

OPERATION MANUAL

MARINE PROPULSION ENGINE

6AYM

6AYM-WGT

6AYM-WET

6AYM-WST





YANMAR MARINE DIESEL ENGINE OPERATION MANUAL

Thank you for purchasing a YANMAR Marine Diesel Engine.

[INTRODUCTION]

- This Operation Manual describes the operation, maintenance and inspection of the YANMAR marine diesel engine.
- Read this Operation Manual carefully before operating the engine to ensure that the engine is used correctly and that it stays in the best possible condition.
- 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 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 such differences, please contact your authorized YANMAR dealer or distributor.
- The specifications and components (instrument panel, fuel tank, etc) described in this manual may differ from the ones installed on your vessel.
 Please refer to the manual provided by the manufacturer of these components.

In case of exporting this product and providing the related technical material to non-residents in Japan or residents overseas, it is required to comply with the export and trade control laws and regulations of Japan and other relevant countries.

Please be sure to follow the necessary procedure.

OPERATION MANUAL	MODEL	6AYM-WGT, 6AYM-WET, 6AYM-WST
OF ERATION WANDAL	CODE	0A6AY-EN0046

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FOR YOUR SAFETY

Following the precautions described in this manual will enable you to use this engine with complete satisfaction. Failure to observe any of the rules and precautions, however, may result in injury, burns, fires and engine damage. Read this manual carefully and be sure you fully understand it before beginning operation.

Safety Symbols

These are the warning signs used in this manual and on the product.



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.

A WARNING

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

A 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

Safety precautions for operation

▲ DANGER

Burns from steam

- Never remove the filler cap from the coolant tank while the engine is still hot.
 Steam and hot air will spurt out and seriously burn you.
- After engine stop, wait until the water temperature drops. Wrap a cloth around the filler cap and slowly loosen the cap.
- After inspection, tighten the filler cap firmly.
 If the cap is not secure, steam or hot air can spurt out during operation and seriously burn you.



Ventilation of the battery area

Make sure that the area around the battery is well-ventilated and that no flammable materials
are near.

The battery emits hydrogen gas during operation and charging. The gas can catch fire.



Fires from oil ignition

- Be sure to use the correct type of fuel oil. Always double-check before fueling.
 The wrong fuel oils (e.g. gasoline) can cause a fire.
- Be sure to stop the engine before fueling.
 If you spill fuel oil, wipe the spillage carefully.
- Keep oil and other inflammable materials away from the engine.
 They can catch fire.

▲ WARNING



Exhaust gas poisoning

 Never cover or block the windows, air vents, fans or other ventilation devices in the engine room. Always maintain good ventilation in the engine room during operation.
 Breathing exhaust gas is dangerous to your health.



Moving parts

- Keep your hands, other body parts and clothing away from moving parts (e.g. the front drive shaft, V-belt or propeller shaft). You will get caught and injured.
- Never operate the engine without the covers on the moving parts.
- Before engine start, check that you removed all tools and cloths from the area near the engine.



Alcohol and drugs

Never operate the engine while you are under the influence of alcohol or drugs.
 Never operate the engine when you feel ill or unwell.

A CAUTION



Burns

- Be careful of burns. The entire engine is very hot during and after operation.
- Keep your hands, other body parts and clothing away from the exhaust manifold, exhaust pipes, turbocharger, air cooler and engine body.

Safety precautions for maintenance

A DANGER



Burns from steam

- Never remove the filler cap from the coolant tank while the engine is still hot.
 Steam and hot air will spurt out and seriously burn you.
- After engine stop, wait until the water temperature drops. Wrap a cloth around the filler cap and slowly loosen the cap.
- After inspection, tighten the filler cap firmly.
 If the cap is not secure, steam or hot air can spurt out during operation and seriously burn you.

Fires from oil ignition

- Be sure to use the correct type of fuel oil. Always double-check before fueling. The wrong fuel oils (e.g. gasoline) can cause a fire.
- Be sure to stop the engine before fueling.
 If you spill fuel oil, wipe the spillage carefully.
- Keep oil and other inflammable materials away from the engine.
 They can catch fire.

