YANMAR

OPERATION MANUAL

MARINE ENGINES

OPERATION MANUAL

MARINE ENGINES BY3 Series

YANMAR

4BY3-150
4BY3-150Z
4BY3-180
4BY3-180Z
6BY3-160
6BY3-220
6BY3-220Z
6BY3-260
6BY3-260Z

- en English
- da Danish
- de German
- es Spanish
- fr French
- fi Finnish
- el Greek
- it Italian
- no Norwegian
- nl Dutch
- pt Portuguese
- sv Swedish

YANMAR CO., LTD.

■ **Yanmar (Head office)**
Umeda Gate Tower 1-9 Tsurunocho, kita-ku, Osaka,
Japan 530-8311

■ **Marine Operations Division**
Quality Assurance Dept.
3-1, 5-Chome, Tsukaguchi-honmachi, Amagasaki,
Hyogo, Japan 661-0001
Phone: +81-6-6428-3251 Fax: +81-6-6421-5549

Overseas Office

■ **Yanmar Europe B.V. (YEU)**
Brugplein 11, 1332 BS Almere-de Vaart, Netherlands
Phone: +31-36-5493200 Fax: +31-36-5493209

■ **Yanmar Asia (Singapore) Corporation Pte Ltd. (YASC)**
4 Tuas Lane, Singapore 638613
Phone: +65-6595-4200 Fax: +65-6862-5189

■ **Yanmar America Corporation (YA)**
101 International Parkway
Adairsville, GA 30103, U.S.A.
Phone: +1-770-877-9894 Fax: +1-770-877-9009

■ **Yanmar Engine (Shanghai). Co., Ltd.**
10F, E-Block POLY PLAZA, No.18 Dongfang Road,
Pudong Shanghai, CHINA P.R.C. 200120
Phone: +86-21-6880-5090 Fax: +86-21-6880-8090

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6BY3-220, 6BY3-220Z, 6BY3-260, 6BY3-260Z

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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 BY3 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.
- Refer to the YANMAR Limited Warranty Handbook for a complete warranty description.

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

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

SAFETY PRECAUTIONS

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

⚠ WARNING

• 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.**
- **Contact your authorized YANMAR Marine dealer or distributor for additional training.**

During Operation and Maintenance

⚠ DANGER

Crush Hazard

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

- **If the engine needs to be transported for repair, have a helper assist you attach it to a hoist and load it on a truck.**
- **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.**
- **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

Explosion Hazard

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.

⚠ WARNING

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.
- Never use diesel fuel as a cleaning agent.
- Store any containers containing fuel or other flammable products in a well-ventilated area, away from any combustibles or sources of ignition.
- 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.

⚠ WARNING

Fire Hazard

- Undersized wiring systems can cause an electrical fire.

- Store any equipment in a designated area away from moving parts.
- Never use the engine compartment for storage.

⚠ WARNING

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. Never operate the engine without the guards in place.

- Before you start the engine make sure that all bystanders are clear of the area. Keep children and pets away while the engine is operating.
- Check the engine that any tools or shop rags used during maintenance have been removed from the area.

⚠ WARNING

Alcohol and Drug Hazard

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

⚠ WARNING

Exposure Hazard

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

⚠ WARNING

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.**
- **Never operate the engine while wearing a headset to listen to music or radio because it will be difficult to hear the warning signals.**

⚠ 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. Contact your authorized YANMAR Marine dealer or distributor repair the damage.**

⚠ WARNING

Burn Hazard

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.

⚠ WARNING

Sudden Movement Hazard

- **Always stop the engine before beginning service.**
- **Be sure the boat is in open water away from other boats, docks or other obstructions before increasing engine speed. 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.**

⚠ WARNING

Exhaust Hazard

- 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.
- 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.

⚠ WARNING

Welding Hazard

- 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 engine control unit multi-pin connector. 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 alternator and engine control unit prior to reconnecting the batteries.

⚠ WARNING

Shock Hazard

- Always turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the equipment.
- Always keep the electrical connectors and terminals clean. Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.
- Never use undersized wiring for the electrical system.

⚠ WARNING

Never remove the coolant filler cap if the engine is hot. Steam and hot engine coolant will spray out and seriously burn you. Allow the engine to cool down before you attempt to remove the cap.

⚠ CAUTION

Poor Lighting Hazard

Ensure that the work area is adequately illuminated. Always install wire cages on portable safety lamps.

⚠ CAUTION

Tool Hazard

Always use tools appropriate for the task at hand and use the correct size tool for loosening or tightening machine parts.

⚠ CAUTION

Flying Object Hazard

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.

⚠ CAUTION

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.

⚠ CAUTION

- **Do not drain the coolant system. A full coolant system will prevent corrosion and frost damage.**
- **If seawater is left inside of the engine, it may freeze and damage parts of the cooling system when the ambient temperature is below 0 °C (32 °F).**

NOTICE

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.

NOTICE

Contact 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.

NOTICE

Always be environmentally responsible.

Follow the guidelines of the EPA or other governmental agencies for the proper disposal of hazardous materials such as engine oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.

NOTICE

Never dispose of hazardous materials by dumping them into a sewer, on the ground or into ground water or waterways.

NOTICE

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 smoke and serious engine damage. This applies to engines that run continuously or those that run for short periods of time.

NOTICE

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). Contact your authorized YANMAR Marine dealer or distributor for a complete explanation of this condition.

NOTICE

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.

NOTICE

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 speed, 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.

NOTICE

New Engine Break In: On the initial engine start-up, check for proper engine oil pressure, diesel fuel leaks, engine oil leaks, coolant leaks, and for proper operation of the indicators and/or gauges. During the first 50 hours of operation operate your new engine under a substantial load at all times. For best break-in results operate the engine at various speeds. Operating the engine in NEUTRAL must be avoided. During the first 50 hours, avoid operation below 2000 min^{-1}. During the break-in period, carefully observe the engine oil pressure and engine temperature. During the break-in period, check the engine oil and coolant levels frequently.

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. Contact your authorized YANMAR Marine dealer or distributor for service before operating the engine.

NOTICE

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 (+3 °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 (+3 °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.

NOTICE

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

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.

NOTICE

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.

SAFETY DECALS

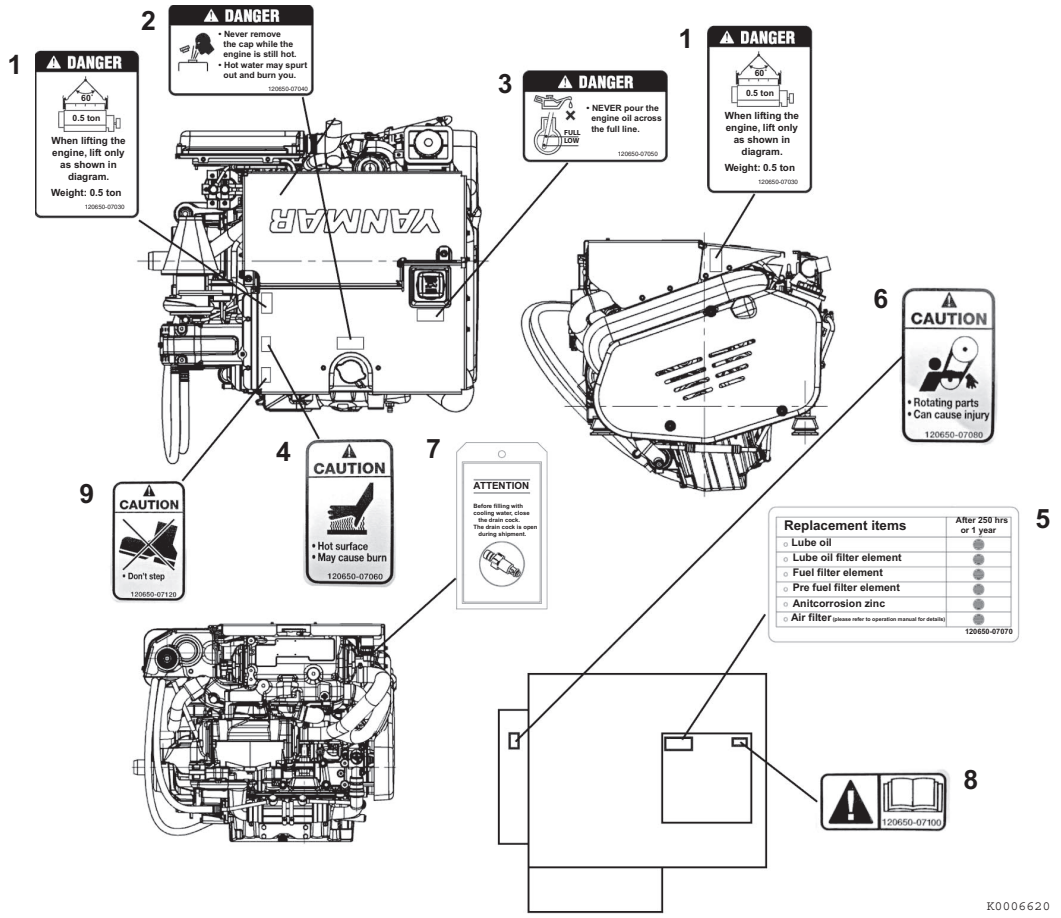

Figure 1

No.	Part Number
1	120650-07030
2	120650-07040
3	120650-07050
4	120650-07060
5	120650-07070
6	120650-07080
7	120650-07090
8	120650-07100
9	120651-07120

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PRODUCT OVERVIEW

YANMAR BY3-SERIES FEATURES AND APPLICATIONS

The BY3-series engines are in-line 4- and 6-cylinder direct injection diesel engines. The engines are turbocharged and equipped with a liquid cooling system.

These engines are designed for pleasure craft use.

It is recommended that new vessels be propped so the engines can operate at 50 to 100 min^{-1} above the fuel stop power engine speed 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 on-board equipment, always observe the instructions and cautions given in the operation manuals supplied by the shipyard and equipment manufacturers.

The BY3 series engines are designed to be operated at maximum throttle (4000 min^{-1}) for less than 5 % of total engine time (30 minutes out of every 10 hours) and cruising speed (3600 - 3700 min^{-1} or less).

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 YANMARs 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.

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, carefully observe the engine oil pressure and engine temperature.

During the first 10 hours of operation, the engine should be run at maximum engine speed minus 400 to 500 min^{-1} (approximately 60 to 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 engine 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.

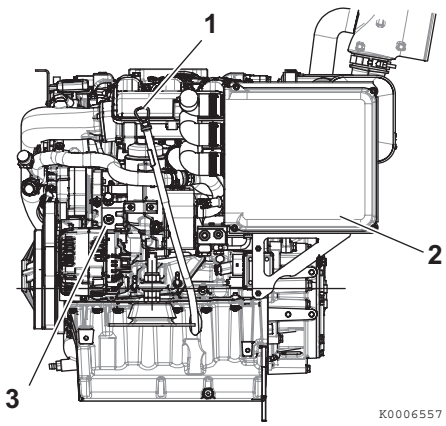
Once past the initial 10 hours until 50 hours, the engine should be used over its full operating range, with special emphasis on running at relatively high power settings. This is not the time for an extended cruise at idle or low speed. The boat should be run at maximum speed minus 400 min^{-1} most of the time (approximately 70 % load), with a 10 minute run at maximum minus 200 min^{-1} (approximately 80 % load) every 30 minutes and a 4 to 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 of Operation* maintenance procedures. *See After Initial 50 Hours of Operation on page 53*.

COMPONENT IDENTIFICATION

Figure 1, **Figure 2** and **Figure 3** illustrate a typical version of a 4BY3 engine. Your engine may have different equipment from that illustrated.

