator will turn off. No alarm will sound for low battery charge.



**Figure 17**

Coolant High Temperature Indicator and Alarm (**Figure 17**) - When coolant temperature reaches the maximum allowable temperature (95°C [203°F] or higher), the indicator will light and the alarm will sound. Continuing operation at temperatures exceeding the maximum limit will result in damage and seizure. Check the load and troubleshoot the cooling system.



**Figure 18**

Engine Oil Low Pressure Indicator and Alarm (**Figure 18**) - When the engine oil pressure falls below normal, the oil pressure sensor will send a signal to the indicator causing it to light and the alarm to sound. Stop operation immediately to avoid damage to the engine. Check the oil level and troubleshoot the lubrication system.



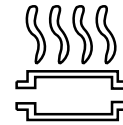
**Figure 19**

Water in Sail Drive Seal Indicator and Alarm (**Figure 19**) - When water is detected between the seals of the sail drive, the indicator will light and the alarm will sound.



**Figure 20**

Water in Fuel Filter Indicator and Alarm (C-Type only) - 4JH4-TE and 4JH4-HTE engines only - (**Figure 20**) - When the water level in the fuel filter / water separator becomes too high, the indicator will light and the alarm will sound. Drain the water from the fuel filter / water separator. *See Draining Fuel Filter / Water Separator on page 65.*



**Figure 21**

Insufficient Seawater Flow Indicator and Alarm (C-Type only) (**Figure 21**).

## PRODUCT OVERVIEW

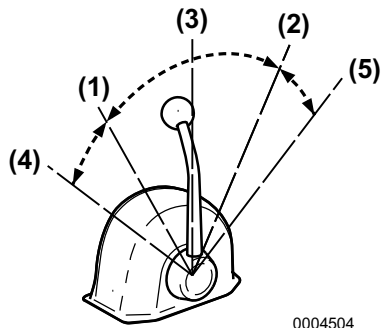
### Alarms

Check that indicators and alarms are working normally when the key is turned to ON.

Key Switch		OFF ⇒ ON	START ⇒ ON
Engine		Before start	Running
Alarm		Sound	Stop
Indicators	Battery Low Charge Indicator	ON	OFF
	Coolant High Temperature Indicator	OFF	OFF
	Engine Oil Low Pressure Indicator	ON	OFF
	Water in Sail Drive Seal Indicator (if equipped)	OFF	OFF

## PRODUCT OVERVIEW

### Single Lever Remote Control Handle



**Figure 22**

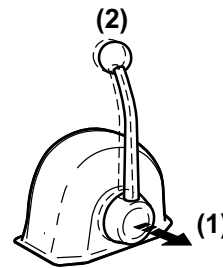
*Note: Direction of travel will vary depending on installation location.*

- 1 – Low Speed - FWD or REV
- 2 – Low Speed - FWD or REV
- 3 – NEUTRAL - Power to the propeller shaft is cut off and the engine idles
- 4 – Maximum Engine Speed - FWD or REV
- 5 – Maximum Engine Speed - FWD or REV

A single handle-type (**Figure 22**) should be used to operate the marine gear clutch (NEUTRAL, FORWARD, and REVERSE) and to control the engine speed.

The handle controls the direction of the boat (ahead or astern) and also acts as an accelerator by increasing engine speed as the lever is pushed further in FORWARD or REVERSE directions.

When the handle is pulled out (**Figure 23, (1)**), the engine speed can be controlled without engaging the clutch. The clutch remains in NEUTRAL, no load position. Turn the knob (**Figure 23, (2)**) counterclockwise to move the handle or clockwise to lock the handle.



0004511

**Figure 23**

*Note: Yanmar recommends the use of a single-lever type for the remote control system. If only a two-lever type is available in the market, reduce engine rpm to 1000 rpm or less before engaging and disengaging the marine gear clutch.*



# BEFORE YOU OPERATE

---

This section of the *Operation Manual* describes the diesel fuel, engine oil, and engine coolant specifications and how to replenish them. It also describes the daily engine checks.

## DIESEL FUEL

### Diesel Fuel Specifications

*NOTICE: Only use diesel fuels recommended by Yanmar for the best engine performance, to prevent engine damage and to comply with EPA warranty requirements. Only use clean diesel fuel.*

Diesel fuel should comply with the following specifications. The table lists several worldwide specifications for diesel fuels.

DIESEL FUEL SPECIFICATION	LOCATION
No. 2-D, No. 1-D, ASTM D975	USA
EN590:96	European Union
ISO 8217 DMX	International
BS 2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan

## BEFORE YOU OPERATE

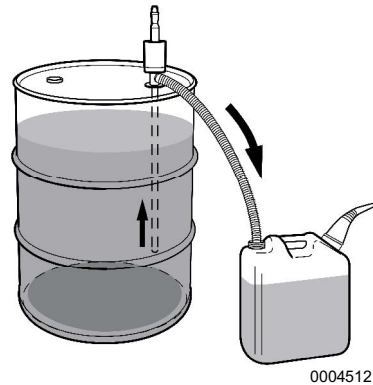
---

### Additional Technical Fuel Requirements

- The fuel cetane number should be equal to 45 or higher.
- The sulfur content must not exceed 0.5% by volume. Less than 0.05% is preferred.
- NEVER mix kerosene, used engine oil, or residual fuels with the diesel fuel.
- Water and sediment in the fuel should not exceed 0.05% by volume.
- Keep the fuel tank and fuel-handling equipment clean at all times.
- Ash content not to exceed 0.01% by volume.
- Carbon residue content not to exceed 0.35% by volume. Less than 0.1% is preferred.
- Total aromatics content should not exceed 35% by volume. Less than 30% is preferred.
- PAH (polycyclic aromatic hydrocarbons) content should be below 10% by volume.
- Do not use Biocide.
- Do not use kerosene or residual fuels.

### Handling of Diesel Fuel

1. Water and dust in the fuel may cause engine failure. When fuel is stored, be sure that the inside of the storage container is clean and dry, and that the fuel is stored away from dirt or rain.

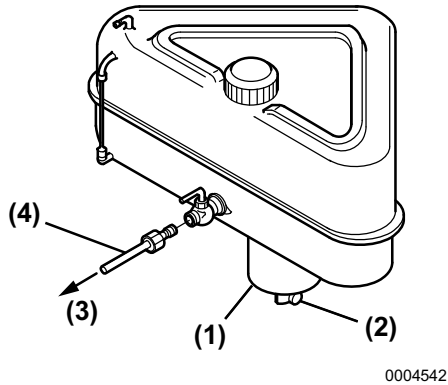


**Figure 1**

2. Keep the fuel container stationary for several hours to allow any dirt or water to settle to the bottom of the container. Use a pump to extract the clear, filtered fuel from the top of the container.

## BEFORE YOU OPERATE

### Fuel Tank (Optional)



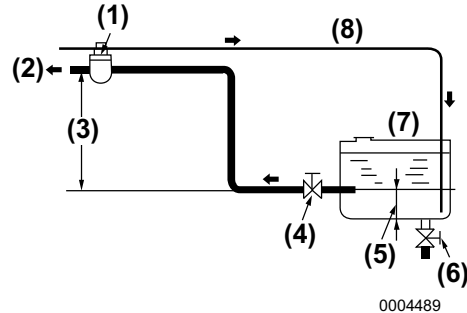
**Figure 2**

- 1 – Sediment Bowl
- 2 – Drain Cock
- 3 – To Engine
- 4 – Fuel Line

Install a drain cock (**Figure 2, (2)**) at the bottom of the fuel tank to remove water and contaminants from the sediment bowl (**Figure 2, (1)**).

The fuel outlet should be positioned 20 - 30 mm (0.75 - 1.125 in.) above the bottom of the tank so that only clean fuel is distributed to the engine.

### Fuel System - 3JH4E, 4JH4-TE and 4JH4-HTE



**Figure 3**

- 1 – Fuel Filter
- 2 – To Fuel Injection Pump
- 3 – Less than 500 mm (20.0 in.)
- 4 – Fuel Cock
- 5 – 20 - 30 mm (0.75 - 1.125 in.) approximate
- 6 – Drain Cock
- 7 – Fuel Tank
- 8 – Fuel Return Line

Install the fuel line from the fuel tank to the fuel injection pump as shown in **Figure 3**. The recommended fuel / water separator (optional) is installed at the center section of that line.

## BEFORE YOU OPERATE

### Fuel System - 4JH4AE

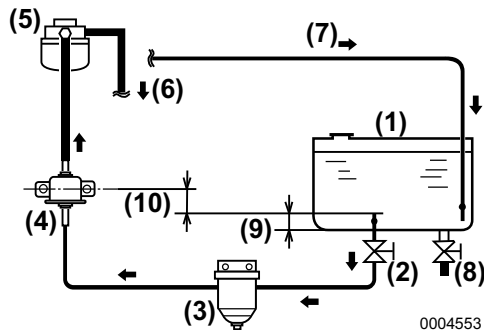


Figure 4

- 1 – Fuel Tank
- 2 – Fuel Cock
- 3 – Water Separator
- 4 – Fuel Feed Pump
- 5 – Fuel Filter
- 6 – To Fuel Injection Pump
- 7 – Fuel Return Line
- 8 – Drain Cock
- 9 – 20 - 30 mm (0.75 - 1.25 in.) approximate
- 10 – Less than 400 mm (16.38 in.)

### Filling the Fuel Tank

Before filling fuel tank for the first time:

1. Rinse fuel tank with kerosene or diesel fuel. Dispose of waste properly.

#### To fill the fuel tank:

NOTICE: Operate bilge ventilation (blowers) for a minimum of 5 minutes to purge fumes from engine compartment after refueling. Never operate bilge blower while refueling. Doing so can pump explosive fumes into the engine compartment and result in an explosion.

1. Clean the area around the fuel cap.
2. Remove the fuel cap from the fuel tank.

3. Fill the tank with clean fuel free of oil and dirt. NOTICE: Hold the hose nozzle firmly against the filler port while filling. This prevents static electricity buildup which could cause sparks and ignite fuel vapors.
4. Stop fueling when the gauge shows the fuel tank is full. NOTICE: NEVER overfill the fuel tank.
5. Replace the fuel cap and hand-tighten. Over-tightening the fuel cap will damage it.

### Bleeding the Fuel System

The fuel system has an automatic air bleeding device that purges air from the fuel system. No manual air bleeding is required for normal operation. Bleeding must be done if any fuel system maintenance has been performed (replacement of fuel filter, etc.) or if the engine does not start after several attempts.