A WARNING



Fires from electric short-circuits

• Always turn off the battery switch or detach the earth cable (-) before you inspect the electrical system.

If you cause a short-circuit, a fire can occur.



Moving parts

Stop the engine before you inspect it. If you have no choice but to inspect the engine while it
operates, keep your hands, other body parts and clothing away from rotating parts.
 You will get caught and injured.



Exhaust gas poisoning

 Never cover or block the windows, air vents, fans or other ventilation devices in the engine room. Always maintain good ventilation in the engine room during operation.
 Breathing exhaust gas is dangerous to your health.

▲ WARNING



Side cover opening

 Do not open the side cover when the engine is hot. The new air intrusion may lead to an explosion.

A CAUTION



Battery fluid

Be very careful not to expose your skin or eyes to the battery electrolyte.
 The electrolyte is a strong acid and can cause inflammations.
 If you come in contact with the battery fluid, wash it off immediately with a lot of freshwater.



Burns

- Be careful of burns. The entire engine is very hot during and after operation.
- Keep your hands, other body parts and clothing away from the exhaust manifold, exhaust pipes, turbocharger, air cooler and engine body.

NOTICE

No modification

To keep the engine in good condition, the engine has been sealed to control the engine speed limit and the fuel injection quantity. If a seal is removed, the sliding and moving parts of the engine will suffer from increased wear. Engine performance will deteriorate and service life may shorten significantly. Removing a seal may also lead to increased lubricating oil and fuel consumption, seizure and breakage in all portions of the engine. Therefore, do not remove any seals. If the seal is removed, no warranty will be given even during the warranty period.

Regulation on NOx

Laws on maritime pollution and hazard prevention regulate the replacement of certain parts. The laws require that a record and the signature of personnel who replaces these parts is kept. All inspections and maintenance must be performed by our professional service technicians with the necessary expertise and skills.

Waste disposal

- Never dispose of waste oil, such as lubricating oil, by dumping it into a sewer, river, lake or ocean waters.
- Do not spill waste oil into ocean waters. Use a container to collect waste oil from the engine.
- Comply with relevant laws and/or regulations for the disposal of hazardous materials such lubricating oil, fuel, filters or batteries.

Labels

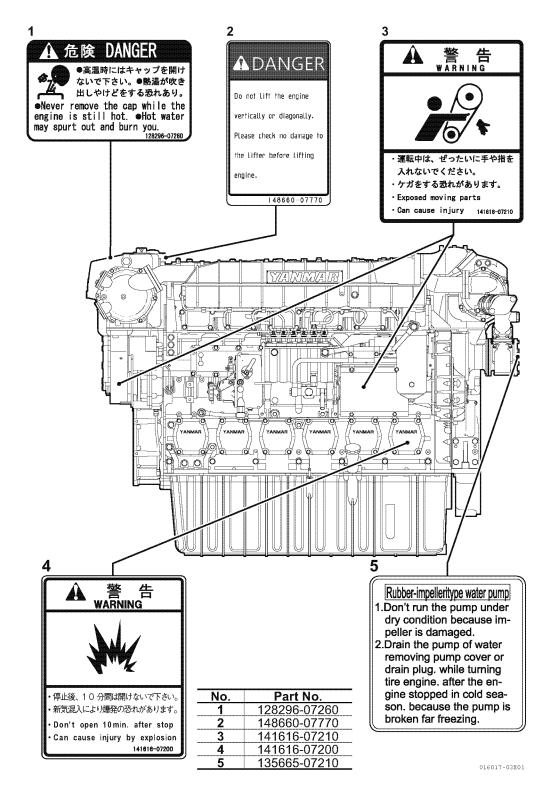
For safe operation, the affixed position of the labels is indicated.

Read the remarks of the labels carefully to attempt prevention of the accident.