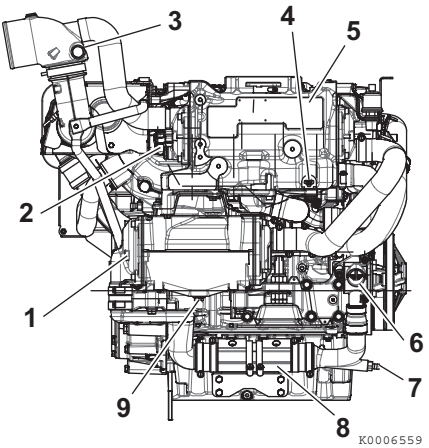
Left Side (as Viewed from Flywheel) - 4BY3



1 – Engine oil dipstick
2 – E-Box panel
3 – High pressure fuel pump

Figure 1

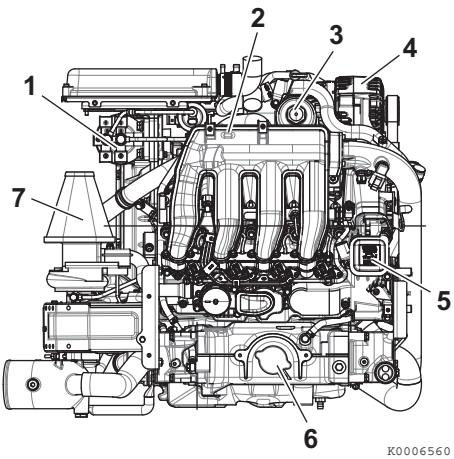
Right Side (as Viewed from Flywheel) - 4BY3



1 – Zinc anode
2 – Zinc anode
3 – Exhaust/water mixing elbow
4 – Coolant drain cock
5 – Heat exchanger
6 – Seawater pump
7 – Seawater drain cock
8 – Hydraulic oil cooler
9 – Coolant drain plug

Figure 2

Top View - 4BY3



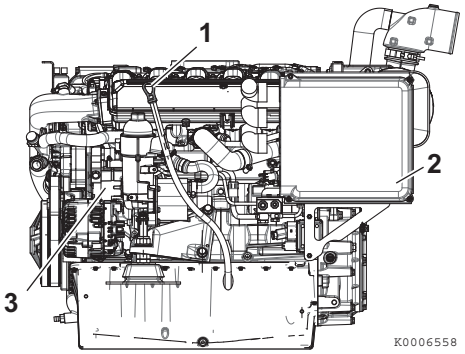
1 – Fuel fine filter
2 – Intake air manifold
3 – Engine oil filter
4 – Power steering filler port (if equipped)
5 – Engine oil filler port
6 – Coolant filler port
7 – Air filter

Figure 3

*Note: YANMAR supplies a water-separating pre-filter for mounting by the installer. The engine is equipped with an on-engine fine filter (1, **Figure 3**).*

Figure 4, **Figure 5** and **Figure 6** illustrate a typical version of a 6BY3 engine. Your engine may have different equipment from that illustrated.

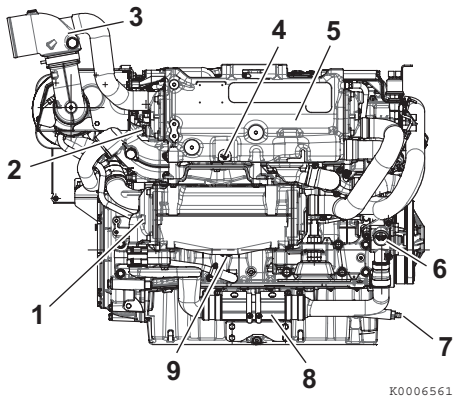
Left Side - 6BY3



1 – Engine oil dipstick
2 – E-Box panel
3 – High pressure fuel pump

Figure 4

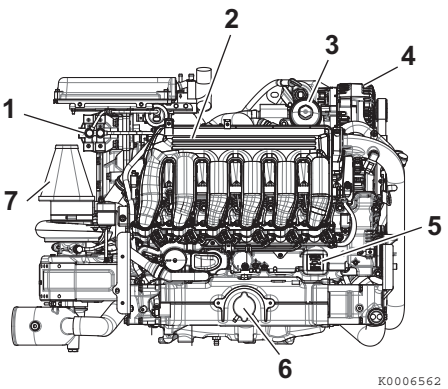
Right Side - 6BY3



1 – Zinc anode
2 – Zinc anode
3 – Exhaust/water mixing elbow
4 – Coolant drain cock
5 – Heat exchanger
6 – Seawater pump
7 – Seawater drain cock
8 – Hydraulic oil cooler
9 – Coolant drain plug

Figure 5

Top View - 6BY3



1 – Fuel fine filter
2 – Intake air manifold
3 – Engine oil filter
4 – Power steering filler port (if equipped)
5 – Engine oil filler port
6 – Coolant filler port
7 – Air filter

Figure 6

*Note: YANMAR supplies a water-separating pre-filter for mounting by the installer. The engine is equipped with an on-engine fine filter (1, **Figure 6**).*

LOCATION OF NAMEPLATES

The engine data and drive information nameplates on YANMAR BY3 series engines are shown in **Figure 7**, **Figure 8** and **Figure 9**. Replace if damaged or lost.

The typical location of the engine name plate is shown for YANMAR 4BY3 Series marine engines **(Figure 7)** and 6BY3 engines **(Figure 8)**.

4BY3

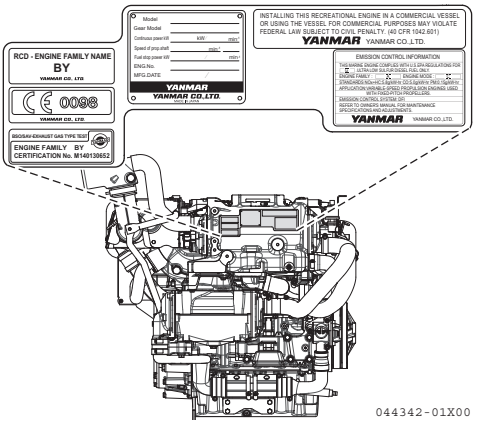


Figure 7

6BY3

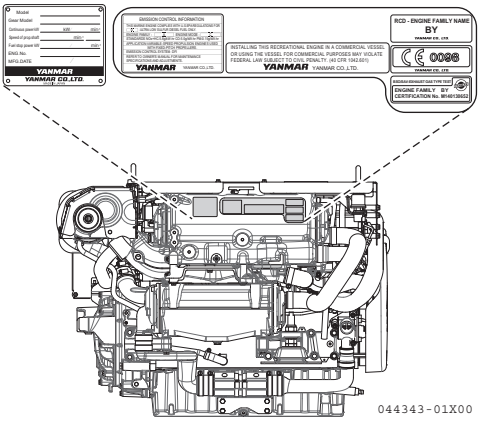


Figure 8

The engine block information is etched into the cylinder block behind the engine oil cooler near the end of the starting motor **(Figure 9)**.

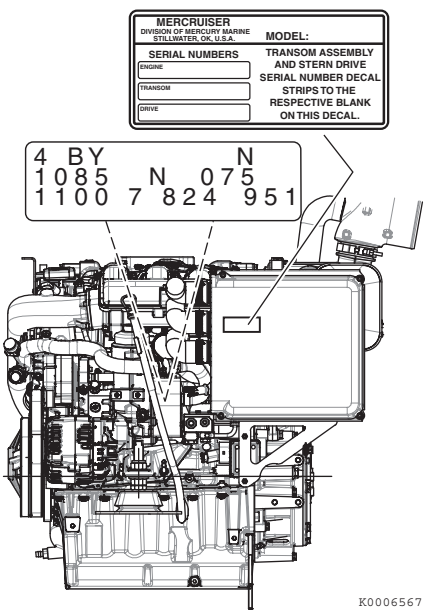


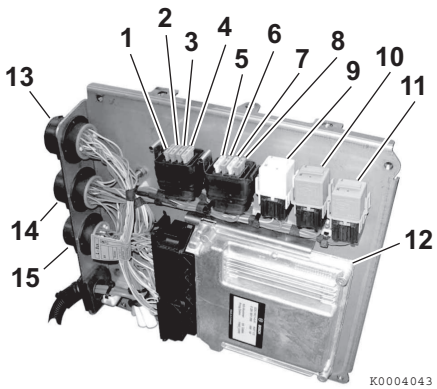
Figure 9

FUNCTION OF MAJOR COMPONENTS

Name of component	Function
Fuel filter/water separator (not supplied by YANMAR)	Removes dirt and water from the fuel. The filter element should be replaced periodically. *See Replacing fuel filter/water separator element on page 57*. The water separator should be drained periodically. *See Draining the Fuel/Water Separator on page 52*.
Fuel fine filter	Removes extremely fine contaminants from fuel prior to entering fuel injection system.
Fuel feed pump	Pumps fuel from the tank to the fuel injection system.
Engine oil fill port	To add 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 Changing the engine oil and replacing the engine oil filter on page 53*.
Coolant system	There are two cooling systems: 1) closed cooling with coolant and 2) seawater. The engine is cooled by the closed cooling system. The closed system coolant is cooled by seawater using a heat exchanger. The seawater also cools the marine gear or power steering oil, and the combustion intake air through cooler(s) in an open circuit.
Closed cooling circulation pump	The centrifugal coolant pump circulates coolant inside the engine. The circulating pump is driven by a poly V-belt.
Seawater pump	Pumps seawater from outside vessel to the engine. The seawater pump is belt-driven and has a replaceable rubber impeller. Avoid impeller damage, do not operate it without seawater.
Coolant fill cap	When the coolant temperature rises, the pressure inside the heat exchanger increases, causing the pressure valve in the filler cap to open, forcing hot water and steam through a rubber hose to the reservoir. When the engine becomes cool and the pressure inside the coolant tank drops, the vacuum valve in the filler cap opens and the coolant in the reservoir returns to the heat exchanger through the hose and filler cap. This minimizes coolant consumption.
Reservoir	The coolant fill cap valve releases vapor and hot water overflow to the reservoir. When the engine stops and the coolant cools, the pressure in the heat exchanger drops. The fill cap valve then opens to send coolant back from the reservoir. This minimizes coolant consumption. 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 engine coolant.
Oil cooler - hydraulic	A heat exchanger that cools the marine gear oil or power steering fluid using seawater.
Turbocharger	The turbocharger pressurizes the air coming into the engine. It is powered by a turbine that is driven by exhaust gases.
Air filter	The air filter removes dirt from the intake combustion air reducing engine wear.
Nameplates	Nameplates are provided on the engine and the marine gear and have the model, serial number and other data.

Name of component	Function
Electrical panel (E-Box)	The electrical panel houses the engine electrical system fuses, relays, and ECU. The ECU monitors data from the various sensors and controls such functions as low-pressure fuel pump operation, fuel injection pressure, fuel injection system volume, and the timing and volume of fuel injected by the Bosch electronic fuel injectors. Throttle control is fly-by-wire meaning it is controlled by electric signals from the helm. The throttle control is either analog or digital depending on the level of control options installed. The ECU also uses sensor inputs to monitor engine condition and will set a trouble code if a system or sensor indicates a problem. In most cases, a Check Engine light will be displayed. The engine may or may not run normally depending on the fault. Not all inputs are monitored by the ECU. Low oil pressure and water in fuel are two examples. Either of these conditions will result in a warning indicator and possible audible alarm. Low oil pressure will also be indicated by the oil gauge at the helm (not available with Classic Controls).
Electrical panel (E-Box) circuit breaker	The electrical panel circuit breaker is installed in the positive (+) cable of the electrical panel power lead, and provides overload protection for the electrical panel. The electrical panel power leads must be connected directly to the battery, and must have a breaker installed in the B+ (red) lead.

FUSES AND RELAYS



1 – Fuse F1 (3 A) - CAN switched power
2 – Fuse F2 (10 A) - Ignition*
3 – Fuse F3 (15 A) - Fuel supply pump
4 – Fuse F4 (30 A) - ECU switched power
5 – Fuse F5 (20 A) - Power to sensors and actuators
6 – Fuse F6 (10 A) - Auxiliary power
7 – Jumper fuse F7 (3 A) - Single/port selection, default is single/port (fuse in). Remove fuse for starboard configuration.
8 – Jumper fuse F8 (3 A) - CAN/Analog throttle selection, default is analog (fuse out). Insert 3 A fuse to configure for CAN.
9 – K1 - Starter relay
10 – K3 - Fuel supply pump relay
11 – K2 - Main power relay
12 – ECU
13 – Connector X1 - Communication to helm display
14 – Connector X21/1 - Engine wiring harness
15 – Connector X22/1 - Fuel injector wiring harness

Figure 10

To access the fuse and relay panel, remove the four bolts from the E-Box cover and remove cover.

NOTICE

The electrical panel cables must be connected directly to the battery, and must have a circuit breaker installed in the B+ (red) lead.

---

* *Never connect any additional devices to F2. F6 may be used however, it is not switched.*

ENGINE COVER

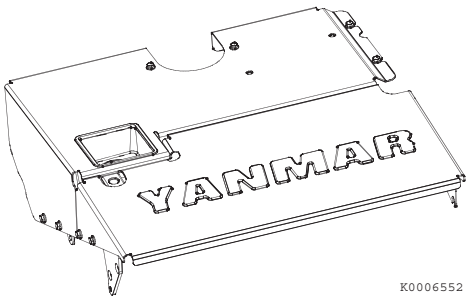


Figure 11

To remove the cover from the engine, remove all bolts, then lift cover from engine.

BEFORE YOU OPERATE

INTRODUCTION

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

SAFETY PRECAUTIONS

Before performing any operations within this section, review the *Safety* section on page *3*.

DIESEL FUEL

Diesel Fuel Specifications

⚠ WARNING

Fire and Explosion Hazard

Diesel fuel is flammable and explosive under certain conditions.

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
ASTM D975 No. 2-D S15, No. 1-D S15, D6751, D7467	USA
EN590-2009, **EN14214**	European Union
ISO 8217 DMX	International
BS 2869-A1 or A2	United Kingdom
JIS K2204 Grade No. 2	Japan

■ Biodiesel fuels

YANMAR approves the use of biodiesel fuels that do not exceed a blend of 7 % non-mineral oil based fuel with 93 % standard diesel fuel. Such biodiesel fuels are known in the marketplace as B7 biodiesel fuels. B7 biodiesel fuel can reduce particulate matter and the emission of “greenhouse” gases compared to standard diesel fuel.

