

YANMAR
®

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
Introduction	1
Record of Ownership	2
Safety	3
Safety Precautions	4
General Information	4
Before You Operate	4
During Operation and Maintenance	4
Location of Safety Decals	8
Product Overview	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
Before You Operate	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
Engine Operation	43
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
Periodic Maintenance	51
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
Troubleshooting	77
Troubleshooting After Starting	77
Troubleshooting Chart	79
Troubleshooting Information	82
Long-Term Storage	83
Prepare Engine for Long-Term Storage	83
Drain Seawater Cooling System	84
Specifications	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
System Diagrams	101
Piping Diagrams	101
Wiring Diagrams	116
EPA Warranty USA Only	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
Emission System Warranty	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.

⚠ 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.

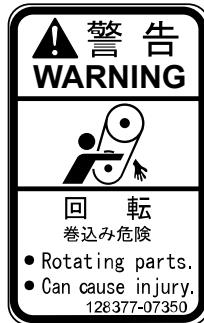
SAFETY

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

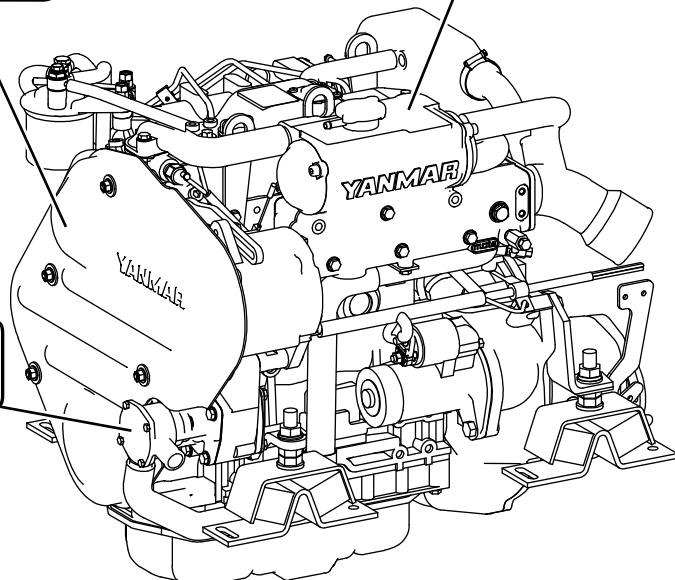
(1)



(2)



(3)



0004550

Figure 1

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

4JH4AE Engines

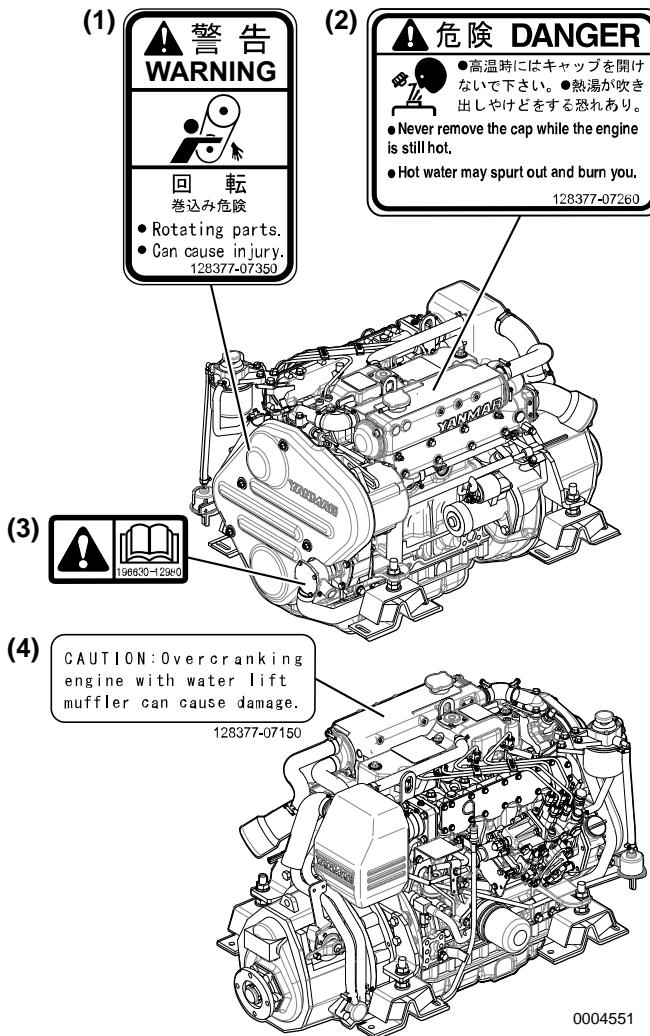


Figure 2

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

4JH4-TE Engines

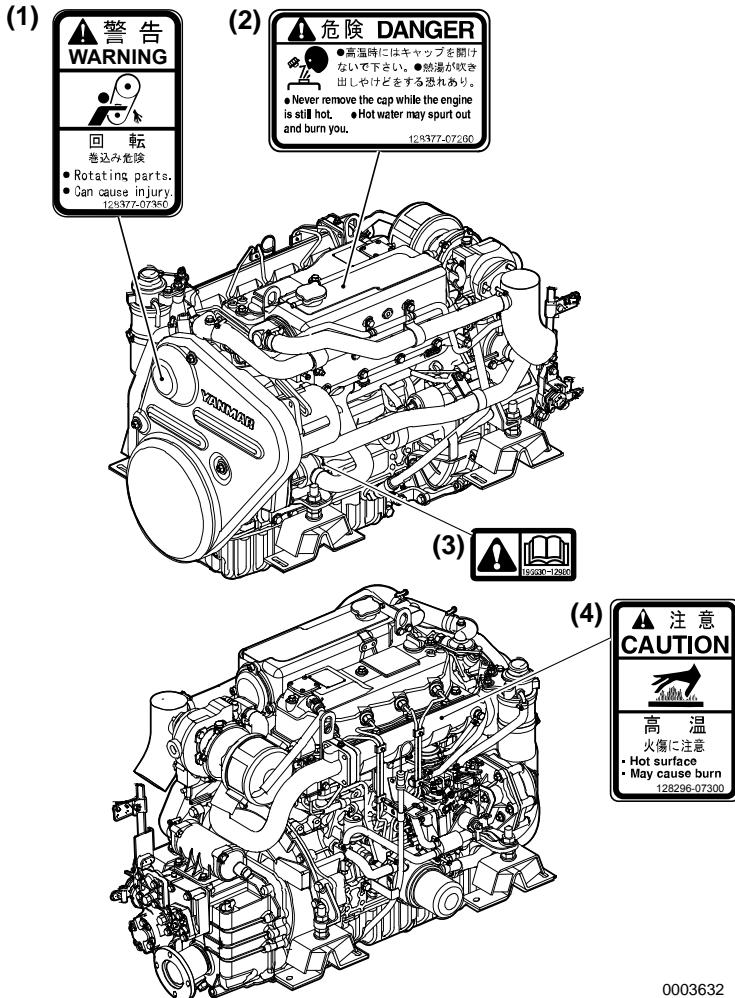
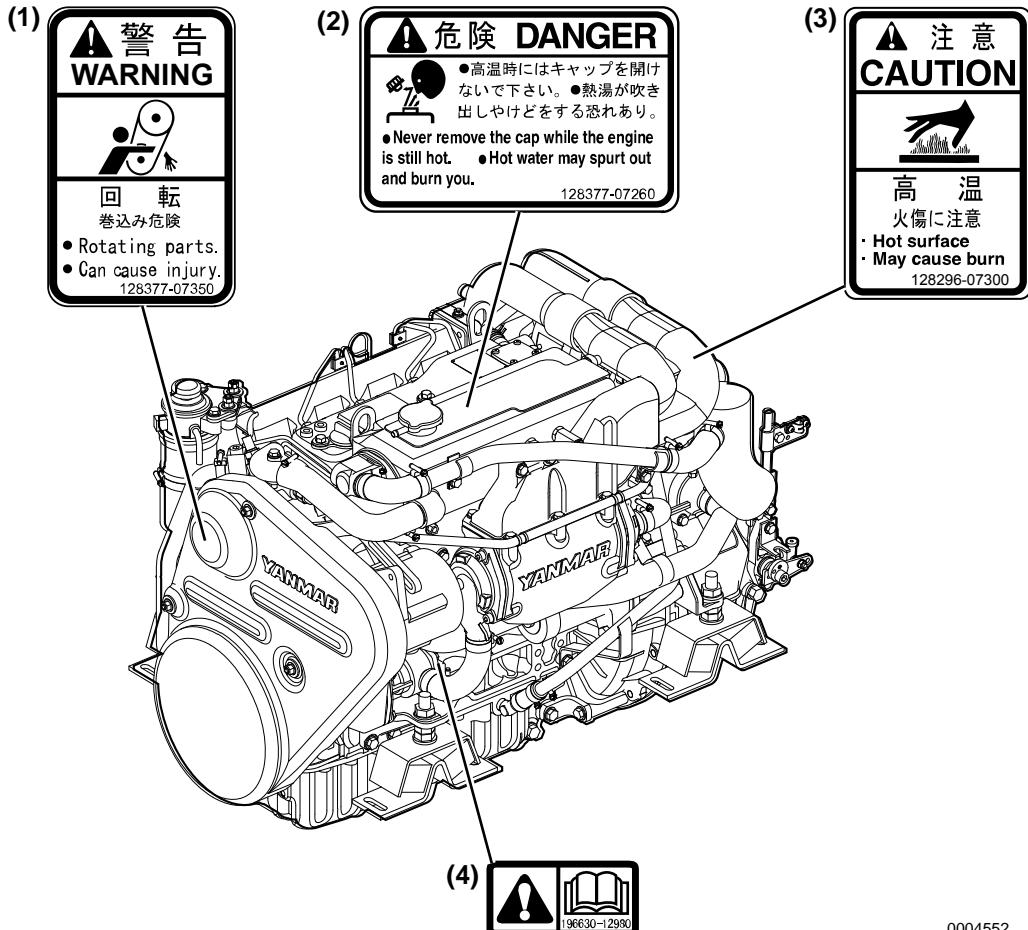


Figure 3

- 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

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.

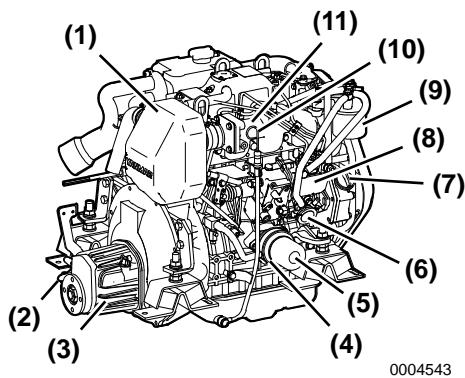


Figure 1

- 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

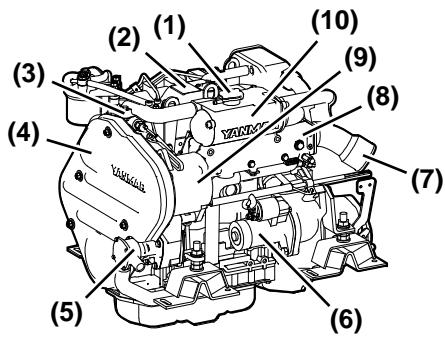


Figure 2

- 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.

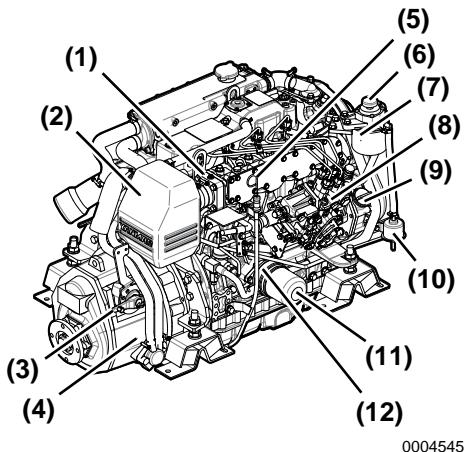


Figure 3

- 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

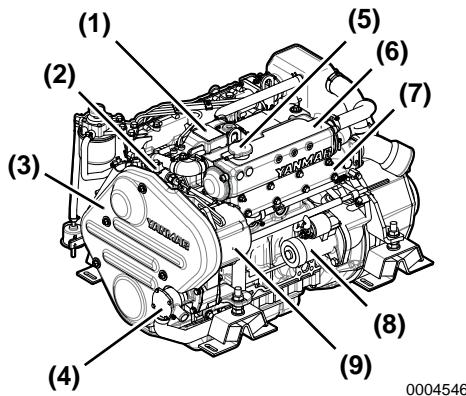
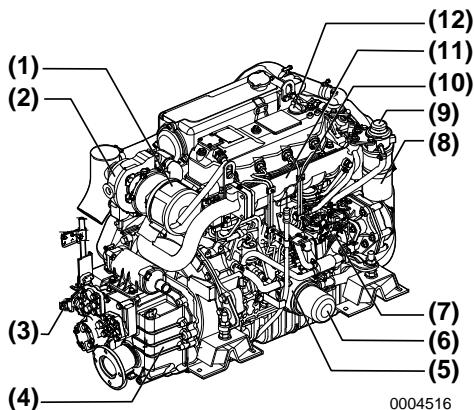


Figure 4

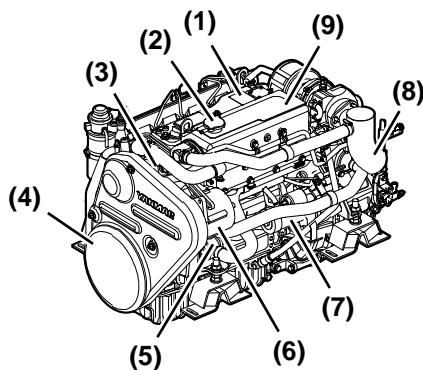
- 1 – Engine Nameplate (on rocker arm cover)
- 2 – Fresh Water Pump
- 3 – Belt Cover
- 4 – Seawater Pump
- 5 – Coolant Filler Cap
- 6 – Coolant Tank / Heat Exchanger
- 7 – Exhaust Manifold
- 8 – Starter Motor
- 9 – Alternator

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.

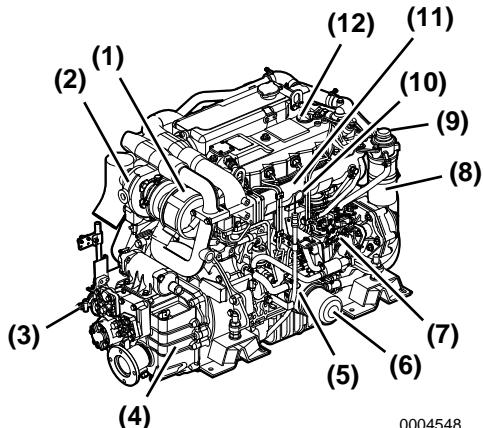


Figure 7

- 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

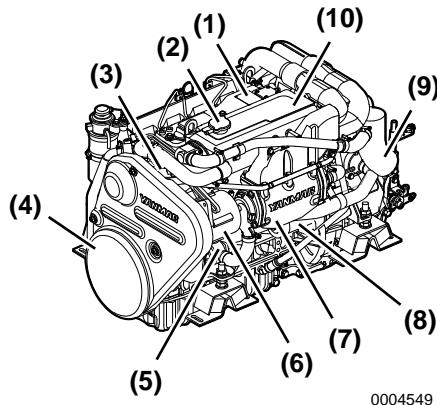


Figure 8

- 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

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.

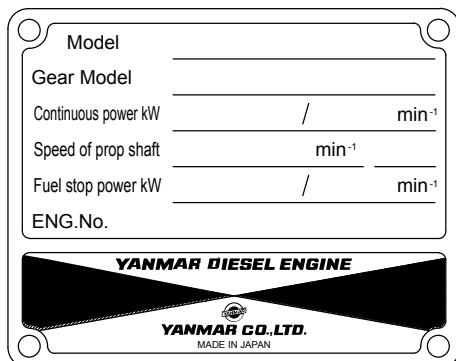


Figure 9

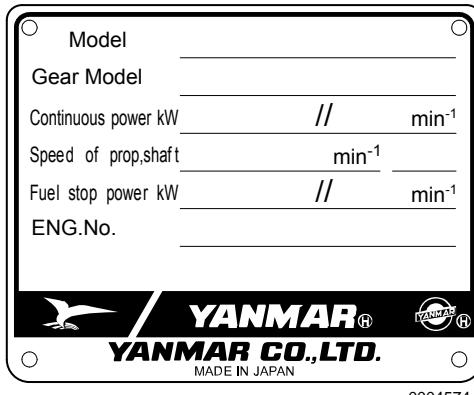


Figure 10

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



Figure 11

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

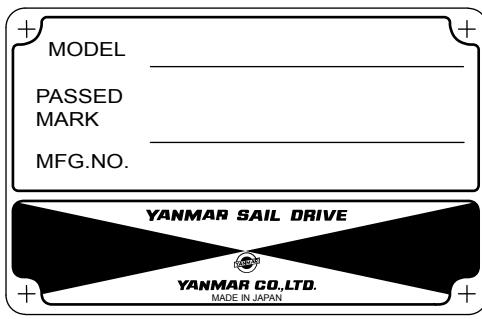


Figure 12

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. See <i>Draining Fuel Filter / Water Separator</i> on page 65.
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. See <i>Changing the Engine Oil and Replacing the Engine Oil Filter Element</i> on page 69.
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

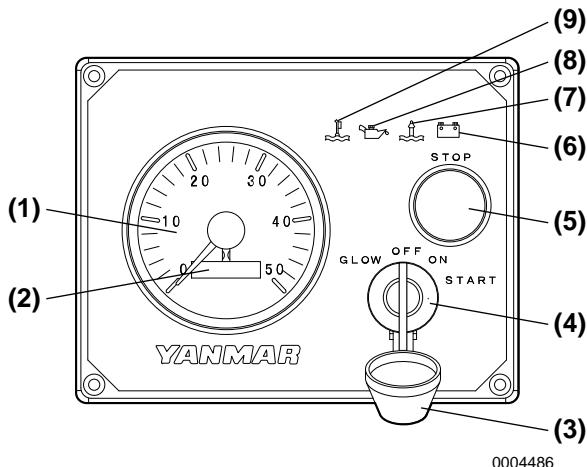


Figure 13

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

C-Type

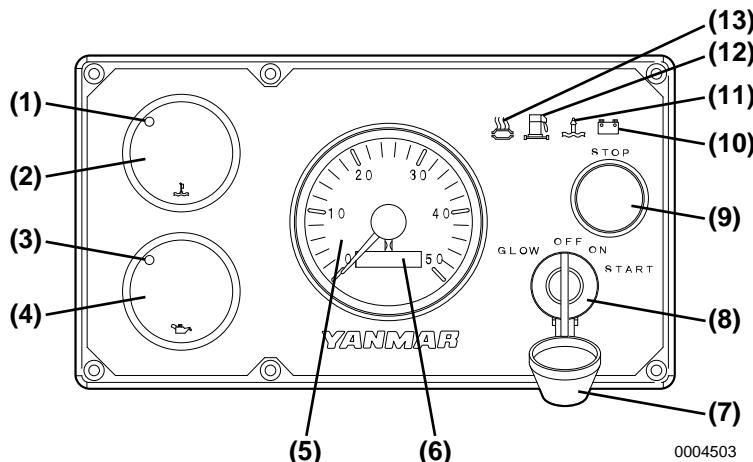


Figure 14

- | | |
|--|---|
| 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 | |
| 7 – Moisture Cap for Key Switch | 13 – Insufficient Seawater Flow Indicator |

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

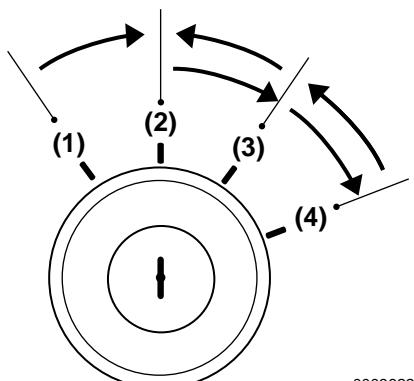


Figure 15

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.

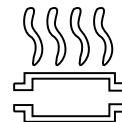


Figure 21

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

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

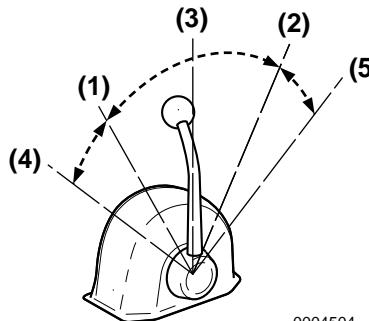


Figure 22

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.

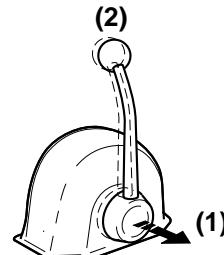


Figure 23

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.

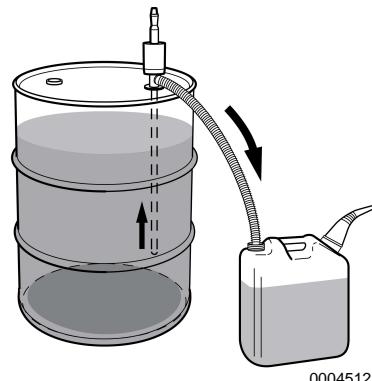


Figure 1

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.

Fuel Tank (Optional)

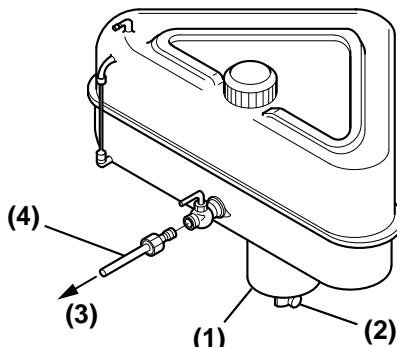


Figure 2

- 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

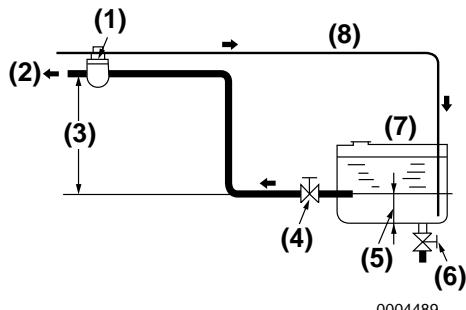


Figure 3

- 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

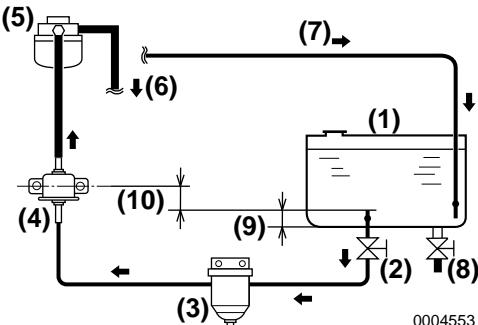


Figure 4

- 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.)

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.

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.