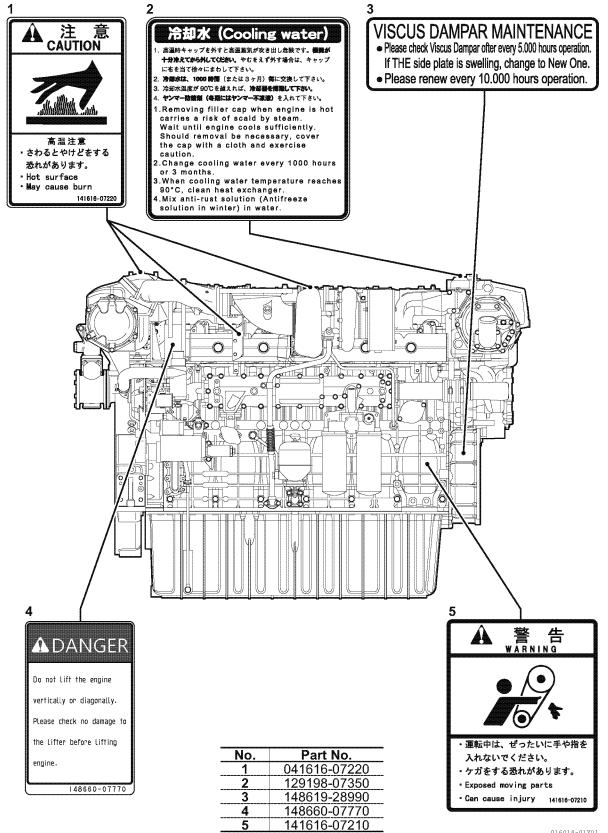
Also, if you need to replace a part that has a label affixed to it, make sure you order the new part and label at the same time.

If the labels are damaged or fallen, order them from your authorized YANMAR dealer or distributor.

■ Operation side



■ Non-operation side



Precautions for Lifting the Engine

The engine can cause serious injury when it falls during lifting. Obey the below instructions to prevent accidents during lifting.

▲ WARNING

- Make sure that the engine is lifted by qualified persons.
- Before lifting, make sure that the engine lifting bracket and mounting bolt have no damage and are in good shape. If you find a fault, stop immediately and contact your authorized YANMAR dealer or distributor.
- Select lifting tools (e.g. wire rope and shackle) that are appropriate for heavy loads.
- Select the wire rope length so that the engine does not tilt during lifting.
- Before lifting, examine the lifting tools and make sure that they have no damage and are in good shape.
- Protect the parts of the engine or driven equipment that touch the wire rope with protective material.
- The tension of the wire rope changes depending on the lifting angle. Make sure that the angle is within 60°.
- If you use a marine gear that is not listed in this operation manual, separate the marine gear from the engine, and lift the marine gear and engine separately.
- During lifting and moving the engine, do not go under the engine or near the engine.
- Do not lift the engine vertically or diagonally. Please check no damage to the lifter before lifting engine.

Within 60°

For the mass, refer to Specifications in the Operation Manual.

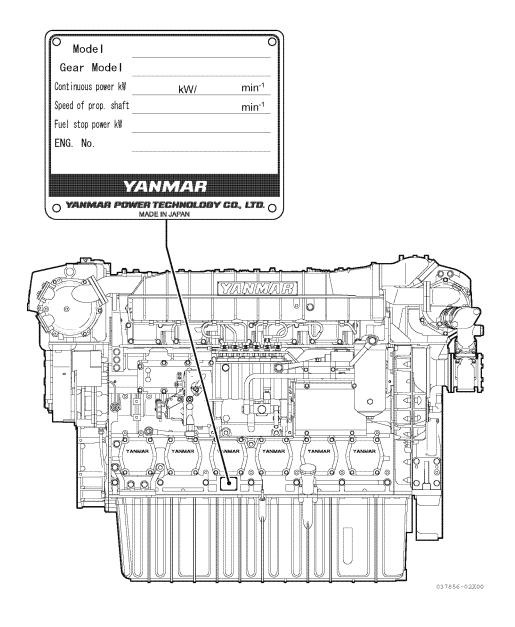
Engine Nameplates

Periodic inspection and maintenance are important to help you enjoy your engine.

Your serial number is required at the time of requesting an engine maintenance or ordering a part. Confirm it beforehand.