## BEFORE YOU OPERATE

### Bleeding the Fuel System - 3JH4E

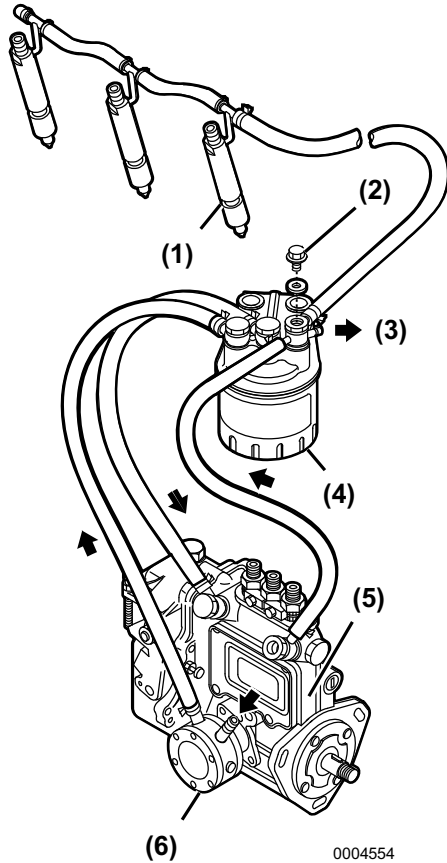


Figure 5

- 1 – Fuel Injector
- 2 – Air Bleed Screw
- 3 – To Fuel Tank
- 4 – Fuel Filter
- 5 – Fuel Injection Pump
- 6 – Fuel Feed Pump

1. Check the fuel level in the fuel tank. Refill if necessary.
2. Open the fuel cock of the fuel tank.
3. Loosen the air bleed screw (**Figure 5, (2)**) 2 - 3 turns.
4. Push up and down on the priming pump (**Figure 5, (1)**) to release air out of the air bleed screw.

5. Continue pumping until a solid stream of fuel with no air bubbles begins to flow.
6. Tighten the air bleed screw.

*Note: After engine start-up, the automatic air-bleeding device works to purge the air in the fuel system.*

### Bleeding the Fuel System - 4JH4AE

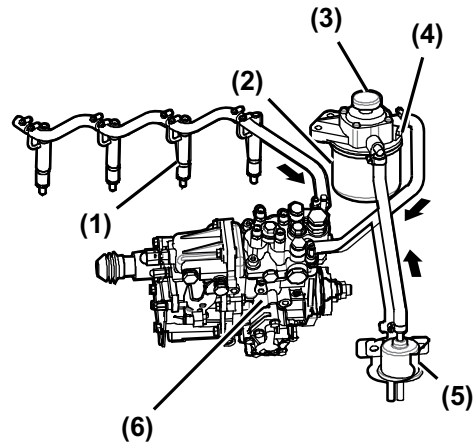


Figure 6

- 1 – Fuel Injector
- 2 – Fuel Filter
- 3 – Priming Pump
- 4 – Air Bleed Screw
- 5 – Fuel Feed Pump
- 6 – Fuel Injection Pump

1. Check the fuel level in the fuel tank. Refill if necessary.
2. Open the fuel cock of the fuel tank.
3. Loosen the air bleed screw (**Figure 6, (4)**) 2 - 3 turns.
4. Push up and down on the priming pump (**Figure 6, (3)**) to release air out of the air bleed screw.
5. Continue pumping until a solid stream of fuel with no air bubbles begins to flow.
6. Tighten the air bleed screw.

## BEFORE YOU OPERATE

### Bleeding the Fuel System - 4JH4-TE and 4JH4-HTE

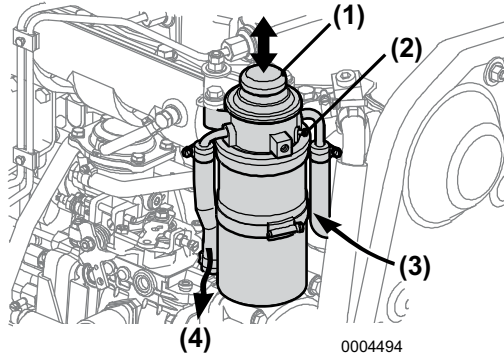


Figure 7

- 1 – Priming Pump
- 2 – Air Bleed Screw
- 3 – From Fuel Tank
- 4 – To Fuel Injection Pump

1. Check the fuel level in the fuel tank. Refill if necessary.
2. Open the fuel cock of the fuel tank.
3. Loosen the air bleed screw (**Figure 7, (2)**) 2 - 3 turns.
4. Push up and down on the priming pump (**Figure 7, (1)**) to release air out of the air bleed screw.
5. Continue pumping until a solid stream of fuel with no air bubbles begins to flow.
6. Tighten the air bleed screw.

**NOTICE:** NEVER use an engine starting aid such as ether. Engine damage will result.

## ENGINE OIL

### Engine Oil Specifications

**NOTICE:** Using engine oil that does not meet or exceed the following guidelines or specifications may cause seizure of parts, abnormal wear and shorten engine life.

Use an engine oil that meets or exceeds the following guidelines and classifications:

- **3JH4E, 4JH4-TE and 4JH4-HTE:** API Service Categories CD or higher
- **4JH4AE:** API Service Category CH-4 only
- SAE Viscosity: 10W30, 15W40. Engine oil 10W30 and 15W40 can be used throughout the year.

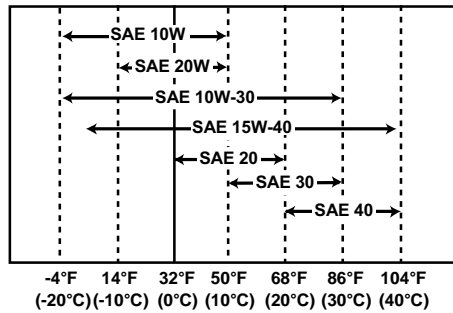
*Note:*

1. Be sure the engine oil, engine oil storage containers, and engine oil filling equipment are free of sediment or water.
2. Change the engine oil after the first 50 hours of operation and then at every 250 hours thereafter.
3. Select the oil viscosity based on the ambient temperature where the engine is being operated. See the SAE Service Grade Viscosity Chart (**Figure 8**).
4. Yanmar does not recommend the use of engine oil "additives."

### Handling Engine Oil

1. When handling and storing engine oil, be careful not to allow dust and water to contaminate the oil. Clean around the filler port before filling.
2. Do not mix lube oils of different types or brands. Mixing may cause the chemical characteristics of the oil to change and lubricating performance to decrease, reducing the engines life.
3. Engine oil should be replaced at the specified intervals, regardless if the engine has been operated.

**Engine Oil Viscosity**



0000005

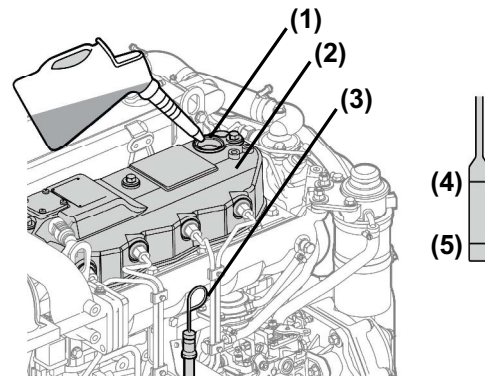
**Figure 8**

Select the appropriate engine oil viscosity based on the ambient temperature shown in the SAE Service Grade Viscosity Chart in **Figure 8**.

SAE 10W30 or SAE15W40 are the recommended oil viscosities.

If you operate your equipment at temperatures outside the limits shown, consult your authorized Yanmar dealer or distributor for special lubricants or starting aids.

**Checking the Engine Oil**



0004490

**Figure 9**

*Note: 4JH4-TE shown. Other models are similar.*

1. It is recommended that the engine be as level as possible before checking the oil.
2. Remove dipstick (**Figure 9, (3)**) and wipe with clean cloth.
3. Fully reinsert dipstick.
4. Remove dipstick. The oil level should be between upper (**Figure 9, (4)**) and lower (**Figure 9, (5)**) lines on the dipstick.
5. Add oil if necessary. See *Adding Engine Oil* on page 33.
6. Fully reinsert dipstick.

**Adding Engine Oil**

1. **NOTICE: Prevent dirt and debris from contaminating engine oil. Carefully clean the dipstick and the surrounding area before you remove the cap.** Remove the yellow oil filler port cap from filler port (**Figure 9, (1)**) and fill with engine oil.
2. Fill with oil to the upper limit (**Figure 9, (4)**) on the dipstick (**Figure 9, (3)**). **NOTICE: NEVER overfill the engine with engine oil.**

## **BEFORE YOU OPERATE**

---

3. Insert the dipstick fully to check the level. NOTICE: *ALWAYS keep the oil level between upper and lower lines on the oil cap / dipstick.*
4. Tighten the filler port cap securely by hand.

### **MARINE GEAR OR SAIL DRIVE OIL**

#### **Marine Gear Oil Specifications**

Use marine gear oil that meets or exceeds the following guidelines and classifications:

##### **KM4A2, KMH4A:**

- API Service Categories CD or higher
- SAE Viscosity #20 or #30

##### **ZF30M, ZF25A:**

- ATF (Automatic Transmission Fluid)

#### **Sail Drive Oil Specifications - SD50**

Refer to the operation manual of the sail drive for the procedure to fill or replace the sail drive oil.

##### **3JH4E, 4JH4AE:**

- SAE Viscosity #90 or 80W90
- QuickSilver®<sup>1</sup> High Performance Gear Lube.

##### **4JH4-TE:**

- Only use QuickSilver® High Performance Gear Lube.

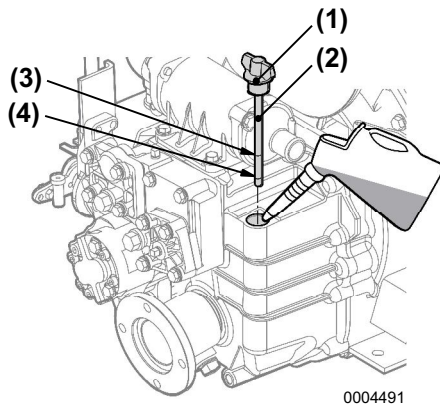
---

<sup>1</sup> QuickSilver is a registered trademark of Brunswick Corporation.



## BEFORE YOU OPERATE

### Checking Marine Gear Oil



**Figure 10**

*Note: 4JH4-TE with KM4A marine gear shown.*

1. Make sure engine is level.
2. Remove the filler cap (**Figure 10, (1)**) at the top of the housing.
3. Remove dipstick (**Figure 10, (2)**) and wipe with clean cloth.
4. Fully reinsert dipstick.
5. Remove dipstick. The oil level should be between upper (**Figure 10, (3)**) and lower (**Figure 10, (4)**) lines on the dipstick.
6. Fully reinsert dipstick.

### Adding Marine Gear Oil

1. Make sure the engine is level.
2. Remove the filler cap at the top of the housing (**Figure 10, (1)**).
3. Fill with oil to the upper limit on the dipstick (**Figure 10, (3)**). See *Marine Gear Oil Specifications* on page 34. **NOTICE: NEVER overfill the marine gear with oil.**
4. Fully reinsert dipstick.
5. Tighten the filler port cap by hand.

### Checking and Adding Sail Drive Oil

Refer to the operation manual for SD50-T for the procedure to check and fill the sail drive oil.

## BEFORE YOU OPERATE

### ENGINE COOLANT

#### Engine Coolant Specifications

- Texaco Long Life Coolant (LLC), both standard and premixed, product code 7997 and 7998.
- Havoline Extended Life Antifreeze / Coolant, product code 7994.