Bleeding the Fuel System - 3JH4E

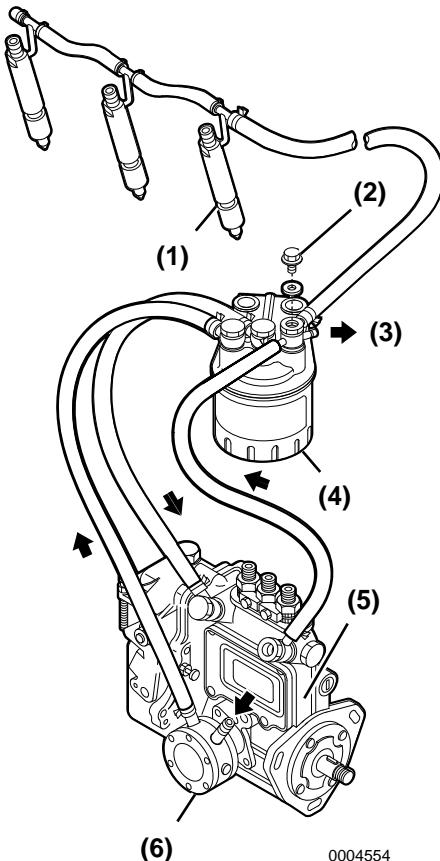


Figure 5

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

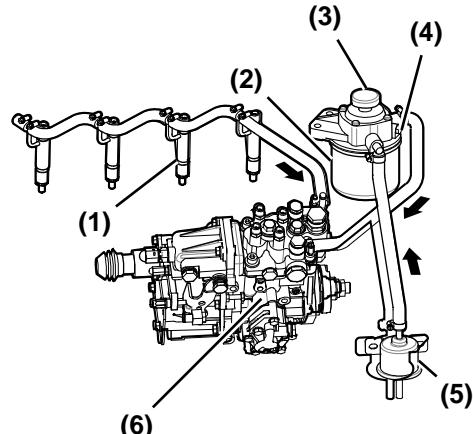


Figure 6

1 – Fuel Injector

2 – Air Bleed Screw

3 – Priming Pump

4 – Fuel Filter

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

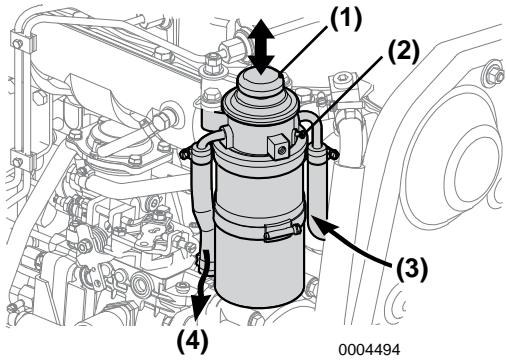


Figure 7

- 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

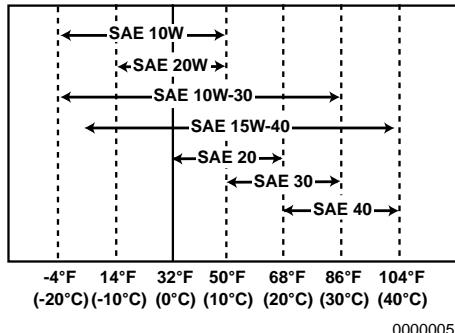


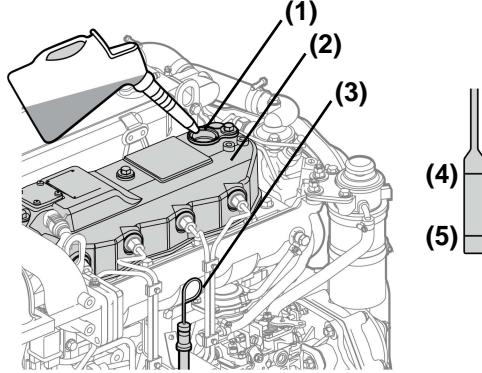
Figure 8

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®¹ High Performance Gear Lube.

4JH4-TE:

- Only use QuickSilver® High Performance Gear Lube.

¹ QuickSilver is a registered trademark of Brunswick Corporation.

Checking Marine Gear Oil

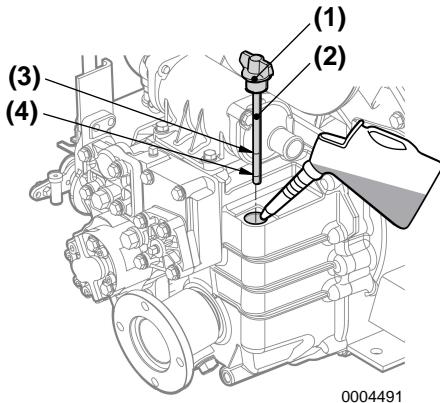


Figure 10

Note: 4JH4-TE with KMH4A 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

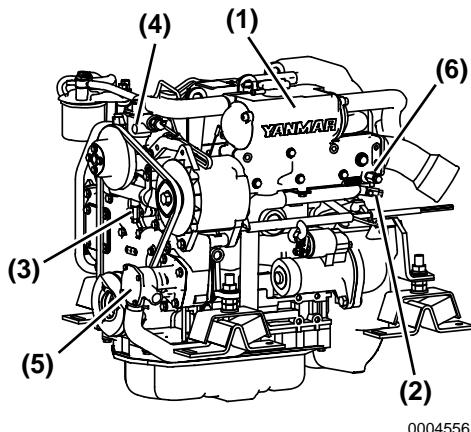


Figure 11

- 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

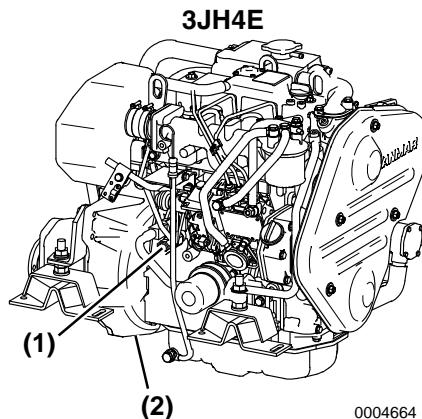


Figure 12

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

4JH4AE

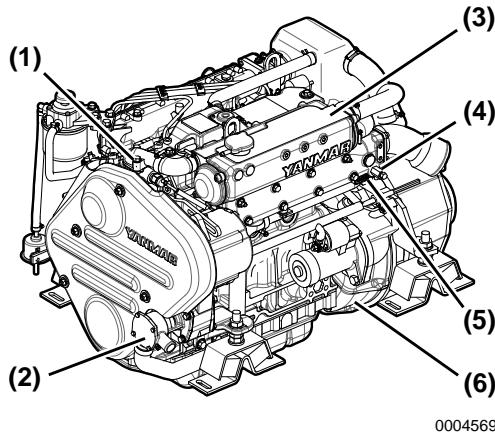


Figure 13

4JH4-TE

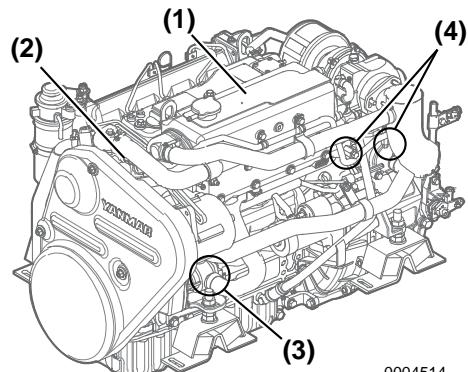


Figure 15

- 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

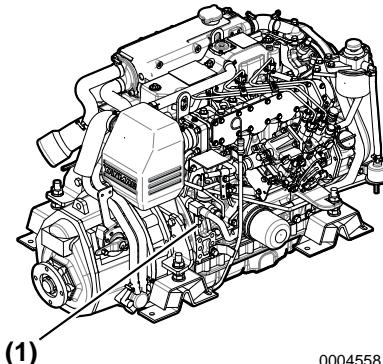


Figure 14

- 1 – Coolant Drain Cock

- 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

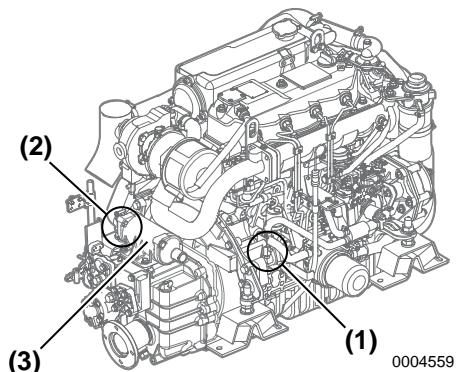


Figure 16

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

BEFORE YOU OPERATE

4JH4-HTE

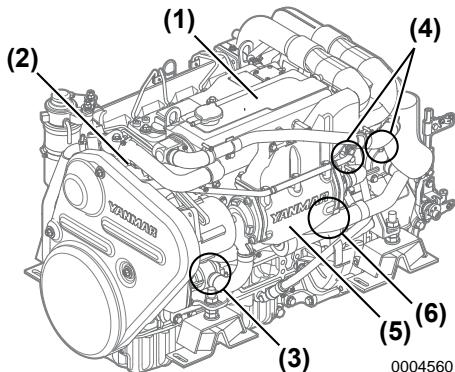


Figure 17

- 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

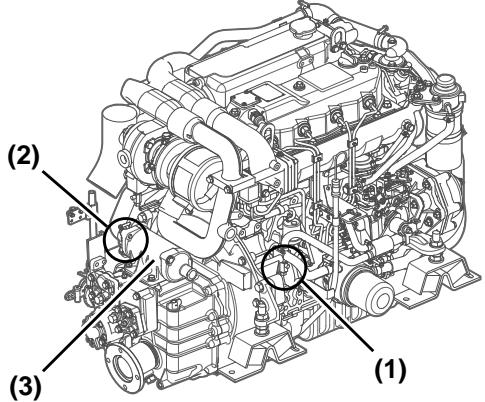


Figure 18

- 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.

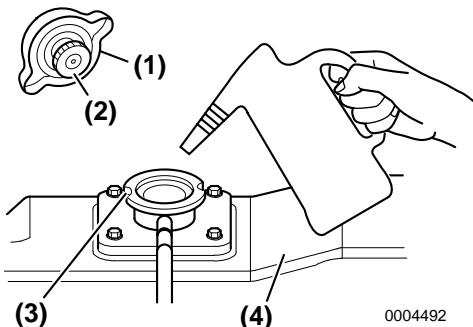
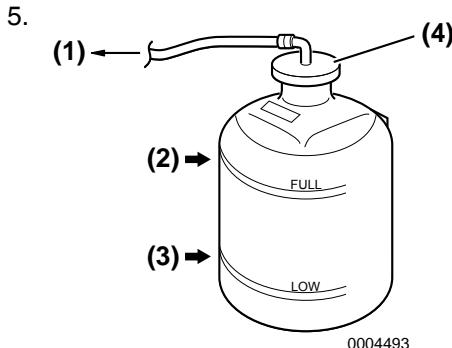


Figure 19

- 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.

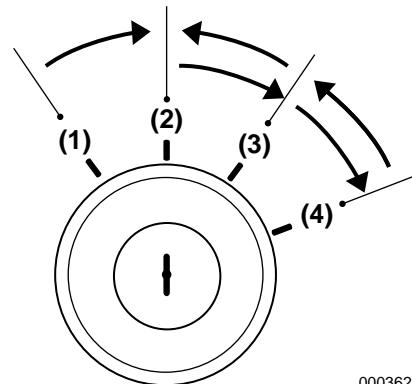
Note: If the coolant runs low too often or only the coolant level in the coolant tank drops without any change in the level in the coolant recovery tank, there may be water or air leaks in the cooling system. See your authorized Yanmar dealer or distributor.

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:

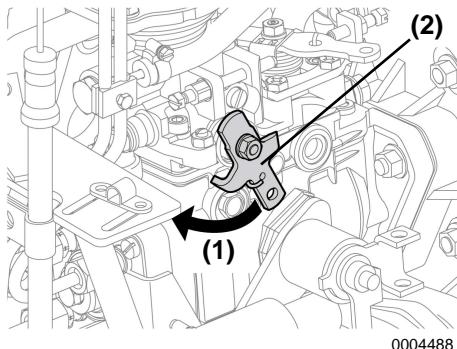


Figure 22

- 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.

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.

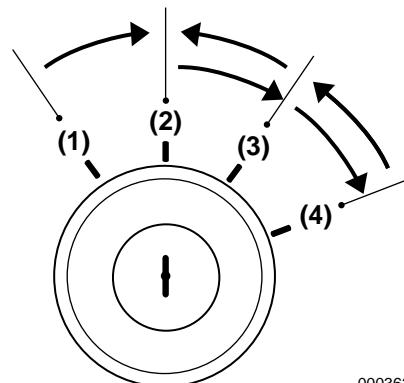
NEVER engage the starter motor while the engine is running. Damage to the starter motor pinion and / or ring gear will result.

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 engines does start, 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

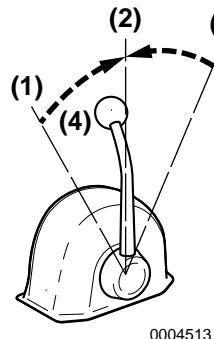


Figure 2

- 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.

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.*

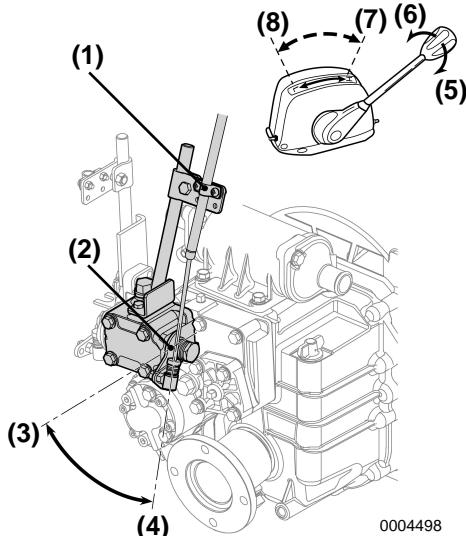


Figure 3

- 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.

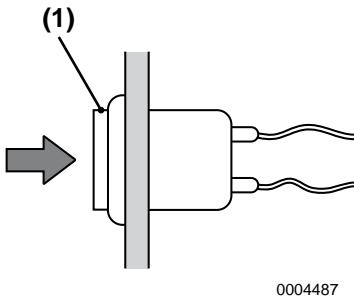


Figure 4

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.

3JH4E / 4JH4AE

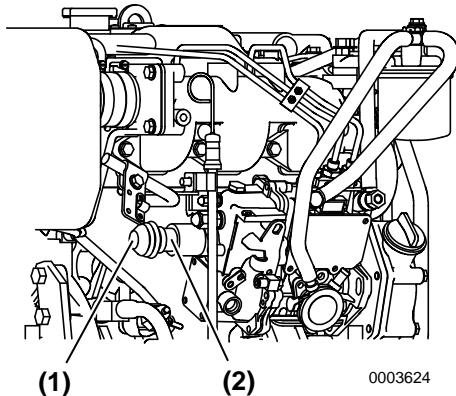


Figure 5

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)**).

4JH4-TE / 4JH4-HTE

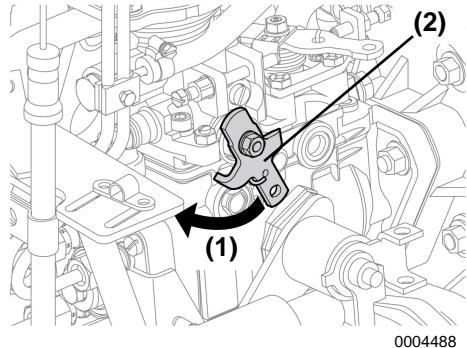


Figure 6

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).

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.

⚠ 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.

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.

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.

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

O: 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	O				
Fuel System	Check the fuel level and refill if necessary	O				
	Drain water and sediment from fuel tank		O Initial 50	O		
	Drain the fuel / water separator		O			
	Replace the fuel filter element			◇		
	Check the fuel injection timing					●
	Check the fuel injector spray pattern					●*
Lubricating System	Check the lube oil level	Engine	O			
		Marine Gear	O			
	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	◇	
	Seawater outlet	O During Operation				
Cooling System	Check coolant level	O				
	Check or replace the seawater pump impeller			O		◇
	Replace coolant	Every year. When Long Life Coolant is used, replace every two years. See <i>Engine Coolant Specifications</i> 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

Parts	Interval
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

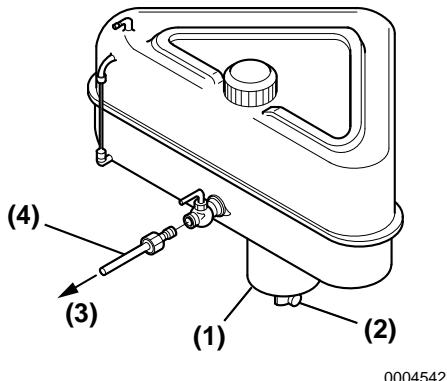


Figure 1

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.

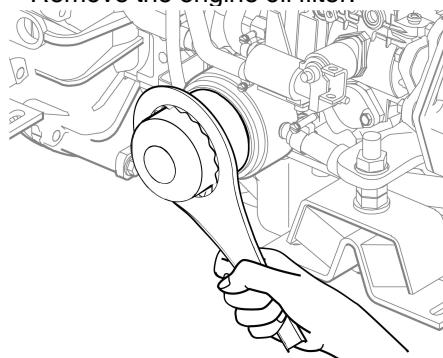


Figure 2

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

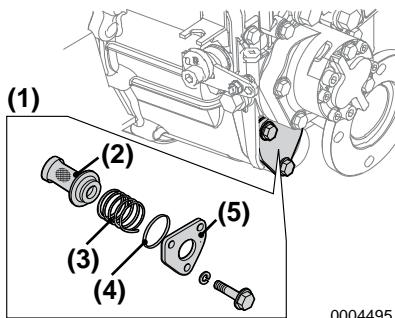


Figure 3

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.*

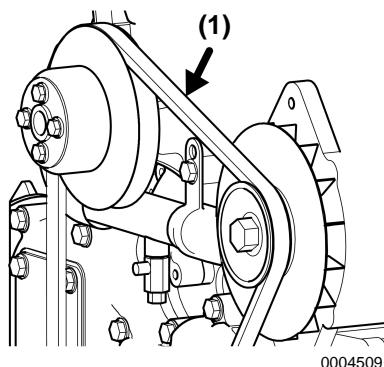


Figure 4

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.

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

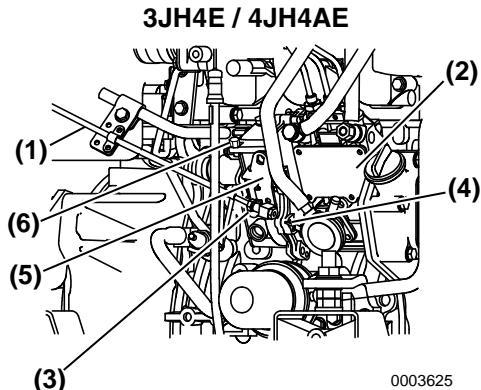
Proper adjustment is necessary to maintain the correct timing for opening and closing the valves. Improper adjustment will cause the engine to run noisily, resulting in poor engine performance and engine damage. See your authorized Yanmar marine dealer or distributor to adjust the intake / exhaust valve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

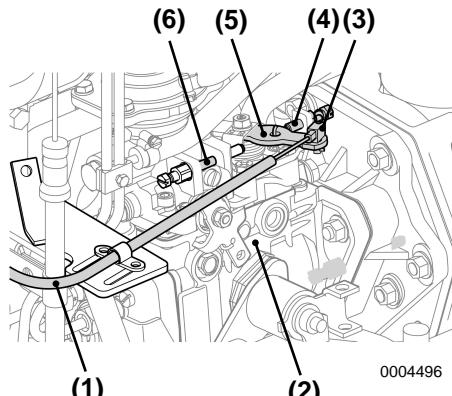


0003625

Figure 5

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

4JH4-TE / 4JH4-HTE



0004496

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

2. 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

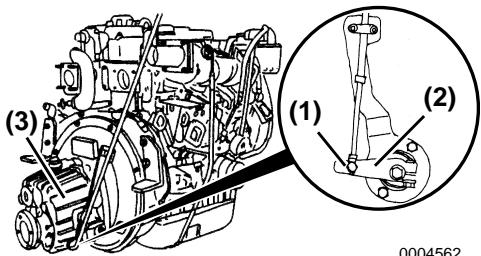


Figure 7

4JH4-TE / 4JH4-HTE

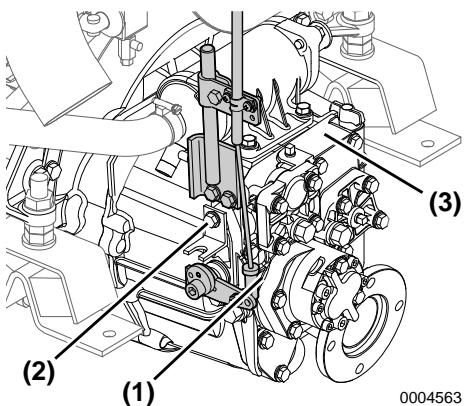


Figure 8

1. 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.
2. To adjust, loosen and retighten the cable fitting (**Figure 7, (1)**) (**Figure 8, (1)**).

Adjusting Trolling Remote Control Handle - If Equipped

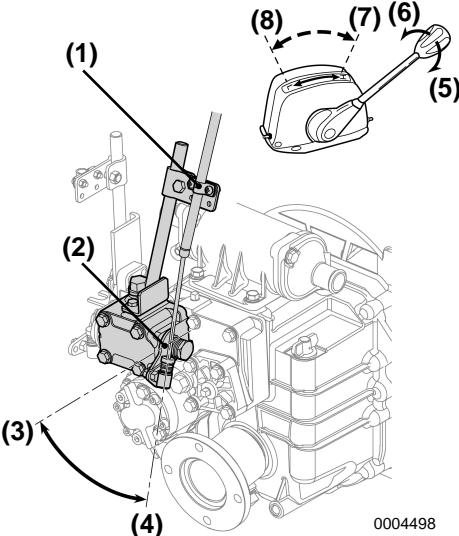


Figure 9

- 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.

1. 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)**).
2. 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)**).
3. To adjust, loosen the adjustment screw of the cable fitting (**Figure 9, (1)**) and adjust the position of the cable.

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.

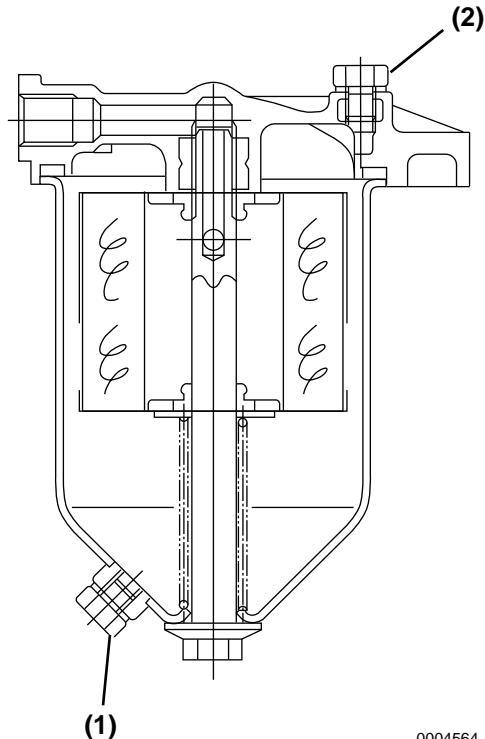
Every 50 Hours of Operation

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)



0004564

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)**).

PERIODIC MAINTENANCE

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

4JH4-TE and 4JH4-HTE

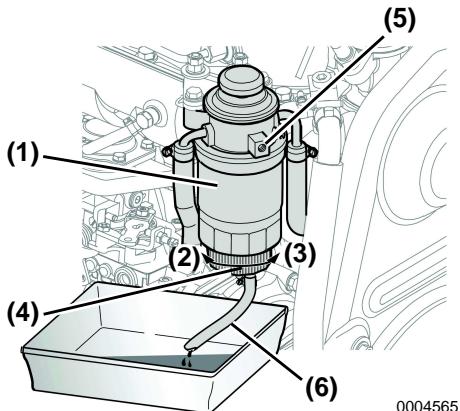


Figure 11

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.

Checking the Battery Electrolyte Level (Serviceable Batteries Only)

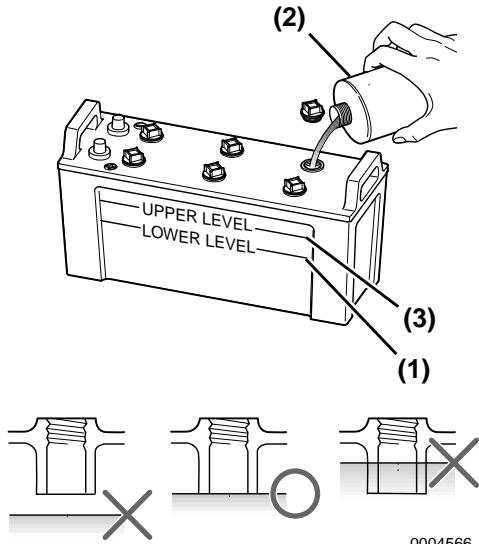
WARNING! *Batteries contain sulfuric acid. NEVER allow battery fluid to come in contact with clothing, skin or eyes. Severe burns could result. ALWAYS wear safety goggles and protective clothing when servicing the battery. If battery fluid contacts the eyes and / or skin, immediately flush the affected 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.*

4. 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

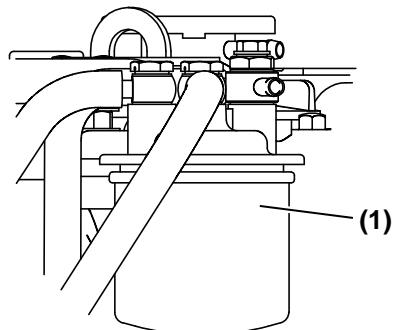
Perform the following maintenance every 250 hours or one year of operation, whichever comes first.

- **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

2. 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.