■ Location of engine nameplate:

It is affixed under the No. 4 cylinder side cover of the cylinder block on the fuel injection pump side.

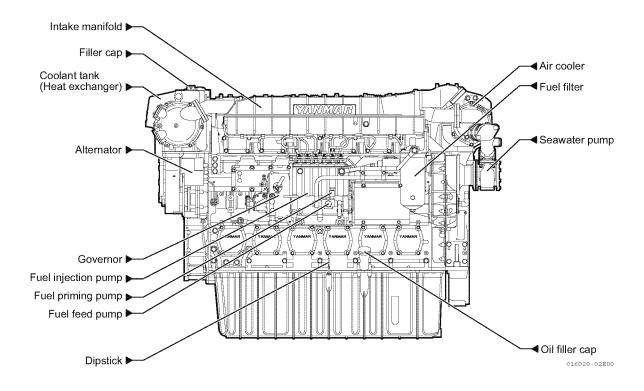


SPECIFICATIONS

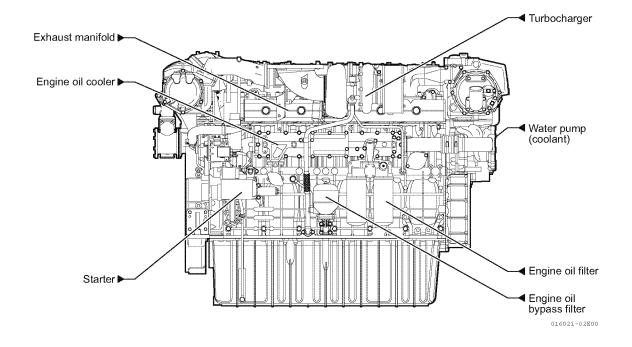
Мос	let	Unit	6AYM-WGT 6AYM-WET			6AYM-WST
Туре		_	Vertical, single acting 4-cycle, turbo-charged diesel engine			el engine
Combustion syste	em	_	Direct injection			
No. of cylinders		_	6			
Bore × stroke		mm	155 × 180			
Displacement		L		20.	379	
		Rating	L	М	Continuous	Continuous
Rated output (flywheel output)		kW/min ⁻¹ (hp/rpm)	670/1938 (911/1938) (2 hour rating)	610/1900 (829/1900) (10 hour rating)	555/1840 (755/1840) (24 hour rating)	485/1900 (659/1900) (24 hour rating)
Direction of rotation		_	Counterclockwise (Viewed from flywheel side)			
Cooling system		Constant temperature cooling system (with heat exchange)		xchanger)		
Carlantaranih	Engine	L		6	5	
Coolant capacity	Reservoir tank	L	3			
Lubrication syste	m	_		Forced lubricatio	n with gear pump	
Lubricating oil	Engine	L	Standard oil pan: 91 Shallow oil pan: 53			
capacity	Marine gear	L	Refer to marine gear manual			
Turbocharger type		-	Exhaust gas turbocharger (with air cooler)			
Starting system		_	- Electric starting or air starting			
Engine mass (without marine g	ear)	kg	2365			

Location of Components

■ Operation side



■ Non-operation side



FUEL OIL, LUBRICATING OIL AND COOLANT

Fuel

The specification of fuel oil for this model is shown in the following table.

The properties of fuel are uncertain and broadly ranged; thus they affect such factors as a smooth run of the engine, maintenance interval and service life of parts. Consequently, it might be necessary to change the specifications of engine or add attachment in accordance with the applied fuel oil.

■ Quality criteria of fuel oil

Viscosity	at 50 °C		mm²/s	3 - 8
	Specific gravity at 15 °C		g/cm ³	< 0.86
	Flash point		°C	> 60
	Residual carbon		mass.%	< 0.7
	Sulfur content		mass.%	< 1.0
Property critical	Ash content		mass.%	< 0.03
value	Moisture content		vol.%	< 0.1
	Vanadium		ppm	-
	Sodium		ppm	-
	Aluminum		ppm	-
	Diesel index		-	(Cetane no. of ≥ 45)
Quality criteria equivalent fuel oil		AST	И D975	2D
		BS-2869		Class B1
		ISO 8217		DMX
		EN		590

NOTICE

The fuel injection system consists of precision parts and for that reason, do not use fuel to which water and dust are mixed in. If such fuel is used, it causes a trouble. Consequently, pay attention to the following in supply of fuel. Besides, as for daily maintenance, carry out draining and maintenance servicing of fuel filter mentioned in Periodic Maintenance on page 38.