NOTICE

If the B7 biodiesel fuel used does not meet the approved specifications, it will cause abnormal wear of injectors, reduce the life of the engine and it may affect the warranty coverage of your engine.

B7 diesel fuels must meet certain specifications.

The biodiesel fuels must meet the minimum specifications for the country in which they are used:

- In Europe, biodiesel fuels must comply with the European Standard EN590-2009. EN14214
- In the United States, biodiesel fuels must comply with the American Standard ASTM D-6751. D7467

Biodiesel should be purchased only from recognized and authorized diesel fuel suppliers.

Precautions and concerns regarding the use of biofuels:

- Biodiesel fuels have a higher content of methyl-esters, which may deteriorate certain metal, rubber and plastic components of the fuel system. The customer and/or boat builder are responsible to verify the usage of biodiesel compatible components on the vessel fuel supply and return systems.
- Free water in biodiesel may result in plugging of fuel filters and increased bacterial growth.
- High viscosity at low temperatures may result in fuel delivery problems, injection pump seizures and poor injection nozzle spray atomization.

- Biodiesel may have adverse effects on some elastomers (seal materials) and may result in fuel leakage and dilution of the engine lubricating oil.
- Even biodiesel fuels that comply with a suitable standard as delivered will require additional care and attention to maintain the quality of the fuel in the equipment or other fuel tanks. It is important to maintain a supply of clean, fresh fuel. Regular flushing of the fuel system, and/or fuel storage containers, may be necessary.
- The use of biodiesel fuels that do not comply with the standards as agreed to by the diesel engine manufacturers and the diesel fuel injection equipment manufacturers, or biodiesel fuels that have degraded as per the precautions and concerns above, may affect the warranty coverage of your engine.

■ Additional technical fuel requirements

- The fuel cetane number should be 45 or higher.
- The sulfur content must not exceed 15 ppm by volume.
  A higher sulfur content fuel may cause sulfuric acid corrosion in the cylinders of the engines.
  Especially in U.S.A. and Canada, Ultra Low Sulfur fuel must be used.
- 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.

■ Handling of diesel fuel

⚠ WARNING

Fire and Explosion Hazard

- **Only fill the fuel tank with diesel fuel. Filling the fuel tank with gasoline may result in a fire and will damage the engine. Never refuel with the engine running. Wipe up all spills immediately. Keep sparks, open flames or any other form of ignition (match, cigarette, static electric source) well away when refueling.**
- **Always put the diesel fuel container on the ground when transferring the diesel fuel from the pump to the container. Hold the hose nozzle firmly against the side of the container while filling it. This prevents static electricity buildup which could cause sparks and ignite fuel vapors.**

---

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.

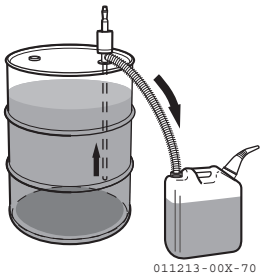
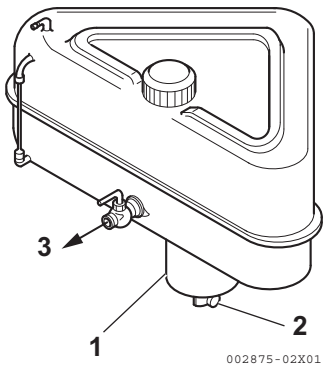


Figure 1

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)



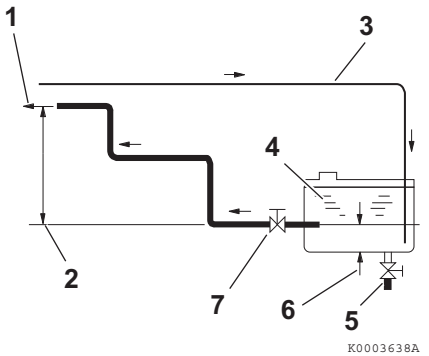
1 – Sediment bowl
2 – Drain cock
3 – Fuel line to engine

Figure 2

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

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

■ Diesel Fuel Lines



1 – To fuel feed pump
2 – Less than 500 mm (19.68 in.)
3 – Fuel return line
4 – Fuel tank
5 – Fuel tank drain cock
6 – 20 - 30 mm (0.75 - 1.125 in.)
7 – Fuel shutoff valve

Figure 3

Shown is a typical installation of a boat fuel system. Fuel supply (2, **Figure 3**) and return (4, **Figure 3**) lines connect to fittings at the engine.

Total suction resistance shall be less than 0.1 bar (40 in.Aq). High resistance may cause poor performance and reduce fuel system life.

Note: YANMAR supplies a water separating pre-filter for mounting by the installer. The engine is also equipped with an on-engine fine filter.

Filling the Fuel Tank

■ **Before filling fuel tank for the first time:**

⚠ WARNING

Fire and Explosion Hazard

Never refuel with the engine running.

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

■ **To fill the fuel tank:**

⚠ WARNING

Fire and Explosion Hazard

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

1. Clean the area around the fuel cap.
2. Remove the fuel cap from the fuel tank.
3. Fill the tank with clean fuel free of oil and dirt.

⚠ WARNING

Fire and Explosion Hazard

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.

⚠ WARNING

Fire and Explosion Hazard

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 needs to be bled under the following conditions:

- Before starting the engine for the first time.
- After running out of fuel and fuel has been added to the fuel tank.
- After fuel system maintenance, such as changing the fuel filter and draining the fuel filter/water separator, or replacing a fuel system component.

The fuel feed pump is ECU-controlled and will operate for only 10 seconds when the key switch is turned ON while the engine is not running or being started. For this reason, the key switch must be repeatedly turned ON then OFF to sufficiently bleed the fuel system.

1. Turn the key switch on and leave on for 10 seconds.

   NOTICE

   Never hold the key in the START position for longer than 10 seconds or the starter motor will overheat.

2. Turn key switch OFF for 5 seconds, then turn key switch ON for 10 seconds.
3. Repeat steps 1 and 2 five more times.

   Note: The engine may run rough and misfire for a few seconds when first started until any remaining air is purged from the fuel system.

4. Attempt to start the engine. If the engine does not start within a reasonable time, repeat steps 1 and 2 until the engine starts and runs.

   NOTICE

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

ENGINE OIL

Engine Oil Specifications

Use a full-synthetic long-life engine oil that meets or exceeds the following guidelines and classifications:

■ Service categories

- API Service Categories SM, SL, SJ, SH/CF and CF
- ACEA Service Categories A3, B3 and B4

■ Definitions

- API Classification (American Petroleum Institute)
- ACEA Classification (Association des Constructeurs Européens d'Automobilies)

Note:

1. Be sure the engine oil, engine oil storage containers, and engine oil filling equipment are free of sediment and 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.
4. YANMAR does not recommend the use of engine oil "additives".

■ Engine oil viscosity

Select the appropriate engine oil viscosity based on the ambient temperature shown in the SAE Service Grade Viscosity Chart **(Figure 4)**.

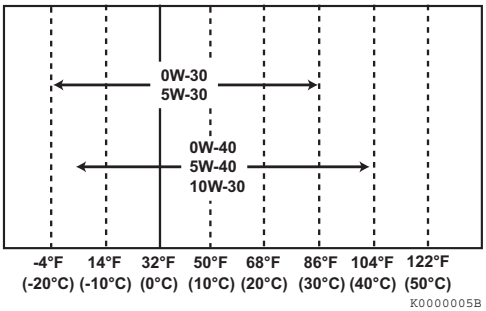


Figure 4

Note: YANMAR recommends using genuine YANMAR Marine Oil specially formulated for the BY3 engine. Contact your authorized YANMAR dealer or distributor.

Acceptable Engine Oil

LongLife 01 Oils

Trade name	Producer/Supplier
Addinol Super power MV 0537	Addinol Lube Oil GmbH
Agip Formula LL B 01	ENI S.p.A. Refining and Marketing Division
Agip Sint 2000 Evolution	ENI S.p.A. Refining and Marketing Division
Agip TECSINT SL	ENI S.p.A. Refining and Marketing Division
ALPINE Longlife	Mitan Mineralöl GmbH
Aral SuperTronic B	Aral
Aral SuperTronic G	Aral
AXCL S-Class Motor Oil	AXCL Gulf FZE
BMW Quality Longlife 01	BMW
BP Visco 7000	BP Oil International
BP Visco 7000 GM	BP Oil International
BP Visco 7000 Turbo Diesel	BP Oil International
Castrol Edge	Castrol Limited
Castrol Formula RS Power and Protection	Castrol Limited
Castrol Formula SLX	Castrol Limited
Castrol Formula SLX LL01	Castrol Limited
Castrol Formula SLX Long Tex	Castrol Limited
Castrol Formula SLX Turbodiesel	Castrol Limited
Castrol Syntec	Castrol Limited
Castrol Syntec 0W-30 European Formula	Castrol Limited
Castrol Super Racing 0W-40	Castrol Limited
Castrol TXT Softec LL01	Castrol Limited
Cepsa Star Mega Synthetic	Cepsa Lubricantes S.A.
Divinol Syntholight	Zeller+Gmelin
Elf Excellium Full-Tech	Total
Elf Excellium LDX	Total
Elf Excellium XLL	Total
Esso Ultron FE	ExxonMobil
Galp Formula XLD	Petrogal SA
Gulf Formula TLX	Total
Havoline Synthetic BM	Chevron Texaco
Havoline Ultra BM	Chevron Texaco
Igol Process Compact P	Igol France S.A.
INA Futura Compact P	INA Maziva Rijeka
Jet Top Level	ConocoPhillips GmbH

Trade name	Producer/Supplier
Labo RC	Fuchs Labo Auto S.A.
Liqui Moly Longtime High Tech	Liqui Moly
Megol Motorenöl New Generation	Meguin GmbH
Mobil 1	ExxonMobil
Mobil 1 Turbo Diesel	ExxonMobil
Mobil 1 Spezial XS	ExxonMobil
Motorex Profile B-XL	Bucher AG
Motorex Select SP-X	Bucher AG
Motul Specific LL-01	Motul S.A.
OMV full syn plus	OMV AG
Opaljet Longlife	Unil Opal
Panolin Exclusive BD	Panolin AG
Pennzoil European Formula Ultra	Pennzoil-Quaker State
Pentospeed 0W-30 VS*	Deutsche Pentosin-Werke
Petronas Syntium 3000 LL	Petronas
Q8 Formula Special	Kuwait Petroleum
Quaker State European Formula Ultra	Pennzoil-Quaker State
Ravenol HCL	Ravensburger Schmierstoffvertrieb GmbH
Repsol Elite Common Rail	Repsol YPF
Shell Helix Ultra AB	Shell International Petroleum Company
Shell Helix Ultra AL	Shell International Petroleum Company
Statoli LazerWay B	Statoil Lubricants
Tecar Motorenöl Supersyn	Techno-Einkauf GmbH
Titan Supersyn SL	Fuchs Petrolub AG
Titan Supersyn SL Longlife	Fuchs Petrolub AG
Tor Synthetic LL	De Oliebron
Total Activa Expertise 9000	Total
Total Quartz Expertise 9000	Total
Valvoline SynPower MXL	Valvoline
Veedol Powertron LL01	Veedol International
Veedol Syntron	Veedol International
Veritas Syntolube	Ölwerke Julius Schindler GmbH
Wako's Super Synthe	Wako Chemical Co.Ltd
Wintershall VIVA 1 Longlife	SRS Schmierstoff Vertrieb GmbH
Yacco VX 1600	Yacco S.A.S.

LongLife 04 Oils

Trade name	Producer/Supplier
Addinol Super power MV 0537	Addinol Lube Oil GmbH
Agip Formula MS B04	ENI S.p.A.
Aral SuperTronic	Aral
BMW Longlife-04	BMW
Castrol Edge Sport	Castrol Limited
Castrol Edge Turbo Diesel	Castrol Limited
Castrol Formula RS	Castrol Limited
Castrol GTX Magnatec	Castrol Limited
Castrol SLX LL-04	Castrol Limited
Castrol TXT LL-04	Castrol Limited
Elf Excellium LSX	Total
Galp Energy Ultra LS	Petrogal SA
Liqui Moly TopTec 4100	Liqui Moly
Midland ® Synova	Oel-Brack AG
Midland ® Synova	Oel-Brack AG
Mobil 1 ESP Formula	ExxonMobil
Motorenöl Low Emission	Meguin GmbH
Motul 1 Specific LL-04	Motul S.A.
OMV eco plus	OMV AG
Repsol Elite Evolution	Repsol YPF
Shell Helix Ultra AP	Shell International Petroleum Company
Titan GT1	Fuchs Petrolub AG
Wintershall VIVA 1 topsynth alpha LS	SRS Schmierstoff Vertrieb GmbH
York 848	Ginouves SAS

Checking Engine Oil

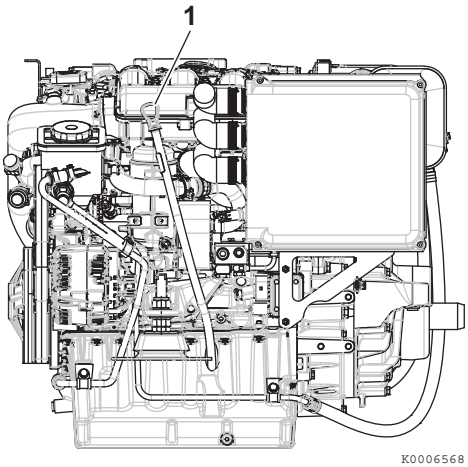


Figure 5

Note: 4BY3 series shown. 6BY3 is similar.