3. 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

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

4JH4-TE / 4JH4-HTE

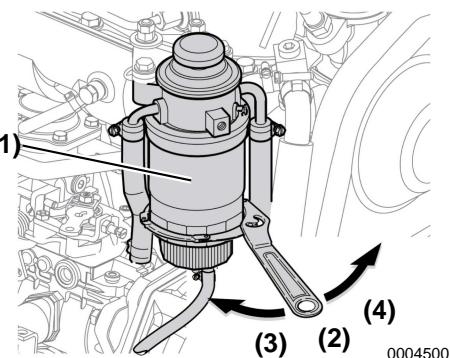


Figure 14

1. Close the fuel cock of the fuel tank.
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 to the drain plug.
4. Loosen the drain plug and drain the fuel from the drain plug.
5. Disconnect the electrical connectors and remove the alarm switch with a spanner wrench.
6. Remove the filter housing (**Figure 14, (1)**) with a filter wrench (**Figure 14, (2)**).
7. Clean the filter housing mounting surface. Install new filter element in filter housing.

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

8. Install the alarm switch to the fuel filter. Apply clean fuel to the gasket of the new fuel filter.
9. 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).

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.

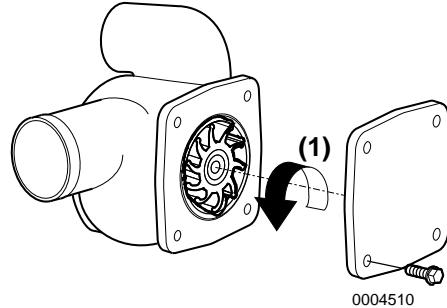


Figure 15

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

Puller A (Standard) Part No. 129671-92110

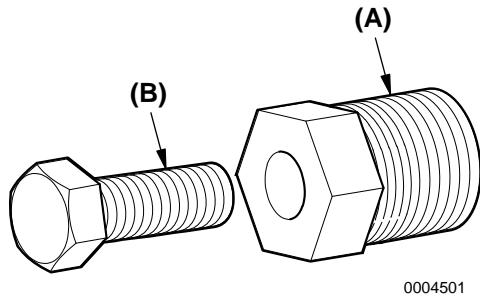


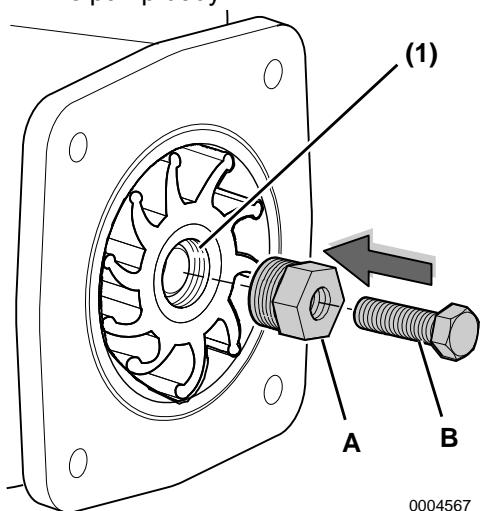
Figure 16

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.

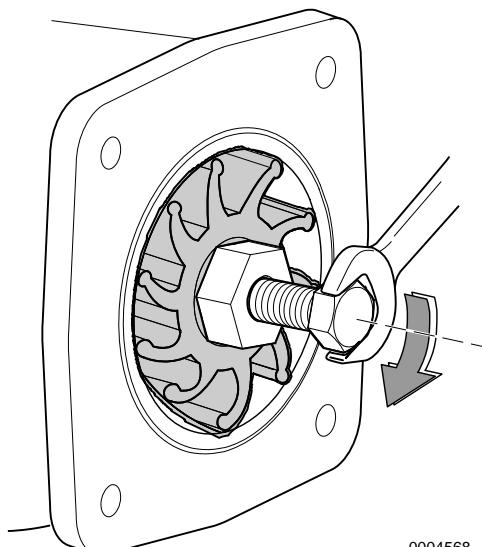
PERIODIC MAINTENANCE

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



0004567

Figure 17



0004568

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

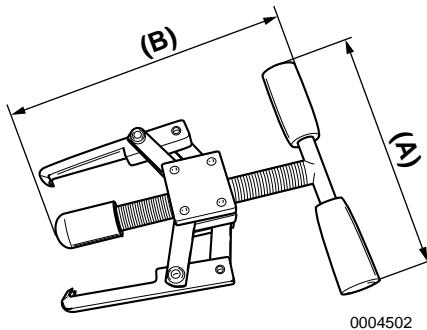


Figure 19

A	B
110 mm	140 mm

Replacing Coolant

Replace coolant every year.

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

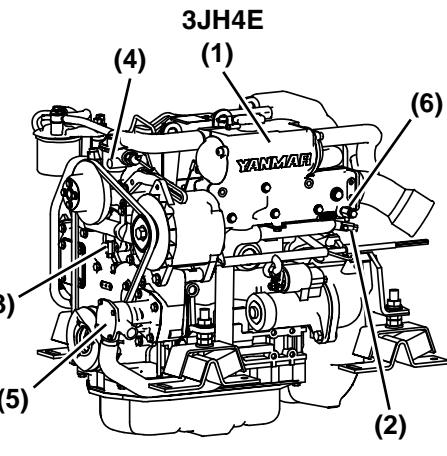


Figure 20

- 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

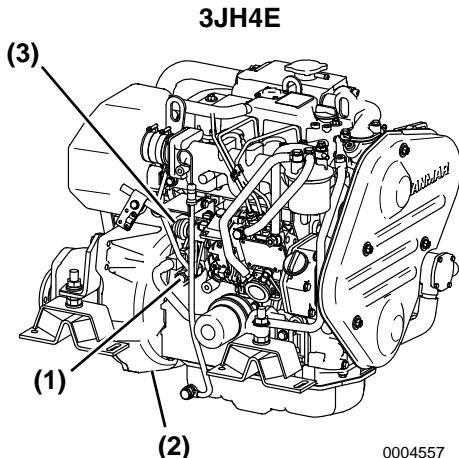


Figure 21

0004557

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

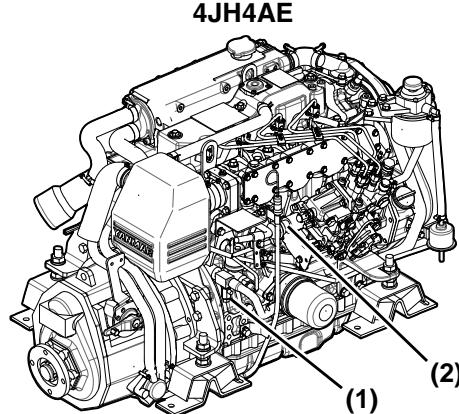


Figure 23

0004570

- 1 – Coolant Drain Cock
- 2 – Stop Solenoid

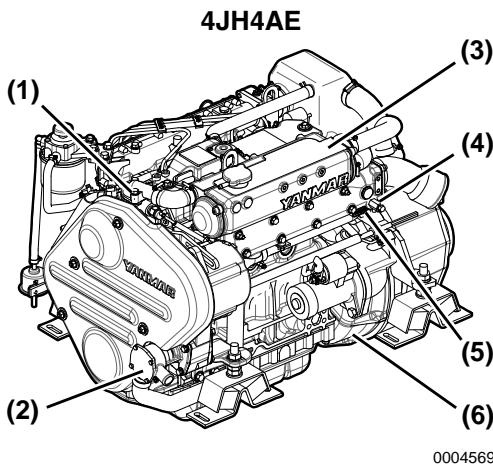


Figure 22

0004569

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

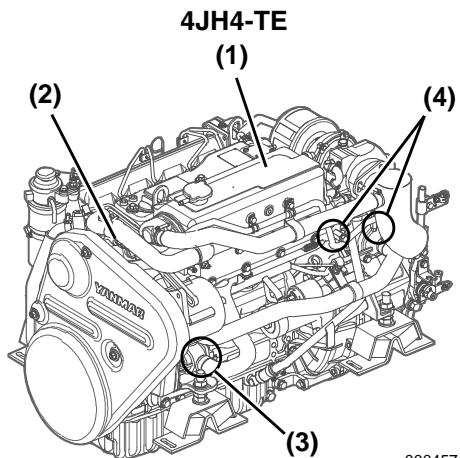


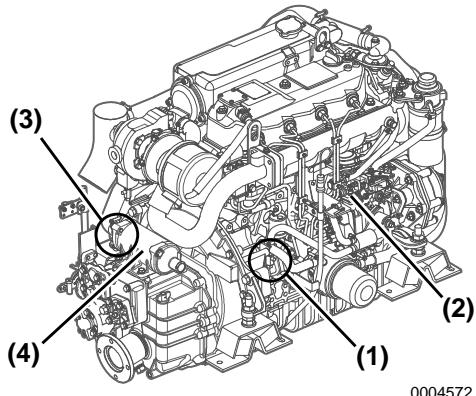
Figure 24

0004571

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

PERIODIC MAINTENANCE

4JH4-TE



4JH4-HTE

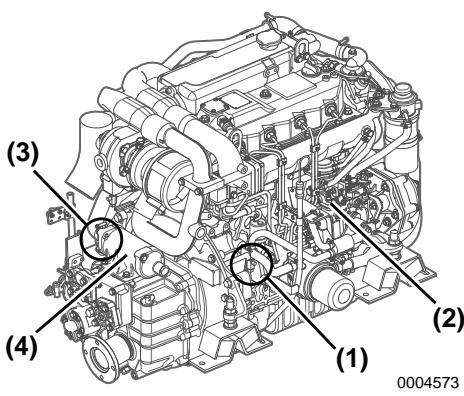


Figure 25

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

4JH4-HTE

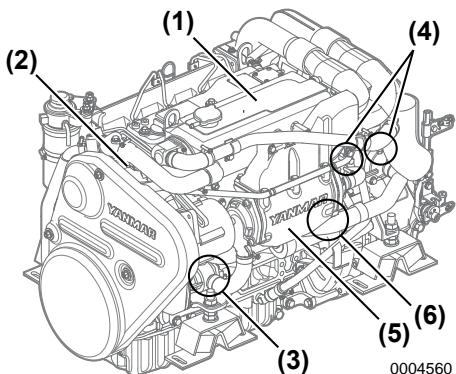


Figure 26

- 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 from Seawater Pump Cover

Figure 27

- 1 – Coolant Drain Cock
- 2 – Fuel Pump
- 3 – Seawater Drain Cock
- 4 – 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. Open all coolant drain cocks.
2. Allow to drain completely. Dispose of waste properly.
3. Close all the drain cocks.
4. Fill coolant tank and coolant recovery tank with appropriate coolant. See *Engine Coolant Specifications* on page 36 and See *Checking and Adding Coolant* on page 36.

Cleaning the Intake Silencer (Air Cleaner) Element

1. Disassemble the intake silencer (air cleaner).
2. Remove element. Clean element and housing with a neutral detergent.
3. Dry completely and reassemble.

Cleaning Exhaust / Water Mixing Elbow

The mixing elbow is attached to the turbocharger. The exhaust gas is mixed with seawater in the mixing elbow.

1. Remove the mixing elbow.
2. Clean dirt and scale out of the exhaust and seawater passages.
3. If the mixing elbow is damaged, repair or replace. See your authorized Yanmar marine dealer or distributor.
4. Inspect the gasket and replace if necessary.

Cleaning the Turbocharger (If Equipped)

Contamination of the turbocharger causes revolutions to drop and engine output to fall.

If a significant drop in engine output is noted (10% or more), clean the turbocharger.

This should be done only by a trained and qualified technician. See your authorized Yanmar marine dealer or distributor.

Adjusting the Alternator V-Belt Tension

See *Checking and Adjusting the Alternator V-Belt Tension on page 62*.

Checking the Wiring Connectors

See your authorized Yanmar marine dealer or distributor.

Tightening All Major Nuts and Bolts

See *Tightening Fasteners on page 54* or see your authorized Yanmar marine dealer or distributor.

Every 500 Hours of Operation

Perform the following maintenance every 500 hours or 2 years of operation, whichever comes first.

- **Replacing Exhaust / Water Mixing Elbow**
- **Replacing Rubber Hoses**

Replacing Exhaust / Water Mixing Elbow

Replace the mixing elbow with a new one every 500 hours or 2 years, whichever comes first, even if no damage is found.

See your authorized Yanmar marine dealer or distributor.

Replacing Rubber Hoses

Replace rubber hoses every 2000 hours or 2 years, whichever comes first.

See your authorized Yanmar marine dealer or distributor.

PERIODIC MAINTENANCE

Every 1000 Hours of Operation

Perform the following maintenance every 1000 hours or 4 years of operation, whichever comes first.

- **Checking the Fuel Injection Timing**
- **Checking the Fuel Injector Spray Pattern**
- **Replacing the Seawater Pump Impeller**
- **Cleaning and Checking the Seawater Passages**
- **Checking Diaphragm Assembly (3JH4E / 4JH4AE only)**
- **Replacing the Alternator V-Belt**
- **Adjusting Intake / Exhaust Valve Clearance**
- **Checking the Remote Control Cable Operation**
- **Adjusting the Propeller Shaft Alignment**

Checking the Fuel Injection Timing

See your authorized Yanmar marine dealer or distributor.

Checking the Fuel Injector Spray Pattern

See your authorized Yanmar marine dealer or distributor.

Replacing the Seawater Pump Impeller

The seawater impeller must be replaced every 1000 hours even if it is not damaged.

See *Checking or Replacing Seawater Pump Impeller* on page 69.

Clean and Check the Seawater Passages

After prolonged use, clean the seawater passages to remove trash, scale, rust and other contaminants that collect in the cooling water passages. This can cause declining cooling performance. The following items need to be inspected:

- Heat Exchanger
- Pressure Cap

See your authorized Yanmar marine dealer or distributor.

Check Diaphragm Assembly (3JH4E / 4JH4AE only)

NOTICE: If the diaphragm is damaged, crankcase pressure control is affected. Excessive crankcase pressure will cause leaks at seals and mating part surfaces.

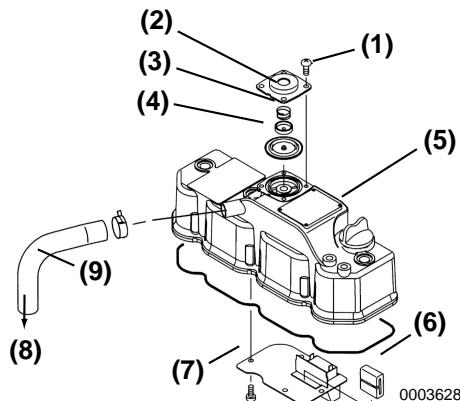


Figure 28

- 1 – Diaphragm Cover
- 2 – Spring
- 3 – Center Plate
- 4 – Diaphragm
- 5 – Rocker Arm Cover
- 6 – Breather Baffle
- 7 – Baffle Plate
- 8 – Intake Silencer
- 9 – Breather Pipe

See your authorized Yanmar marine dealer or distributor.

Replacing the Alternator V-Belt

See Checking and Adjusting the Alternator V-Belt Tension on page 62.

Adjusting Intake / Exhaust Valve Clearance

See your authorized Yanmar marine dealer or distributor.

Checking the Remote Control Cable Operation

See your authorized Yanmar marine dealer or distributor.

Adjusting the Propeller Shaft Alignment

See your authorized Yanmar marine dealer or distributor.

This Page Intentionally Left Blank

TROUBLESHOOTING

If a problem occurs, stop the engine immediately. Refer to the SYMPTOM column in the Troubleshooting Chart to identify the problem.

TROUBLESHOOTING AFTER STARTING

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

Is sufficient water being discharged from the seawater outlet pipe?

- If the discharge is low, stop the engine immediately. Identify the cause and repair.

Is the exhaust color normal?

- The continuous emission of black exhaust smoke indicates engine overloading. This shortens the engine's life and should be avoided.

Are there abnormal vibrations or noise?

- Depending on the hull structure, engine and hull resonance may suddenly increase at certain engine speed ranges, causing heavy vibrations. Avoid operation in this speed range. If any abnormal sounds are heard, stop the engine and inspect for cause.

Alarm sounds during operation.

- If the alarm sounds during operation, lower the engine speed immediately, check the warning lamps and stop the engine for repairs.

Is there water, oil or fuel leakage? Are there any loose bolts or connections?

TROUBLESHOOTING

- Check the engine room daily for any leaks or loose connections.

Is there sufficient fuel in the fuel tank?

- Refill fuel in advance to avoid running out of fuel. If the tank runs out of fuel, bleed the fuel system. See *Bleeding the Fuel System* on page 30.

When operating the engine at low speed for long periods of time, race the engine once every 2 hours. Racing the engine with the clutch in NEUTRAL, accelerate from the low speed position to the high speed position and repeat this process about five times. This is done to clean out carbon from the cylinders and the fuel injection valves. NOTICE: Neglecting the race the engine will result in poor exhaust color and reduce engine performance.

Periodically operate the engine near maximum speed while underway. This will generate higher exhaust temperatures, which will help clean out hard carbon deposits, maintain engine performance and prolong the life of the engine.

TROUBLESHOOTING CHART

Symptom	Probable Cause	Measure	Reference
Indicators light on the instrument panel and alarm sounds during operation	Shift to low speed operation immediately, and check which indicator has come on. Stop the engine and inspect. If no abnormality is identified and there is no problem with operation, return to port at lowest speed and request repairs.		
• Engine oil low pressure alarm indicator comes on	Engine oil level is low.	Check engine oil level. Add or replace.	<i>See Checking the Engine Oil on page 33</i>
	Engine oil filter clogged.	Replace engine oil filter. Replace engine oil.	<i>See Changing the Engine Oil and Replacing the Engine Oil Filter Element on page 61</i>
• Water in sail drive seal indicator comes on	Rubber sail drive seal broken.	See your authorized Yanmar marine dealer or distributor.	-
• Coolant high temperature alarm comes on	Coolant / fresh water in coolant tank is low.	Check coolant level and refill.	<i>See Checking and Adding Coolant on page 36</i>
	Insufficient seawater causing temperature to rise.	Check seawater system.	-
	Contamination inside cooling system.	See your authorized Yanmar marine dealer or distributor.	-
Faulty Warning Devices	Do not operate the engine if alarm devices are not repaired. Serious accidents may result if abnormalities are not identified due to faulty indicators or alarm.		
Indicators Do Not Go On:			
• When key is turned ON • When any trouble occurs (oil pressure etc.)	No electrical current available. Circuit broken or lamp burned out.	See your authorized Yanmar marine dealer or distributor.	-
• One of the indicators does not go out	Sensor switch is faulty.	See your authorized Yanmar marine dealer or distributor.	-

TROUBLESHOOTING

Symptom	Probable Cause	Measure	Reference
• Battery low charge indicator does not go out during operation	V-belt is loose or broken.	Replace V-belt or adjust tension.	<i>See Checking and Adjusting the Alternator V-Belt Tension on page 62</i>
	Battery is defective.	Check battery fluid level, specific gravity or replace battery.	<i>See Checking the Battery Electrolyte Level (Serviceable Batteries Only) on page 66</i>
	Alternator power generation failure.	See your authorized Yanmar marine dealer or distributor.	-
Starting Failures:			
• Starter turns but engine does not start	No fuel.	Add fuel. Bleed fuel system.	<i>See Filling the Fuel Tank on page 30 and See Bleeding the Fuel System on page 30</i>
	Fuel filter is clogged.	Replace filter element.	<i>See Replacing the Fuel Filter Element on page 67</i>
	Improper fuel.	Replace with recommended fuel.	<i>See Diesel Fuel Specifications on page 27</i>
	Problem with fuel injection.	See your authorized Yanmar marine dealer or distributor.	-
Compression leakage from intake / exhaust valve.	See your authorized Yanmar marine dealer or distributor.	-	
• Starter does not turn or turns slowly (engine can be turned manually)	Faulty clutch position.	Shift to NEUTRAL and start.	-
	Insufficient battery charge.	Check fluid level. Recharge. Replace.	<i>See Checking the Battery Electrolyte Level (Serviceable Batteries Only) on page 66</i>
	Cable terminal contact failure.	Remove corrosion from terminals. Tighten battery cables.	-
	Faulty safety switch device.	See your authorized Yanmar marine dealer or distributor.	-
	Faulty starter switch.	See your authorized Yanmar marine dealer or distributor.	-
Power lacking due to accessory drive being engaged.	See your authorized Yanmar marine dealer or distributor.	-	
• Engine cannot be turned manually	Internal parts seized.	See your authorized Yanmar marine dealer or distributor.	-

TROUBLESHOOTING

Symptom	Probable Cause	Measure	Reference
Abnormal Exhaust Color:			
• Black smoke	<ul style="list-style-type: none"> Load increased. 	See your authorized Yanmar marine dealer or distributor.	-
	<ul style="list-style-type: none"> • Improper propeller matching. 	See your authorized Yanmar marine dealer or distributor.	-
	<ul style="list-style-type: none"> • Dirty intake silencer (air cleaner). 	Clean element.	<i>See Cleaning the Intake Silencer (Air Cleaner) Element on page 72</i>
	<ul style="list-style-type: none"> • Improper fuel. 	Replace with recommended fuel.	<i>See Diesel Fuel Specifications on page 27</i>
	<ul style="list-style-type: none"> • Faulty spraying of fuel injector. 	See your authorized Yanmar marine dealer or distributor.	-
• Incorrect intake / exhaust valve clearance.	See your authorized Yanmar marine dealer or distributor.	-	
• White smoke	<ul style="list-style-type: none"> Improper fuel. 	Replace with recommended fuel.	<i>See Diesel Fuel Specifications on page 27</i>
	<ul style="list-style-type: none"> • Faulty spraying of fuel injector. 	See your authorized Yanmar marine dealer or distributor.	-
	<ul style="list-style-type: none"> • Fuel injection timing off. 	See your authorized Yanmar marine dealer or distributor.	-
	<ul style="list-style-type: none"> • Engine burning oil (excessive consumption). 	See your authorized Yanmar marine dealer or distributor.	-

TROUBLESHOOTING INFORMATION

If the engine does not operate properly, refer to the *Troubleshooting Chart on page 79* or see your authorized Yanmar marine dealer or distributor.

Supply the authorized Yanmar marine dealer or distributor with the following information:

- Model name and serial number of your engine
- Boat model, hull material, size (tons)
- Use, type of boating, number of hours run
- Total number of operation hours (refer to hourmeter), age of boat
- The operating conditions when the problem occurs:
 - Engine rpm
 - Color of exhaust smoke
 - Type of diesel fuel
 - Type of engine oil
 - Any abnormal noises or vibration
 - Operating environment such as high altitude or extreme ambient temperatures, etc.
- Engine maintenance history and previous problems
- Other factors that contribute to the problem

LONG-TERM STORAGE

If the engine will not be used for an extended period of time, special measures should be taken to protect the cooling system, fuel system and combustion chamber from corrosion and the exterior from rusting.

The engine can normally stand idle for up to 6 months. If it remains unused for longer than this, please contact your authorized Yanmar marine dealer or distributor.

PREPARE ENGINE FOR LONG-TERM STORAGE

NOTICE: *Do not drain closed cooling system for long-term storage. Antifreeze must be used to avoid freezing and damaging of components. Antifreeze will prevent rusting during long-term storage.*

Note: If the engine is close to a periodic maintenance interval, perform those maintenance procedures before putting the engine into long-term storage.

1. Wipe off any dust or oil from the outside of engine.
2. Drain water from fuel filters.
3. Drain fuel tank completely or fill the tank to prevent condensation.
4. Grease the exposed areas and joints of the remote control cables and the bearings of the remote control handle.
5. Seal the intake silencer, exhaust pipe, etc. to prevent moisture or contamination from entering engine.
6. Completely drain bilge in hull bottom.
7. Waterproof the engine room to prevent rain or seawater from entering.
8. Charge the battery once a month to compensate for battery's self-discharge.
9. Remove key from key switch and cover the key switch with moisture cap.