In time of fuel supply

- · When supplying fuel stored in a drum, stand the drum still for longer than one whole day to settle the impurity, and supply supernatant liquid of the drum to this engine.
- In the case of supplying fuel from a storage tank to the service tank, supply such fuel after more than one whole day elapsed from when fuel is supplied to the storage tank.

Lubricating Oil

- Selection of lubricating oil is very important for a diesel engine. If improper lubricating oil is used or change of lubricating oil is neglected, it causes sticking of piston rings, seizure or early wear of pistons and cylinder liners and faster wear of bearings and various other moving parts that reduce the durability of the engine.
- Service categories

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

· A.P.I. classification: Grade CD, CF SAE viscosity grade: 40, 15W-40

• T.B.N [mgKOH/g]: 9 - 15

Viscosity		Specific	Flash point	Pour point	Kinetic viscosity mm²/s (cSt)		Viscosity
Application	(SAE)	gravity	(°C) (open type)	(°C)	40 °C	100 °C	index
Marine propulsion	40	0.893	> 240	< -7.5	140 - 155	14 - 15.5	96 - 110
engine	15W-40	0.88	> 230	< -30	> 100	14 - 15.5	> 140

NOTICE

- · Avoid blended use of different brands. (In the unavoidable case of blended use of different brands of lub, consult your lubricating oil supplier.)
- If lubricating oil of a high total base number (T.B.N.) is used when using fuel oil of a low sulfur content, additive (calcium carbonate) of lubricating oil sticks to the high-temperature area together with carbon residue and causes adverse effects as mentioned below: For that reason, use the proper lubricating oil.

Accumulation of the aforementioned deposits on the combustion chamber hinders sliding of piston rings and may cause scuffing to the rings, cylinder liners, etc. Besides, they may cause bite-in and blow-bye if intruded into exhaust valves.

Coolant

■ Coolant selection

Use clean coolant (tap water) for the coolant.

Use the water having the properties shown in the following table.

Water quality for coolant			
pH 298 K (25 °C)	6.5 - 8.0		
Total hardness (CaCO ₃)	< 100 ppm		
M alkalinity	30 - 100 ppm		
Ammonium ion (NH ₄ +) concentration	< 0.05 ppm		
Chloride ion (Cl -) concentration	< 100 ppm		
Sulfate ion (SO ₄ ² -) concentration	< 100 ppm		
Evaporation residue	< 400 ppm		

■ Long Life Coolant (LLC) mixture selection

Always add Long Life Coolant (LLC) to the tap water. This mixture serves as the coolant.

YANMAR recommends the following Long Life Coolant (LLC):

- TEXACO LONG LIFE COOLANT/standard and premixed Product Code 7997 and 7998
- HAVOLINE EXTENDED LIFE ANTIFREEZE/COOLANT Product Code 7994

or equivalent to the above LLC.

NOTICE

Choose LLC which will not have any adverse effects on the materials (cast iron, aluminum, copper, etc.) used in the engine's cooling system, if different from the above.

Without this mixture, scale or rust is generated inside the parts of the coolant system, thus deteriorating cooling performance. In winter, never neglect to us LLC in order to prevent freezing.

If LLC use is neglected, the cooling water freezes and expands inside the engine, resulting in breakage of parts in the coolant system. The mixing ratio of LLC depends on the temperature. Be careful in using the mixing ratio specified by the manufacturer.