NOTICE

Prevent dirt and debris from contaminating engine oil. Carefully clean the dipstick and the surrounding area before you remove the cap.

1. Clean area around dipstick.
2. Remove dipstick (1, **Figure 5**) and wipe with clean cloth.
3. Fully reinsert dipstick.
4. Remove dipstick. The oil level should be between upper (1, **Figure 6**) and lower lines (2, **Figure 6**) on the dipstick.

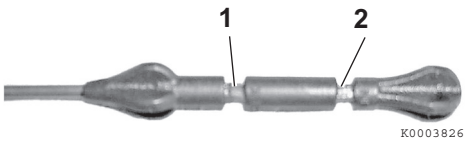


Figure 6

5. Fully reinsert dipstick.

Adding Engine Oil

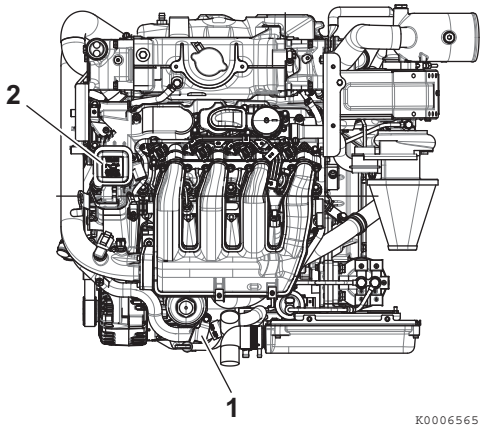


Figure 7

Note: 4BY3 series shown. 6BY3 is similar.

1. Remove the oil filler port cap (2, **Figure 7**) and pour engine oil into filler port. *See Engine Oil Specifications on page 28*.
2. Fill with oil to the upper limit on the dipstick (1, **Figure 6**).

NOTICE

Never overfill the engine with engine oil.

3. Fully insert the dipstick to check the level.

NOTICE

Always keep the oil level between upper and lower lines on the dipstick.

4. Tighten the fill port cap securely by hand.

MARINE GEAR OR STERN DRIVE OIL

Note: Refer to the marine gear manufacturer's operation manual for the marine gear oil specifications. Refer to the manufacturer's operation manual for marine gear or stern drive oil specifications.

Marine Gear Oil Specifications

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

■ KMH41A, KMH51A, KMH50V

- API Service Categories CF
- SAE Viscosity #30

Stern Drive Oil Specifications

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

■ ZT370

- GL-5 (SAE #80W90 or 75W90)

■ Mercruiser® Bravo

- QuickSilver®* High Performance Gear Lube

POWER STEERING FLUID SPECIFICATIONS

Refer to the stern drive manufacturer's literature for power steering fluid specifications.

■ Power steering oil (stern drive only)

- QuickSilver® Power Trim and Steering Fluid or Dexlone-II

■ Power trim oil

- QuickSilver® Power Trim and Steering Fluid or SAE 10W-30 or 10W-40 Engine Oil

Checking Power Steering Fluid Level

1. Remove power steering filler cap.
2. Power steering fluid level must be between the upper (1, **Figure 8**) and lower (2, **Figure 8**) level marks.

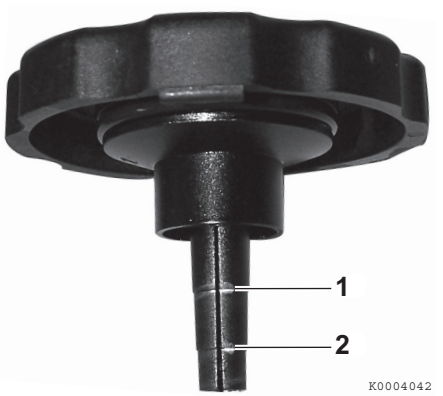


Figure 8

3. Add fluid if necessary.

* *QuickSilver is a registered trademark of Brunswick Corporation.*

ENGINE COOLANT

Acceptable Engine Coolant

Trade name	Manufacturer
Addinol Antifreeze Super	Addinol Lube Oil GmbH
Aral Antifreeze Extra	Aral AG
AVIA Antifreeze APN	AVIA Mineralöl AG
BMW Coolant	BMW AG
BP anti-frost X 2270A	BP Schmierstoff GMBH, Hamburg
Caltex CX Engine Coolant	Caltex
Castrol ANTI-FREEZE NF	Castrol International
Fridex G48	Velena s.a.
Glacelf Plus	Total
GlycoShell	Shell International
Glyco star	Bremin Mineralöl GmbH & Co.
Glysantin G48-24 Engine Coolant	UNICO Ltd.
Glysantin Protect Plus / G48	BASF
GUSOFROST LV 505	Chemische Industrielle Gesellschaft
Mobil Frostchutz 600	Mobil Schmierstoff GmbH
Havoline AFC (BD04)	Chevron Texaco/Arteco
Mobil Frostschutz 600	ExxonMobil
OMV Kühlerfrostschutz	OMV AG
Total Thermofreeze Plus	Total

Note: YANMAR recommends using genuine YANMAR antifreeze/coolant. Contact your authorized YANMAR dealer or distributor.

■ Adding engine coolant

1. Remove the pressure cap and pour coolant mix slowly into the heat exchanger to prevent the formation of air pockets. Fill until the heat exchanger is completely full.

NOTICE

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

2. Start the engine and allow to idle for approximately 5 minutes.
3. Stop the engine and check the coolant level. Add additional coolant if necessary.
4. Install the pressure cap and tighten firmly.

⚠ WARNING

Securely tighten the filler cap after checking the coolant level. Steam can escape during engine operation if the cap is loose.

5. Remove the reservoir cap and fill with coolant mix to approximately 50 mm (2 in.) below the full line. Replace cap. Never fill to the full line.
6. After filling an empty cooling system, test-run the engine for about five minutes and check the engine coolant level at the reservoir again.

ENGINE OPERATION

INTRODUCTION

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 checkout.

SAFETY PRECAUTIONS

Before performing any operations within this section, review the *Safety* section on page *3*.

STARTING THE ENGINE

1. Open the seacock (if equipped).
2. Open the fuel cock.
3. Turn the battery switch (if equipped) ON.
4. Put remote control handle in NEUTRAL.
5. Ensure lanyard is connected to emergency stop switch.
6. Attach lanyard to clothing.
7. Turn key switch to ON. Ensure that the instrument panel indicators are powered and working.

⚠ CAUTION

Never hold the key in the START position for longer than 10 seconds or the starter motor will overheat.

8. Turn key switch to START. Release the key switch when the engine has started.

Note: Once the engine has started, the ECU will raise the engine speed to 1080 min^{-1} to start alternator charging, and then reduce to low idle.

Starting at Low Temperatures

NOTICE

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

Comply with local environmental requirements. Use optional glow plugs (if equipped) to avoid starting problems and white smoke.

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.

SHUTTING DOWN THE ENGINE

Under normal operating conditions, shut down the engine by turning the key switch to OFF.

There will be a delay of up to 3 seconds after turning the key to OFF. This is normal and allows the ECU computer to store data. Wait at least 10 seconds after the engine stops before turning the battery switch to OFF.

Emergency Shut Down

NOTICE

Never use the emergency stop switch for a normal engine shut-down. Use this switch only when stopping the engine suddenly in an emergency

1. Ensure lanyard is connected to the emergency stop switch.
2. Attach the lanyard to a secure place on the operator's clothing or life vest - not where it might tear away.

   NOTICE

   - Do not cut or re-tie the lanyard. If it is too long, shorten it by knotting or looping it.
   - Test the emergency engine shut off switch before each outing.

3. Disconnecting the clip from the stop switch will stop the engine.

   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.

CHECKING THE ENGINE AFTER OPERATION

- Check that the key switch is in the OFF position and battery switch (if equipped) is OFF.
- Fill the fuel tank. Make sure that the fill cap and the area around the fill opening are clean to avoid contamination of the fuel.
- Close seawater cock(s).
- If there is a risk of freezing, check that the cooling system contains enough coolant. *See Engine Coolant on page 35*.
- If there is a risk of freezing, drain the seawater system. *See Draining the Seawater Cooling System on page 76*.

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PERIODIC MAINTENANCE

INTRODUCTION

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

SAFETY PRECAUTIONS

Before performing any maintenance procedures within this section, read the following safety information and review the *Safety* section on page *3*.

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.

The Importance of Daily Checks

Periodic Maintenance Schedules 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 Periodic Maintenance Procedures on page 51*.

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, 1000 and 2000 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.

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.

■ Standard torque values

Hexagon bolts and nuts

Nominal diameter	Grade (lubricated)		
	8.8 or 8	10.9 or 10	12.9 or 12
M4	2.7 N·m (24 in.-lb)	3.88 N·m (34.3 in.-lb)	4.6 N·m (41 in.-lb)
M5	5.5 N·m (48.6 in.-lb)	8 N·m (71 in.-lb)	9.5 N·m (84 in.-lb)
M6	9.5 N·m (84 in.-lb)	13 N·m (115 in.-lb)	16 N·m (142 in.-lb)
M7	15 N·m (133 in.-lb)	22 N·m (195 in.-lb)	26 N·m (230 in.-lb)
M8	23 N·m (204 in.-lb)	32 N·m (24 ft-lb)	39 N·m (29 ft-lb)
M8 × 1	25 N·m (221 in.-lb)	35 N·m (26 ft-lb)	42 N·m (31 ft-lb)
M10	46 N·m (34 ft-lb)	64 N·m (47 ft-lb)	77 N·m (57 ft-lb)
M10 × 1.25	49 N·m (36 ft-lb)	68 N·m (50 ft-lb)	82 N·m (60 ft-lb)
M12	80 N·m (59 ft-lb)	110 N·m (81 ft-lb)	135 N·m (100 ft-lb)
M12 × 1.5	88 N·m (65 ft-lb)	125 N·m (92 ft-lb)	150 N·m (111 ft-lb)

Hose clamps

Note: Reuse and retightening is prohibited for all hose clamps. Always install new hose clamps.

Size	Specification
5 mm Hex head	1.0 - 1.5 N·m (8.9 - 13 in.-lb)
6 mm Hex head	2.5 - 3.5 N·m (22 - 31 in.-lb)

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 47* and the *Periodic Maintenance Procedures on page 51* .

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 45. 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 adopted 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 BY3-series 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: -16° to +40 °C (3° to 104 °F)
- Relative humidity: 80 % or lower

The fuel and lubricating oil used should be as follows:

- Diesel fuel: ASTM D975 No. 1-D S15 or No. 2-D S15, D6751, D7467 or equivalent (minimum cetane No. 45)
- Lubricating oil: Type API, Class SM, SL, SJ, SH/CF and CF

Be sure to perform inspections as outlined in *Periodic Maintenance Procedures on page 51* 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 air filter

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

Inspection and Maintenance

See Inspection and Maintenance of EPA Emission-Related Parts on page 51 for the EPA emission-related parts. Inspection and maintenance procedures not shown in *Inspection and Maintenance of EPA Emission-Related Parts on page 51* are covered in *Periodic Maintenance Schedule on page 47* .

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.

Installation of Exhaust Sampling Port

All engines subject to emission standards shall be equipped with a connection in the engine exhaust system that is located downstream of the engine, and before any point at which the exhaust contacts water (or any other cooling/scrubbing medium), for the temporary attachment of gaseous and/or particulate emissions sampling equipment. This connection shall be internally threaded with standard pipe threads of a size not larger than 12.7 mm (0.5 in.), and shall be closed by a pipe plug when not in use. Equivalent connections are allowed.