LONG-TERM STORAGE

DRAIN SEAWATER COOLING SYSTEM

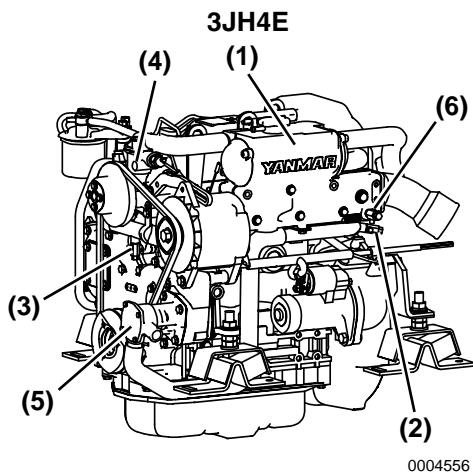


Figure 1

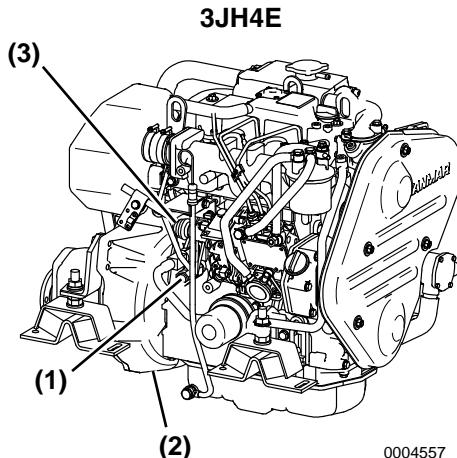


Figure 2

- 1 – Coolant Tank (Heat Exchanger)
- 2 – Seawater Drain Cock
- 3 – Coolant Drain Cock (3JH4E only)
- 4 – Coolant Pump (Fresh Water)
- 5 – Seawater Drain from Seawater Pump Cover
- 6 – Coolant Drain Cock

4JH4AE

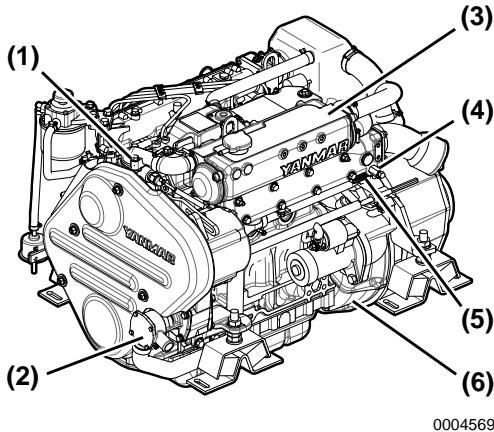


Figure 3

4JH4-TE

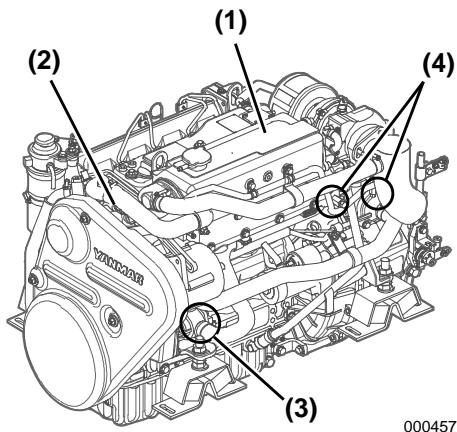


Figure 5

4JH4AE

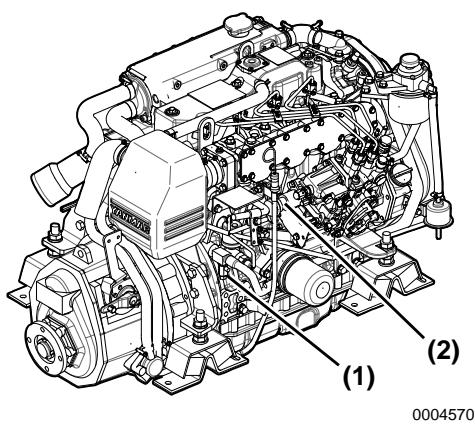


Figure 4

- 1 – Coolant Drain Cock
- 2 – Stop Solenoid

4JH4-TE

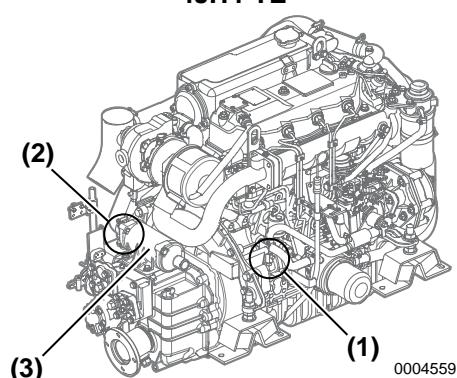


Figure 6

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

LONG-TERM STORAGE

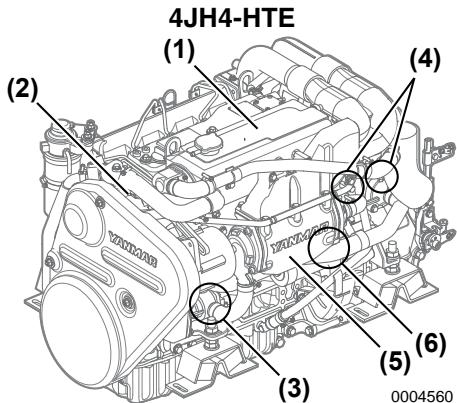


Figure 7

- 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 from Heat Exchanger

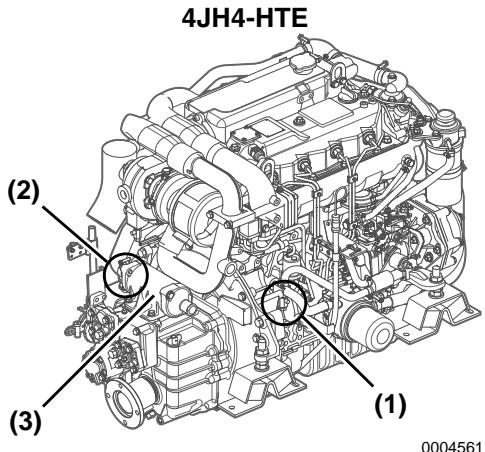


Figure 8

- 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.

NOTICE: If seawater is left inside, it may freeze and damage parts of the cooling system (fresh water cooler, seawater pump, etc.) when ambient temperature is below 32°F (0°C).

1. Open the seawater drain cock on the clutch cooler (if equipped). Allow to drain. Open the seawater drain cock on the intercooler (4JH4-HTE only) and drain. If no water drains, use a stiff brush to remove any debris.
2. Remove four bolts attaching the side cover of the seawater pump. Remove the cover and drain the seawater.
3. Install cover and tighten bolts.
4. Close all the drain cocks.

SPECIFICATIONS

PRINCIPAL ENGINE SPECIFICATIONS

3JH4E Engine Specifications

Specification		3JH4E					
Marine Gear Model	KM35P	KM35A	SD40/SD50	Bobtail			
Use	Pleasure use						
Type	Vertical water cooled 4-cycle diesel engine						
Combustion system	Direct injection						
Air charging	Natural aspiration						
Number of cylinders	3						
Bore x stroke	88 mm x 90 mm (3.46 in. x 3.54 in.)						
Displacement	1.642 L (100.20 cu in.)						
Continuous power	Output at crankshaft / Engine speed	26.7 kW (36.3 hp metric)/2907 rpm*					
Fuel stop power	Output at crankshaft / Engine speed	29.4 kW (40.0 hp metric)/3000 rpm*		28.7 kW (39.0 hp metric)/3000 rpm**			
	Output at propeller / Engine speed	28.0 kW (38.1 hp metric)/3000 rpm*	27.4 kW (37.3 hp metric)/3000 rpm**	-	-		
Installation	Flexible mounting						
Fuel injection timing	FIC 13 ± 1 ° BTDC (FID 12 ± 1 ° BTDC)						
Fuel injection opening pressure	21.6 ± 0.5 MPa						
Main power take off	At flywheel end						
Direction of rotation	Crankshaft	Counterclockwise viewed from stern					
	Propeller shaft (Ahead)	Clockwise viewed from stern	-	-	-		
Cooling system	Fresh water cooling with heat exchanger						
Lubrication system	Complete enclosed forced lubrication system						
Cooling water capacity (fresh)	Engine 4.5 L (4.8 qt), Coolant recovery tank: 0.8 L (0.8 qt)						

SPECIFICATIONS

Specification		3JH4E		
Marine Gear Model		KM35P	KM35A	SD40/SD50
Lubricating oil capacity (engine)	Rake angle	at rake angle 8°	at rake angle 0°	-
	Total***	5.0 ± 0.3 L (5.3 ± 0.3 qt)	5.5 ± 0.3 L (5.8 ± 0.3 qt)	
	Oil pan only	4.5 ± 0.3 L (4.8 ± 0.3 qt)	5.0 ± 0.3 L (5.3 ± 0.3 qt)	
	Effective****	1.1 L (1.2 qt)	1.2 L (1.3 qt)	
Starting system	Type	Electric		
	Starting motor	DC 12 V - 1.4 kW		
	AC generator	12 V - 80 A (12 V - 60 A optional)		
Engine dimension	Overall length	777 mm (30.6 in.)	776 mm (30.6 in.)	700 mm (27.6 in.)
	Overall width	539 mm (21.2 in.)		
	Overall height	623 mm (24.5 in.)		
Flywheel major dimension		D300 x 66 mm (11.8 x 2.6 in.)		
Engine dry mass (include marine gear)		185 kg (408 lb)	186 kg (410 lb)	213 kg engine: 173 kg (470 lb) (engine: 381 lb)
		173 kg (467 lb)		

* Rating Condition: Temperature of fuel; 25°C at fuel pump inlet; ISO 3046-1

** Rating Condition: Temperature of fuel; 40°C at fuel pump inlet; ISO 8665

*** The "total" oil quantity includes oil in oil pan, channels, coolers and filter.

**** The effective amount of oil shows the difference in maximum scale of the dipstick and minimum scale.

Note: Density of fuel: 0.842g/cm³ at 15°C. Fuel temperature at the inlet of the fuel injection pump.

1 hp metric = 0.7355 kW

3JH4E Marine Gear Specifications

Model	KM35P	KM35A	SD40/SD50 (coupled at boat builder)
Type	Mechanical cone clutch		
Reduction ratio (Forward / Reverse)	2.33/3.16	2.33/3.06	2.32
Propeller speed (Forward / Reverse) *	1231/1114 rpm	1246/1103 rpm	1253 rpm
Lubrication system	Splash	-	Oil bath
Lubricating oil capacity (Total)	0.5 L (0.5 qt)	0.65 L (0.69 qt)	SD40 (Old type): 1.8 L (1.9 qt) SD50: 2.2 L (2.3 qt) Long Reach (58): 2.35 L (2.48 qt) Long Reach (100): 2.45 L (2.59 qt)
Lubricating oil capacity (Effective)	0.05 L (0.05 qt)	0.15 L (0.16 qt)	-
Cooling system	Air cooling by fan on flywheel		
Weight	12 kg (26.5 lb)	13 kg (28.7 lb)	39 kg (86.0 lb)

* At continuous power engine speed 2907 rpm

SPECIFICATIONS

4JH4AE Engine Specifications

Engine Model		4JH4AE					
Marine Gear Model		KM35P	ZF30M	KM35A2	KM4A1		
Use	Pleasure use						
Type	Vertical water cooled 4-cycle diesel engine						
Combustion system	Direct injection						
Air charging	Natural aspiration						
Number of cylinders	4						
Bore x stroke	88 mm x 90 mm (3.46 in. x 3.54 in.)						
Displacement	2.190 L (133.64 cu in.)						
Continuous power	Output at crankshaft / Engine speed	36.0 kW (48.9 hp metric)/2907 rpm *					
Fuel stop power	Output at crankshaft / Engine speed	39.6 kW (53.8 hp metric)/3000 rpm ***					
	Output at propeller / Engine speed	38.0 kW (51.7 hp metric) / 3000 rpm *	-	-			
Installation	Flexible mounting						
Fuel injection timing	FIR 5 ± 1° BTDC (at Fuel Stop Power) FIT 18 ± 1° BTDC (at Plunger Lift 2.5)						
Fuel injection opening pressure	19.6 - 20.6 MPa						
Main power take off	At flywheel end						
Direction of rotation	Crankshaft	Counterclockwise viewed from stern					
	Propeller shaft (ahead)	Clockwise viewed from stern					
Cooling system	Fresh water cooling with heat exchanger						
Lubrication system	Complete enclosed forced lubrication system						
Cooling water capacity (fresh)	Engine 6.0 L (6.3 qt) Coolant recovery tank: 0.8 L (0.8 qt)						
Lubricating oil capacity (engine)	Rake angle	at rake angle 8°		at rake angle 0°			
	Total***	5.0 ± 0.3 L (5.3 ± 0.3 qt)		5.5 ± 0.3 L (5.8 ± 0.3 qt)			
	Oil pan only	4.5 ± 0.3 L (4.8 ± 0.3 qt)		5.0 ± 0.3 L (5.3 ± 0.3 qt)			
	Effective ****	1.2 L (1.3 qt)		1.4 L (1.5 qt)			
Starting system	Type	Electric					
	Starting motor	DC 12 V - 1.4 kW					
	AC generator	12 V - 80 A					
Engine dimension	Overall length	871 mm (34.3 in.)	950 mm (37.4 in.)	864 mm (34.0 in.)	922 mm (36.3 in.)		
	Overall width	560 mm (22.0 in.)					
	Overall height	625 mm (24.6 in.)					
Flywheel major dimension		D300 x 66 mm (11.8 x 2.6 in.)					
Engine dry mass (include marine gear)		213 kg (470 lb)	229 kg (505 lb)	214 kg (472 lb)	230 kg (507 lb)		

* Rating Condition: Temperature of fuel; 25°C at fuel pump inlet; ISO 3046-1

** Rating Condition: Temperature of fuel; 40°C at fuel pump inlet; ISO 8665

*** The "total" oil quantity includes oil in oil pan, channels, coolers and filter.

**** The effective amount of oil shows the difference in maximum scale of the dipstick and minimum scale.

Note: Density of fuel: 0.842g/cm³ at 15°C. Fuel temperature at the inlet of the fuel injection pump.

1 hp metric = 0.7355 kW

SPECIFICATIONS

4JH4AE Specifications (Continued)

Engine Model		4JH4AE	
Marine Gear Model		SD50	Bobtail
Use			Pleasure use
Type			Vertical water cooled 4-cycle diesel engine
Combustion system			Direct injection
Air charging			Natural aspiration
Number of cylinders		4	
Bore x stroke		88 x 90 mm (3.46 x 3.54 in.)	
Displacement		2.190 L 133.6 cu in.	
Continuous power	Output at crankshaft / Engine speed	36.0 kW (48.9 hp)/2907 rpm*	
Fuel stop power	Output at crankshaft / Engine speed	39.6 kW (53.8hp)/3000 rpm***	
	Output at propeller / Engine speed	-	
Installation		Flexible mounting	
Fuel injection timing		FIR 5 ± 1° BTDC (at Fuel Stop Power) FIT 18 ± 1° BTDC (at Plunger Lift 2.5)	
Fuel injection opening pressure		19.6 - 20.6 MPa	
Main power take off		At flywheel end	
Direction of rotation	Crankshaft	Counterclockwise viewed from stern	
	Propeller shaft (Ahead)	Clockwise viewed from stern	
Cooling system		Fresh water cooling with heat exchanger	
Lubrication system		Closed forced lubrication system	
Cooling water capacity (fresh)		Engine 6.0 L (6.3 qt) Coolant recovery tank: 0.8 L (0.8 qt)	
Lubricating oil capacity (engine)	Rake angle	at rake angle 0°	
	Total ***	5.5 ± 0.3 L (5.8 ± 0.3 qt)	
	Oil pan only	5.0 ± 0.3 L (5.3 ± 0.3 qt)	
	Effective ****	1.4 L (1.5 qt)	
Starting system	Type	Electric	
	Starting motor	DC 12 V - 1.4 kW	
	AC generator	12 V - 80 A	
Engine dimension	Overall length	795 mm (31.3 in.)	
	Overall width	560 mm (22.0 in.)	
	Overall height	625 mm (24.6 in.)	
Flywheel major dimension		D300 x 66 mm (11.8 x 2.6 in.)	
Engine dry mass (include marine gear)		241 kg engine: 201 kg (531 lb) (engine: 443 lb)	201 kg (443 lb)

* Rating Condition: Temperature of fuel; 25°C at fuel pump inlet; ISO 3046-1

** Rating Condition: Temperature of fuel; 40°C at fuel pump inlet; ISO 8665

*** The "total" oil quantity includes oil in oil pan, channels, coolers and filter.

**** The effective amount of oil shows the difference in maximum scale of the dipstick and minimum scale.

Note: Density of fuel: 0.842g/cm³ at 15°C. Fuel temperature at the inlet of the fuel injection pump.

1 hp metric = 0.7355 kW

SPECIFICATIONS

4JH4AE Marine Gear or Sail Drive Specifications

Model	KM35P		ZF30M	
Type	Mechanical cone clutch			
Reduction ratio (Forward / Reverse)	2.36/3.16	2.61/3.16	2.15/2.64	2.70/2.64
Propeller speed (Forward / Reverse) *	1232/921rpm	1114/921 rpm	1353/1103 rpm	1078/1103 rpm
Lubrication system	Splash			
Lubricating oil capacity (Total)	0.5 L (0.5 qt)		1.1 L (1.2 qt)**	
Lubricating oil capacity (Effective)	0.05 L (0.05 qt)		0.2 L (0.2 qt)	
Cooling system	Air cooling by fan		Seawater cooling	
Weight	12 kg (26 lb)		27.5 kg (61 lb)	

* At continuous power engine speed 2907 rpm

** ZF30M Lubricating oil: ATF

Model	KM35A2		KM4A1			SD50 (coupled at boat builder)
Type	Mechanical cone clutch					
Reduction ratio (Forward / Reverse)	2.33/ 3.06	2.64/ 3.06	1.47/ 1.47	2.14/ 2.14	2.63/ 2.63	3.30/ 3.30
Propeller speed (Forward / Reverse) *	1246/ 955 rpm	1103/ 955 rpm	1983/ 1993 rpm	1360/ 1360 rpm	1106/ 1106 rpm	882/ 882 rpm
Lubrication system	Splash		-			Oil bath
Lubricating oil capacity (Total)	0.65 L (0.69 qt)		2.3 L (2.4 qt)			SD50: 2.1 L (2.2 qt)
Lubricating oil capacity (Effective)	0.15 L (0.16 qt)		0.20 L (0.21 qt)			SD50: 0.5 L (0.6 qt)
Cooling system	Air cooling by fan		Seawater cooling			-
Weight	13 kg (28 lb)		29.0 kg (64 lb)			40 kg (88 lb)

* At continuous power engine speed 2907 rpm

This Page Intentionally Left Blank

SPECIFICATIONS

4JH4-TE Engine Specifications

Engine Model		4JH4-TE												
Marine Gear Model		ZF30M	KM4A2	KMH4A	ZF25A	SD50-4T	Bobtail							
Use		Pleasure use												
Type		Vertical water cooled 4-cycle diesel engine												
Combustion system		Direct injection												
Air charging		Turbocharged												
Number of cylinders		4												
Bore x stroke		84 x 90 mm (3.31 x 3.54 in.)												
Displacement		1.995 L (121.74 cu in.)												
Continuous power	Output at crankshaft / Engine speed	50.2 kW (68.3 hp metric)/3101 rpm *												
Fuel stop power	Output at crankshaft / Engine speed	55.2 kW (75.1hp metric)/3200 rpm*												
	Output at propeller / Engine speed	53.0 kW (72.1hp metric)/3200 rpm*			-									
Installation		Flexible mounting												
Fuel injection timing		Plunger lift at TDC 1.26 ± 0.01 mm (when W-CSD is released)												
Fuel injection opening pressure		21.6 ± 0.5 MPa												
Main power take off		At flywheel end												
Direction of rotation	Crankshaft	Counterclockwise viewed from stern												
	Propeller shaft (Ahead)	Clockwise from stern	Clockwise or counterclockwise (Bi-rotation)	-										
Cooling system		Fresh water cooling with heat exchanger												
Lubrication system		Complete enclosed forced lubrication system												
Cooling water capacity (fresh)		Engine: 7.2 L (7.6 qt), Coolant recovery tank: 0.8 L (0.8 qt)												
Lubricating oil capacity (engine)	Rake angle	7°	0°			7° or 0°								
	Total**	5.7 ± 0.3 L (6.0 ± 0.3 qt)	6.9 ± 0.3 L (7.3 ± 0.3 qt)			Refer to left								
	Oil pan only	5.2 ± 0.3 L (5.5 ± 0.3 qt)	6.4 ± 0.3 L (6.8 ± 0.3 qt)			Refer to left								
	Effective***	2.4 L (2.5 qt)												
Starting system	Type	Electric												
	Starting motor	DC 12 V - 1.4 kW												
	AC generator	12 V - 80 A (12 V - 60 A optional)												

SPECIFICATIONS

Engine Model		4JH4-TE					
Marine Gear Model		ZF30M	KM4A2	KMH4A	ZF25A	SD50-4T	Bobtail
Engine dimension	Overall length	923 mm (36.3 in.)	903 mm (35.6 in.)	933 mm (36.7 in.)	1017 mm (40.0 in.)	782 mm (30.8 in.)	782 mm (30.8 in.)
	Overall width	616 mm (24.3 in.)					
	Overall height	659 mm (25.9 in.)					
Flywheel major dimension		D339 x 66 mm (13.3 x 2.6 in.)					
Engine dry mass (including marine gear)		235 kg (518 lb)	237 kg (523 lb)	238 kg (525 lb)	237 kg engine: 173 kg (523 lb) (engine: 381 lb)	249 kg (engine: 207 kg) (549 lb) (engine: 456 lb)	207 kg (456 lb)

* Rating Condition: Temperature of fuel; 40°C at fuel pump inlet; ISO 8665

** The "total" oil quantity includes oil in oil pan, channels, coolers and filter.

*** The effective amount of oil shows the difference in maximum scale of the dipstick and minimum scale.

Note: Density of fuel: 0.842g/cm³ at 15°C. Fuel temperature at the inlet of the fuel injection pump.

1 hp metric = 0.7355 kW

SPECIFICATIONS

4JH4-HTE Engine Specifications

Engine Model		4JH4-HTE							
Marine Gear Model		ZF30M	KM4A2	KMH4A	ZF25A	Bobtail			
Use		Pleasure use							
Type		Vertical water cooled 4-cycle diesel engine							
Combustion system		Direct injection							
Air charging		Turbocharged							
Number of cylinders		4							
Bore x stroke		84 x 90 mm (3.31 x 3.54 in.)							
Displacement		1.995 L (121.74 cu in.)							
Continuous power	Output at crankshaft / Engine speed	73.6 kW (100 hp metric)/3101 rpm *							
Fuel stop power	Output at crankshaft / Engine speed	80.9 kW (110 hp metric)/3200 rpm*							
	Output at propeller / Engine speed	77.7 kW (106 hp metric)/3200 rpm*				-			
Installation		Flexible mounting							
Fuel injection timing		Plunger lift at TDC 1.26 ± 0.01 mm (when W-CSD is released)							
Fuel injection opening pressure		21.6 ± 0.5 MPa							
Main power take off		At flywheel end							
Direction of rotation	Crankshaft	Counterclockwise viewed from stern							
	Propeller shaft (Ahead)	Clockwise from stern	Clockwise or counterclockwise (Bi-rotation)	-					
Cooling system		Fresh water cooling with heat exchanger							
Lubrication system		Complete enclosed forced lubrication system							
Cooling water capacity (fresh)		Engine: 7.2 L (7.6 qt), Coolant recovery tank: 0.8 L (0.8 qt)							
Lubricating oil capacity (engine)	Rake angle	7°	0°			7° or 0°			
	Total**	5.7 ± 0.3 L (6.0 ± 0.3 qt)	6.9 ± 0.3 L (7.3 ± 0.3 qt)			Refer to left			
	Oil pan only	5.2 ± 0.3 L (5.5 ± 0.3 qt)	6.4 ± 0.3 L (6.8 ± 0.3 qt)			Refer to left			
	Effective***	2.4 L (2.5 qt)							
Starting system	Type	Electric							
	Starting motor	DC 12 V - 1.4 kW							
	AC generator	12 V - 80 A (12 V - 60 A optional)							

SPECIFICATIONS

Engine Model		4JH4-HTE				
Marine Gear Model		ZF30M	KM4A2	KMH4A	ZF25A	Bobtail
Engine dimension	Overall length	923 mm (36.3 in.)	903 mm (35.6 in.)	933 mm (36.7 in.)	1017 mm (40.0 in.)	782 mm (30.8 in.)
	Overall width	616 mm (24.3 in.)				
	Overall height	659 mm (25.9 in.)				
Flywheel major dimension		D339 x 66 mm (13.3 x 2.6 in.)				
Engine dry mass (including marine gear)		245 kg (540 lb)	247 kg (545 lb)	248 kg (547 lb)	247 kg (545 lb)	217 kg (478 lb)

* Rating Condition: Temperature of fuel: 40°C at fuel pump inlet; ISO 8665

** The "total" oil quantity includes oil in oil pan, channels, coolers and filter.

*** The effective amount of oil shows the difference in maximum scale of the dipstick and minimum scale.

Note: Density of fuel: 0.842g/cm³ at 15°C. Fuel temperature at the inlet of the fuel injection pump.