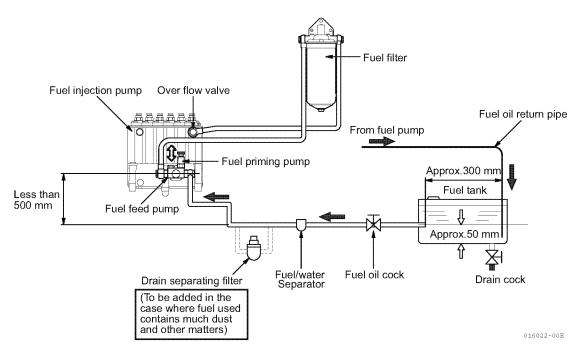
NOTICE

- Excess LLC deteriorates cooling performance. A thin mixture which does not provide protection sufficient for the lowest temperature will freeze and damage the cooling water system.
- Never mix different types (brands) of LLC, chemical reactions may make the LLC useless and engine trouble could result.

RUNNING-IN

When starting a new engine, perform the following procedure.

Fuel



- Check the piping between the fuel tank and the engine as illustrated above.
- Be sure to install a drain cock at the bottom of the fuel tank to remove drain and a fuel/water separator (filter) in the fuel piping.
- Make sure the inside of the fuel tank and fuel lines have been thoroughly cleaned.
- · Fill the fuel tank with recommended fuel.

A DANGER

- Use only diesel fuel. Never use other fuels, including gasoline, kerosene, etc., because they could cause a fire. Be sure to check that you have selected diesel fuel before filling the fuel tank.
- Be sure to stop the engine and confirm that there are no open flames in the vicinity before supplying fuel.
- · If you spill fuel, wipe such spillage carefully.

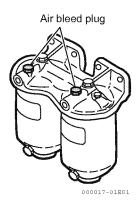
Bleed the fuel oil system

If air enters the fuel system, the fuel injection pump does not work correctly.

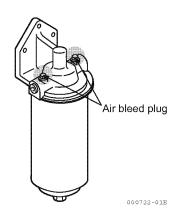
Bleed the fuel system and obey the following procedure when you fill fuel oil to the fuel tank for the first time, perform maintenance (such as replacing the fuel filter) of the fuel system, after the fuel oil has run out, and there is a failure at startup.

- 1. Check the fuel oil level in the fuel tank and open the fuel cock (or valve).
- 2. Loosen the air vent plug on the top of the fuel/water separator (option).
 - When fuel oil without air bubbles comes out of the air vent plug hole, tighten the air vent plug.
- 3. Loosen the air vent plug on the top of the fuel filter.
- 4. Fill the fuel oil with the fuel priming pump.
 - 1-The knob on the top of the priming pump rises when you turn it counterclockwise.
 - 2-Repeat moving the knob up and down continuously by hand.
 - Fuel oil with air bubbles comes out of the air vent plug hole of the fuel filter.
- 5. When fuel oil without air bubbles comes out of the air vent plug hole, tighten the air vent plug.
- After you discharged air, screw the priming knob tight while pressing it down.

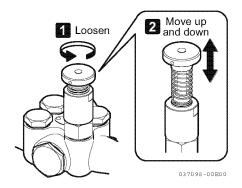
Fuel/water separator (option)

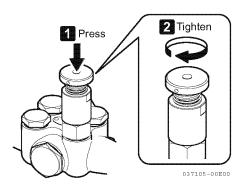


Fuel filter



Priming pump





Lubricating Oil

As it is necessary to keep oil level correctly, obey following procedure when you fill the engine lubricating oil.

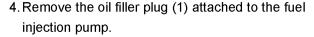
- 1. Remove the oil filler cap (1).
- 2. Fill recommended oil to the upper level mark on the dipstick (2) while checking the level with the dipstick (2).

Oil capacity	Shallow oil pan	53 L
On capacity	Standard oil pan	91 L

3. Install the oil filler cap.

NOTICE

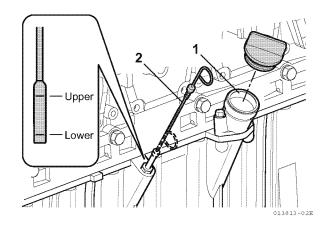
- Be sure to stop the engine before refilling.
- · When checking the oil level, insert the dipstick fully.
- · Do not overfill with oil, as this may cause oil to be sprayed out from the breather and damage the engine.