The instructions for the proper installation and location of the required sample port, in addition to those specified above in the quoted federal regulation, are as follows:

1. The connection should be located as far downstream as reasonably practicable from any sharp bend (of 30 degrees or more) in the exhaust pipe to help ensure that a well-mixed exhaust flow sample may be taken;
2. The requirement that the connection be located before any point at which the exhaust contacts water (or any other cooling/scrubbing medium) does not include contact with water used to cool exhaust manifolds, unless the water is allowed to come into direct contact with the exhaust gases;
3. To allow ready access to the sample port, the connection should be located, if possible given the constraints of vessel design, approximately 0.6 to 1.8 m (2 to 6 ft) above a deck or walkway;
4. To facilitate insertion and withdrawal of an exhaust sample probe, there should be no obstructions for at least one and one-half exhaust pipe/stack diameters perpendicular, i.e., 90 degrees, from the sample port; and
5. If a threaded connection is used, both the internal and external threads should be coated with a high-temperature, anti-seize compound before the initial installation and at every subsequent re-installation to facilitate removal of the connection for testing.

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.

NOTICE

Establish a periodic maintenance plan according to the engine application and make sure to perform the required periodic maintenance at the 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 ●.

○: Check or Clean ◇: Replace ●: Contact your authorized YANMAR marine dealer or distributor

System	Item	Periodic maintenance interval					
		Daily *See Daily Checks on page 51*	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	Every 2000 hours or 8 years whichever comes first
Whole	Visual inspection of engine exterior	○ Before starting					
Fuel system	Check for fuel leakage	○ Before starting					
	Check the fuel level and refill if necessary	○ Before starting					
	Drain water and sediment from fuel tank			○			
	Drain the fuel filter/water separator If necessary	○					
	Replace the fuel fine filter			◇			
	Replace fuel filter/water separator element			◇			
	Check the fuel pump and fuel lines				●		
Lubricating system	Check the engine oil level and refill if necessary	○ Before starting					
	Change the engine oil and replace the oil filter element		◇ Initial 50	◇			
Cooling system - engine coolant	Visual inspection of cooling system	○ Before starting					
	Check coolant level and check for leaks	○ Before starting					
	Replace coolant	When Long Life Coolant (LLC) is used, replace every two years.					

○: Check or Clean ◇: Replace ●: Contact your authorized YANMAR marine dealer or distributor

System	Item	Periodic maintenance interval					
		Daily *See Daily Checks on page 51*	Every 50 hours or monthly which-ever comes first	Every 250 hours or one year which-ever comes first	Every 500 hours or 2 years which-ever comes first	Every 1000 hours or 4 years which-ever comes first	Every 2000 hours or 8 years which-ever comes first
Cooling system - seawater circuit	Visual inspection of cooling system	○ Before starting					
	Check the seawater outlet	○ Before starting					
	Check seawater pump belt for wear, replace if necessary			◇			
	Check seawater filter (if equipped) and inlet		○				
	Replace the anodes*			◇			
	Check or replace the seawater pump impeller			●			●
Air intake and exhaust system	Visual inspection	○ Before starting					
	Replace turbocharger heat shield			◇			
	Check the exhaust pipe	○					
	Check the air intake system		○				
	Check the exhaust/water mixing elbow			●			
	Replace the air filter element			●			

○: Check or Clean ◇: Replace ●: Contact your authorized YANMAR marine dealer or distributor

System	Item	Periodic maintenance interval					
		Daily *See Daily Checks on page 51*	Every 50 hours or monthly which-ever comes first	Every 250 hours or one year which-ever comes first	Every 500 hours or 2 years which-ever comes first	Every 1000 hours or 4 years which-ever comes first	Every 2000 hours or 8 years which-ever comes first
Electrical system	Check the electrolyte level in the battery (serviceable batteries only)		●				
	Check the wiring connectors	○ Before starting					
	Check alternator belt for wear, replace if necessary			○			●
Miscellaneous items	Check the alarm and indicators (if equipped)	○					
	Check or change power steering fluid	●		●			
	Check for water or oil leakage	○ Before starting					
	Check shift cable adjustment		● Initial 50	●			
	Adjust the propeller shaft alignment (if equipped with marine gear)		● Initial 50	●			
	Check hydraulic oil cooler			●			
	Check and replace rubberized hoses (fuel and water)			●			
	Check flexible engine mounts			○		●	

* Check anodes periodically. Any anode having less than half its original size remaining should be replaced - use this to establish a regular replacement interval.

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

Inspection and Maintenance of EPA Emission-Related Parts

Parts	Interval
Check fuel injection nozzle (cleaning)	1500 hours
Check fuel injection nozzle (adjustment)	3000 hours
Check fuel injection pump (adjustment)	
Check turbocharger (adjustment)	
Check electronic engine control unit (ECU) and its associated sensors and actuators	

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

PERIODIC MAINTENANCE PROCEDURES

Daily Checks

Before heading out 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

- Check the exterior of the engine for leaks, wear or damage.
- Check for engine oil leaks.
- Check for fuel leaks.
- Check for engine coolant leaks.
- Check for damaged or missing parts.
- Check for loose, missing, or damaged fasteners.
- Check the seawater inlet and outlet for blockage or damage.
- Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.
- Check hoses for cracks, abrasions, and damaged, loose or corroded clamps.

⚠ 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 27* and *Checking Engine Oil on page 33* to check these levels.

Checking the Battery Electrolyte Level

Check the battery electrolyte level before use. *See Checking the battery electrolyte level (serviceable batteries only) on page 54*.

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.

Checking Power Steering Fluid

See Checking Power Steering Fluid Level on page 34.

Draining the Fuel/Water Separator

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. 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 56*.

1. Turn engine OFF.
2. Ensure the fuel cock is closed.
3. Loosen the drain plug at the bottom of the fuel filter/water separator and drain off any water or sediment.
4. Dispose of waste properly.
5. Tighten the drain plug and open the fuel cock.

After Initial 50 Hours of Operation

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

- **Changing the engine oil and replacing the engine oil filter**
- **Checking shift cable adjustment**
- **Adjusting the propeller shaft alignment (if equipped with marine gear)**

■ Changing the engine oil and replacing the engine oil filter

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 engine OFF.
2. Remove engine cover.

NOTICE

Prevent dirt and debris from contaminating engine oil. Carefully clean the dipstick and the surrounding area before you remove the cap.

3. Loosen the engine oil filter cap (2, **Figure 1**) 1 - 2 turns with a socket wrench. Allow to sit a few minutes to allow oil to drain into crankcase.

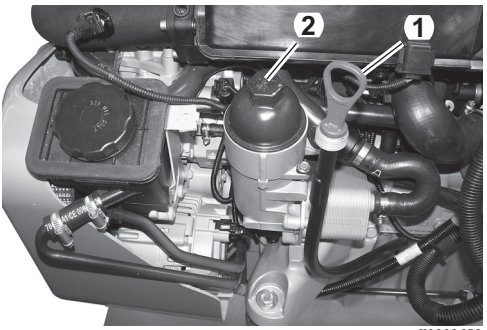


Figure 1

4. Remove the engine oil dipstick (1, **Figure 1**). Attach an oil drain pump and pump out the oil. Dispose of waste properly.
5. Remove the engine oil filter cap and filter assembly.
6. Remove the filter element from stem.
7. Replace the three O-rings (1, **Figure 2**) on the stem.

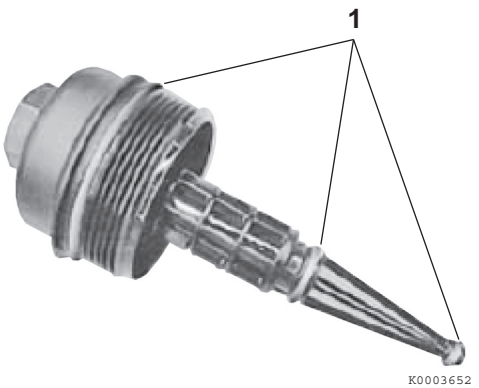


Figure 2

8. Install a new filter element. Ensure the filter fits snugly in the filter cap.

9. Install the cap and filter assembly. Tighten cap by hand until the seal touches the housing.
10. Tighten to 25 N·m (225 in.-lb).
11. 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 smoke, engine overspeed or internal damage.

12. Perform a trial run and check for oil leaks.
13. Approximately 10 minutes after stopping the engine, remove the oil dipstick and check the oil level. Add oil if the level is too low.

■ Checking shift cable adjustment

See your authorized YANMAR dealer or distributor.

■ Adjusting propeller shaft alignment (if equipped with marine gear)

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

This adjustment requires specialized knowledge and techniques. See your authorized YANMAR dealer or distributor.

Every 50 Hours of Operation

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

- **Checking seawater filter (if equipped) and inlet**
- **Checking the air intake system**
- **Checking battery electrolyte level (serviceable batteries only)**

■ Checking the seawater filter (if equipped) and inlet

Refer to boat builder's literature for information on the seawater filter.

■ Checking the air intake system

Check the air intake system for damage or wear. If necessary, consult your authorized YANMAR dealer or distributor for repair.

■ 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.

1. Turn the battery master switch OFF (if equipped) or disconnect the negative (-) battery cable.
2. Do not operate with insufficient battery electrolyte as the battery will be destroyed.

NOTICE

Never attempt to remove the covers or fill a maintenance-free battery.

3. Remove the caps and check the electrolyte level in all cells.
4. If the level is lower than the minimum fill level (1, **Figure 3**), fill with distilled water (2, **Figure 3**) (available locally) up to the upper limit (3, **Figure 3**) of the battery.

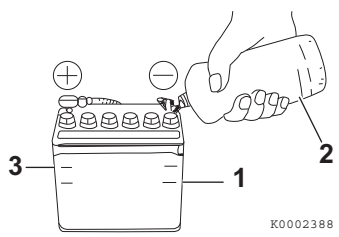


Figure 3

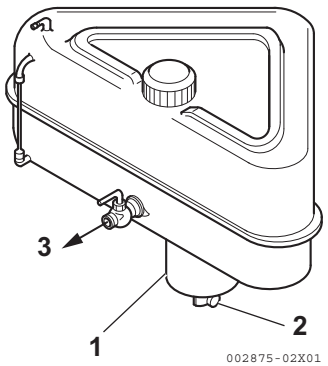
Note: The maximum fill level is approximately 10 - 15 mm (3/8 - 9/16 in.) above the plates. Battery fluid tends to evaporate in high temperatures, especially in summer. In such conditions, inspect the battery more often.

Every 250 Hours of Operation

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

- **Draining the fuel tank**
- **Replacing the fuel fine filter**
- **Replacing the fuel filter/water separator element**
- **Changing the engine oil and replacing the engine oil filter element**
- **Checking or replacing the seawater pump belt**
- **Replacing the anodes**
- **Checking or replacing the seawater pump impeller**
- **Replacing the turbocharger heat shield**
- **Checking the exhaust/water mixing elbow**
- **Replacing the air filter element**
- **Cleaning the turbocharger blower**
- **Checking or replacing the alternator belt**
- **Changing the power steering fluid**
- **Checking the shift cable adjustment**
- **Adjusting the propeller shaft alignment**
- **Checking the hydraulic oil cooler**
- **Checking or replacing rubber hoses**
- **Checking flexible engine mounts**

■ Draining the fuel tank



1 – Sediment bowl
2 – Drain cock
3 – Fuel line to engine

Figure 4

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

1. Turn engine OFF.
2. Put a container under the drain cock (2, **Figure 4**) to catch fuel.
3. Open the drain cock and drain water and sediment. Close the drain cock when the fuel is clean.
4. Dispose of waste properly.

■ Replacing the fuel fine filter

1. Disconnect the battery negative (-) cable.
2. Close the fuel tank cock.

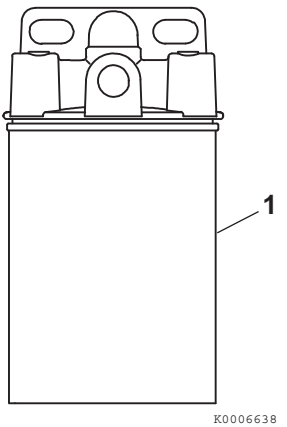


Figure 5

3. Unscrew and remove filter cartridge (1, **Figure 5**).
4. Replace rubber seal.
5. Replace filter.

NOTICE

When replacing fuel filters, always pre-fill them with fresh, clean fuel to improve the system's ability to be bled.

6. Hand-tighten cartridge to filter.
7. Connect battery negative (-) cable.
8. Bleed the fuel system and check for leaks. *See Bleeding the Fuel System on page 28*.

■ Replacing fuel filter/water separator element

Note: YANMAR supplies a water separating pre-filter separate from the engine. Location and type of filter may vary.

1. Disconnect the battery negative (-) cable.
2. Close the fuel tank cock.
3. Loosen the drain plug (4, **Figure 6**) on the bottom of the fuel filter/water separator and drain off any water or sediment.
4. Disconnect water sensor connector (1, **Figure 6**).
5. Turn the filter bowl (5, **Figure 6**) counterclockwise to remove.
6. Remove the old filter element.
7. Clean the filter bowl. Inspect the water sensor probe (1, **Figure 6**) for damage if equipped. Inspect the bowl seal (2, **Figure 6**).

NOTICE

When replacing fuel filters, always pre-fill them with fresh, clean fuel to improve the system's ability to be bled.