1 hp metric = 0.7355 kW

SPECIFICATIONS

4JH4-TE and 4JH4-HTE Marine Gear or Sail Drive Specifications

Model	ZF30M		KM4A2			KMH4A		ZF25A		SD50-4T (coupled at boat builder)
Down angle	0°		7°			8°		8°		-
Type	Mechanical wet multiple disk clutch		Mechanical cone clutch			Hydraulic wet multiple disk clutch		Hydraulic wet multiple disk clutch		Mechanical cone clutch
Reduction ratio (Forward / Reverse)	2.15/ 2.64	2.70/ 2.64	1.47/ 1.47	2.14/ 2.14	2.63/ 2.63	2.04/ 2.04	2.45/ 2.45	1.93/ 1.93	2.48/ 2.48	2.32
Propeller speed (Forward / Reverse) (rpm) *	1444/ 1176	1150/ 1176	2115 2113	1451/ 1450	1180/ 1179	1520/ 1520	1263/ 1263	1607/ 1607	1250 1250	1337
Lubrication system	Splash		Centrifugal pump			Trochoid pump		Trochoid pump		Oil bath
Lubrication oil	ATF		API CD or higher SAE #20 or #30					ATF		Quick-Silver® only
Lubricating oil capacity (Total)	1.1 L (1.2 qt)		2.0 L (2.1 qt)			2.0 L (2.1 qt)		1.8 L (1.9 qt)	2.2 L (2.3 qt)	
Lubricating oil capacity (Effective)	0.2 L (0.2 qt)		0.2 L (0.2 qt)			0.2 L (0.2 qt)		-	0.1 L (0.1 qt)	
Cooling system	Seawater cooling									-
Weight	27.5 kg (61 lb)		30 kg (66 lb)			31 kg (68 lb)		30 kg (66 lb)		42 kg (93 lb)

* At continuous power engine speed 2907 min⁻¹

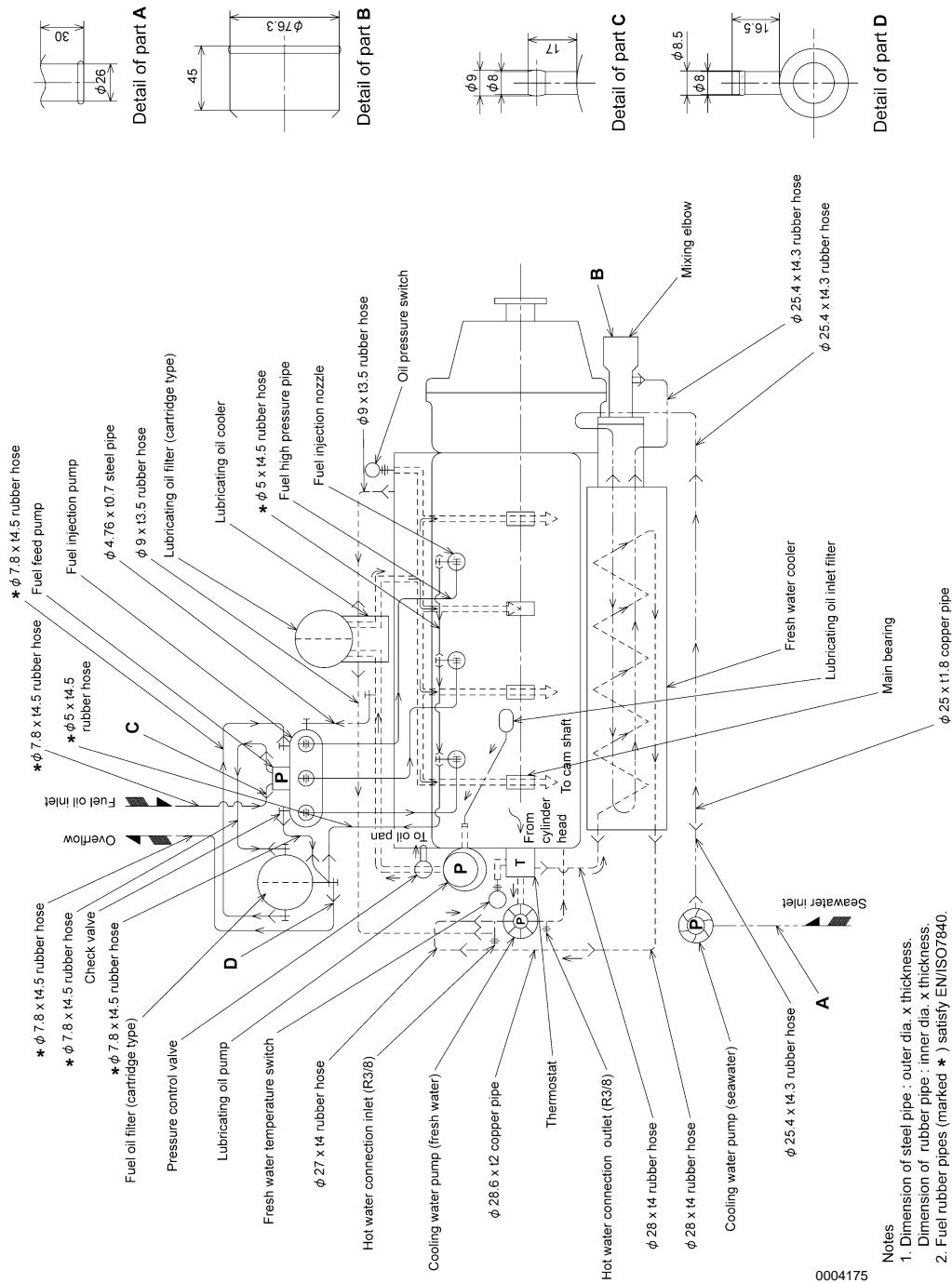
SYSTEM DIAGRAMS

PIPING DIAGRAMS

Notation	
— —	Screw Joint (Union)
— —	Flange Joint
—T—	Eye Joint
—<—	Insertion Joint
-----	Drilled Hole
-----	Coolant Piping
—- - - -	Cooling Seawater Piping
—- - - -	Lubricating Oil Piping
————	Fuel Oil Piping

SYSTEM DIAGRAMS

3JH4E with KM35P, KM35A Marine Gear



0004175

Figure 1

3JH4E with SD50 (SD40) Sail Drive

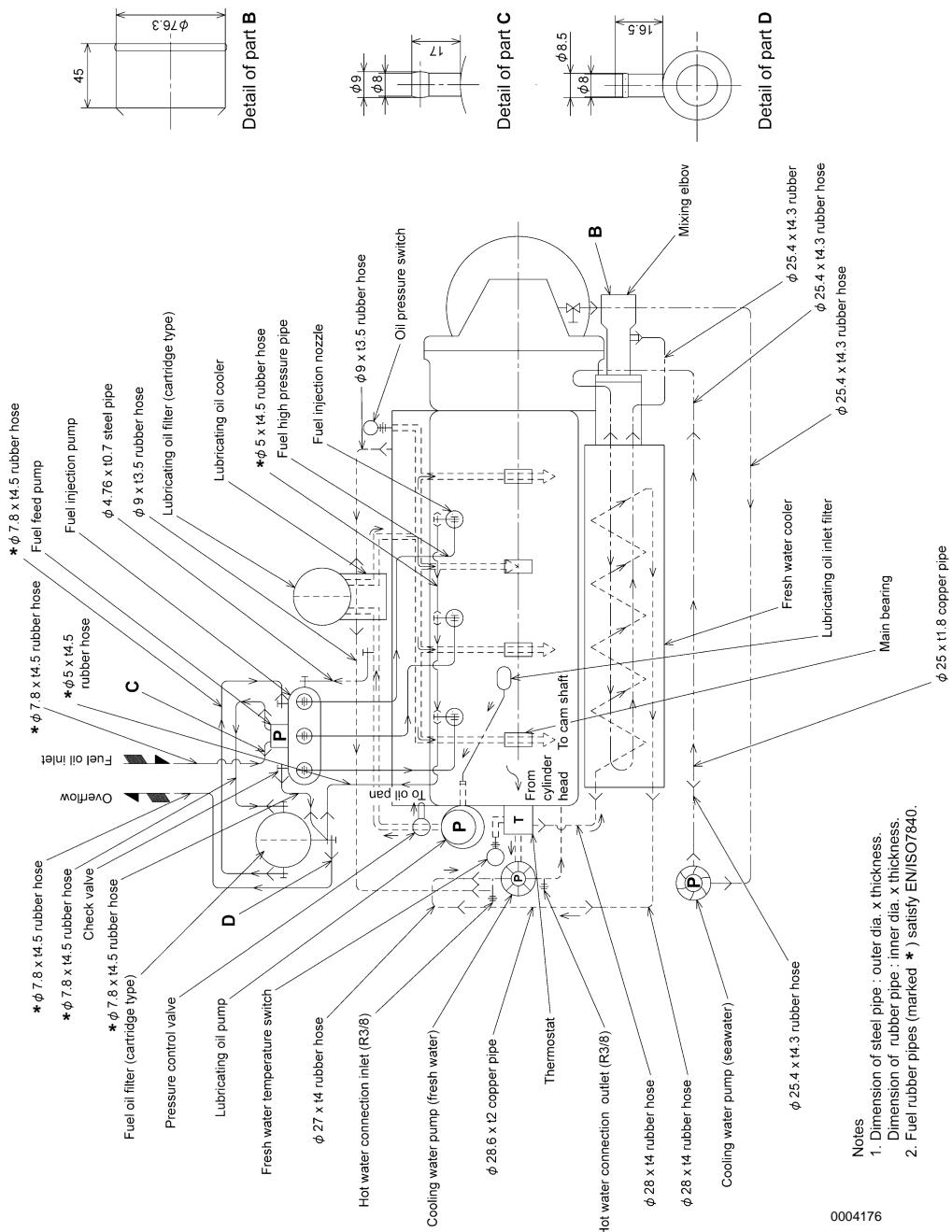


Figure 2

SYSTEM DIAGRAMS

4JH4AE with KM35P, KM35A2 Marine Gear

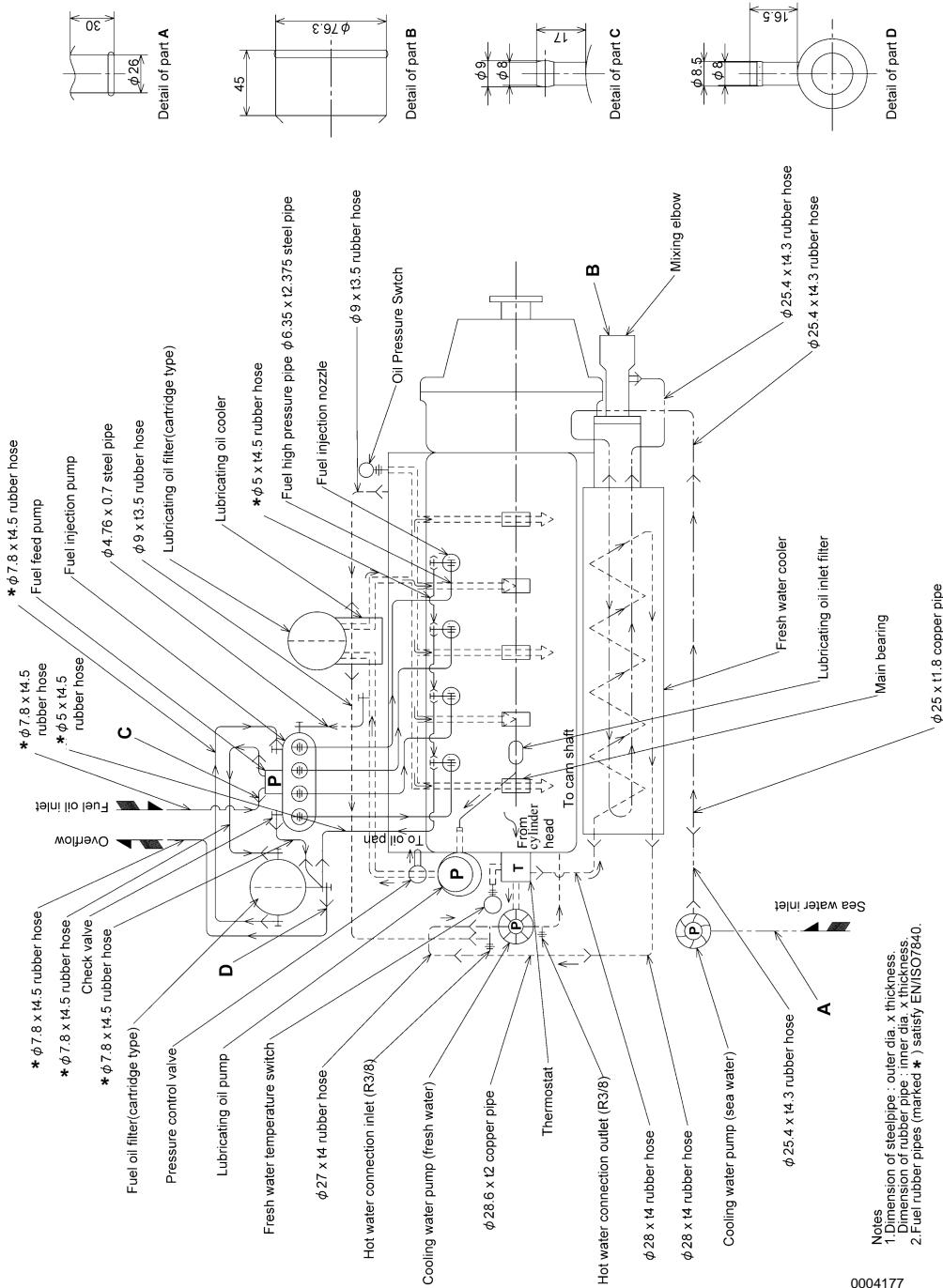


Figure 3

4JH4AE with KM35P, KM35A2 Marine Gear

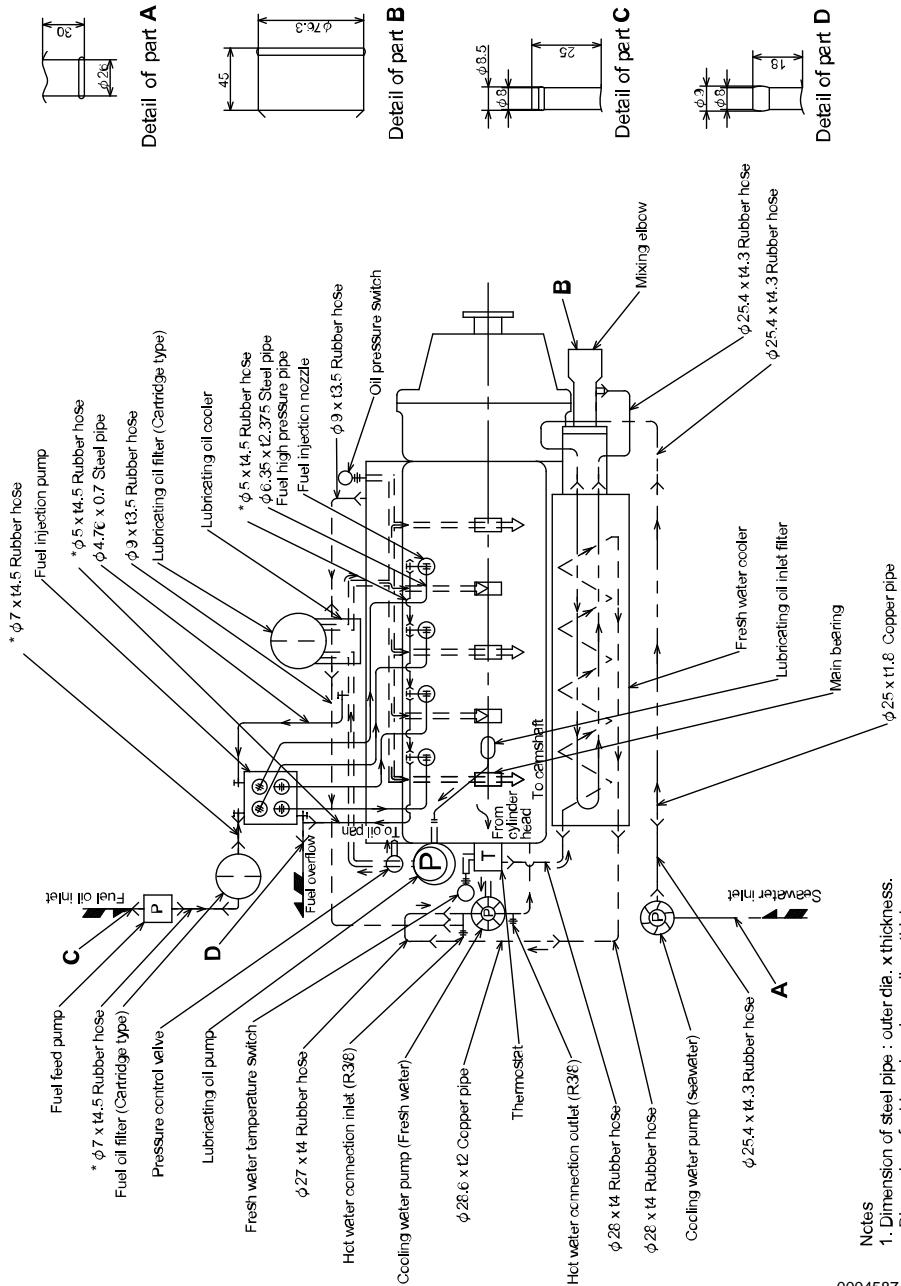


Figure 4

SYSTEM DIAGRAMS

4JH4AE with KM4A1 Marine Gear

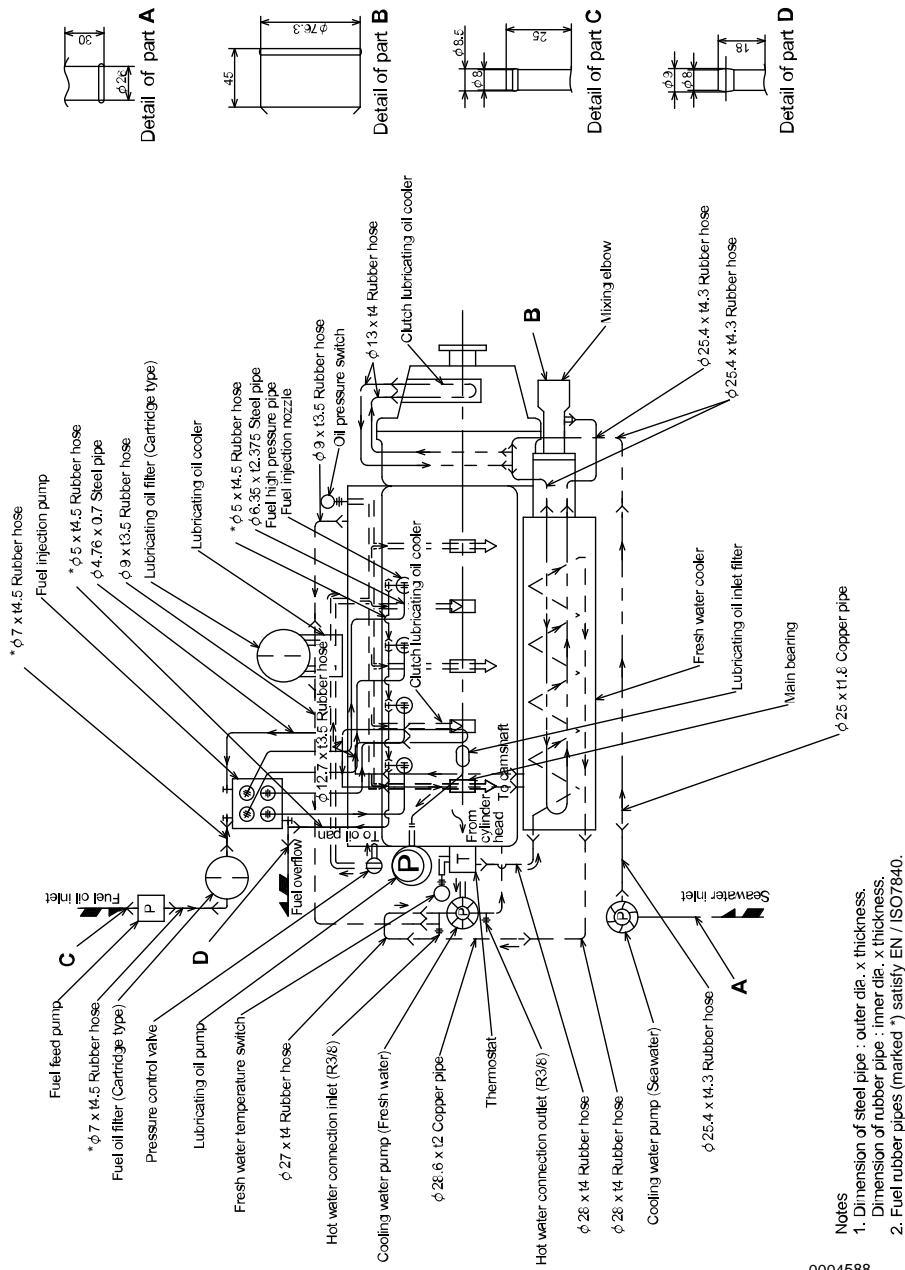
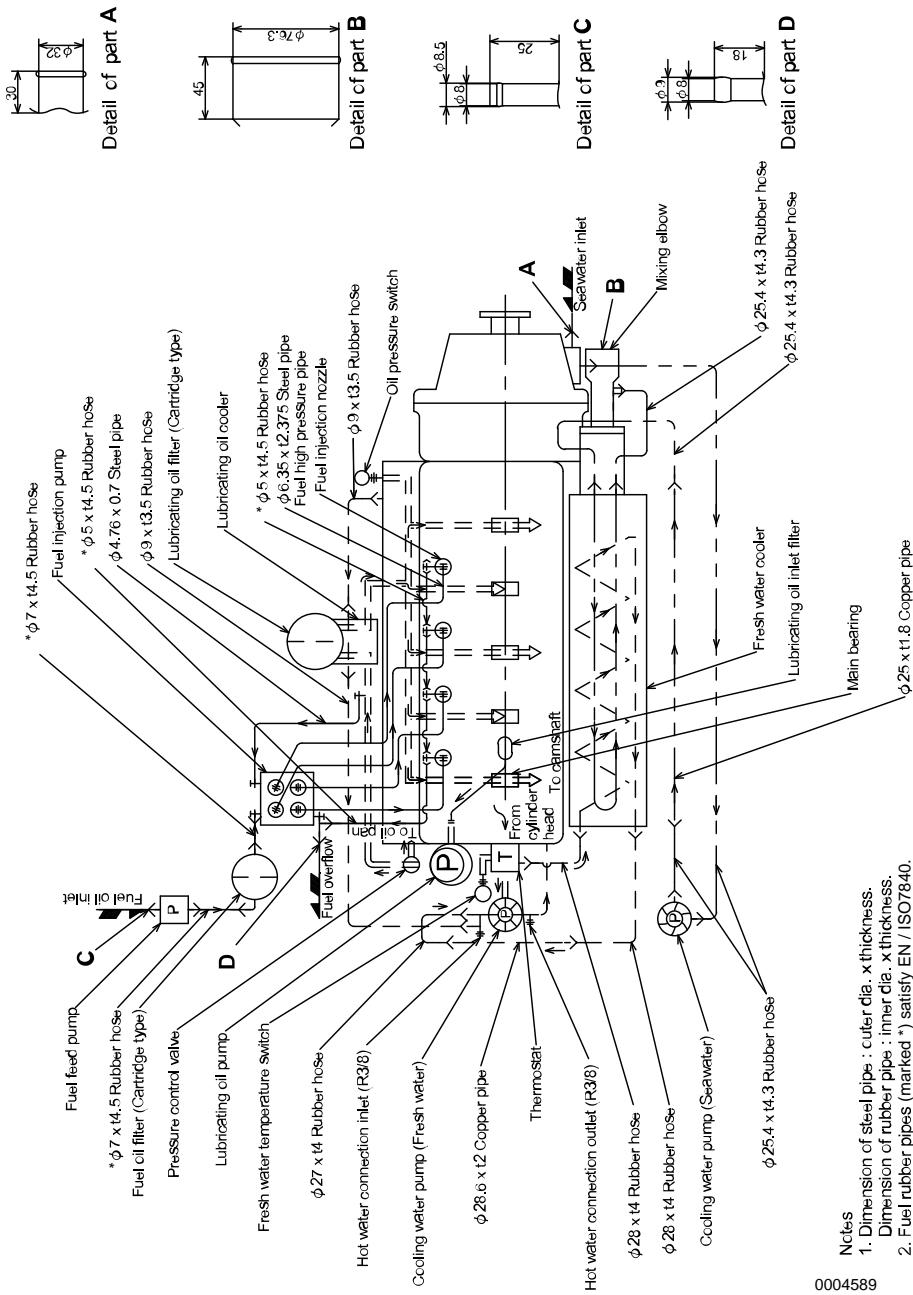