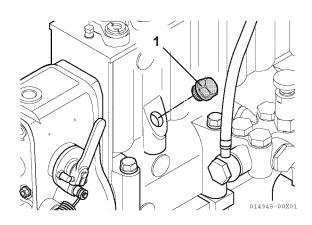


- 5. Fill with recommended lubrication oil to the pump.
- 6. Install the oil filler plug.

Fuel injection pump oil capacity	1.5 L
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7. Fill the marine gear box with what the marine gear manufacture recommended oil up to the proper level.

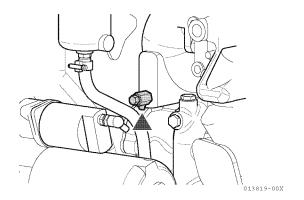




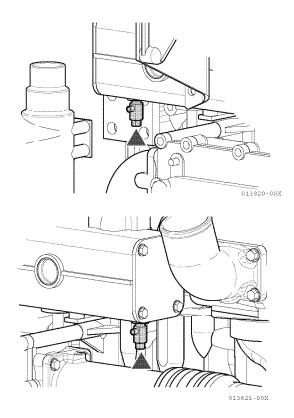
Cooling System (Seawater and Coolant)

Follow the steps below to supply freshwater.

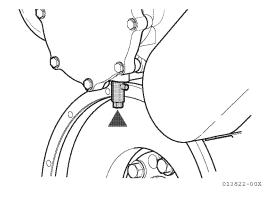
- 1. Make sure the engine is stopped.
- 2. Close the drain valve on the cylinder block.



3. Close the drain valve on the exhaust manifold.



4. Close the drain valve on the fresh water pump.



5. Remove the cooling water filler cap of the freshwater tank by turning it to the left (1/3 turn).



7. Gently add freshwater until it overflows from the water filler port.

Freshwater capacity 65 L

- 8. Start the engine with the cooling water filler cap removed.
- 9. While idling, supply freshwater again from the water filler port until it overflows.
 - The purpose of this operation is to bleed air.
 Run for about 3 minutes.
- 10. Close the drain valve next to the thermostat cover.
- 11. Close the cooling water filler cap.

Align the tab on the back of the cooling water filler cap with the notch in the water filler port and turn it to the right to close it.

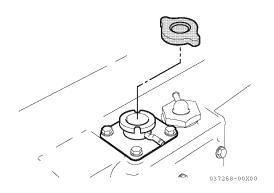
- 12. Stop the engine.
- 13. Check the sight glass of the freshwater tank for proper cooling water level.
 - If the sight glass is filled with water:
 Remove the air bleeding plug on the top of the thermostat cover, and remove the cooling water filler cap of the freshwater tank.

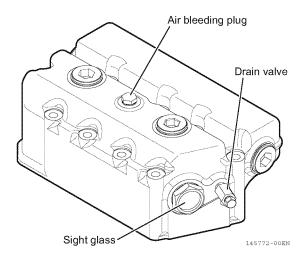
Open the drain valve and drain the water until no more water comes out of the valve.

After adjustment, close the drain valve, air bleeding plug and cooling water filler cap.

 If the sight glass is filled with air and the cooling water level is not visible:

If water is filled to the point where it overflows from the water filler port when water is supplied, there is no problem.





NOTICE

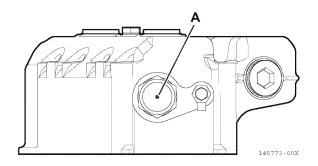
The red circle (A) in the center of the sight glass is a guide to indicate the height of the water filler port and drain valve. Even if water is filled to the point where it overflows from the water filler port, the cooling water level will show differently depending on the hull attitude, engine rake angle and temperature. It is not always a standard indicating the proper cooling water level.

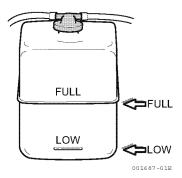


- 1-Remove the cap of the freshwater reserve tank.
- 2-Supply freshwater up to the upper limit (FULL) level.
- 3- Attach the cap of the freshwater reserve tank.