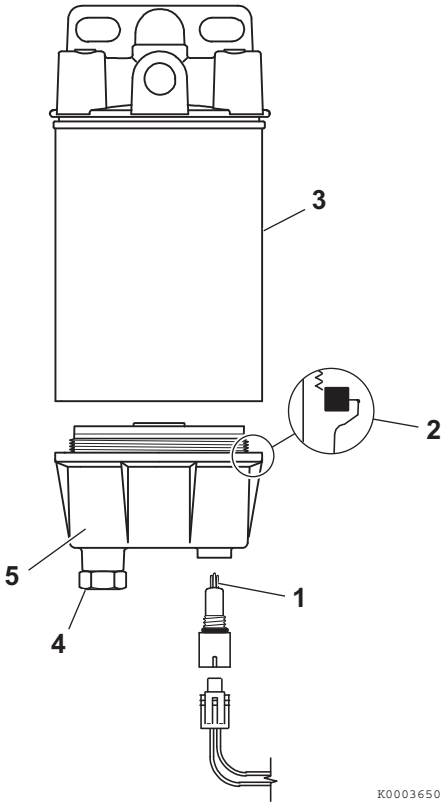


Figure 6

8. Lubricate the seal at the top of the new filter element (3, **Figure 6**) and install.
9. Lubricate the filter bowl seal (2, **Figure 6**) and install the filter bowl (5, **Figure 6**). Turn clockwise by hand to tighten.
10. Ensure drain plug (4, **Figure 6**) is securely tightened.
11. Connect water sensor connector (1, **Figure 6**) if equipped.
12. Open the fuel cock.
13. Connect the battery negative (-) cable.
14. Bleed air from the fuel system and check for leaks. *See Bleeding the Fuel System on page 28*.

■ Changing the engine oil and replacing engine oil filter element

To change engine oil and replace the engine oil filter element, see *Changing the engine oil and replacing the engine oil filter on page 53* .

■ Checking or replacing the seawater pump and alternator belts

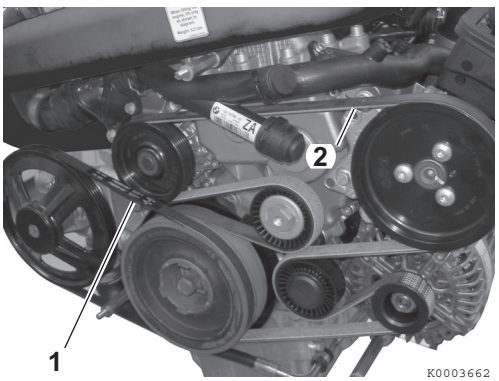


Figure 7

NOTICE

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

1. Disconnect battery negative (-) cable from the battery.
2. Remove belt guard.
3. Check the seawater pump belt (1, **Figure 7**) and alternator belt (2, **Figure 7**) for wear, cracks or damage.
4. Replace if necessary. See your authorized YANMAR dealer or distributor.
5. Install belt guard and connect battery negative (-) cable.

■ Replacing the zinc anodes

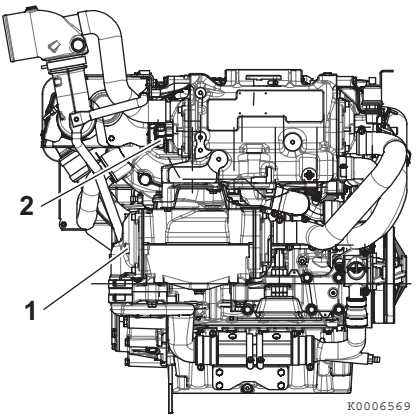


Figure 8

There are zinc anodes in the seawater cooling system and they should be inspected and replaced periodically.

Zinc anodes are located in the heat exchanger (1, **Figure 8**) and the charge air cooler (2, **Figure 8**). An additional zinc anode may also be located in the exhaust/water mixing elbow.

1. Disconnect battery negative (-) cable.
2. Remove each anode and inspect for corrosion. Any anode having less than half its original size remaining should be replaced.

   ### *NOTICE*

   Never use thread sealer or thread sealing tape when installing zinc anodes. Anodes must make good metal-to-metal contact to perform properly.

3. Install each anode using a new copper gasket and tighten to 25 N·m (18 ft-lb).
4. Start engine and check for water leaks.

■ Checking or replacing the seawater pump impeller

See your authorized YANMAR dealer or distributor.

■ Replacing the turbocharger heat shield

See your authorized YANMAR dealer or distributor.

■ Checking exhaust/water mixing elbow

See your authorized YANMAR dealer or distributor.

■ Replacing air filter element

1. Turn engine OFF.
2. Remove engine cover.
3. Remove clamp (1, **Figure 9**).

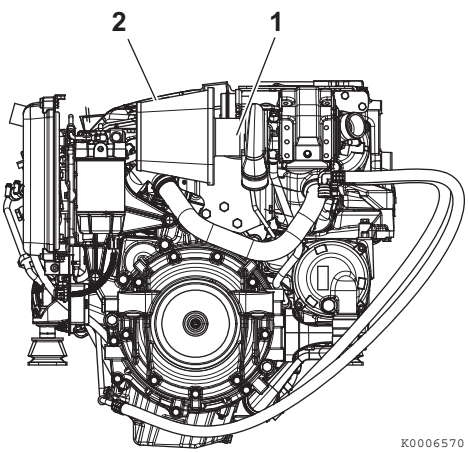


Figure 9

4. Remove air filter (2, **Figure 9**).
5. Replace air filter.

■ Cleaning the turbocharger blower

See your authorized YANMAR dealer or distributor.

■ Checking or replacing alternator belt

See Checking or replacing the seawater pump and alternator belts on page 58.

■ Changing power steering fluid

See your authorized YANMAR dealer or distributor.

■ Checking shift cable adjustment

See Checking shift cable adjustment on page 54.

■ Adjusting the propeller shaft alignment

See Adjusting propeller shaft alignment (if equipped with marine gear) on page 54.

■ Checking hydraulic oil cooler

See your authorized YANMAR dealer or distributor.

■ Checking or replacing rubber hoses

Check rubber water and fuel hoses for wear or damage. See your authorized YANMAR dealer or distributor for replacement.

■ Checking or replacing flexible engine mounts

Check the flexible engine mounts for wear or damage. See your authorized YANMAR dealer or distributor for replacement.

Every 500 Hours of Operation

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

- **Checking the fuel pump and fuel lines**
- **Draining and refilling closed cooling system (engine coolant)**

■ Checking the fuel pump and fuel lines

See your authorized YANMAR dealer or distributor.

■ Draining and refilling closed cooling system (engine coolant)

1. Disconnect battery negative (-) cable.
2. Remove the engine cover.
3. Remove the coolant pressure cap from heat exchanger.
4. Remove the heat exchanger to access the cylinder block drain plug behind it.

   *Note: The charge air cooler has been removed for clarity of **(Figure 10)**.*

5. Remove drain plug (1, **Figure 10**) from the engine block. Allow coolant to drain into a container of appropriate size.

⚠ WARNING

Never remove the coolant filler cap if the engine is hot. Steam and hot engine coolant will escape and seriously burn you. Allow the engine to cool before attempting to remove the filler cap.

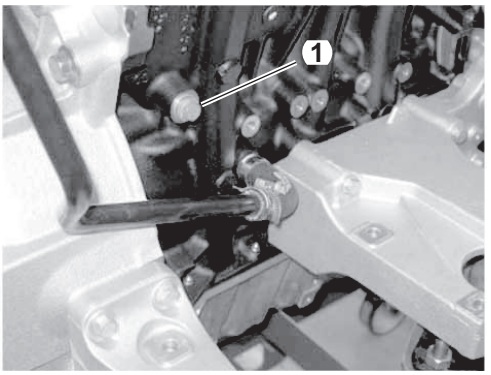


Figure 10

6. Install cylinder block drain plug with a new gasket.
7. Install heat exchanger. Ensure the drain cock (1, **Figure 11**) on the heat exchanger is closed.

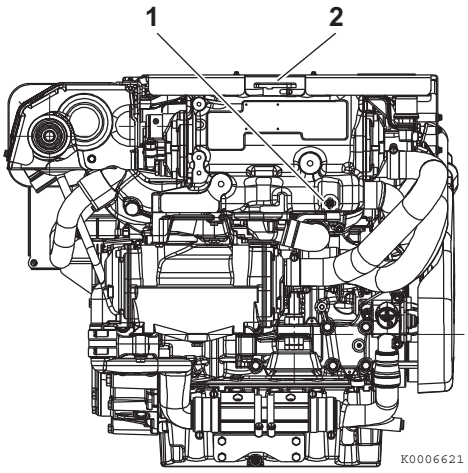


Figure 11

8. Remove the pressure cap (2, **Figure 11**) from the heat exchanger.
9. Inspect the cap gasket and flange on the filler neck for damage. Replace if necessary.
10. Check the rubber hose connecting the reservoir to the heat exchanger. Be sure the hose is securely connected and there is no damage.
11. Fill the heat exchanger and reservoir with approved coolant mix.*See Adding engine coolant on page 36*.

Every 1000 Hours of Operation

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

- **Checking flexible engine mounts**

■ Checking flexible engine mounts

Check flexible engine mounts for damage, cracks or wear. See your authorized YANMAR marine dealer or distributor for replacement.

Every 2000 Hours of Operation

Perform the following maintenance every 2000 hours of operation or every 8 years, whichever comes first.

- **Replacing seawater pump impeller**
- **Replacing alternator belt**

■ Replacing seawater pump impeller

See your authorized YANMAR marine dealer or distributor for replacement.

■ Replacing alternator belt

See your authorized YANMAR marine dealer or distributor for replacement.

TROUBLESHOOTING

SAFETY PRECAUTIONS

Before performing any troubleshooting procedures within this section, review the *Safety* section on page *3*.

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 smoke color normal?

The continuous emission of black smoke indicates engine overloading. This shortens the engines 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 alarm lamps and stop the engine for repairs.

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

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 28*.

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 to race the engine will result in poor smoke 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 INFORMATION

If the engine does not operate properly, refer to the *Troubleshooting Chart on page 66* 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 speed (min^{-1})
  - Color of 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

TROUBLESHOOTING CHART

Starting Trouble

Problem/Symptom	Cause	Action
Engine will not crank	Discharged battery	Charge/replace battery
	Blown fuse	Replace fuse
	Defective starter motor	See your authorized YANMAR dealer or distributor
	Loose wiring connections	Tighten connections
	Electrical panel power circuit breaker is tripped	Reset circuit breaker
Engine cranks but will not start	No fuel to engine	Check fuel level in tank
		See your authorized YANMAR dealer or distributor
	No fuel to cylinders	Check fuel filter/water separator
		Clean or replace clogged fuel fine filter
		Bleed air from fuel system
		Replace blown fuse (F3)
		See your authorized YANMAR dealer or distributor
	Low ambient temperature	See your authorized YANMAR dealer or distributor
	Oil high	Replace with correct viscosity oil for operating conditions

Smoke Color

Problem/Symptom	Cause	Action
White smoke	Cold engine	Allow engine to warm to operating temperature
		See your authorized YANMAR dealer or distributor
	Incorrect fuel	Replace fuel with correct type
	Defective (leaking) fuel injector	See your authorized YANMAR dealer or distributor
	Injection timing is incorrect	
White smoke with water vapor	Leaking cylinder head gasket	See your authorized YANMAR dealer or distributor
	Leaking charge air cooler	
	Cracked cylinder head	
	Cracked cylinder	
Blue smoke	Worn piston rings/cylinders	See your authorized YANMAR dealer or distributor
	Oil leak in turbocharger (oil present in intake manifold)	
	Damaged piston cooling nozzles	
Black smoke under load	Clogged intake air filter	Replace or clean as necessary
	Incorrect valve timing	See your authorized YANMAR dealer or distributor
	Defective (leaking) fuel injector	
	Low charge air pressure	Clean or replace clogged air filter
		See your authorized YANMAR dealer or distributor
	Excessive exhaust back pressure	See your authorized YANMAR dealer or distributor
	Plugged intake port(s)	See your authorized YANMAR dealer or distributor

Vibration - Drive Disengaged

Problem/Symptom	Cause	Action
Rough at all engine speeds	Air in fuel system	Bleed fuel system
	Faulty fuel injector	See your authorized YANMAR dealer or distributor
	Leaking cylinder head gasket	
	Damaged intake or exhaust valves	
	Incorrect injection pressure	

Vibration - Drive Engaged

Problem/Symptom	Cause	Action
Rough at all speeds	Engine and propeller shaft misaligned	See your authorized YANMAR dealer or distributor
	Leaking cylinder head gasket	
	Bent propeller shaft	
Rough at higher speeds	Bent propeller	See your authorized YANMAR dealer or distributor
	Slipping clutch/clutch dog	
	Incorrect injection pressure	
	Injection timing is incorrect	