*Note: In the U.S., LLC is required for the warranty to be valid.*

#### Coolant (Closed Cooling System)

**NOTICE:** Always add LLC to soft water - especially when operating in cold weather. Without LLC, cooling performance will decrease due to scale and rust in the cooling system. Water alone may freeze and form ice; it expands approximately 9% in volume. Use the proper amount of coolant concentrate for the ambient temperature as specified by the LLC manufacturer. LLC concentration should be a minimum of 30% to a maximum of 60%. Too much LLC will decrease the cooling efficiency also. Do not mix different types or brands of LLC or a harmful sludge may form. Do not use hard water. Water should be clean and free from sludge or particles. Following the manufacturer's recommendations, use a proper LLC which will not have any adverse effects on the materials (cast iron, aluminum, copper, etc.) of the engine's fresh water cooling system. See Engine Coolant Specifications on page 36. Excessive use of antifreeze also lowers the cooling efficiency of the engine. Be sure to use the mixing ratios specified by the antifreeze manufacturer for the temperature range. Replace engine coolant periodically, according to the maintenance schedule in this Operation Manual. Remove scale from the cooling system periodically by flushing the system. Do not mix different brands of antifreeze. Chemical reactions may make the antifreeze useless and engine problems may result.

#### Checking and Adding Coolant 3JH4E

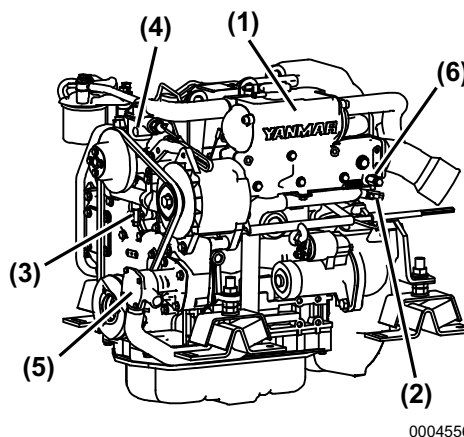


Figure 11

- 1 – Coolant Tank (Heat Exchanger)
- 2 – Seawater Drain Cock
- 3 – Coolant Drain Cock (located behind the V-belt cover) - 3JH4E Only
- 4 – Coolant Pump (Fresh Water)
- 5 – Seawater Drain from Seawater Pump Cover
- 6 – Coolant Drain Cock

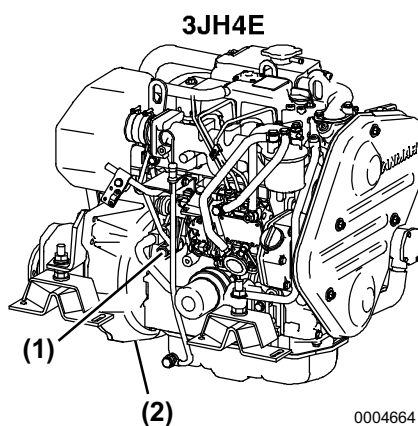
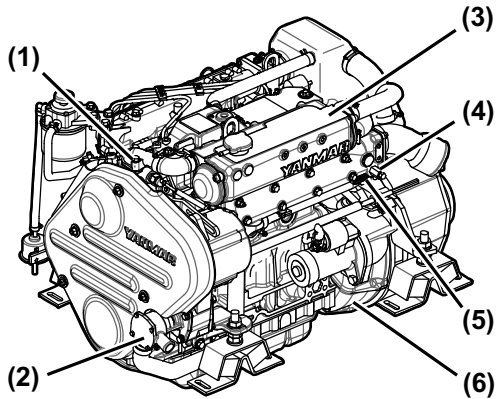


Figure 12

- 1 – Coolant Drain Cock
- 2 – Flywheel Housing
- 3 – Stop Solenoid

**BEFORE YOU OPERATE**

**4JH4AE**

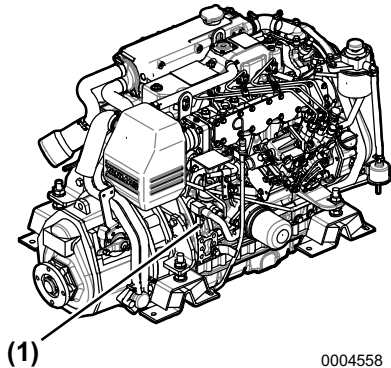


0004569

**Figure 13**

- 1 – Coolant Pump (Fresh Water)
- 2 – Seawater Drain from Seawater Pump Cover
- 3 – Coolant Tank (Heat Exchanger)
- 4 – Coolant Drain Cock
- 5 – Seawater Drain Cock
- 6 – Flywheel Housing

**4JH4AE**

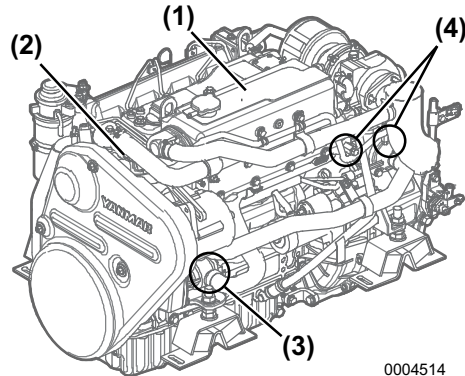


0004558

**Figure 14**

- 1 – Coolant Drain Cock

**4JH4-TE**

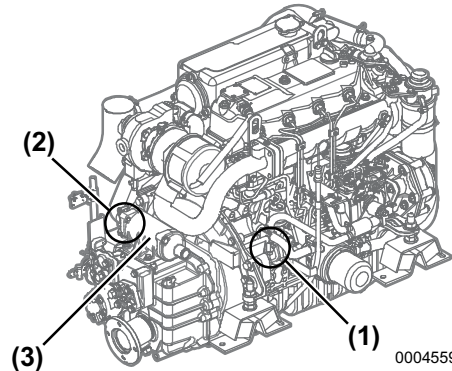


0004514

**Figure 15**

- 1 – Coolant Tank (Heat Exchanger)
- 2 – Coolant Pump (Fresh Water)
- 3 – Seawater Drain from Seawater Pump Cover
- 4 – Coolant Drain Cock (2 used)

**4JH4-TE**



0004559

**Figure 16**

- 1 – Coolant Drain Cock
- 2 – Seawater Drain Cock
- 3 – Marine Gear Cooler

## BEFORE YOU OPERATE

### 4JH4-HTE

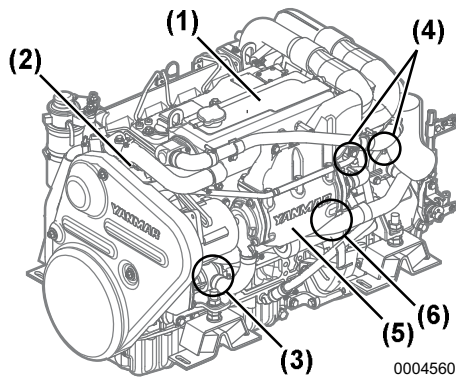


Figure 17

- 1 – Coolant Tank (Heat Exchanger)
- 2 – Coolant Pump (Fresh Water)
- 3 – Seawater Drain from Seawater Pump Cover
- 4 – Coolant Drain Cock
- 5 – Intercooler
- 6 – Seawater Drain Cock

### 4JH4-HTE

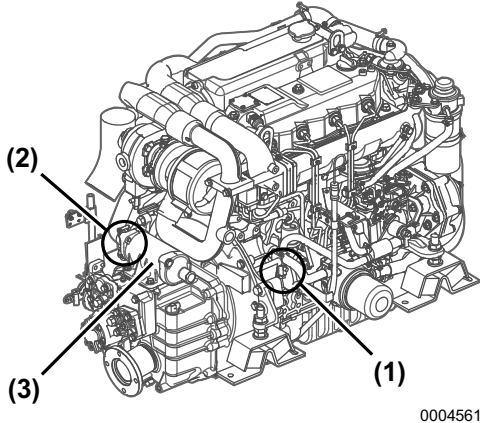


Figure 18

- 1 – Coolant Drain Cock
- 2 – Seawater Drain Cock
- 3 – Marine Gear Cooler

*Note: The drain cocks are opened before shipping from the factory. Marine gear ZF25A does not have a drain cock on the clutch cooler.*

1. Ensure all drain cocks are closed.

2. Loosen the filler cap of the coolant tank to relieve the pressure then remove the filler cap.

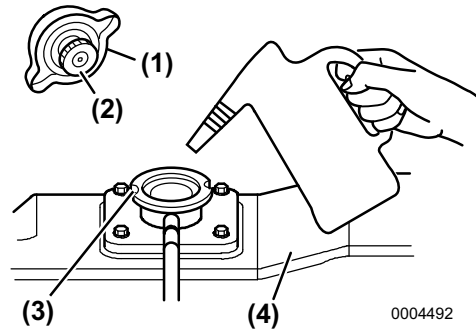
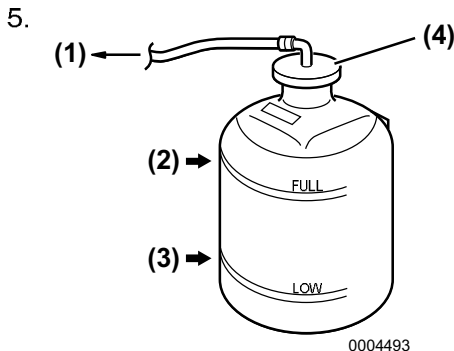


Figure 19

- 1 – Coolant Filler Cap
- 2 – Filler Cap Tabs
- 3 – Filler Port Notches
- 4 – Coolant Tank

3. Pour coolant slowly into the coolant tank (**Figure 19, (4)**) to avoid air bubbles. Fill until coolant overflows from the filler port.
4. Align filler cap tabs (**Figure 19, (2)**) with filler port notches (**Figure 19, (3)**) and tighten filler cap (**Figure 19, (1)**).

*Note: The coolant level rises in the coolant recovery tank during operation. After stopping the engine, the coolant will cool down and the extra coolant will return to the coolant tank.*



**Figure 20**

Check the coolant level in the coolant recovery tank. The level should be at the FULL mark (**Figure 20, (2)**). Add coolant if necessary. **NOTICE: NEVER pour cold coolant into a hot engine.**

6. Remove coolant recovery tank cap (**Figure 20, (4)**) to add coolant if necessary. Do not add water.
7. Replace filler cap and tighten it firmly. Failure to do so will cause water leakage.

Coolant Recovery Tank Capacity
0.8 L (1.7 pt)

8. Check the rubber hose (**Figure 20, (1)**) connecting the coolant recovery tank to the coolant tank / heat exchanger. Replace if damaged.

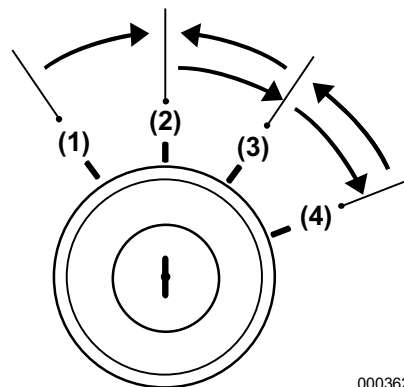
*Note: If the coolant runs low too often or only the coolant level in the coolant tank drops without any change in the level in the coolant recovery tank, there may be water or air leaks in the cooling system. See your authorized Yanmar dealer or distributor.*

## CRANKING THE ENGINE

When performing engine break-in or if the engine has not been used for a long period of time, engine oil will not be distributed to all of the operating parts. Using the engine in this condition will lead to seizure.

After a long period of non-use, distribute engine oil to each part by cranking the engine. Perform the following procedure before beginning operation:

1. Open seacock.
2. Open fuel cock.
3. Put remote control shift lever in NEUTRAL.
4. Turn battery switch to ON (if equipped).