Figure 5

4JH4AE with ZF30M Marine Gear



0004589

Figure 6

SYSTEM DIAGRAMS

4JH4AE with SD50 Sail Drive

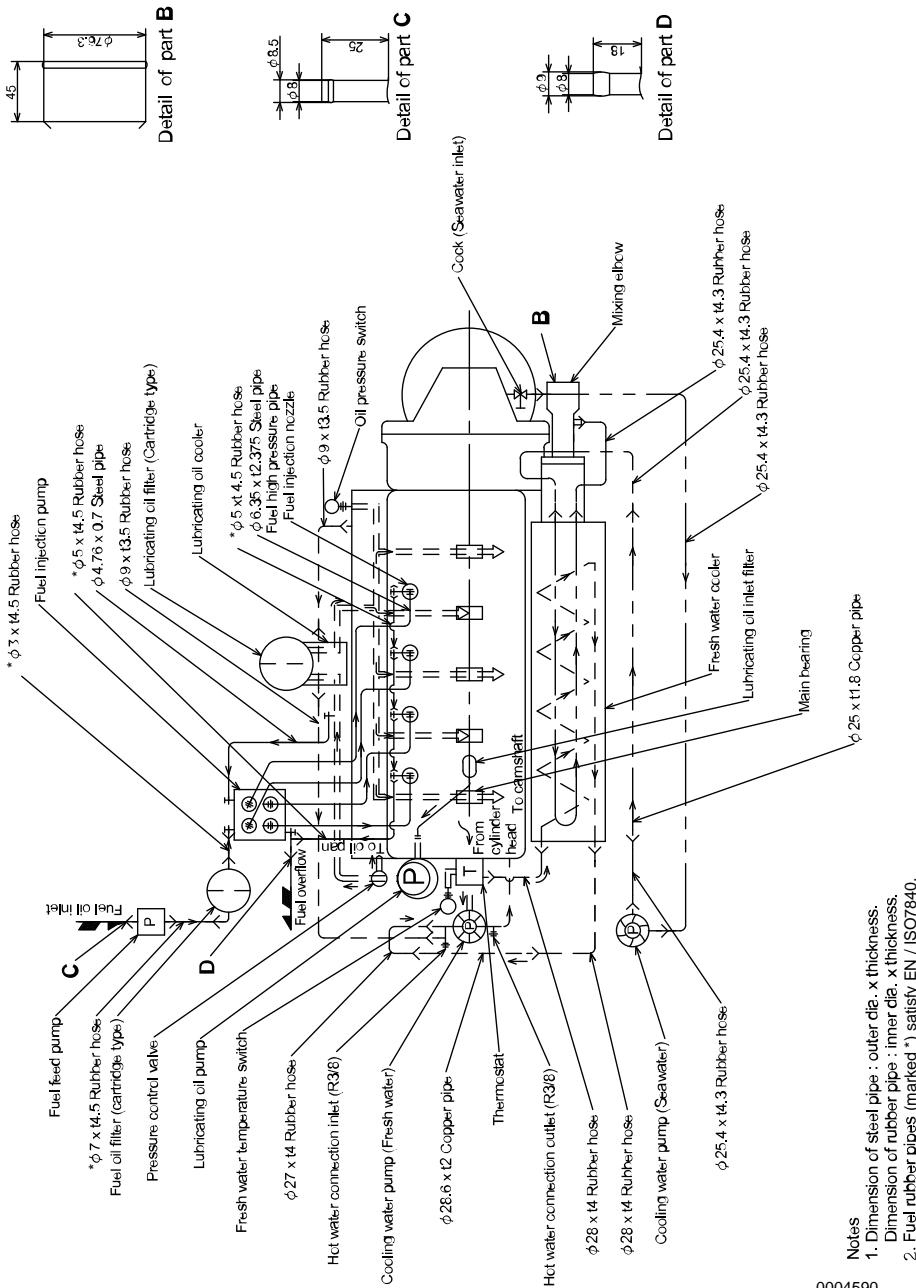


Figure 7

104590

- Notes**

 1. Dimension of steel pipe : outer dia. x thickness.
 2. Dimension of rubber pipe : inner dia. x thickness.
 2. Fuel rubber pipes (marked *) satisfy EN / ISO7840

4JH4-TE with ZF30M

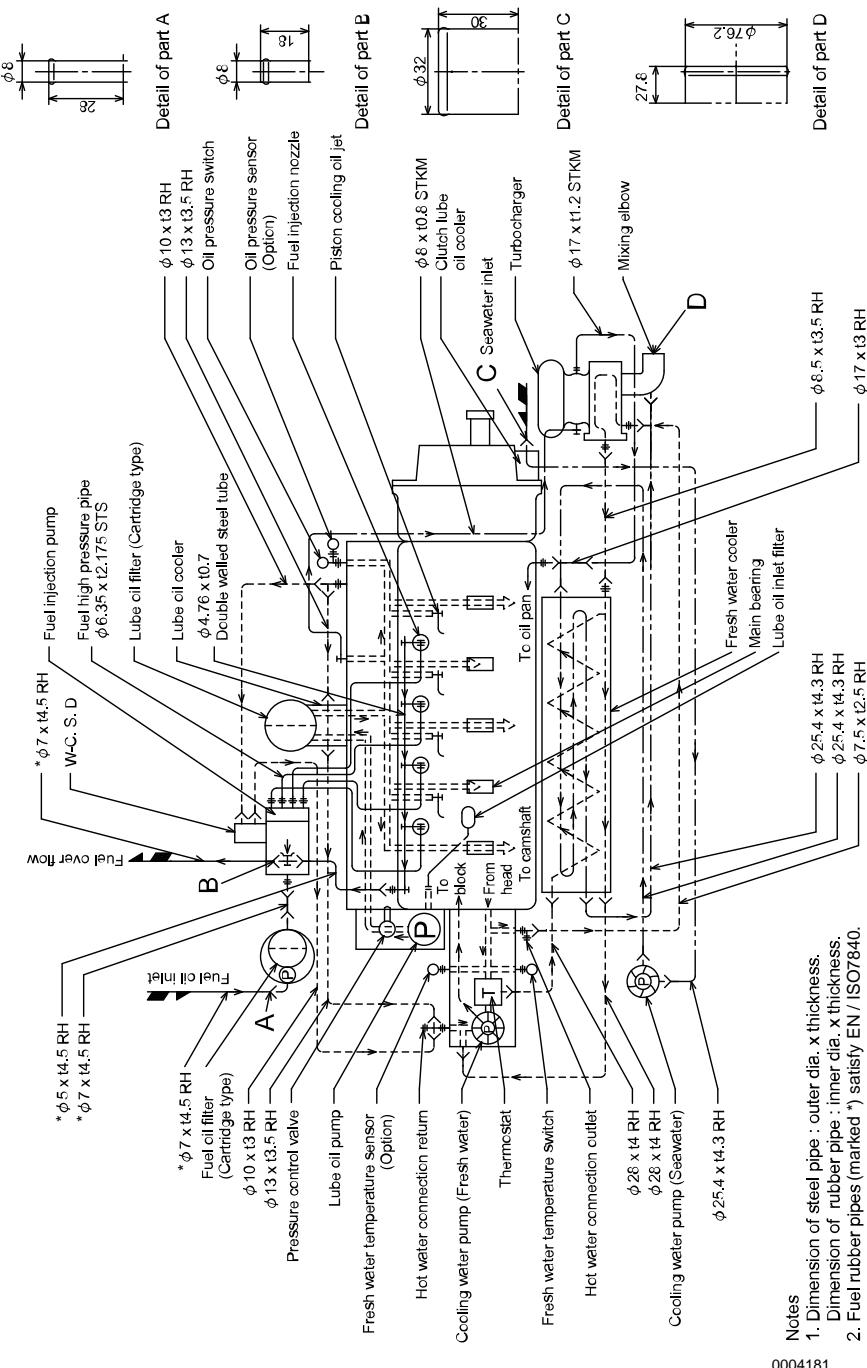


Figure 8

0004181

- 1. Dimension of steel pipe : outer dia. x thickness.
 - 2. Dimension of rubber pipe : inner dia. x thickness.
 - 3. Fuel rubber pipes (marked *) satisfy EN / ISO 7844

SYSTEM DIAGRAMS

4JH4-TE with KM4A2

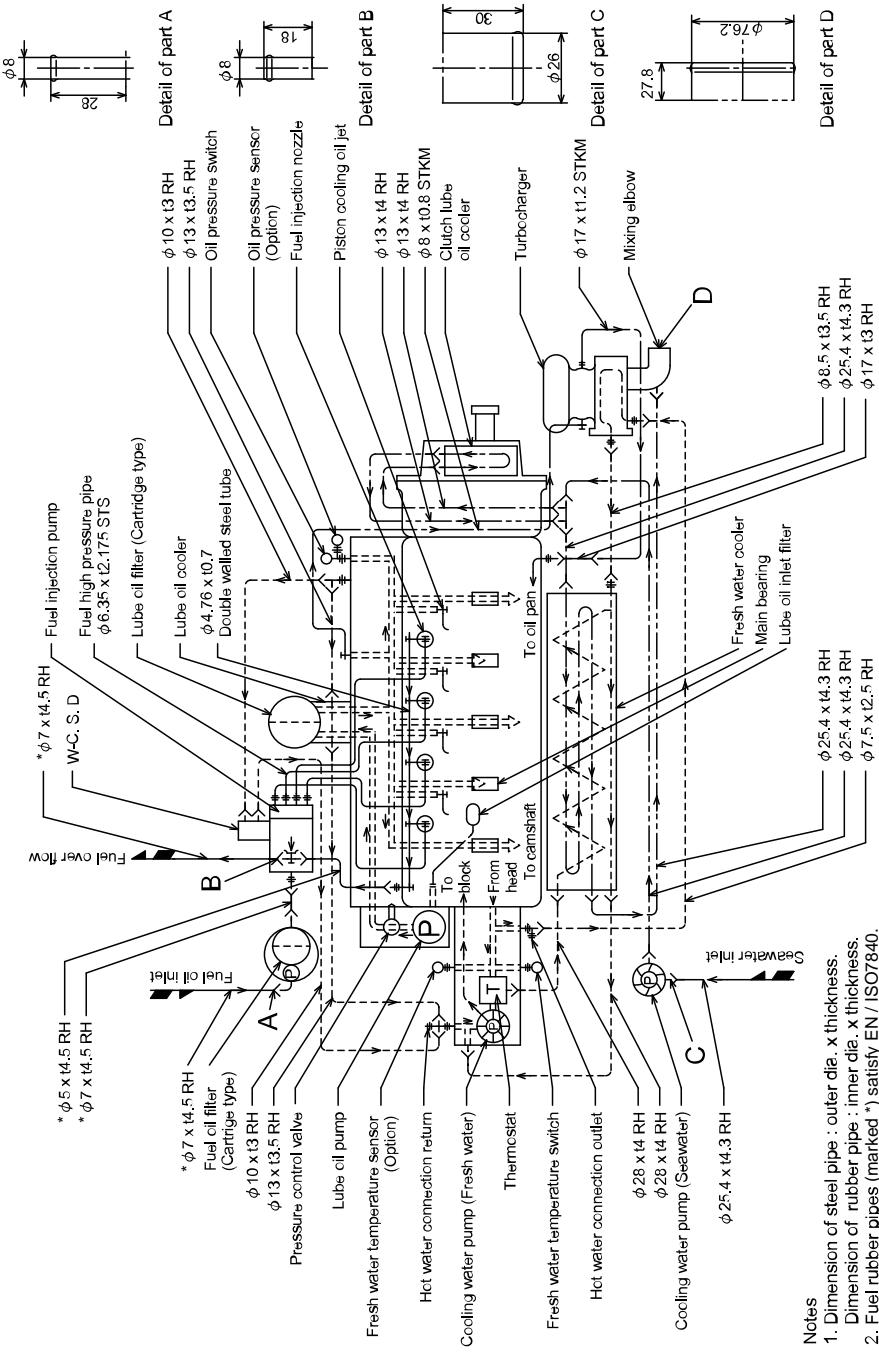


Figure 9

0004182

Notes
1. Dimension of steel pipe : outer dia. x thickness.
2. Dimension of rubber pipe : inner dia. x thickness
3. Fuel rubber pipes (marked *) satisfy EN / ISO 78

4JH4-TE with KM4A / ZF25A

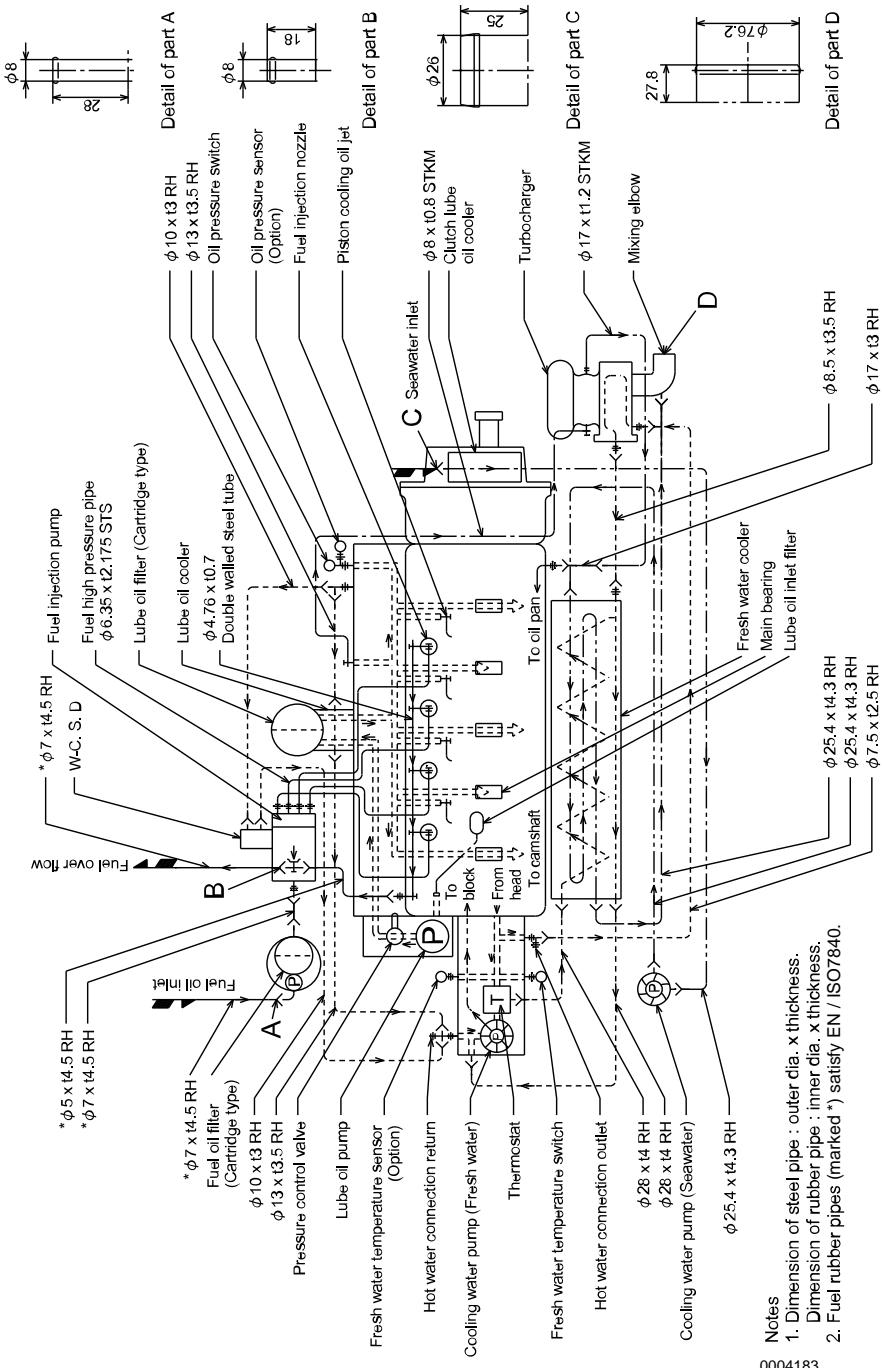


Figure 10

SYSTEM DIAGRAMS

4JH4-TE with SD50 (SD40)

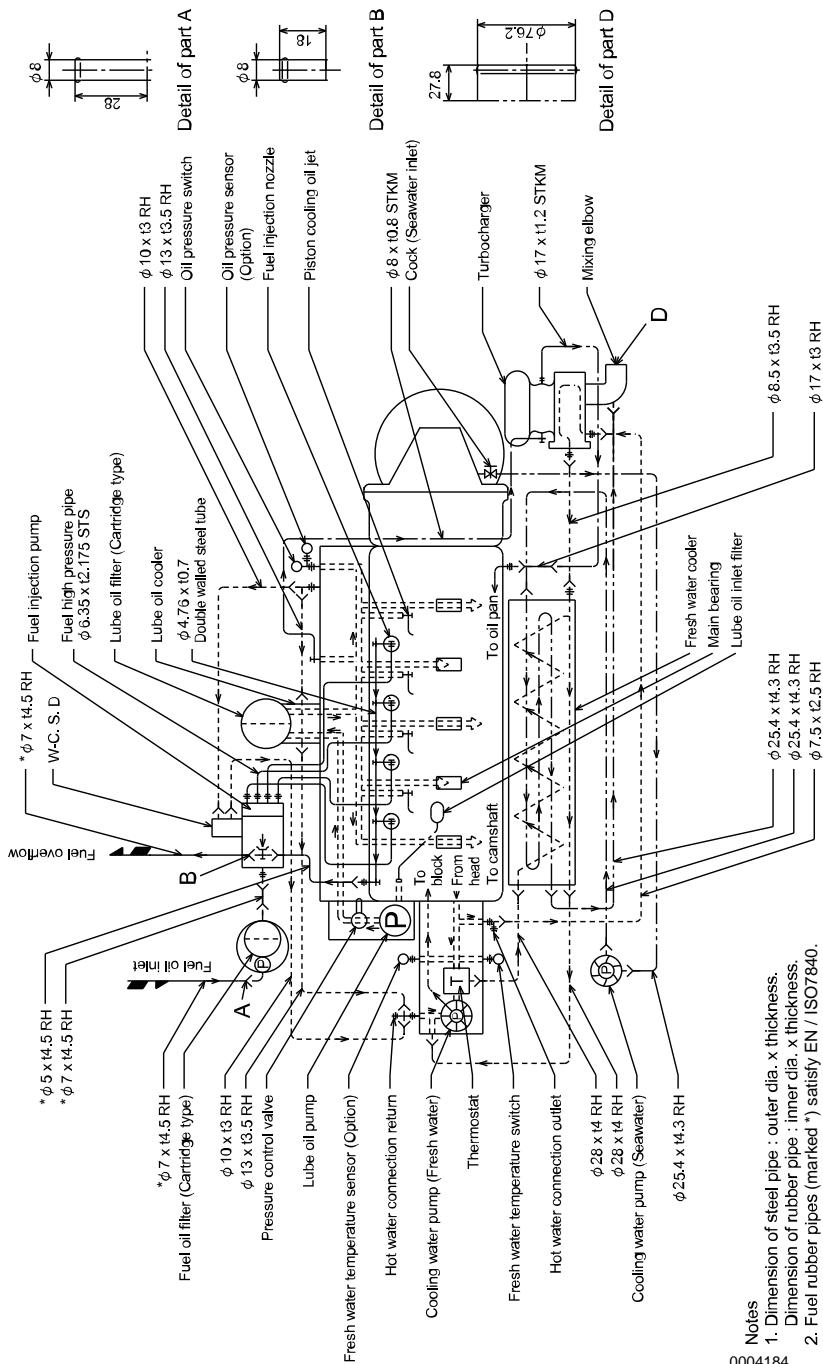


Figure 11

Note
1. D

- Dimension of steel pipe : outer dia. x thickness.
 - Dimension of rubber pipe : inner dia. x thickness.
 - Fuel rubber pipes (marked *) satisfy EN /ISO7840

4JH4-HTE with KM4A2

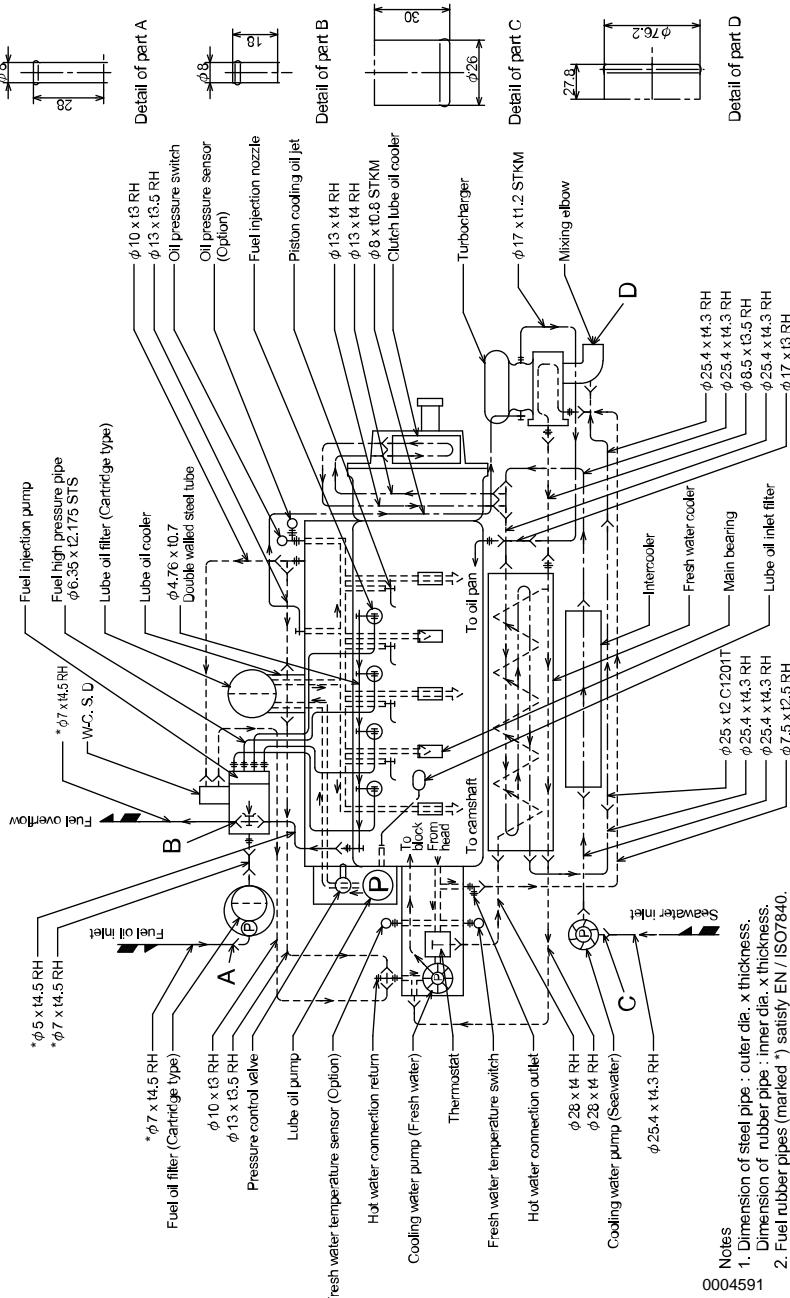


Figure 12

SYSTEM DIAGRAMS

4JH4-HTE with KMH4A / ZF25A

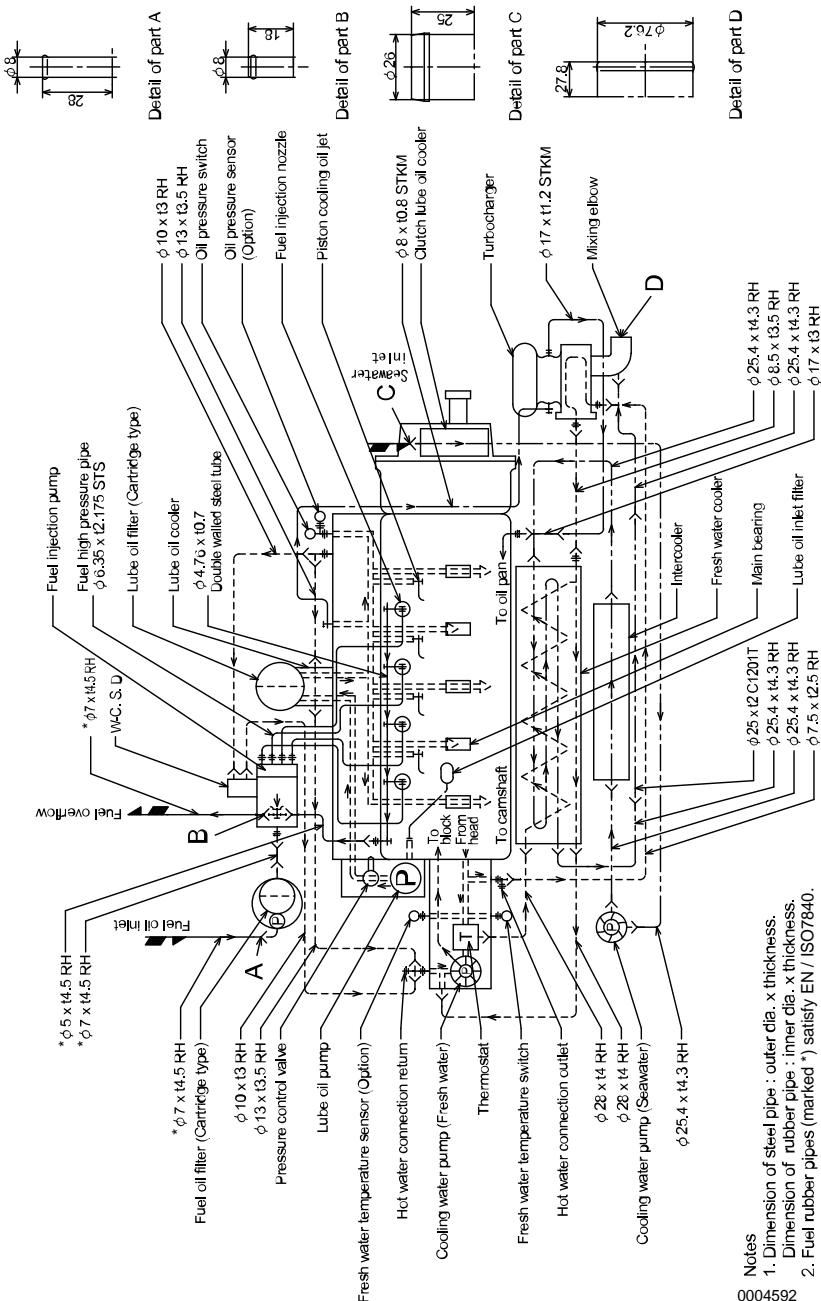


Figure 13

Notes
1. Dim
Dim
0004503

- Notes
 1. Dimension of steel pipe : outer dia. x thickness.
 Dimension of rubber pipe : inner dia. x thickness.
 2. Fuel rubber pipes (marked *) satisfy EN / ISO7840.