Engine Knocks

Problem/Symptom	Cause	Action
Excess fuel injected	Defective fuel injector	See your authorized YANMAR dealer or distributor
	High fuel injection pressure	
Noise changes with engine load	Incorrect or poor quality fuel	Drain and refill tank with proper fuel
	Worn crankshaft/bearings	See your authorized YANMAR dealer or distributor
	Broken piston/rings	

Low Power Output

Problem/Symptom	Cause	Action
Miscellaneous	Clogged air filter	Replace air filter
	Leaking cylinder head gasket	See your authorized YANMAR dealer or distributor
	Damaged turbocharger	
	Incorrect propeller	
	Excessive exhaust back pressure	
Fuel	Plugged fuel filter(s)	Replace as necessary
	Faulty fuel supply pump	See your authorized YANMAR dealer or distributor
Low fuel injection pressure	Defective fuel pressure regulator/sensor	See your authorized YANMAR dealer or distributor
	Worn high-pressure fuel pump	
	Injection timing is incorrect	
Low engine speed at wide open throttle	Propeller pitch too great	See your authorized YANMAR dealer or distributor
	Engine overheated	
	Damaged turbocharger	

Engine Overheat

Problem/Symptom	Cause	Action
Instrument shows high temperature	Clogged seawater inlet	Clean
	Low coolant level	Fill with coolant/inspect for leaks
	Clogged seawater filter (if equipped)	Clean
	Clogged hydraulic cooler	See your authorized YANMAR dealer or distributor
	Seawater pump worn or damaged	
	Defective sensor/instrument	
	Defective thermostat	
	Damaged closed coolant pump	
	Combustion gas leakage (causes loss of coolant)	
	Seawater pump belt slips or pump pulley loose on pump shaft	
	Clogged heat exchanger	

Engine Runs Cold

Problem/Symptom	Cause	Action
Instrument shows low temperature	Defective sensor/instrument	See your authorized YANMAR dealer or distributor
	Defective thermostat	
	Cabin heater or boiler too large	

Coolant Loss

Problem/Symptom	Cause	Action
Repeated low coolant level	Defective cylinder head gasket (external leakage)	See your authorized YANMAR dealer or distributor
	External leakage at connection	
Coolant forced out of coolant recovery tank	Turbocharging pressure enters cooling system via leaking charge air cooler	See your authorized YANMAR dealer or distributor
	Defective cylinder head gasket (internal leakage)	
White smoke when engine hot indicates water vapor	Crack in cylinder head (not cracks between valve seats)	See your authorized YANMAR dealer or distributor
	Cracked cylinder wall	
	Leaking cylinder head gasket	

DIAGNOSTIC TROUBLE CODES

When certain faults occur, or when certain limits have been exceeded, the engine ECU may generate a “Check Engine” warning or turn on a check engine light (if equipped). Some of these faults may also generate a DTC or Diagnostic Trouble Code and an audible alarm. If a DTC is generated, the engine ECU will store that code or codes for reference. To read the DTC codes, a special tool is used by the technician. The technician then can use a list to more quickly find the cause of the fault and correct it.

Some conditions will produce an alarm but do not generate a trouble code. An example is engine overheat (over 108 °C) caused by an obstructed seawater inlet. The overheat alarm will sound and the engine torque will be reduced to protect the engine, but no code will be set.

Under some conditions, the warning alarm will sound until the fault code is checked and corrected. Under other conditions, the alarm will be canceled if the engine is turned off and then restarted.

For further information, please contact your authorized YANMAR distributor or dealer.

Diagnostic Trouble Code Table

Code	Part or system	Mode	Run or condition	engine can start	Check engine alarm
No code	Coolant temp	Under 0 °C (32 °F)	1000 min^{-1}	Yes	No
No code	Coolant temp	Over 108 °C (226 °F)	Reduce	Yes	No
No code	Coolant temp	Over 110 °C (230 °F)	Reduce	Yes	Alarm
No code	Charge air temp	Over 110 °C (230 °F)	Reduce	Yes	No
No code	Boost pressure reading	4BY2 - over 1.9 bar (27.5 PSI) (relative*) or 2.9 bar (42.0 PSI) (absolute**) 6BY2 - over 2.3 bar (33.3 PSI) (relative*) or 3.3 bar (42.9 PSI) (absolute**)	Reduce	Yes	Alarm
No code	Fuel temperature	Over 90 °C (194 °F)	Reduce	Yes	No
No code	Neutral switch	Only in case of analog throttle or in case of CAN-fault (U0001), wrong configuration - neutral position	No	No	Alarm
P0001	Fuel metering unit	Not connected	Reduce	Yes	Alarm
P0003	Fuel metering unit	Short circuit to ground	No	No	Alarm
P0004	Fuel metering unit	Short circuit to B+	Reduce	Yes	Alarm
P0087	Rail pressure governor deviation	Fuel rail pressure out of range	Reduce or shut off	Depends on fault	Alarm
P0088	Rail pressure governor deviation	Fuel rail pressure out of range	Reduce or shut off	Depends on fault	Alarm
P0089	Rail pressure governor deviation	Fuel rail pressure out of range	Yes	Yes	Alarm
P0090	Fuel pressure control valve	Not connected	No	No	Alarm
	Rail pressure governor deviation	Fuel rail pressure out of range	Reduce	Yes	Alarm
P0091	Fuel pressure control valve	Short circuit to ground	Reduce	Yes	Alarm
P0092	Fuel pressure control valve	Short circuit to B+	No	No	Alarm
P0112	Charge air temp	Over 125 °C (257 °F)	Reduce	Yes	Alarm
	Charge air temp sensor	Short circuit to B+	Reduce	Yes	Alarm
P0113	Charge air temp	Under -20 °C (-4 °F)	Reduce	Yes	Alarm
	Charge air temp sensor	No connection/short circuit to ground	Reduce	Yes	Alarm
P0117	Coolant temp sensor	Short circuit to B+	Reduce	Yes	Alarm
P0118	Coolant temp sensor	No connection/short circuit to ground	Reduce	Yes	Alarm

Code	Part or system	Mode	Run or condition	engine can start	Check engine alarm
P0122	Throttle signal	Both throttle signals are missing/short circuit to ground	1600	Yes	Alarm
	Throttle signal	Throttle signal 1 is missing/short circuit to ground	Reduce	Yes	Alarm
P0123	Throttle signal	Both throttle signals are short circuited to B+	1600	Yes	Alarm
	Throttle signal	Throttle signal 1 short circuit to B+	Reduce	Yes	Alarm
P0182	Fuel temperature sensor	Short circuit to B+	Reduce	Yes	Alarm
P0183	Fuel temperature sensor	No connection/short circuit to Ground	Reduce	Yes	Alarm
P0192	Fuel rail pressure sensor	Short circuit to ground	Reduce	Yes	Alarm
P0193	Fuel rail pressure sensor	No connection/short circuit B+	Reduce	Yes	Alarm
P0201	Injector No. 1	Open circuit/short circuit to Ground	Reduce	Yes	Alarm
P0202	Injector No. 2	Open circuit/short circuit to Ground	Reduce	Yes	Alarm
P0203	Injector No. 3	Open circuit/short circuit to Ground	Reduce	Yes	Alarm
P0204	Injector No. 4	Open circuit/short circuit to Ground	Reduce	Yes	Alarm
P0205	Injector No. 5	Open circuit/short circuit to Ground	Reduce	Yes	Alarm
P0206	Injector No. 6	Open circuit/short circuit to Ground	Reduce	Yes	Alarm
P0222	Throttle signal	Both throttle signals are missing/short circuit to Ground	1600	Yes	Alarm
	Throttle signal	Throttle signal 2 is missing/short circuit to ground	Reduce	Yes	Alarm
P0223	Throttle signal	Both throttle signals are short circuited to B+	1600	Yes	Alarm
	Throttle signal	Throttle signal 2 short circuited to B+	Reduce	Yes	Alarm
P0230	Fuel feed pump	Not connected	No	No	Alarm
P0231	Fuel feed pump	Short circuit to ground	Reduce	Yes	Alarm
P0232	Fuel feed pump	Short circuit to B+	No	No	Alarm
P0236	Boost pressure	Plausibility check with APS (ambient air pressure sensor) fail	Reduce	Yes	Alarm

Code	Part or system	Mode	Run or condition	engine can start	Check engine alarm
P0237	Boost pressure	Under 0.5 bar (7.3 PSI) (absolute**)	Reduce	Yes	Alarm
	Boost pressure sensor	No connection/short circuit to ground	Reduce	Yes	Alarm
P0238	Boost pressure	4 bar (58.0 PSI) (absolute**)	Reduce	Yes	Alarm
	Boost pressure sensor	Short circuit to B+	Reduce	Yes	Alarm
P0243	Turbocharger positive boost pressure deviation	Leakage in the air routing (hole in the charge air pipe)	Yes	Yes	Alarm
P0261	Injector No. 1	Short circuit to B+	Reduce	Yes	Alarm
P0264	Injector No. 2	Short circuit to B+	Reduce	Yes	Alarm
P0267	Injector No. 3	Short circuit to B+	Reduce	Yes	Alarm
P0270	Injector No. 4	Short circuit to B+	Reduce	Yes	Alarm
P0273	Injector No. 5	Short circuit to B+	Reduce	Yes	Alarm
P0276	Injector No. 6	Short circuit to B+	Reduce	Yes	Alarm
P0299	Turbocharger negative boost pressure deviation	Boost pressure actuator is sticking defect waste gate hose	Yes	Yes	Alarm
P0344	Crankshaft speed sensor	Disagreement between camshaft speed sensor and crankshaft speed sensor	No	No	Alarm
P0380	Glow control relay actuator	Not connected, short circuit	Yes	Yes	Alarm
P0562	System voltage low	–	Yes	No	Alarm
P0563	System voltage high	–	Yes	Yes	Alarm
P0602	Control module programming error (hwemon)	Overvoltage/undervoltage	No	No	Alarm
	Shut off path	Control module programming error	No	No	Alarm
P0607	Injector chip fault	Injector control module performance	No	No	Alarm
P0642	Sensor supply monitoring 1	Short circuit	Reduce	Yes	Alarm
P0643	Sensor supply monitoring 1	Short circuit	Reduce	Yes	Alarm
P0650	Check engine lamp	Not connected, short circuit	Yes	Yes	Alarm
P0652	Sensor supply monitoring 2	Short circuit	Reduce	Yes	Alarm
P0653	Sensor supply monitoring 3	Short circuit	Reduce	Yes	Alarm

Code	Part or system	Mode	Run or condition	engine can start	Check engine alarm
P0670	Glow plug control module	Failure, short circuit, over-current	Yes	Yes	Alarm
P0671	Glow system - glow spark No. 1	Not connected, short circuit	Yes	Yes	Alarm
P0672	Glow system - glow spark No. 2	Not connected, short circuit	Yes	Yes	Alarm
P0673	Glow system - glow spark No. 3	Not connected, short circuit	Yes	Yes	Alarm
P0674	Glow system - glow spark No. 4	Not connected, short circuit	Yes	Yes	Alarm
P0675	Glow system - glow spark No. 5	Not connected, short circuit	Yes	Yes	Alarm
P0676	Glow system - glow spark No. 6	Not connected, short circuit	Yes	Yes	Alarm
P0689	Main relay	Power relay sense short circuit low	No	No	Alarm
P0690	Main relay	Power relay sense short circuit high	No	No	Alarm
P2049	4BY2 - Injector bank 1	Short circuit on high side to ground/B+	No	No	Alarm
	6BY2 - Injector bank 1	Short circuit on high side to ground/B+	Reduce	No	Alarm
P2052	4BY2 - Injector bank 2	Short circuit on high side to ground/B+	Reduce	Yes	Alarm
	6BY2 - Injector bank 2	Short circuit on high side to ground/B+	Reduce	Yes	Alarm
P2227	Atmospheric pressure	Plausibility check with BPS (boost pressure sensor) fail	Yes	Yes	Alarm
P2228	Atmospheric pressure	Short circuit low	Yes	Yes	Alarm
P2229	Atmospheric pressure	Short circuit high	Yes	Yes	Alarm
P2614	Camshaft speed sensor	No connection/short circuit	Reduce	Yes	Alarm
P2617	Crankshaft speed sensor	No connection/short circuit	No	No	Alarm
U0001	CAN throttle signal	No signal	Idle	Yes	Alarm
U0106	Glow control unit	No communication error	Yes	Yes	Alarm
U0426	Immobilizer	Manipulation error	No	No	Alarm

* Relative value is the value read on a pressure gauge attached to the intake pipe.

** Absolute is the value reported by the ECU and displayed at the helm digital display.

LONG-TERM STORAGE

If the engine is not to be used for an extended period of time, special measures should be taken to protect the coolant system, fuel system and combustion chambers from corrosion and the exterior from rusting. It is recommended that you see your authorized YANMAR marine dealer or distributor to prepare the engine for long-term storage.

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

Winter Storage

Drain water from fuel tank and fuel filters before and after extended storage.