**Figure 21**

*Note: If the engine has not been operated for a long period of time, check that the key can be moved from START to ON positions smoothly.*

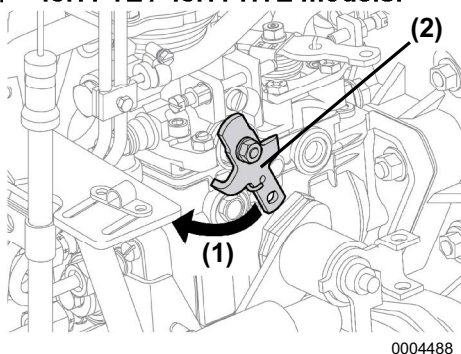
5. Turn key to ON (**Figure 21, (3)**).
6. **3JH4E / 4JH4AE models:**
  - a. While pushing the STOP button on the control panel, turn the key to the START position (**Figure 21, (4)**). **NOTICE: NEVER hold the key in the START position for longer than 15 seconds or the starter motor will overheat.**

## BEFORE YOU OPERATE

- b. When the key is in the START position, the engine will begin cranking. Continue cranking for about 5 seconds and listen for abnormal noise during that time.

*Note: If the STOP button is released during the cranking procedure, the engine will start. Do not start the engine in this mode.*

### 7. 4JH4-TE / 4JH4-HTE models:



**Figure 22**

- a. Move and hold (**Figure 22, (1)**) the stop lever (**Figure 22, (2)**) on the governor to stop fuel flow while cranking.

*Note: 4JH4-TE / 4JH4-HTE models: Do not use the STOP button on the control panel for cranking procedure.*

- b. Hold key in START position for about 5 seconds and listen for abnormal noise during that time.

*Note: If the governor lever is released during the cranking procedure, the engine will start.*

## DAILY CHECKS

Before you start for the day, make sure the Yanmar engine is in good operating condition. **CAUTION! It is important to perform daily checks as listed in this Operation Manual. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor engine performance and helps extend the life of the engine.** Make sure you check the following items:

### Visual Checks

1. Check for engine oil leaks.
2. Check for fuel leaks.
3. Check for engine coolant leaks.
4. Check for damaged or missing parts.
5. Check for loose, missing or damaged fasteners.
6. Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.
7. Check hoses for cracks, abrasions and damaged, loose or corroded clamps.
8. Check the fuel filter / water separator for presence of water and contaminants. If you find any water or contaminants, drain the fuel filter / water separator. *See Draining Fuel Filter / Water Separator on page 65.* If you have to drain the fuel filter / water separator frequently, drain the fuel tank and check for water in your fuel supply. *See Draining the Fuel Tank on page 67.*

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

### **Checking Diesel Fuel, Engine Oil and Engine Coolant Levels**

Follow the procedures in *Filling the Fuel Tank on page 30*, *Checking the Engine Oil on page 33* and *Checking Diesel Fuel, Engine Oil and Engine Coolant Levels on page 41* to check these levels.

### **Checking and Refilling Marine Gear Oil**

See *Checking Marine Gear Oil on page 35*.

### **Checking the Battery Electrolyte Level**

Check the battery electrolyte level before use. See *Checking the Battery Electrolyte Level (Serviceable Batteries Only) on page 66*.

### **Checking the Alternator Belt**

Check the belt tension before use. See *Checking and Adjusting the Alternator V-Belt Tension on page 62*.

### **Checking the Remote Control Handle**

Check the operation of the remote control handle and ensure it moves smoothly. If it is hard to operate, grease the joints of the remote control cable and lever bearings. If the lever is too loose, adjust the remote control cable. See *Checking and Adjusting Remote Control Cables on page 63*.

### **Checking the Alarm Indicators**

Check the instruments and alarm indicators at regular intervals.

### **Preparing Fuel, Oil and Coolant in Reserve**

Prepare sufficient fuel for the day's operation. Always store engine oil and coolant in reserve (for at least one refill) on board, to be ready for emergencies.

**BEFORE YOU OPERATE**

---

**This Page Intentionally Left Blank**



# ENGINE OPERATION

---

## WARNING

### **Fire and Explosion Hazard**



Avoid serious personal injury. NEVER jump-start the engine. Sparks caused by shorting the battery to the starter terminals may cause a fire or explosion.

ONLY use the key switch to start the engine.

### **Sudden Movement Hazard**

Be sure the boat is in open water away from other boats, docks or other obstructions before increasing rpm. Avoid unexpected equipment movement. Shift the marine gear into the NEUTRAL position any time the engine is at idle.

To prevent accidental equipment movement, NEVER start the engine in gear.

### **Sever Hazard**



Keep children and pets away while the engine is operating.

### **Exhaust Hazard**



Avoid serious injury or death. 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 and special precautions are required to avoid carbon monoxide poisoning.

## ENGINE OPERATION

### 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. If the alarm window with audible alarm fails to display and go out about 3 seconds later when the ignition switch is in the ON position, see your authorized Yanmar marine dealer or distributor for service before operating the engine.

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.
- NEVER run the engine if the ambient temperature is above +40°C (+104°F) or below -16°C (+5°F).
- If the ambient temperature exceeds +40°C (+104°F), the engine may overheat and cause the engine oil to break down.
- If the ambient temperature is below -16°C (+5°F), rubber components such as gaskets and seals will harden causing premature engine wear and damage.
- Contact your authorized Yanmar marine engine dealer or distributor if the engine will be operated outside of this standard temperature range.

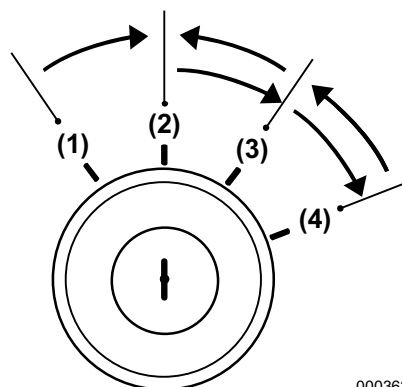
NEVER engage the starter motor while the engine is running. Damage to the starter motor pinion and / or ring gear will result.

## STARTING THE ENGINE

**NOTICE:** If the vessel is equipped with a water lift (water lock) muffler, excessive cranking could cause sea water to enter the cylinders and damage the engine. If the engine does not start after cranking for 10 seconds, close the thru-hull water intake valve to avoid filling the muffler with water. Crank for 10 seconds or until the engine starts. When the engine starts, stop the engine immediately and press the switch to the OFF position.

1. Open the seacock (if equipped).
2. Open the fuel cock.
3. Put remote control handle in NEUTRAL.

*Note:* Safety equipment should make it impossible to start the engine in any other position than NEUTRAL.



0003622

**Figure 1**

4. Turn the battery master switch (if equipped) to ON.
5. Turn key switch to ON (**Figure 1, (3)**). Ensure that the instrument panel indicators light and the alarm sounds. This indicates that indicators and alarm are working correctly.

*Note:* The coolant high temperature alarm indicator does not come on during start-up.

6. Turn key switch to START (**Figure 1, (4)**). Release the key switch when the engine has started. NOTICE: *NEVER hold the key in the START position for longer than 15 seconds or the starter motor will overheat.*
7. The alarm should stop and the indicators should go out. NOTICE: *If any indicator fails to illuminate when the key switch is in the ON position, see your authorized Yanmar marine dealer or distributor for service before operating the engine.*

*Note: When the engine has not been used for a long period of time, check that the key can move from the START position to the ON position smoothly.*

### Restarting After Starting Failure

Before turning the key switch again, be sure to confirm that the engine has stopped completely. If an attempt to restart is made while the engine is running, the pinion gear of the starter motor will be damaged. NOTICE: *NEVER hold the key in the START position for longer than 15 seconds or the starter motor will overheat.*

NOTICE: *NEVER attempt to restart the engine if the engine has not stopped completely. Pinion gear and starter motor damage will occur.*

### Air Bleeding the Fuel System After Starting Failure

If the engine does not start after several attempts, there may be air in the fuel system. If air is in the fuel system, fuel cannot reach the fuel injection pump. Bleed the air out of the system. *See Bleeding the Fuel System on page 30.*

### Starting at Low Temperatures

Comply with local environmental requirements. Use engine heaters to avoid starting problems and white smoke. Do not use starting aids. NOTICE: *NEVER use an engine starting aid such as ether. Engine damage will result.*

To limit white smoke, run the engine at low speed and under moderate load until the engine reaches normal operating temperature. A light load on a cold engine provides better combustion and faster engine warm-up than no load.

Avoid running the engine at idling speed any longer than necessary.

### Starting with Air Heater (If Equipped)

1. Open the seacock (if equipped).
2. Open the fuel tank cock.
3. Put remote control handle in NEUTRAL.
4. Turn the battery master switch (if equipped) ON.
5. Turn key switch to GLOW for 15 seconds.
6. Turn key switch to ON. Ensure that the instrument panel indicators light and the alarm sounds. This shows that indicators and alarm are working correctly.

*Note: The coolant high temperature alarm indicator does not come on during start-up.*

7. Turn key switch to START. Release the key switch when the engine has started. The alarm should stop and the indicators should go out. NOTICE: *NEVER hold the key in the START position for longer than 15 seconds or the starter motor will overheat.*

## ENGINE OPERATION

### After the Engine Has Started

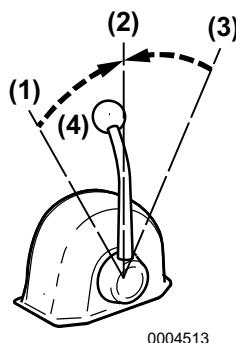
After the engine has started, check the following items at a low engine speed:

1. Check that the gauges, indicators, and alarm are normal.
  2. Check for water, fuel or oil leakage from the engine.
  3. Check that the exhaust color, engine vibration and sound are normal.
  4. When there are no problems, keep the engine at low speed with the boat still stopped to distribute engine oil to all parts of the engine.
  5. Check that sufficient cooling water is discharged from the seawater outlet pipe. Operation with inadequate seawater discharge will damage the impeller of the seawater pump. If seawater discharge is too low, stop the engine immediately. Identify the cause and repair. **NOTICE:** *The engine will seize if it is operated when cooling seawater discharge is inadequate or if load is applied without any warm-up operation.*
- For troubleshooting assistance, see *Troubleshooting After Starting on page 77* or *Troubleshooting Chart on page 79*.

If necessary, see your authorized Yanmar dealer or distributor.

## REMOTE CONTROL HANDLE OPERATION

### Acceleration and Deceleration



**Figure 2**

- 1 – Forward or Reverse
- 2 – Neutral
- 3 – Reverse or Forward
- 4 – Throttle Handle / Clutch Handle

*Note: Direction of travel will vary depending on installation location.*

Use the throttle handle (**Figure 2, (4)**) to control acceleration and deceleration. Move the handle slowly.

### Shifting the Engine

**NOTICE:** *Shifting the marine gear while operating at high speed or not pushing the handle fully into position (partial engagement) will result in damage to marine gear parts and abnormal wear.*

1. Before using the marine gear, be sure to move the throttle handle to a low idle position (less than 1000 rpm). Move the throttle handle slowly to a higher speed position after completing clutch engagement.

## ENGINE OPERATION

2. NOTICE: NEVER shift the marine gear at high engine speed. During normal operation, the marine gear should only be shifted with the engine at idle. When moving the handle between FORWARD (Figure 2, (1)) and REVERSE (Figure 2, (3)), bring the clutch to NEUTRAL (Figure 2, (2)) and pause before slowly shifting to the desired position. Do not shift abruptly from FORWARD to REVERSE or vice versa.