4JH4-HTE with ZF30

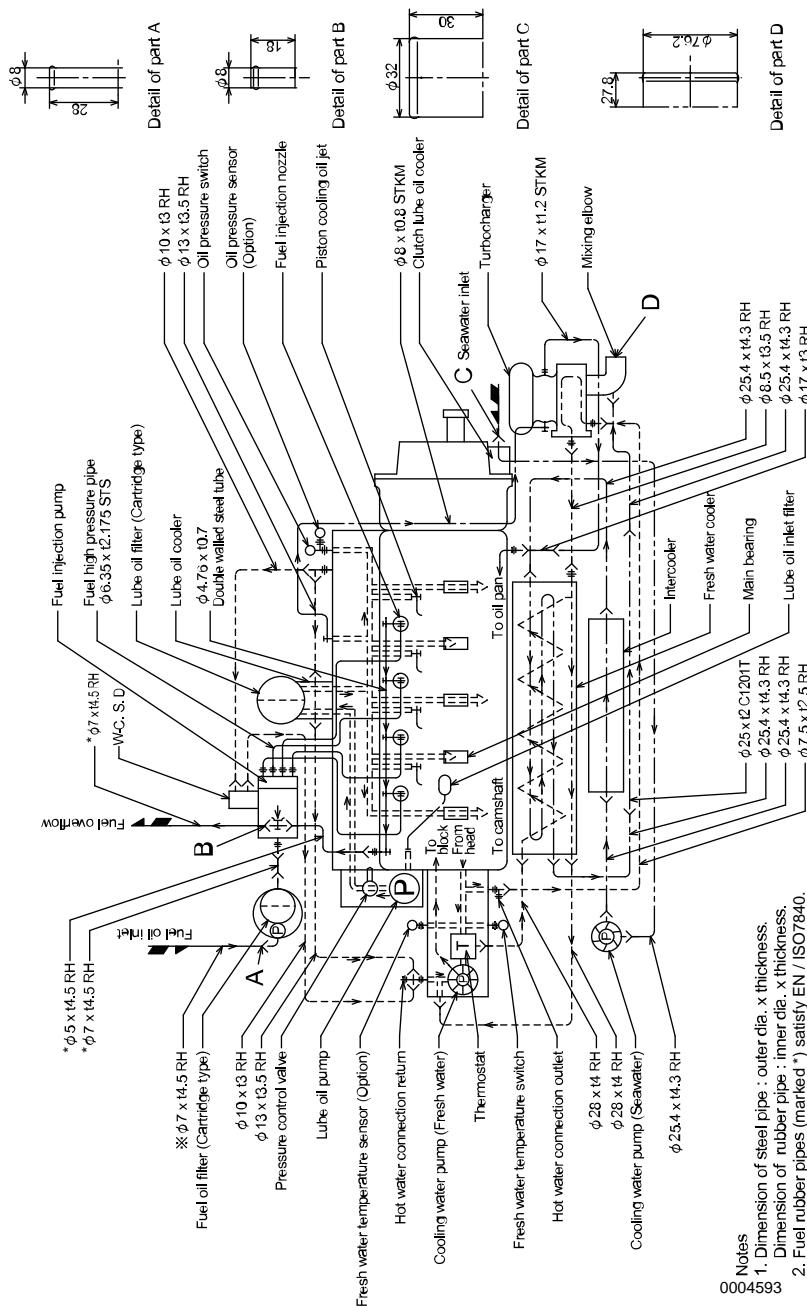


Figure 14

SYSTEM DIAGRAMS

WIRING DIAGRAMS

3JH4E - B-Type Instrument Panel

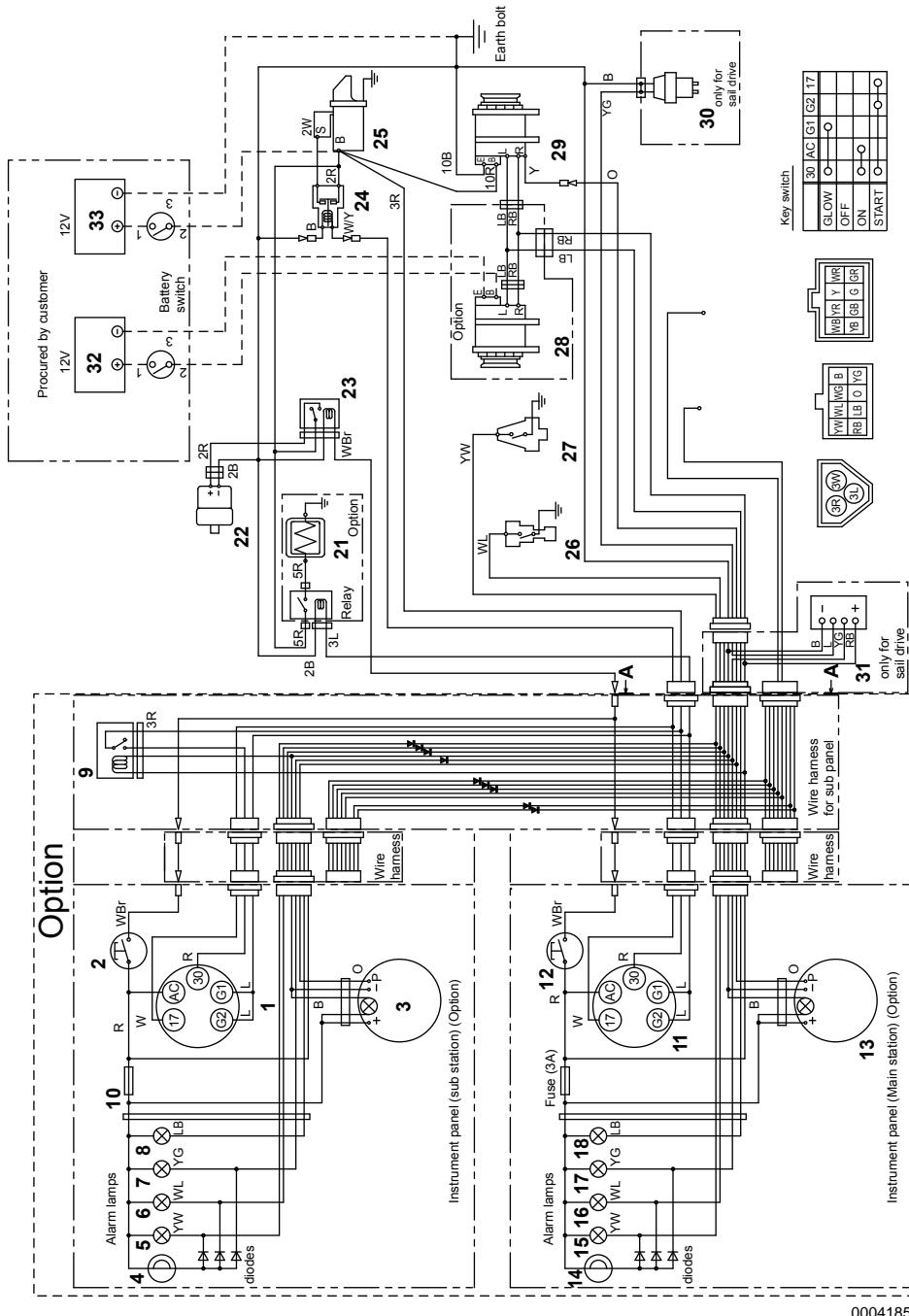


Figure 15

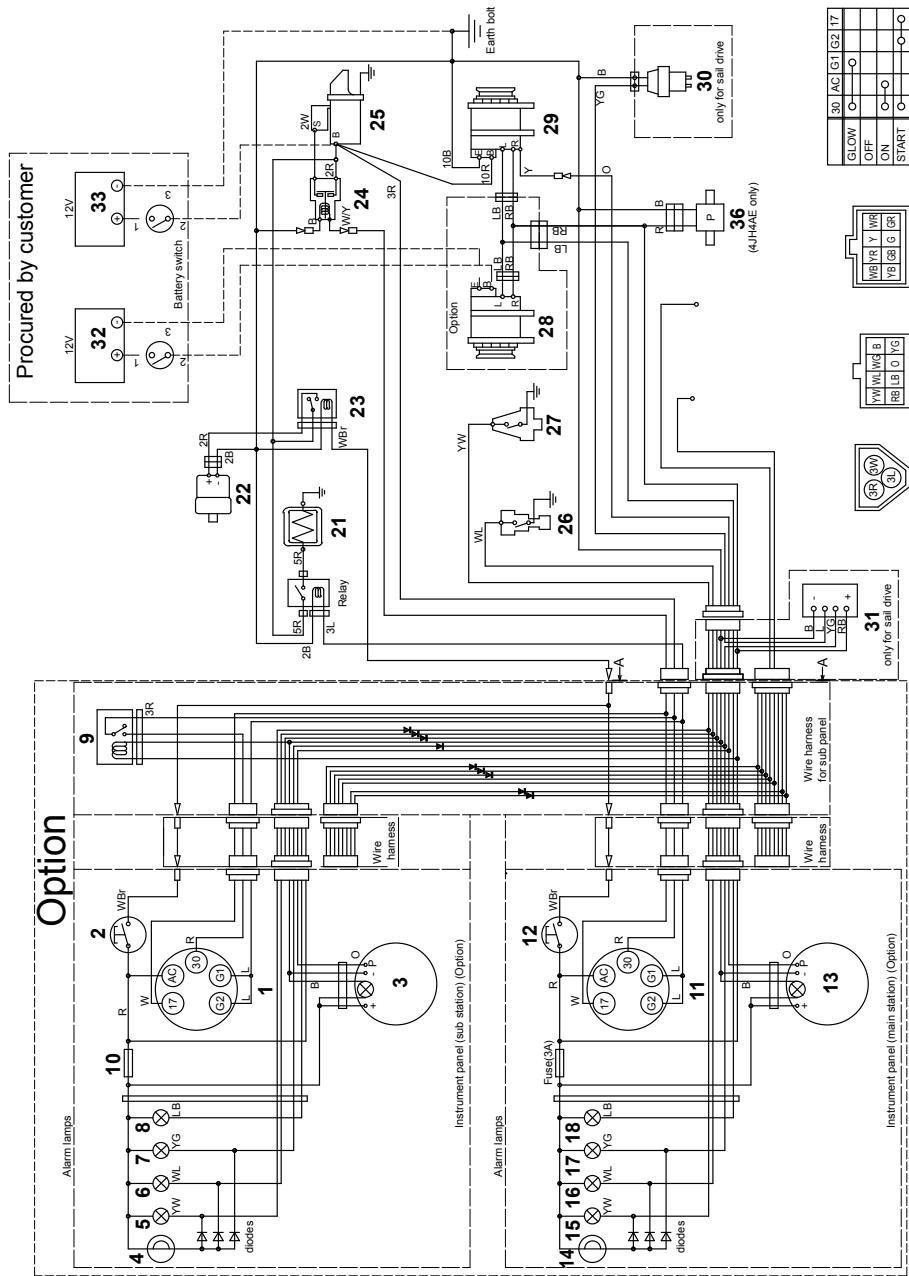
3JH4E - B-Type Instrument Panel

Color Coding	Description
R	Red
B	Black
W	White
L	Blue
RB	Red / Black
LB	Blue / Black
YW	Yellow / White
YB	Yellow / Black
YG	Yellow / Green
WL	White / Blue
WB	White / Black
WG	White / Green
GR	Green / Red
O	Orange
WBr	White / Brown

1	Starter Switch
2	Stop Switch
3	Tachometer / Hourmeter
4	Buzzer
5	Lubricating Oil Low Pressure Alarm
6	Coolant High Temperature Alarm
7	Water in Sail Drive Seal Alarm
8	Battery Low Charge Alarm
9	Relay (for 2 station - Optional)
10	Fuse (3A)
11	Starter Switch
12	Stop Switch
13	Tachometer / Hourmeter
14	Buzzer
15	Lubricating Oil Low Pressure Alarm
16	Coolant High Temperature Alarm
17	Water in Sail Drive Seal Alarm
18	Battery Low Charge Alarm
19	-
20	-
21	Air Heater (Optional)
22	Engine Stop Solenoid
23	Stop Relay
24	Starter Relay
25	Starter
26	Coolant High Temperature Switch
27	Lubricating Oil Low Pressure Switch
28	Alternator (Optional)
29	Alternator
30	Water In Sail Drive Seal Sensor (on Sail Drive)
31	Water in Sail Drive Seal Sensor Amplifier (Sail Drive Only)
32	Battery (Optional)
33	Battery
34	-
35	-

SYSTEM DIAGRAMS

4JH4AE - B-Type Instrument Panel



0004594

Figure 16

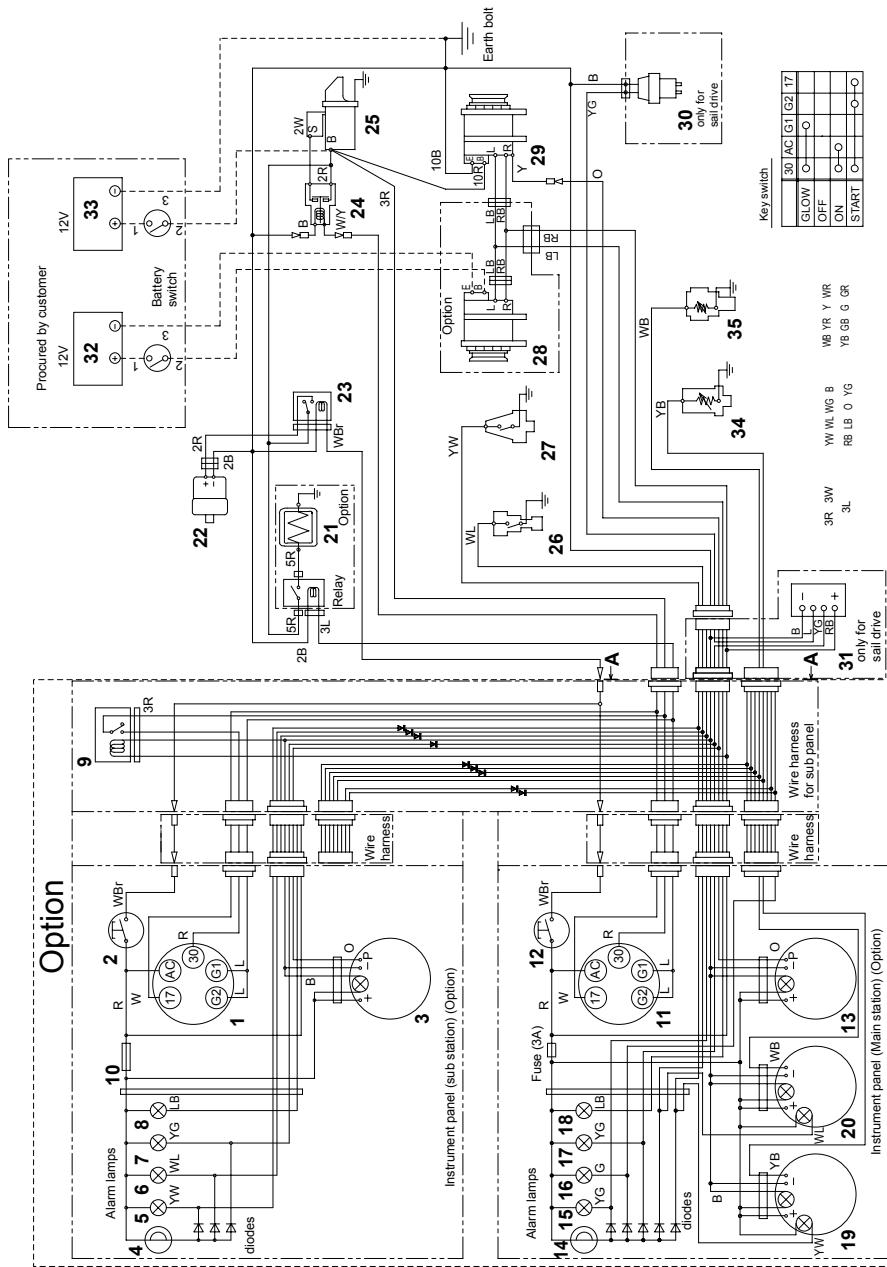
4JH4AE - B-Type Instrument Panel

Color Coding	Description
R	Red
B	Black
W	White
L	Blue
RB	Red / Black
LB	Blue / Black
YW	Yellow / White
YB	Yellow / Black
YG	Yellow / Green
WL	White / Blue
WB	White / Black
WG	White / Green
GR	Green / Red
O	Orange
WBr	White / Brown

1	Starter Switch
2	Stop Switch
3	Tachometer / Hourmeter
4	Buzzer
5	Lubricating Oil Low Pressure Alarm
6	Coolant High Temperature Alarm
7	Water in Sail Drive Seal Alarm
8	Battery Low Charge Alarm
9	Relay (for 2 station - Optional)
10	Fuse (3A)
11	Starter Switch
12	Stop Switch
13	Tachometer / Hourmeter
14	Buzzer
15	Lubricating Oil Low Pressure Alarm
16	Coolant High Temperature Alarm
17	Water in Sail Drive Seal Alarm
18	Battery Low Charge Alarm
19	-
20	-
21	Air Heater
22	Engine Stop Solenoid
23	Stop Relay
24	Starter Relay
25	Starter
26	Coolant High Temperature Switch
27	Lubricating Oil Low Pressure Switch
28	Alternator (Optional)
29	Alternator
30	Water In Sail Drive Seal Sensor (on Sail Drive)
31	Water in Sail Drive Seal Sensor Amplifier (Sail Drive Only)
32	Battery (Optional)
33	Battery
34	-
35	-
36	Fuel Feed Pump (4JH4AE Only)

SYSTEM DIAGRAMS

3JH4E - C-Type Instrument Panel



0004186

Figure 17

3JH4E - C-Type Instrument Panel

Color Coding	Description
R	Red
B	Black
W	White
L	Blue
RB	Red / Black
LB	Blue / Black
YW	Yellow / White
YB	Yellow / Black
YG	Yellow / Green
WL	White / Blue
WB	White / Black
WG	White / Green
GR	Green / Red
O	Orange
WBr	White / Brown

1	Starter Switch
2	Stop Switch
3	Tachometer / Hourmeter
4	Buzzer
5	Lubricating Oil Low Pressure Alarm
6	Coolant High Temperature Alarm
7	Water in Sail Drive Seal Alarm
8	Battery Low Charge Alarm
9	Relay (for 2 station - Optional)
10	Fuse (3A)
11	Starter Switch
12	Stop Switch
13	Tachometer / Hourmeter
14	Buzzer
15	Seawater
16	Fuel Filter
17	Water in Sail Drive Seal Alarm
18	Battery Low Charge Alarm
19	Oil Pressure Meter / Alarm
20	Coolant Temperature Meter / Alarm
21	Air Heater (Optional)
22	Engine Stop Solenoid
23	Stop Relay
24	Starter Relay
25	Starter
26	Coolant High Temperature Switch
27	Lubricating Oil Low Pressure Switch
28	Alternator (Optional)
29	Alternator
30	Water In Sail Drive Seal Sensor (on Sail Drive)
31	Water in Sail Drive Seal Sensor Amplifier (Sail Drive Only)
32	Battery (Optional)
33	Battery
34	Oil Pressure Sensor (Optional)
35	Coolant Temperature Sensor (Optional)

SYSTEM DIAGRAMS

4JH4AE - C-Type Instrument Panel

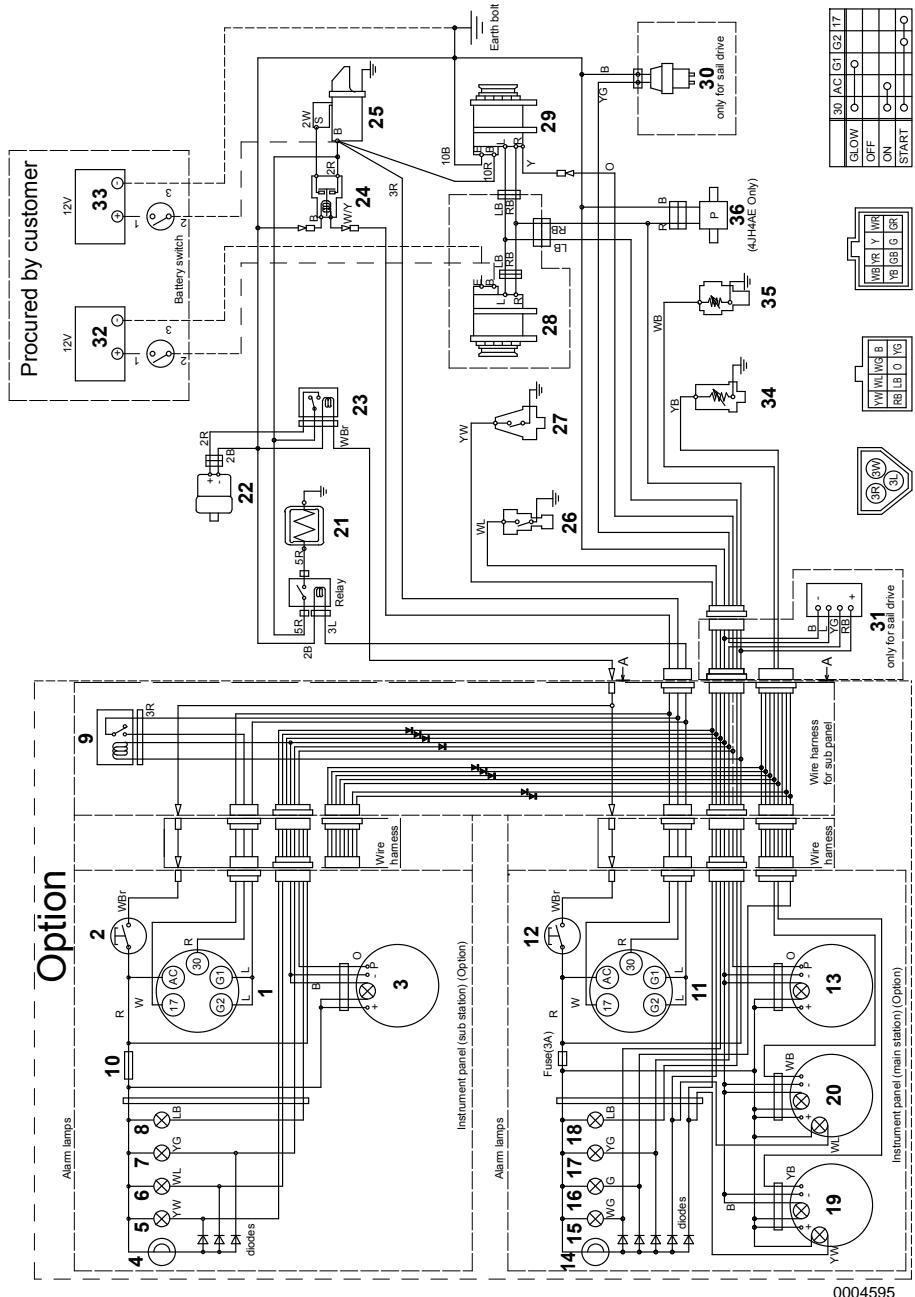


Figure 18

4JH4AE - C-Type Instrument Panel

Color Coding	Description
R	Red
B	Black
W	White
L	Blue
RB	Red / Black
LB	Blue / Black
YW	Yellow / White
YB	Yellow / Black
YG	Yellow / Green
WL	White / Blue
WB	White / Black
WG	White / Green
GR	Green / Red
O	Orange
WBr	White / Brown