To reduce the risk of condensation in the fuel tank during winter storage, fill the tank with fuel and treat with diesel fuel stabilizer.

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.

1. Change engine oil and filter.
2. Drain seawater cooling system. *See Draining the Seawater Cooling System on page 76*.
3. Wipe off any dust or oil from the outside of the engine.
4. Drain fuel tank or fill the tank to prevent condensation.
5. Grease the exposed areas and joints of the remote control cables and the bearings of the remote control handle.
6. Seal the intake silencer, exhaust pipe, etc. to prevent moisture or contamination from entering engine.
7. Completely drain bilge in hull bottom.
8. Waterproof the engine room to prevent rain or seawater from entering.
9. Charge the battery once a month to compensate for battery's self-discharge.

10. Remove key from key switch and cover key switch with moisture cap (if equipped).

Draining the Seawater Cooling System

⚠ CAUTION

- **Do not drain the coolant system. A full coolant system will prevent corrosion and frost damage.**
- **If seawater is left inside of the engine, it may freeze and damage parts of the cooling system when the ambient temperature is below 0 °C (32 °F).**

NOTICE

If water fails to drain from any open drain cock or port, remove the cock completely and probe the opening with a small piece of wire to loosen debris.

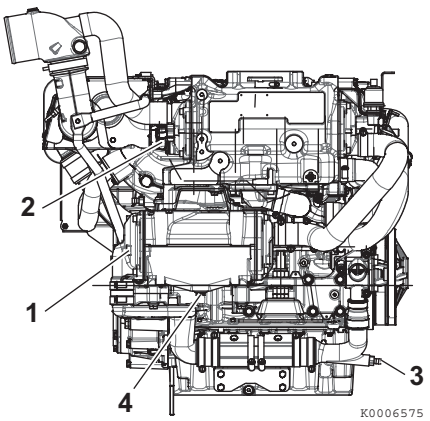


Figure 1

⚠ WARNING

Never drain the seawater cooling system if the engine is hot. Steam and hot fluid will escape and seriously burn you. Allow the engine to cool before attempting to opening the drain cocks.

1. Open the lower seawater drain cock (3, **Figure 1**) located in the piping between the seawater pump and hydraulic oil cooler. Allow to drain.
2. Open the drain cock (4, **Figure 1**) on the bottom of the charge air cooler.
3. Remove the seawater pump cover. See your authorized YANMAR dealer or distributor.
4. Remove zinc anodes from the heat exchanger (2, **Figure 1**) and charge air cooler (1, **Figure 1**) and allow water to drain from housings.
5. Inspect condition of zinc anodes. Install anodes. *See Replacing the zinc anodes on page 58*.

   ### *NOTICE*

   Do not use thread sealer or thread sealing tape when installing zinc anodes. Anodes must make good metal-to-metal contact to perform properly.

6. Close all drain cocks.

SPECIFICATIONS

Engine model	4BY3-150/150Z	4BY3-180/180Z	6BY3-220/220Z	6BY3-260/260Z	6BY3-160
Application design	Models numbers with no suffix letter are used in marine gear Models having a “Z” suffix are used with stern drive.				Marine gear
Number of cylinders	In-line 4		In-line 6		
Type	15° inclined, water-cooled, dual overhead camshaft, 4-cycle diesel				
Combustion system	Direct injection				
Aspiration	Turbocharged with charge air cooler				
Bore × stroke	84 mm × 90 mm (3.307 in. × 3.543 in.)				
Displacement	1.995 l (122 cu in.)		2.993 l (183 cu in.)		
Firing order*	1-3-4-2		1-5-3-6-2-4		
Compression ratio	16.5:1		16.5:1		
Continuous power (at crankshaft**)/engine speed kW/min-1	100/3876	120/3876	148/3876	174/3876	107/2714
Fuel stop power (at crankshaft**)/engine speed kW/min-1	110/4000 (150 hp)	132/4000 (180 hp)	162/4000 (220 hp)	191/4000 (260 hp)	117/2800 (160 hp)
Low idle speed (warm engine @ 88 °C [190 °F])	750 min-1 (ECU-controlled)***		670 min-1 (ECU-controlled)***		
Cold start speed @ 20 °C (68 °F)	1200 min-1 gradually decreasing to warm engine idle @ 88 °C (190 °F) (ECU-controlled)				
High idle speed	4600 min-1				3200 min-1
Rotation direction	Counterclockwise (viewed from flywheel)				
No. of valves per cylinder	4				
Valve adjustment	Hydraulic self-adjusting				
Turbocharger	MHI with pneumatic wastegate		HOLSET with pneumatic wastegate		
Charge air cooler	Seawater cooled				
Electrical system	12 V				

SPECIFICATIONS

Engine model	4BY3-150/150Z	4BY3-180/180Z	6BY3-220/220Z	6BY3-260/260Z	6BY3-160
Starter	12V/2kW (2,7 hp)				
Charging system	12V/150A				
Battery capacity: (recommended)	12 V/85 Ah/680CCA (cold cranking amps)				
Fuel injection system	Common rail (ECU - controlled)				
Fuel injection timing	Variable depending on engine speed: 250 - 1600 bar				
ECU threshold voltage	7,8V				
Cooling system	Closed cooling system with seawater heat exchanger				
Cooling capacity (approximate)	10 Liter (10,6 qt)		13 liter (13,7 qt)		
Seawater pump	Rubber impeller, belt driven				
Capacity	165 liter / min				150 liter/min
Maximum lift	2000 mm (78,75in.)				
Hydraulic oil cooler	Seawater cooled				
Lubrication system	Totally enclosed, forced lube system				
Oil cooler	Engine coolant system				
Engine oil pressure at 4000 min-1	3,5 - 6,0 bar (51 - 87 PSI)				-
Engine oil pressure at 1000 min-1	0,6 - 1,0 bar (8,7 - 14,5 PSI)				
Engine oil capacity	8,0 liter (8,5 qt) ****		11,0 liter (11,5 qt) ****		
Crankcase ventilation	Closed, with filter				
Drive options	-				
Stern drive	ZT370 or MerCuiser Bravo-1, -2, -3				-
Marine gear	KMH41A		KMH51A, KMH50V		KMH51A
Operation angle	-				
Continuous	Front to rear: -5 to 20 degree, Side to side: 20 degree				
Peak	Front to rear: -5 to 25 degree, Side to side: 30 degree				
Height	721 mm (28,4 in.)				
Length (without gear)	-				
Stern drive (front to middle of engine mount)	736,5 mm (30,0 in.)		942 mm (37,1 in.)		
Marine gear (front to marine gear mounting face)	644 mm (25,4 in.)		827,5 mm (32,6 in.)		
Overall length	839,2mm (33,0 in.)		1001 mm (39,4 in.)		
Width	670 mm (26,4 in.) (Local exceeding)				

Engine model		4BY3-150/150Z	4BY3-180/180Z	6BY3-220/220Z	6BY3-260/260Z	6BY3-160
Weight (without marine gear)		-				
	Dry (without mixing elbow)	Stern drive: 273,5 kg (603 lb) Marine gear: 262,5 kg (575,7 lb)		Stern drive: 338 kg (745 lb) Marine gear: 319 kg (703 lb)		319 kg (703 lb)

* Cylinder numbering starts at the coolant pump end of the engine.

** Rating condition: ISO 8665, temperature of fuel: 40°(104 °) at engine inlet.
1 hp (metric horsepower) =0.7355kW
Fuel condition: Density at 15 °C (59°F) + 0.840 g/cm3

*** 1080 min-1 at startup for alternator excitation

**** The " Total engine lubricating oil capacity " includes oil in the oil pan, channels, coolers, and filter. The "Effective engine lubricating capacity " indicates the difference in the maxmum scale of the dipstick and minimum scale.

***** Capacity may very depending on installation angle.

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EPA WARRANTY USA ONLY

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

The following EPA Warranty only applies to engines built on or after January 01, 2006 and labeled with the proper nameplate.

THIS EMISSION WARRANTY APPLIES TO THE ENGINES CERTIFIED TO UNITED STATES EPA 40 CFR Part 1042.135 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.

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**.

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.

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.

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 America Corporation, Marine Engine Division for assistance.

Yanmar America Corporation,
Marine Engine Division
101 International Parkway
Adairsville, GA 30103
USA Telephone: 770-877-9894
Fax: 770-877-7567
Website: us.yanmar.com
E-mail: CS_support@yanmar.com
Toll Free Telephone Numbers:
1-855-416-7091
1-800-872-2867

Maintenance Log

Date	Operating hours	Maintenance performed	Dealer name	Stamp or signature

Date	Operating hours	Maintenance performed	Dealer name	Stamp or signature

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: 1-9 **Town:** Tsuruno-cho, 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: Germanisher Lloyd

Street: Vorsetzen 32/35 **Town:** Hamburg

Post Code: 20459 **Country:** Germany **ID Number:** 0098

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: 2004/108/EC

DESCRIPTION OF ENGINE(s) AND ESSENTIAL REQUIERMENTS

Engine Type:
- ☐ z or sterndrive without integral exhaust
- ☒ Inboard engine

Fuel Type:
- ☒ Diesel
- ☐ Petrol

Combustion cycle:
- ☐ 2 stroke
- ☒ 4 stroke

Essential requirements	Standards Used	Other normative document used	See technical file
Annex I.B – Exhaust Emissions			
engine identification			
exhaust emission requirements	EN ISO 8178-1:1996		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)
Engine family name	35626-06 HH
Model name	
4BY150	
4BY180	
6BY220	
6BY260	
4BY2-150	
4BY2-180	
6BY2-220	
6BY2-260	
4BY3-150	
4BY3-180	
6BY3-220	
6BY3-260	
6BY3-140	
6BY3-160	

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: Mitsuo Kaji **Signature and title:** M. Kaji

(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative) (or an equivalent marking)

Chief Manager
Development Dept.
Marine Operations Division
Yanmar Co.,Ltd.

Date: (yr/month/day) 2013/ 07 / 10

Declaration of Conformity for Recreational Craft Propulsion Engine with the Exhaust and Noise emission requirements of Directive 94/25/EC as amended by 2003/44/EC

(To be completed by manufacturer of outboard or inboard engines with integral exhaust)

Name of engine manufacturer: Yanmar Co., Ltd.

Street: 1-9 **Town:** Tsuruno-cho, Kitaku, Osaka-City

Post Code: 530-8311 **Country:** Japan

Name of Authorised Representative (if applicable): 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: Germanischer Lloyd

Street: Vorsetzen 32/35 **Town:** Hamburg

Post Code: 20459 **Country:** Germany **ID Number:** 0098

Name of Notified Body for noise emission assessment: DCI Dutch Certificate Institute

Street: Nipkowweg 9 **Town:** Joure

Post Code: 8500 AB **Country:** The Netherlands **ID Number:** 0613

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**

Module used for noise emission assessment: Aa ☒ G ☐ H ☐

Other Community Directives applied: 2004/108/EC

DESCRIPTION OF ENGINE(S) AND ESSENTIAL REQUIERMENTS

Engine Type:
☐ Inboard engine
☒ z or sterndrive with integral exhaust

Fuel Type:
☒ Diesel
☐ Petrol

Combusion cycle:
☐ 2 stroke
☒ 4 stroke

Essential requirements	Standards Used	Other normative document used	See technical file
Annex I.B – Exhaust Emissions			
engine identification (I.B.1)			☐
exhaust emission requirements	EN ISO 8178-1:1996		☒
durability			☐
owner's manual			☐
Annex I.C – Noise Emissions			
Noise emission levels (I.C.1)	EN ISO 14509		☒
owner's manual (I.C.2)			☐

ENGINE(S) COVERED BY THIS DECLARATION

Engine model(s) or engine family name(s):	EC Type certificate number (exhaust)
Family name BY	35626-06 HH
Model name	
4BY150Z	
4BY180Z	
6BY220Z	
6BY260Z	
4BY2-150Z	
4BY2-180Z	
6BY2-220Z	
6BY2-260Z	
4BY3-150Z	
4BY3-180Z	
6BY3-220Z	
6BY3-260Z	

I declare on behalf of the engine manufacturer that the engine(s) mentioned above complie(s) with all applicable essential requirements in the way specified and is in conformity with the type for which above mentioned EC type examination certificate(s) has been issued.

Name: Mitsuo Kaji **Signature and title:** M. Kaji

(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative) (or an equivalent marking)

Senior Manager
Small Marine Engine Development Dept.
Marine Operations Division
Yanmar Co.,Ltd.

Date: (yr/month/day) 2012 / 04 / 20

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California
Proposition 65 Warning

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

California
Proposition 65 Warning

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

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:

OPERATION MANUAL	Model	4BY3-150, 4BY3-150Z, 4BY3-180, 4BY3-180Z 6BY3-220, 6BY3-220Z, 6BY3-260, 6BY3-260Z
	Code	0ABY0-M00301

MARINE ENGINES

YANMAR

YANMAR CO., LTD.
http://www.yanmar.com
0ABY0-M00301