### Switching to Trolling (KMH4A only)

Use the trolling handle to begin trolling. When changing from FORWARD or REVERSE to trolling, the speed of the propeller revolution will be reduced to a minimum.

NOTICE: When trolling, do not increase engine speed above 1000 rpm. This may cause premature wear and damage to the clutch.

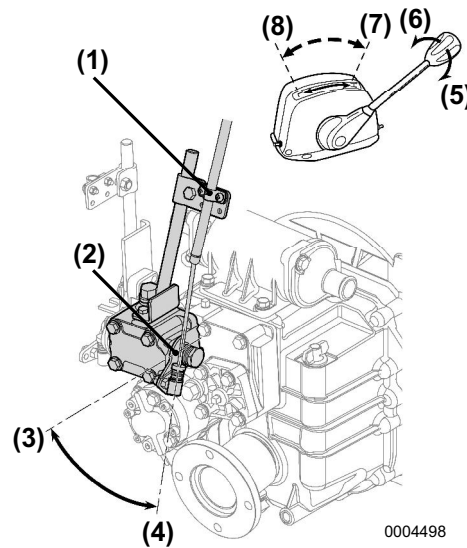


Figure 3

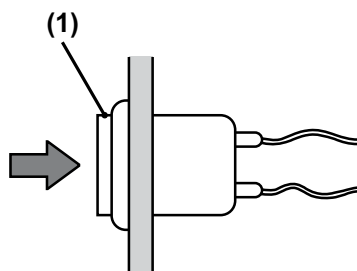
- 1 – Cable Fitting
  - 2 – Trolling Lever
  - 3 – Low Speed (Trolling)
  - 4 – High Speed
  - 5 – Loosen
  - 6 – Tighten
  - 7 – Normal Operation (High Speed)
  - 8 – Trolling (Low Speed)
1. Operation continues at low engine speed of 1000 rpm or less.
  2. Reduce the speed by moving the trolling handle from high speed (H) (Figure 3, (4)) to low speed (L) (Figure 3, (3)). Adjust the speed to the desired rate and secure the trolling handle in place.
  3. Before returning to normal operation, be sure to put the trolling handle in high speed (H) position.
  4. Increase engine speed and continue normal operation.

## ENGINE OPERATION

### SHUTTING DOWN THE ENGINE

**NOTICE:** Avoid engine damage. Do not stop engine abruptly during operation. Yanmar recommends that when shutting the engine down, allow the engine to run, without load, for 5 minutes. This will allow the engine components that operate at high temperatures, such as the exhaust system, to cool slightly before the engine itself is shut down.

1. Reduce engine speed to low idle and put remote control handle in NEUTRAL.
2. Accelerate from low speed to high speed and repeat five times. This will clean out the carbon from the cylinders and the fuel injection nozzles.
3. Allow engine to run at low speed (approximately 1000 rpm) without load for 5 minutes.



0004487

**Figure 4**

4. With the key in the ON position, push and hold the stop button (**Figure 4, (1)**). After the engine has stopped, turn the key switch to OFF.

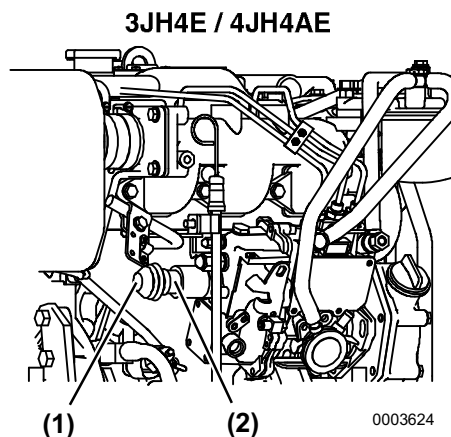
*Note: Continue to hold the stop button in until the engine is completely stopped. If the button is released before the engine has completely stopped, it may restart. If the engine does not shut down, see Emergency Shutdown on page 48.*

5. Remove the key and cover the key switch with the moisture cap.

6. Turn off the battery master switch (if equipped).
  7. Close the fuel cock.
  8. Close the seacock (if equipped).
- NOTICE:** Be sure to close the seacock. Neglecting to close the seacock could allow water to leak into the boat and may cause it to sink.

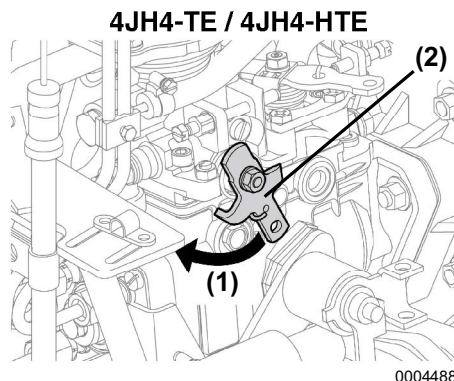
### Emergency Shutdown

**NOTICE:** NEVER use the emergency stop switch for a normal engine shutdown. Use this switch only when stopping the engine suddenly in an emergency.



**Figure 5**

If the engine cannot be shut down by the STOP button on the panel, stop the engine by pushing the button (**Figure 5, (1)**) at the back of the stop solenoid (**Figure 5, (2)**).



**Figure 6**

## ENGINE OPERATION

If the engine cannot be shut down by the STOP button on the panel, stop the engine by moving the stop lever (**Figure 6, (2)**) by hand to the left (**Figure 6, (1)**). The lever is attached to the fuel injection pump.

### CHECKING THE ENGINE AFTER OPERATION

- Check that the key switch is in the OFF position and battery master switch (if equipped) is turned to OFF.
- Fill the fuel tank. *See Filling the Fuel Tank on page 30.*
- Close seawater cock(s).
- If there is a risk of freezing, check that the cooling system contains enough coolant. *See Engine Coolant Specifications on page 36.*
- If there is a risk of freezing, drain the seawater system. *See Drain Seawater Cooling System on page 84.*
- At temperatures below 0°C (32°F), drain seawater system and connect the engine heater (if equipped).

## **ENGINE OPERATION**

---

**This Page Intentionally Left Blank**



# PERIODIC MAINTENANCE

---

This section of the *Operation Manual* describes the procedures for proper care and maintenance of the engine.

## SAFETY PRECAUTIONS

### **WARNING**

#### **Crush Hazard**



If you need to transport an engine for repair, have a helper assist you attach it to a hoist and load it on a truck.

---

Avoid personal injury or equipment damage. The engine lifting eyes are engineered to lift the weight of the marine engine only. **ALWAYS** use the engine lifting eyes when lifting the engine.

---

Avoid serious personal injury. Additional equipment is necessary to lift the marine engine and marine gear together. **ALWAYS** use lifting equipment with sufficient capacity to lift the marine engine.

## PERIODIC MAINTENANCE

---

### **WARNING**

#### **Welding Hazard**

Make welding repairs safely.

- ALWAYS turn off the battery switch (if equipped) or disconnect the negative battery cable and the leads to the alternator when welding on the equipment.
- Remove the multi-pin connector to the engine control unit. Connect the weld clamp to the component to be welded and as close as possible to the welding point.
- NEVER connect the weld clamp to the engine or in a manner which would allow current to pass through a mounting bracket.
- When welding is completed, reconnect the leads to the alternator and engine control unit prior to reconnecting the batteries.

---

#### **Exhaust Hazard**



Avoid serious injury or death. ALWAYS ensure that all connections are tightened to specifications after repair is made to the exhaust system.

All internal combustion engines create carbon monoxide gas during operation and special precautions are required to avoid carbon monoxide poisoning.

---

#### **Shock Hazard**



Avoid serious personal injury or equipment damage. ALWAYS turn off the battery switch (if equipped) or disconnect

the negative battery cable before servicing the equipment.

Avoid personal injury or equipment damage. ALWAYS keep the electrical connectors and terminals clean. Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.

### **NOTICE**

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.

---

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.

### PRECAUTIONS

#### The Importance of Periodic Maintenance

Engine deterioration and wear occur in proportion to the length of time the engine has been in service and the conditions the engine is subjected to during operation. Periodic maintenance prevents unexpected downtime, reduces the number of accidents due to poor machine performance and helps extend the life of the engine.

#### Performing Periodic Maintenance

**WARNING! 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.**

Perform periodic maintenance procedures in an open, level area free from traffic. If possible, perform the procedures indoors to prevent environmental conditions such as rain, wind, or snow from damaging the engine.

#### The Importance of Daily Checks

The Periodic Maintenance Schedule assume that the daily checks are performed on a regular basis. Make it a habit of performing daily checks before the start of each operating day. *See Daily Checks on page 40.*

#### Keep a Log of Engine Hours and Daily Checks

Keep a log of the number of hours the engine is run each day and a log of the daily checks performed. Also note the date, type of repair (e.g., replaced alternator), and parts used for any service needed between the periodic maintenance intervals. Periodic maintenance intervals are every 50, 250, 500, and 1000 engine hours. Failure to perform periodic maintenance will shorten the life of the engine.

#### Yanmar Replacement Parts

Yanmar recommends that you use genuine Yanmar parts when replacement parts are needed. Genuine replacement parts help ensure long engine life.

#### Tools Required

Before you start any periodic maintenance procedure, make sure you have the tools you need to perform all of the required tasks.

#### Ask Your Authorized Yanmar Marine Dealer or Distributor For Help

Our professional service technicians have the expertise and skills to help you with any maintenance or service related procedures.

## PERIODIC MAINTENANCE

### Tightening Fasteners

Use the correct amount of torque when you tighten fasteners on the machine. Applying excessive torque may damage the fastener or component and not enough torque may cause a leak or component failure.

NOTICE: *The tightening torque in the Standard Torque Chart 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.*



Bolt diameter x pitch (mm)		M6 x 1.0	M8 x 1.25	M10 x 1.5	M12 x 1.75	M14 x 1.5	M16 x 1.5
Tightening Torque	N·m	11.0 ± 1.0	26.0 ± 3.0	50.0 ± 5.0	90.0 ± 10.0	140.0 ± 10.0	230.0 ± 10.0
	kgf·m	1.1 ± 0.1	2.7 ± 0.3	5.1 ± 0.5	9.2 ± 1.0	14.3 ± 1.0	23.5 ± 1.0
	lb·ft	—	19.0 ± 2.1	37 ± 3.6	66.0 ± 7.2	103 ± 7.2	170 ± 7.2
	lb·in.	96 ± 9.0	—	—	—	—	—

### EPA MAINTENANCE REQUIREMENTS

To maintain optimum engine performance and compliance with the Environmental Protection Agency (EPA) Regulations for Engines, it is essential that you follow the *Periodic Maintenance Schedule on page 57* and the *Periodic Maintenance Procedures on page 61*.

#### EPA Requirements for USA and Other Applicable Countries

The following are the requirements for the EPA. Unless these requirements are met, the exhaust gas emissions will not be within the limits specified by the EPA.

*See Conditions to Ensure Compliance with EPA Emission Standards on page 55.*

Clean or replace the air cleaner element if the air intake restriction exceeds the referenced specifications.

#### EPA Requirements

The EPA emission regulation is applicable only in the USA and other countries that have adapted the EPA requirements in part or in whole. Determine and follow the emission regulations in the country where your engine will be operating to assist you in specified compliance.

#### Conditions to Ensure Compliance with EPA Emission Standards

The 3JH4E, 4JH4AE, 4JH-TE and 4JH4-HTE are EPA-certified engines.