1	Starter Switch
2	Stop Switch
3	Tachometer / Hourmeter
4	Buzzer
5	Lubricating Oil Low Pressure Alarm
6	Coolant High Temperature Alarm
7	Water in Sail Drive Seal Alarm
8	Battery Low Charge Alarm
9	Relay (for 2 station - Optional)
10	Fuse (3A)
11	Starter Switch
12	Stop Switch
13	Tachometer / Hourmeter
14	Buzzer
15	Seawater
16	Fuel Filter
17	Water in Sail Drive Seal Alarm
18	Battery Low Charge Alarm
19	Oil Pressure Meter / Alarm
20	Coolant Temperature Meter / Alarm
21	Air Heater
22	Engine Stop Solenoid
23	Stop Relay
24	Starter Relay
25	Starter
26	Coolant High Temperature Switch
27	Lubricating Oil Low Pressure Switch
28	Alternator (Optional)
29	Alternator
30	Water In Sail Drive Seal Sensor (on Sail Drive)
31	Water in Sail Drive Seal Sensor Amplifier (Sail Drive Only)
32	Battery (Optional)
33	Battery
34	Oil Pressure Sensor (Optional)
35	Coolant Temperature Sensor (Optional)
36	Fuel Feed Pump (4JH4AE Only)

SYSTEM DIAGRAMS

4JH4-TE / 4JH4-HTE with B x B Type Panel

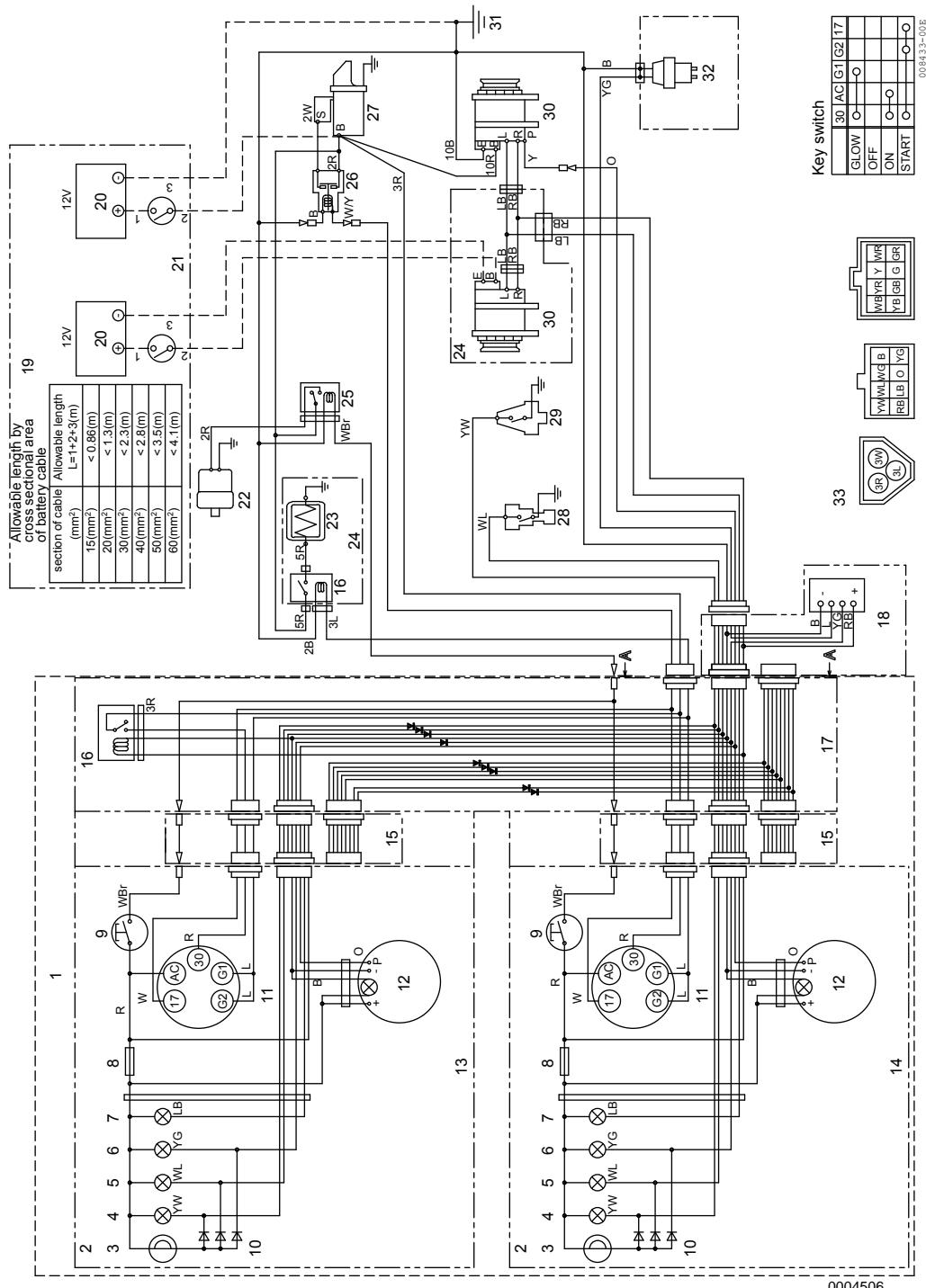


Figure 19

4JH4-TE / 4JH4-HTE with B x B Type Panel

Color Coding		Engine Harness
R	Red	+
B	Black	-
W	White	Ignition
L	Blue	Air heater / glow (option)
RB	Red / Black	Alternator exciter
LB	Blue / Black	Alternator charge alarm
YW	Yellow / White	Engine oil pressure alarm
YB	Yellow / Black	Engine oil pressure
YG	Yellow / Green	Sail drive seal
WL	White / Blue	Water temperature alarm
WB	White / Black	Water temperature
WG	White / Green	Seawater flow alarm
GR	Green / Red	Fuel filter alarm
O	Orange	Pulse for tachometer
WBr	White / Brown	Electric stop

1	Option
2	Alarm Lamps
3	Buzzer
4	Oil Pressure
5	Coolant Temperature
6	Sail Drive Seal
7	Battery Low Charge Alarm
8	Fuse (3A)
9	Stop Switch
10	Diodes
11	Key Switch
12	Tachometer / Hourmeter
13	Instrument panel (sub station) (Option)
14	Instrument panel (main station) (Option)
15	Wire Harness
16	Relay
17	Wire Harness for Sub Panel
18	Amplifier (Sail Drive Only)
19	Procured by Customer
20	Battery
21	Battery Switch
22	Engine Stop Solenoid with VE Pump
23	Air Heater
24	Option
25	Stop Relay
26	Starter Relay
27	Starter
28	Coolant Temperature Switch
29	Engine Oil Pressure Switch
30	Alternator
31	Earth bolt (ground)
32	Sail Drive Only
33	Details of Coupler (View from A-A)

SYSTEM DIAGRAMS

4JH4-TE / 4JH4-HTE with C x B Type Panel

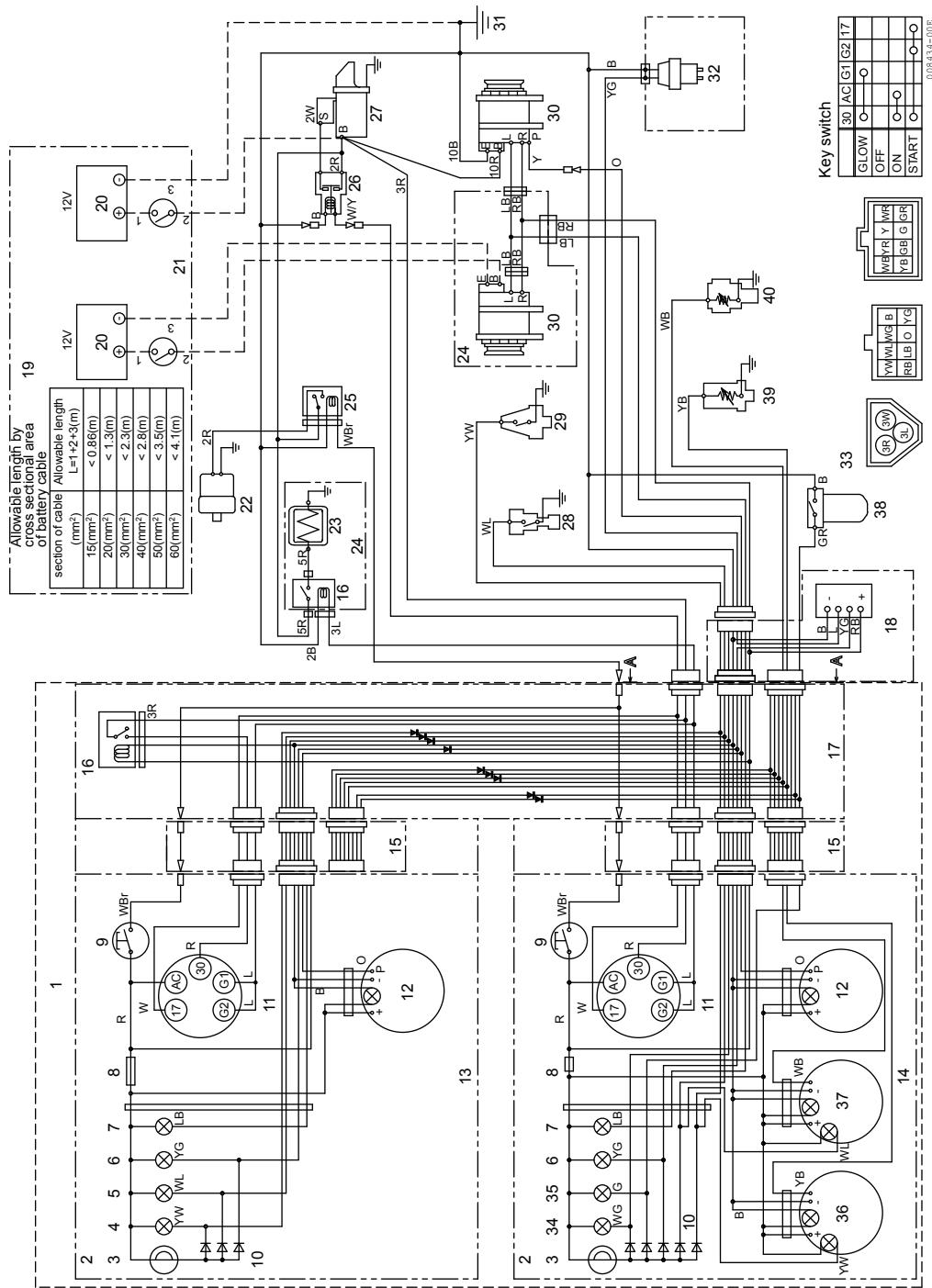


Figure 20

4JH4-TE / 4JH4-HTE with C x B Type Panel

Color Coding		Engine Harness
R	Red	+
B	Black	-
W	White	Ignition
L	Blue	Air heater / glow (option)
RB	Red / Black	Alternator exciter
LB	Blue / Black	Alternator charge alarm
YW	Yellow / White	Engine oil pressure alarm
YB	Yellow / Black	Engine oil pressure
YG	Yellow / Green	Sail drive seal
WL	White / Blue	Water temperature alarm
WB	White / Black	Water temperature
WG	White / Green	Seawater flow alarm
GR	Green / Red	Fuel filter alarm
O	Orange	Pulse for tachometer
WBr	White / Brown	Electric stop

14	Instrument panel (main station) (Option)
15	Wire Harness
16	Relay
17	Wire Harness for Sub Panel
18	Amplifier (Sail Drive Only)
19	Procured by Customer
20	Battery
21	Battery Switch
22	Engine Stop Solenoid with VE Pump
23	Air Heater
24	Option
25	Stop Relay
26	Starter Relay
27	Starter
28	Coolant Temperature Switch
29	Engine Oil Pressure Switch
30	Alternator
31	Earth bolt (ground)
32	Sail Drive Only
33	Details of Coupler (View from A-A)
34	Seawater
35	Fuel Filter
36	Oil Pressure Meter / Alarm
37	Water Temperature Meter / Alarm
38	Fuel Filter Switch
39	Oil Pressure Sender
40	Coolant Temperature Sender

1	Option
2	Alarm Lamps
3	Buzzer
4	Oil Pressure
5	Coolant Temperature
6	Sail Drive Seal
7	Battery Low Charge Alarm
8	Fuse (3A)
9	Stop Switch
10	Diodes
11	Key Switch
12	Tachometer / Hourmeter
13	Instrument panel (sub station) (Option)

This Page Intentionally Left Blank

EPA WARRANTY USA ONLY

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

3JH4E EPA and ARB Nameplate

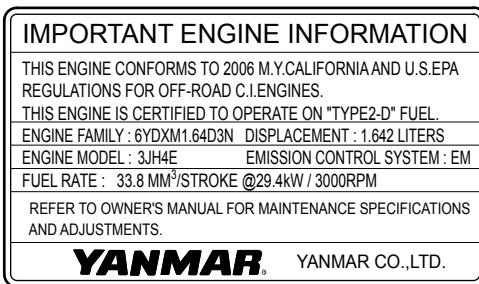


Figure 1

4JH4AE EPA Nameplate

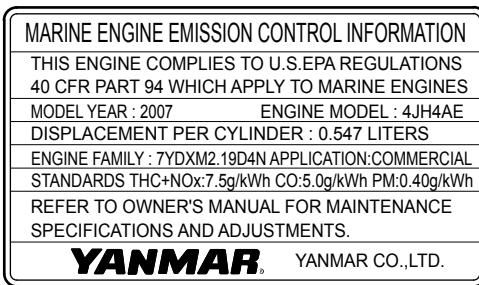


Figure 2

4JH4-TE EPA Nameplate

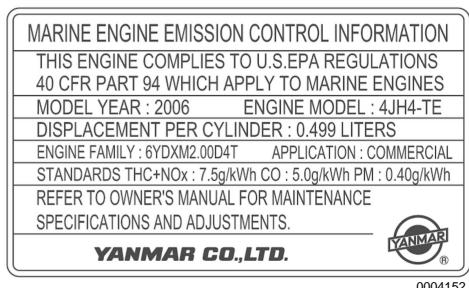


Figure 3

4JH4-HTE EPA Nameplate

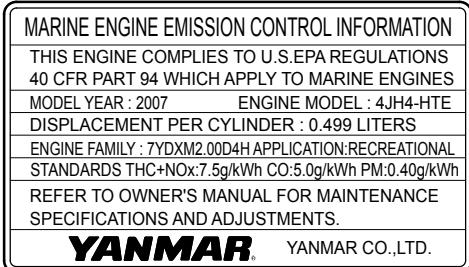


Figure 4

EPA WARRANTY USA ONLY

THIS EMISSION WARRANTY APPLIES TO THE ENGINES CERTIFIED TO UNITED STATES EPA 40 CFR 94 AND SOLD BY YANMAR THAT ARE INSTALLED IN VESSELS FLAGGED OR REGISTERED IN THE UNITED STATES.

Your Warranty Rights and Obligations:

Yanmar warrants to the first user and each subsequent purchaser the emission control system on your engine for periods of time listed below provided the engine has been installed according to Yanmar installation requirements and there has been no abuse, neglect, or improper maintenance of your Yanmar marine engine.

Yanmar warrants that the engine is designed, built and tested using genuine parts and equipped so as to conform to all applicable emission requirements of the U.S. Environmental Protection Agency and is free from defects in material and workmanship which would cause this engine to fail to conform to the applicable emission regulations over its limited emission control system warranty period.

Where a warrantable emissions condition exists, Yanmar will repair your engine at no charge to you for diagnosis, parts, and labor. Warranty service or repair will be provided at authorized Yanmar marine dealers or distributors.

It is recommended that any replacement parts used for maintenance, repair or replacement of emission control systems are Yanmar parts. The owner may elect to have maintenance, replacement or repair of the emission control components and systems performed by any repair establishment or individual and may elect to use parts other than Yanmar parts for such maintenance, replacement or repair. However, the cost of such service or parts and subsequent failures from such service or parts will not be covered under this emission control system warranty:

Warranty Period:

The warranty starts on either the date of delivery to the first end-user, or the date the unit is first leased, rented, or loaned.

1. For Pleasure Use: The warranty period is **five (5) years or 2000 hours** of use, whichever occurs first. In the absence of a device to measure hours of use, the engine has a warranty period of **five (5) years**.
2. For Commercial Use: The warranty period is **five (5) years or 5000 hours** of use, whichever occurs first. In the absence of a device to measure hours of use, the engine has a warranty period of **five (5) years**.

Warranty Coverage:

Repair or replacement of any warranted parts will be performed at an authorized Yanmar dealer or distributor. This limited emission control system warranty covers engine components that are a part of the emission control system of the engine as delivered by Yanmar to the original retail purchaser. Such components may include the following:

1. Fuel Injection System
2. Turbocharger System
3. Aftercooler
4. Electronic Engine Control Units and its associated Sensor and Actuators

Exclusions:

Failures other than those arising from defects in material and / or workmanship are not covered by this limited emissions warranty. This warranty does not extend to the following: malfunction caused by abuse, misuse, improper adjustment, modification, alteration, tampering, disconnection, improper or inadequate maintenance, improper storage or use of non-recommended fuels and lubricating oils, accident-caused damage, and replacement of expendable and / or consumable items made in connection with scheduled maintenance.

Yanmar disclaims any responsibility for incidental or consequential damages such as loss of time, inconvenience, loss of use of marine vessel / engine or commercial loss.

Owner's Responsibility:

As the Yanmar marine engine owner, you are responsible for the performance of the required maintenance listed in your *Operation Manual*. Yanmar recommends that you retain all documentation, including receipts, covering maintenance on your marine engine, but Yanmar cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.

Your engine is designed to operate on diesel fuel only. Use of any other fuel may result in your engine no longer operating in compliance with applicable emission requirements. You are responsible for initiating the warranty process. You must present your marine engine to an authorized Yanmar dealer or distributor as soon as a problem exists.

EPA WARRANTY USA ONLY

Customer Assistance:

If you have any questions regarding your warranty rights and responsibilities or would like information on the nearest authorized Yanmar dealer or distributor, you should contact Yanmar Marine USA Corporation for assistance.

Yanmar Marine USA Corporation

101 International Parkway
Adairsville, GA 30103 USA
Telephone: 770-877-9894
Fax: 770-877-7567

EMISSION SYSTEM WARRANTY

NON-ROAD EMISSION SYSTEM WARRANTY

Yanmar Co., Ltd. Limited Emission Control System Warranty - USA Only

Your Warranty Rights and Obligations:

California

The California Air Resources Board (CARB), the Environmental Protection Agency (EPA) and Yanmar Co., Ltd. hereafter referred to as Yanmar, are pleased to explain the emission control system warranty on your compression-ignition engine. In California, model year 2000 or later off-road compression-ignition engines must be designed, built and equipped to meet the State's stringent anti-smog standards. In all states, 1998 and later non-road compression-ignition engines must be designed, built and equipped to meet the United States EPA emissions standards. Yanmar warrants the emission control system on your engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your engine.

Your emission control system may include parts such as the fuel injection system and the air induction system.

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

Manufacturer's Warranty Period:

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

Engines rated at or above $19 \text{ kW} \leq$ and less than $< 37 \text{ kW}$ $(25.5 \text{ hp} \leq$ and less than $< 49.6 \text{ hp})$	The warranty period is five (5) years or 3,000 hours of use, whichever occurs first. In the absence of a device to measure the hours of use, the engine has a warranty period of five (5) years.
Engines rated under $19 \text{ kW} >$ $(25.5 \text{ hp} >)$	The warranty period is two (2) years or 3,000 hours of use, whichever occurs first. In the absence of a device to measure the hours of use, the engine has a warranty period of two (2) years.

Warranty Coverage:

This warranty is transferable to each subsequent purchaser for the duration of the warranty period. Repair or replacement of any warranted part will be performed at an authorized Yanmar Marine engine dealer or distributor.

EMISSION SYSTEM WARRANTY

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

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

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

Warranted Parts:

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

- Fuel Injection System
- Cold Start Enrichment System
- Positive Crankcase Ventilation System

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

Exclusions:

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

Owner's Warranty Responsibilities:

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

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

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

You are responsible for initiating the warranty process. You must present your engine to a Yanmar dealer as soon as a problem exists. The warranty repairs should be completed by the dealer as expeditiously as possible.

Customer Assistance

If you have any questions regarding your warranty rights and responsibilities or would like information on the nearest authorized Yanmar dealer or distributor, you should contact Yanmar Marine USA Corporation for assistance.

Yanmar Marine USA Corporation

101 International Parkway
Adairsville, GA 30103 USA
Telephone: 770-877-9894
Fax: 770-877-7567

**Declaration of Conformity for Recreational Craft Propulsion Engine with the Exhaust emission requirements of Directive 94/25/EC as amended by 2003/44/EC
(To be completed by manufacturer of inboard engines without integral exhaust)**

Name of engine manufacturer: Yanmar Co., Ltd.

Street: 1-32 Town: Chayamachi, Kitaku, Osaka-City

Post Code: 530-8311 Country: Japan

Name of Authorised Representative: Yanmar Marine International B.V.

Street: Brugplein 11 Town: Almere-de Vaart

Post Code: 1332 BS Country: The Netherlands

Name of Notified Body for **exhaust emission assessment**: Société Nationale de Certification et d'Homologation

Street: 11, route de Luxembourg Town: Sandweiler

Post Code: L-5230 Country: Luxembourg ID Number: 0499

Module used for exhaust emission assessment: B+C B+D B+E B+F G H
or engine type-approved according to: stage II of Directive 97/68/EC Directive 88/77/EC

Other Community Directives applied: 89/336/EEC

DESCRIPTION OF ENGINE(s) AND ESSENTIAL REQUIERMENTS

Engine Type:

z or sterndrive without integral exhaust
 Inboard engine

Fuel Type:

Diesel 2 stroke
 Petrol 4 stroke

Combustion cycle:

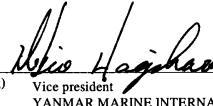
Essential requirements	Standards Used	Other normative document used	See technical file
Annex I.B – Exhaust Emissions			
engine identification			
exhaust emission requirements	<u>EN ISO 8178-1:1996</u>		X
durability			
owner's manual			
Annex I.C – Noise Emissions			
see craft manufacturer's Declaration of Conformity			

ENGINE(S) COVERED BY THIS DECLARATION

Engine model(s) or engine family name(s);	EC Type certificate number (exhaust)
RCD-1GM10X1	SNCH*94/25*2003/44*
RCD-2YM15X1	0009*00
RCD-3YM30X1	0005*00
RCD-4H4X1	0014*00
RCD-4H3TX1	0011*01
RCD-4LHAX1	0015*00
RCD-6LPADX1	0012*00
RCD-6LPASX1	0007*00
RCD-6CXMX1	0006*00
RCD-6LY2X1	0008*00
RCD-6LY3X1	0010*00
RCD-4H3TX2	0016*00
RCD-4H4TX2	0017*00
RCD-4H4X1	0018*00
RCD-6LPASX2	0023*00
RCD-4H4AX1	0025*00

I declare on behalf of the engine manufacturer that the engine(s) will meet the exhaust emission requirements of Directive 94/25/EC as amended by Directive 2003/44/EC when installed in a recreational craft, in accordance with the engine manufacturer's supplied instructions and that this (these) engine(s) must not be put into service until the recreational craft into which it is (they are) to be installed has been declared in conformity with the relevant provisions of the above mentioned Directive.

Name: Mikio Hagihara Signature and title: _____
(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)



Vice president
YANMAR MARINE INTERNATIONAL B.V.

Date: (yr/month/day) 2006 / 12 / 19