The following are the conditions that must be met in order to ensure that the emissions during operation meet the EPA standards.

The operating conditions should be as follows:

- Ambient temperature: -20° to +40°C (-4° to +104°F)
- Relative humidity: 80% or lower
- **3JH4E and 4JH4AE:** Permissible value for intake negative pressure: 4.0 kPa (400 mmAq) or lower
- **4JH4-TE and 4JH4-HTE:** Permissible value for intake negative pressure: 2.0 kPa (200 mmAq) or lower
- **3JH4E and 4JH4AE:** Permissible value for exhaust back pressure: 15.0 kPa (1500 mmAq) or lower
- **4JH4-TE and 4JH4-HTE:** Permissible value for exhaust back pressure: 20.0 kPa (2000 mmAq) or lower

The diesel fuel should be:

- ASTM D975 No. 1-D or No. 2-D, or equivalent (minimum of cetane No. 45)

The lubricating oil should be:

- **3JH4E, 4JH4-TE and 4JH4-HTE:** Type API, Class CD or higher
- **4JH4AE:** Type API, Class CH-4 only

Be sure to perform inspections as outlined in *Periodic Maintenance Procedures on page 61* and keep a record of the results.

Pay particular attention to these important points:

- Replacing the engine oil
- Replacing the engine oil filter
- Replacing the fuel filter
- Cleaning the intake silencer (air cleaner)

*Note: Inspections are divided into two sections in accordance with who is responsible for performing the inspection: the user or the maker.*

## **PERIODIC MAINTENANCE**

---

### **Inspection and Maintenance**

*See Inspection and Maintenance of EPA Emission-Related Parts on page 60 for the EPA emission-related parts. Inspection and maintenance procedures not shown in the Inspection and Maintenance of EPA Emission-Related Parts section are covered in Periodic Maintenance Schedule on page 57.*

This maintenance must be performed to keep the emission values of your engine in the standard values during the warranty period. The warranty period is determined by the age of the engine or the number of hours of operation.

### PERIODIC MAINTENANCE SCHEDULE

Daily and periodic maintenance is important to keep the engine in good operating condition. The following is a summary of maintenance items by periodic maintenance intervals. Periodic maintenance intervals vary depending on engine application, loads, diesel fuel and engine oil used and are hard to establish definitively. The following should be treated only as a general guideline. **CAUTION!** *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 your authorized Yanmar marine dealer or distributor for assistance when checking items marked with a ●.*

## PERIODIC MAINTENANCE

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar marine dealer or distributor							
System	Item	Periodic Maintenance Interval					
		Daily	Every 50 hours or monthly whichever comes first	Every 250 hours or one year whichever comes first	Every 500 hours or 2 years whichever comes first	Every 1000 hours or 4 years whichever comes first	
Whole	Visual inspection of engine exterior	○					
Fuel System	Check the fuel level and refill if necessary	○					
	Drain water and sediment from fuel tank		○ Initial 50	○			
	Drain the fuel / water separator		○				
	Replace the fuel filter element			◇			
	Check the fuel injection timing					●	
	Check the fuel injector spray pattern					●*	
Lubricating System	Check the lube oil level	Engine	○				
		Marine Gear	○				
	Replace the lube oil	Engine		◇ Initial 50	◇		
		Marine Gear		◇ Initial 50	◇		
	Replace the oil filter element	Engine		◇ Initial 50	◇		
		Marine Gear (if equipped)		◇ Initial 50	◇		
Cooling System	Seawater outlet	○ During Operation					
	Check coolant level	○					
	Check or replace the seawater pump impeller			○		◇	
	Replace coolant	Every year. When Long Life Coolant is used, replace every two years. See Engine Coolant Specifications on page 36.					
	Clean and check the seawater passages					●	



## PERIODIC MAINTENANCE

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar marine dealer or distributor						
System	Item	Periodic Maintenance Interval				
		Daily	Every 50 hours or monthly whichever comes first	Every 250 hours or one year whichever comes first	Every 500 hours or 2 years whichever comes first	Every 1000 hours or 4 years whichever comes first
Air Intake and Exhaust System	Clean intake silencer (air cleaner) element			○		
	Clean or replace the exhaust / water mixing elbow			○	◇	
	Clean the turbocharger* - 4JH4-TE or 4JH4-HTE only			●		
	Check diaphragm assembly 3JH4E / 4JH4AE only					●
Electrical System	Check the alarm and indicators	○				
	Check the electrolyte level in the battery		○			
	Adjust the tension of the alternator V-belt or replace V-belt		○ Initial 50	○		◇
	Check the wiring connectors			○		
Engine Cylinder Head and Block	Check for leakage of fuel, engine oil and engine coolant	○ After starting				
	Tighten all major nuts and bolts			●		
	Adjust intake / exhaust valve clearance		● Initial 50			●
Miscellaneous Items	Check the remote control cable operation	○	○ Initial 50			●
	Adjust the propeller shaft alignment		● Initial 50			●
	Replace rubberized hoses (fuel and water)	Replace every 2 years or every 2000 hours, whichever comes first.				

\* For EPA requirements, see *Inspection and Maintenance of EPA Emission-Related Parts* on page 60.

**Note:** These procedures are considered normal maintenance and are performed at the owner's expense.

## **PERIODIC MAINTENANCE**

---

### **Inspection and Maintenance of EPA Emission-Related Parts**

- Marine diesel engines less than 37 kW: 3JH4E is certified as EPA non-road engine
- Marine diesel engines greater than 37 kW: 4JH4AE, 4JH4-TE and 4JH4-HTE are certified as EPA CI marine engines

### **Inspection and Maintenance of EPA Emission-Related Parts for Non-Road and CI Marine Engines**

<b>Parts</b>	<b>Interval</b>
Clean fuel injection nozzle	1500 hours
Check fuel injection nozzle pressure and spray pattern	3000 hours
Check fuel injection pump adjustment	
Check turbocharger adjustment (if equipped)	
Check electronic engine control unit and its associated sensors and actuators (if equipped)	

*Note: The inspection and maintenance items shown above to be performed at your Yanmar dealer or distributor.*

PERIODIC MAINTENANCE PROCEDURES

**After Initial 50 Hours of Operation**

Perform the following maintenance after the initial 50 hours of operation.

- Draining the Fuel Tank
- Changing the Engine Oil and Replacing the Engine Oil Filter Element
- Changing the Marine Gear Oil and Replacing the Marine Gear Oil Filter (If Equipped)
- Adjusting the Alternator V-Belt Tension
- Adjusting Intake / Exhaust Valve Clearance
- Checking and Adjusting the Remote Control Cable
- Adjusting Propeller Shaft Alignment

**Draining the Fuel Tank**

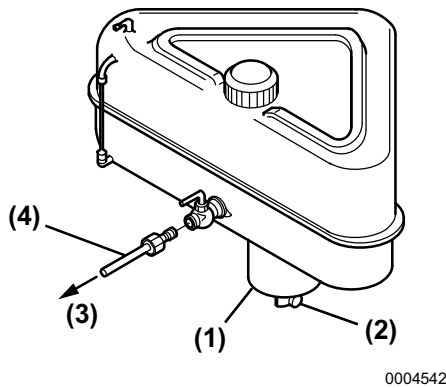


Figure 1

Note: Optional fuel tank shown. Actual equipment may differ.

1. Put a pan under the drain cock (Figure 1, (2)) to catch fuel.
2. Open the drain cock and drain water and sediment. Close the drain cock when the fuel is clean and free of air bubbles.

**Changing the Engine Oil and Replacing the Engine Oil Filter Element**

The engine oil on a new engine becomes contaminated from the initial break-in of internal parts. It is very important that the initial oil replacement is performed as scheduled.

It is easiest and most effective to drain the engine oil after operation while the engine is still warm. **WARNING! 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.**

1. Turn the engine OFF.
2. NOTICE: Prevent dirt and debris from contaminating engine oil. Carefully clean the dipstick and the surrounding area before you remove the dipstick. Remove the engine oil dipstick. Attach the oil drain pump (if equipped) and pump out the oil. For easier draining, remove the engine oil fill cap.
3. Turn the engine oil filter (Figure 2) counterclockwise with a wrench.
4. Remove the engine oil filter.

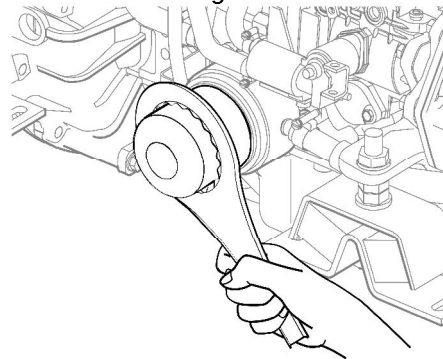


Figure 2

Note: 4JH4-TE shown.

5. Install a new filter element and tighten by hand until the seal touches the housing.

## PERIODIC MAINTENANCE

6. Turn filter an additional 3/4 turn with a box wrench. Tighten to 20 - 24 N·m (177 - 212 in.-lb).
  7. Fill with new engine oil. *See Adding Engine Oil on page 33.* NOTICE: 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.
  8. Perform a trial run and check for oil leaks.
  9. Approximately 10 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.
- c. Hold the filter in place with the coil spring (**Figure 3, (3)**) and insert into the case. Install a new O-ring (**Figure 3, (4)**) in the side cover.
  - d. Install side cover (**Figure 3, (5)**) and tighten side cover bolts.
3. Fill marine gear with clean marine gear oil. *See Marine Gear Oil Specifications on page 34.*
  4. Perform a trial run and check for oil leaks.
  5. Approximately 10 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.

### Replace the Marine Gear Oil Filter (If Equipped) and Change the Marine Gear Oil

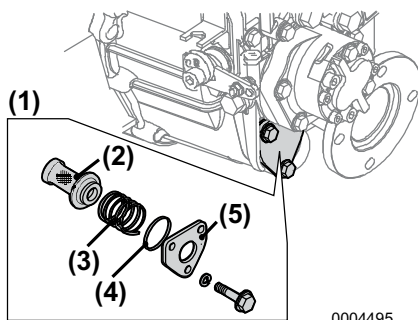


Figure 3

Note: 4JH4-TE / 4JH4-HTE engines with KMH4A marine gear shown. Refer to the operation manual of marine gear or sail drive for procedure.

1. Remove cap from the filler port and attach an oil drain pump. Drain marine gear oil.
2. **KMH4A Marine Gear:** Wash the marine gear oil filter:
  - a. Remove side cover (**Figure 3, (5)**) and remove the filter (**Figure 3, (2)**).
  - b. Clean the filter thoroughly with kerosene or clean diesel fuel.

### Checking and Adjusting the Alternator V-Belt Tension

NOTICE: NEVER get any oil on the belt(s). Oil on the belt causes slipping and stretching. Replace the belt if it is damaged.

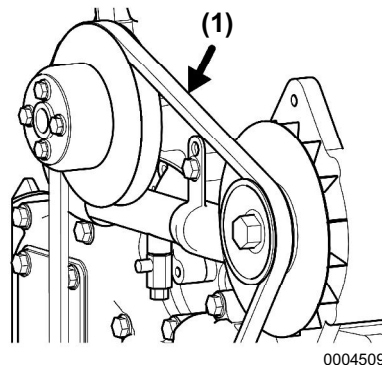


Figure 4

Note: 4JH4-TE shown.

1. Remove the belt cover.
2. Check the belt by pushing on the middle of the belt (**Figure 4, (1)**) with your finger. With proper tension, the belt should deflect 8 - 10 mm (approximately 3/8 in.).
3. Loosen the alternator bolt and move the alternator to adjust the V-belt tension.

## PERIODIC MAINTENANCE

4. Install the belt cover.

*Note: If replacing the V-belt, loosen the V-pulley of the coolant pump to remove V-belt.*

### Inspecting and Adjusting Intake / Exhaust Valve Clearance

Proper adjustment is necessary to maintain the correct timing for opening and closing the valves. Improper adjustment will cause the engine to run noisily, resulting in poor engine performance and engine damage. See your authorized Yanmar marine dealer or distributor to adjust the intake / exhaust valve clearance.

### Checking and Adjusting Remote Control Cables

*Note: Never adjust the high speed stop bolt on the governor. This will void the engine warranty.*

#### Adjusting Engine Speed Remote Control Cable

Ensure the control lever on the engine side moves to the high speed stop position and low speed stop position when the remote control lever is moved to HIGH and then to LOW.

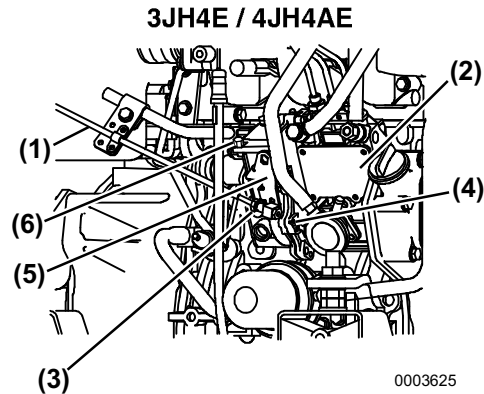


Figure 5

- 1 – Cable
- 2 – Fuel Injection Pump
- 3 – Adjustment Screw
- 4 – Low Speed Stop
- 5 – Control Lever
- 6 – High Speed Stop

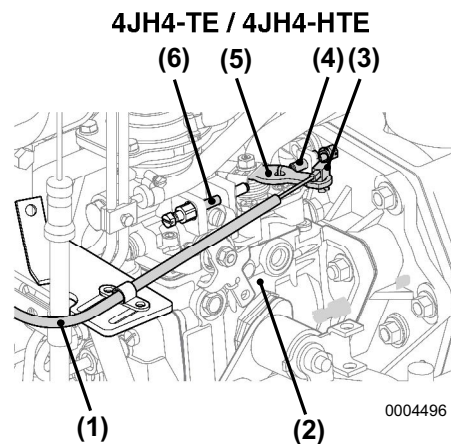


Figure 6

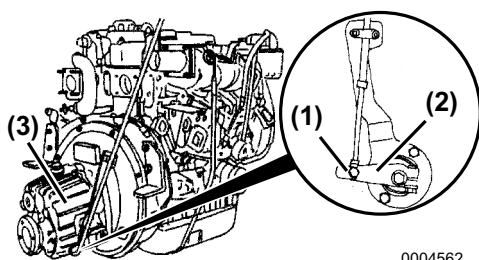
- 1 – Cable
- 2 – Fuel Injection Pump
- 3 – Cable Fitting
- 4 – Low Speed Stop
- 5 – Control Lever
- 6 – High Speed Stop

1. To adjust, loosen the adjustment screw or cable fitting (**Figure 5, (3)**) or (**Figure 6, (3)**) for the remote control cable on the engine side and adjust.

## PERIODIC MAINTENANCE

- Adjust the high speed stop (**Figure 5, (6)**) or (**Figure 6, (6)**), position first and then adjust the low speed stop (**Figure 5, (4)**) or (**Figure 6, (4)**), with the adjustment screw on the remote control lever (**Figure 5, (5)**) or (**Figure 6, (5)**).

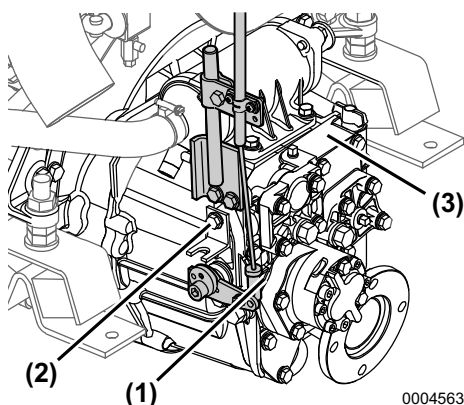
### Adjusting Clutch Remote Control Cable 3JH4E / 4JH4AE



0004562

**Figure 7**

### 4JH4-TE / 4JH4-HTE

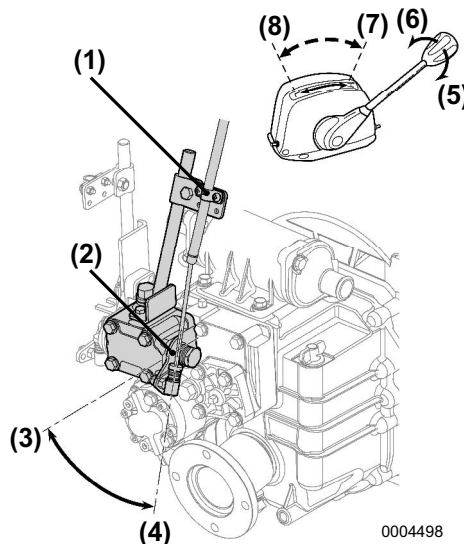


0004563

**Figure 8**

- Ensure that the remote control lever (**Figure 7, (2)**) (**Figure 8, (2)**) moves to the correct position when the remote control handle is in NEUTRAL, FORWARD, and REVERSE positions. Use the NEUTRAL position as the standard for adjustment.
- To adjust, loosen and retighten the cable fitting (**Figure 7, (1)**) (**Figure 8, (1)**).

### Adjusting Trolling Remote Control Handle - If Equipped



0004498

**Figure 9**

- 1 – Cable Fitting
- 2 – Trolling Lever
- 3 – Low Speed (Trolling)
- 4 – High Speed
- 5 – Loosen
- 6 – Tighten
- 7 – Normal Operation (High Speed)
- 8 – Trolling (Low Speed)

*Note: KMH4A marine gear shown.*

- Ensure that the trolling lever (**Figure 9, (2)**) is in the high speed (**Figure 9, (4)**) position when the trolling remote control handle is in HIGH speed position (**Figure 9, (7)**).
- Ensure that the trolling lever is in the low speed (**Figure 9, (3)**) position when the trolling remote control handle is in LOW speed position (**Figure 9, (8)**).
- To adjust, loosen the adjustment screw of the cable fitting (**Figure 9, (1)**) and adjust the position of the cable.

## PERIODIC MAINTENANCE

### Adjusting Propeller Shaft Alignment

The flexible engine mounts are compressed a little during initial engine operation and may cause misalignment between the engine and the propeller shaft.

After the first 50 hours of operation, the alignment should be checked and readjusted if necessary. This is considered normal maintenance and the adjustment requires specialized knowledge and techniques. Consult your authorized Yanmar marine dealer or distributor.

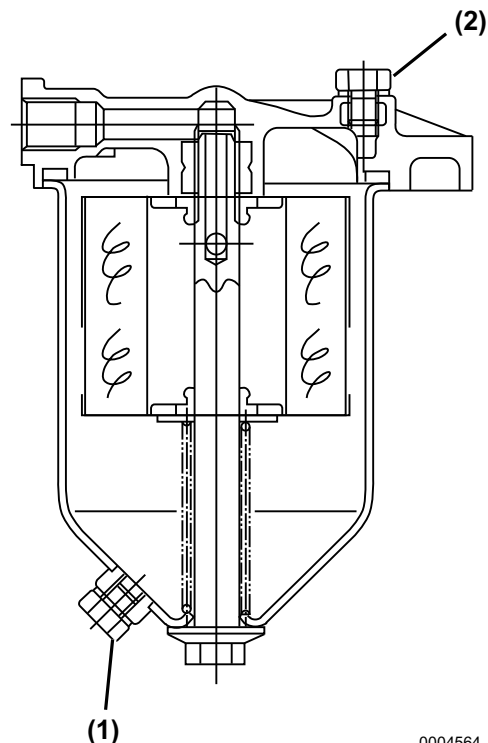
### Every 50 Hours of Operation

After you complete the initial 50 hour maintenance procedures, perform the following procedures every 50 hours thereafter or monthly, whichever comes first.

- **Draining Fuel Filter / Water Separator**
- **Checking Battery Electrolyte Level**

### Draining Fuel Filter / Water Separator

**3JH4E and 4JH4AE (Attach to Hull)**



**Figure 10**

1. Close the fuel cock of the fuel tank.
2. Loosen the drain plug (**Figure 10, (1)**) of water separator and drain off any water or dirt collected inside.
3. After draining, tighten the air bleed screw (**Figure 10, (2)**).

0004564

## PERIODIC MAINTENANCE

4. Be sure to bleed air from the fuel system. See *Bleeding the Fuel System* on page 30.

### 4JH4-TE and 4JH4-HTE

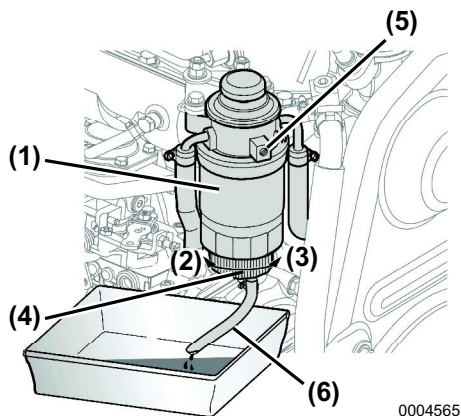


Figure 11

Note: 4JH4-TE shown. If no water or fuel drains from the fuel filter / water separator, loosen the air bleed screw on the fuel filter 2 - 3 times. This can occur when the fuel level is lower than the position of the fuel / water separator.

1. Make sure the fuel cock of the fuel tank is closed.
2. Loosen the hose clamp and remove the fire-resistant cover, which is installed to the lower part of the fuel filter / water separator to protect the water alarm switch.
3. Attach a tube (Figure 11, (6)) to the drain plug (Figure 11, (4)).
4. Loosen the drain plug (Figure 11, (4)) at the bottom of the fuel filter / water separator counterclockwise and drain off any water or sediment.

Note: If there is a large quantity of water and sediment in the fuel filter / water separator, also drain the fuel tank. See *Draining the Fuel Tank* on page 61.

5. Tighten the drain plug.
6. Remove the drain tube.
7. Install the fire-resistant cover and tighten the hose clamp.

8. Bleed air from the fuel system. See *Bleeding the Fuel System* on page 30.

### Checking the Battery Electrolyte Level (Serviceable Batteries Only)

**WARNING!** 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.

NOTICE: NEVER turn off the battery switch (if equipped) or short the battery cables during operation. Damage to the electric system will result.

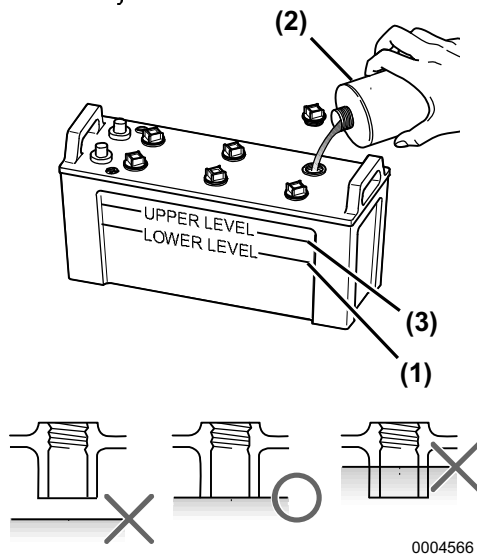
Note: Battery fluid tends to evaporate in high temperatures, especially in summer. In such conditions, inspect the battery earlier than specified.

1. Turn the battery master switch to OFF (if equipped) or disconnect the negative (-) battery cable.
2. Do not operate with insufficient battery electrolyte as the battery will be destroyed.
3. Remove the plugs and check the electrolyte level in all cells. NOTICE: NEVER attempt to remove the covers or fill a maintenance-free battery.



## PERIODIC MAINTENANCE

- If the level is lower than the minimum, fill level (**Figure 12, (1)**), fill with distilled water (**Figure 12, (2)**) (available in the grocery store) up to the upper limit (**Figure 12, (3)**) of the battery.



**Figure 12**

Note: The maximum fill level is approximately 10 - 15 mm (3/8 - 9/16 in.) above the plates.

### Every 250 Hours of Operation

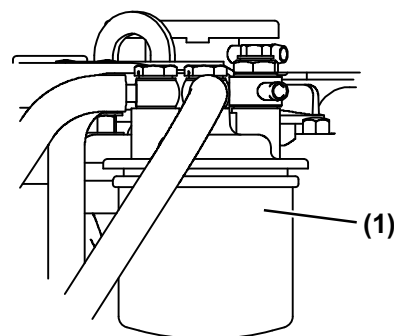
Perform the following maintenance every 250 hours or one year of operation, whichever comes first.

- Draining the Fuel Tank
- Replacing the Fuel Filter Element
- Changing the Engine Oil and Replacing the Engine Oil Filter Element
- Changing the Marine Gear Oil and Replacing Marine Gear Oil Filter Element (If Equipped)
- Checking or Replacing the Seawater Impeller
- Changing the Coolant
- Cleaning Intake Silencer (Air Cleaner) Element
- Cleaning the Exhaust / Water Mixing Elbow
- Cleaning the Turbocharger (If Equipped)
- Adjusting the Tension of the Alternator V-Belt
- Checking the Wiring Connectors
- Tightening All Major Nuts and Bolts

#### Draining the Fuel Tank

See *Draining the Fuel Tank* on page 61.

#### Replacing the Fuel Filter Element 3JH4E / 4JH4AE



**Figure 13**

1. Close the fuel cock of the fuel tank.

## PERIODIC MAINTENANCE

- Remove the cartridge filter (Figure 13, (1)) with a filter wrench.

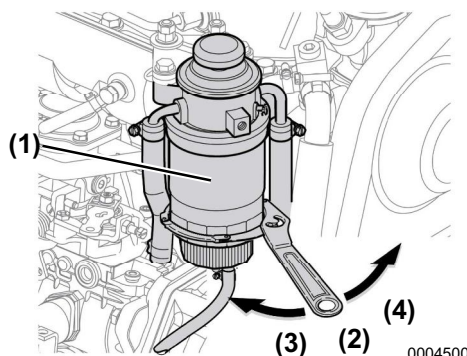
*Note: When removing the fuel filter, hold the bottom of the fuel filter with a cloth to prevent the fuel from spilling. Wipe up any spilled fuel immediately.*

- Apply a thin film of clean diesel fuel to the sealing surface of the new filter gasket.

Component	Part No.
Fuel Filter - 3JH4E	129470-55703
Fuel Filter - 4JH4AE	119802-55801

- Install new filter and tighten hand-tight. Use a filter wrench and tighten to 20 - 24 N·m (14.75 - 17.7 ft·lb).
- Install filter and tighten hand-tight.
- Bleed the fuel system. See *Bleeding the Fuel System* on page 30. Dispose of waste properly.

### 4JH4-TE / 4JH4-HTE



**Figure 14**

- Close the fuel cock of the fuel tank.
- Loosen the hose clamp and remove the fire-resistant cover, which is installed to the lower part of the fuel filter / water separator to protect the water alarm switch.
- Attach a tube to the drain plug.
- Loosen the drain plug and drain the fuel from the drain plug.
- Disconnect the electrical connectors and remove the alarm switch with a spanner wrench.
- Remove the filter housing (Figure 14, (1)) with a filter wrench (Figure 14, (2)).
- Clean the filter housing mounting surface. Install new filter element in filter housing.

Component	Part No.
Fuel Filter - 4JH4-TE / 4JH4-HTE	129574-55711

- Install the alarm switch to the fuel filter. Apply clean fuel to the gasket of the new fuel filter.
- Install filter housing into engine and tighten hand-tight until the gasket comes into contact with the seat. Use a filter wrench and tighten approximately 3/4 turn to 11.8 - 15.6 N·m (104.4 - 138.1 in.-lb).

## PERIODIC MAINTENANCE

10. Install the fire-resistant cover and tighten the hose clamp.
11. Bleed the fuel system. *See Bleeding the Fuel System on page 30.*
12. Dispose of waste properly.

### Changing the Engine Oil and Replacing the Engine Oil Filter Element

*See Changing the Engine Oil and Replacing the Engine Oil Filter Element on page 61.*

### Changing the Marine Gear Oil and Replacing the Marine Gear Oil Filter Element (If Equipped)

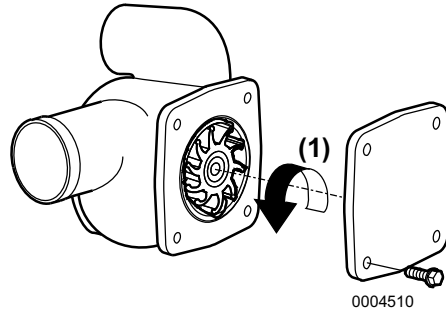
*See Replace the Marine Gear Oil Filter (If Equipped) and Change the Marine Gear Oil on page 62.*

### Checking or Replacing Seawater Pump Impeller

1. Loosen side cover bolts and remove the side cover.
2. Inspect the inside of the seawater pump with a flashlight. If any of the following are found, disassembly and maintenance are required:
  - Impeller blades are cracked or nicked. Edges or surfaces of the blades are marred or scratched.
  - Wear plate is damaged.
3. If no damage is found when inspecting the inside of the pump, install the O-ring and side cover.
4. If a large amount of water leaks continuously from the water drain line below the seawater pump during operation, replace the mechanical seal. See your authorized Yanmar marine dealer or distributor.

### Replacing the Seawater Pump Impeller

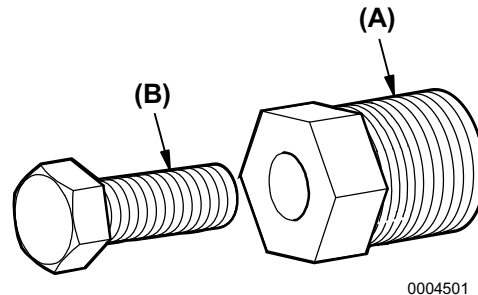
*Note: The impeller must be replaced periodically (every 1000 hours) even if there is no damage.*



**Figure 15**

There are two types of special service tools for removing the impeller:

**Puller A (Standard) Part No. 129671-92110**



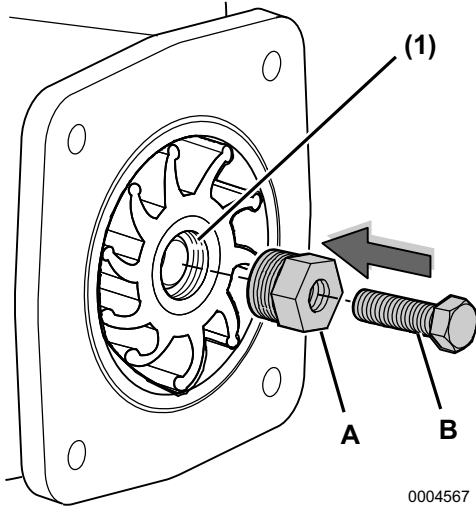
**Figure 16**

Puller A	Jack Screw B
M18 x 1.5	M10 x 40 mm length

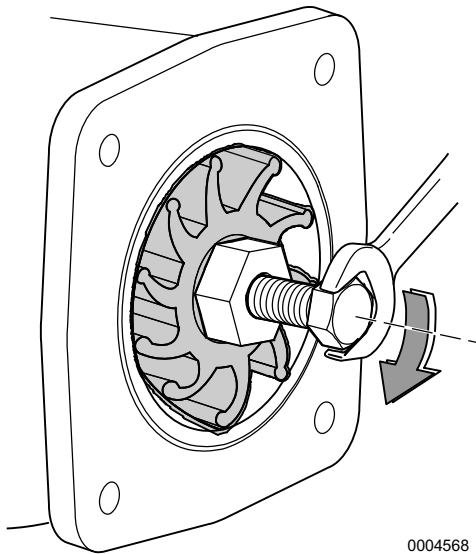
1. Remove the side cover of the seawater pump.
2. Install puller (**Figure 16, (A)**) in the impeller.

## PERIODIC MAINTENANCE

- Turn the jack screw (**Figure 16, (B)**) clockwise to remove the impeller from the pump body.



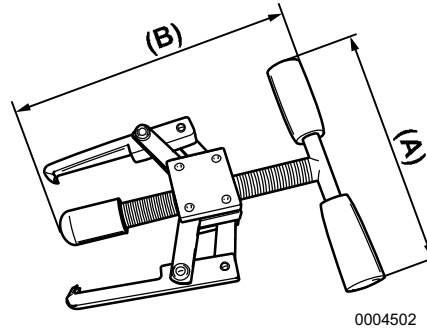
**Figure 17**



**Figure 18**

*Note: When replacing a used impeller with a new one, the impeller must have an M18 x 1.5 thread (**Figure 17, (1)**). Turn the M18 screw-side of the impeller to the cover side and install (**Figure 18**).*

### Puller B (Option) Part No. 129671-92100



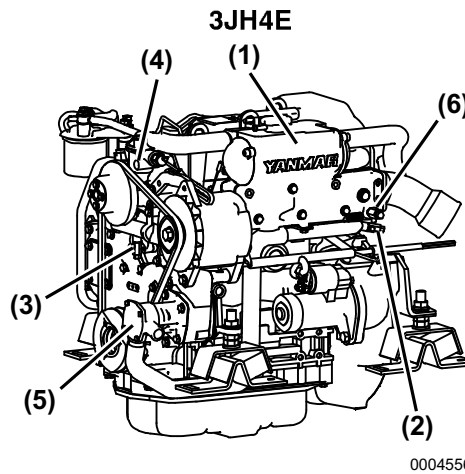
**Figure 19**

A	B
110 mm	140 mm

### Replacing Coolant

Replace coolant every year.

*Note: If Long Life coolant is used, replace coolant every 2 years.*



**Figure 20**

- 1 – Coolant Tank (Heat Exchanger)
- 2 – Seawater Drain Cock
- 3 – Coolant Drain Cock (3JH4E Only) - Located behind the V-belt cover
- 4 – Coolant Pump (Fresh Water)
- 5 – Seawater Drain from Seawater Pump Cover
- 6 – Coolant Drain Cock