Freshwater reserve tank	1.9 L (FULL)
capacity	(Total: 3 L)

- 15. Check the rubber hose connecting the freshwater tank and freshwater reserve tank.
 - Make sure that there is no looseness or damage to the joints of the hose.
- 16. Tighten the side cover bolts of the seawater pump.



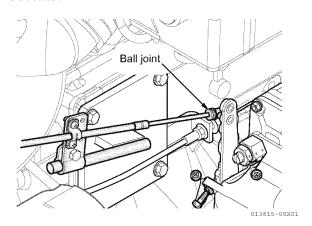




Lubrication

Apply grease to the lubricating points on the ball joints of remote control cable (for the governor).

Governor



Remote Control Device (Option)

- 1. Operate the throttle handle from the position "L" to the (full) position "H" and check that the governor lever at the governor moves into correct position. Adjust the control cable if necessary.
- 2. Operate the shift handle into "AHEAD", "NEUTRAL" and "ASTERN" and check that the marine gear control lever at the shift moves into correct positions. Adjust the control cable if necessary.

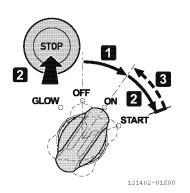
Shift handle AHEAD STERN 000044-03E04

Throttle handle

Cranking

Oil reaches all moving parts of the engine sufficiently, crank the engine according to the following procedure.

- 1. Open the sea cock.
- 2. Set the shift handle into the "NEUTRAL" position.
- 3. Set the throttle handle into the "L" position.
- 4. Turn the battery switch "ON".
- 5. Start cranking.
 - 1-Put the key in the starter switch and turn it to the ON position.
 - 2-Pull the engine stop lever or press the "STOP" button of the instruments while turning the key to the START position to start the cranking.
 - 3- Cranking time is 5 seconds; check for abnormal sounds during that time. Release your hand after cranking.



Instruments Check before Starting

Before starting, the needle on the meter should be in a fixed position on the left side.

Turn the starter key to the "ON" position.

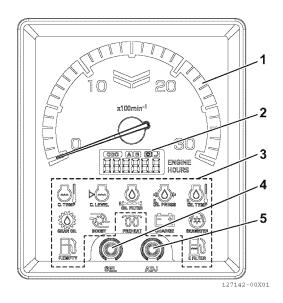
- 1. The needle of the oil pressure meter and tachometer should indicate "0".
- 2. Make sure that the coolant temperature meter operates properly.
- 3. The buzzer sounds should be working.
- 4. The illumination lamps of the Lubricating oil pressure meter, the boost pressure meter, the tachometer, and the coolant temperature meter should all come on.
- 5. All alarm lamps come on temporarily.

Part name	Instrument panel	Analog/CAN converter
	Panel D 3 10 10 10 10 10 10 10 10 10 10 10 10 10	121400-00X01
Power supply	DC12 V / DC24 V (8 V to 32 V)	DC24 V (16 V to 32 V)
Operating temperature	-20 °C to 60 °C	-20 °C to 75 °C
Storage temperature	-30 °C to 80 °C	-30 °C to 100 °C
Water resistance (Protection class)	Front IPX7 Back IPX6	IPX7

A CAUTION

Do not use high pressure spray. It may damage the instrument panel.

Tachometer



	Name	Description	
4	Tachometer	Indicates the engine speed in min-1.	
	(analog display)	You can monitor the load conditions and speed.	
2.	LCD display (digital display)	Shows the operating hours / exhaust air temperature (option)* / propeller speed (option)* / configured brightness of backlight. Press the SEL and ADJ buttons to switch between the different screens.	
3.	Alarm lamp	Flashes to indicate where an abnormality is occurring.	
4.	SEL button	Used for switching the LCD display screen.	
5.	ADJ button	Used for resetting the operating hours / adjusting the brightness.	

^{*} Display of the exhaust temperature and propeller speed are optional extras. (They are not displayed on the standard specification panel. Depending on your engine model, the sensors cannot be installed and displayed.)

A CAUTION

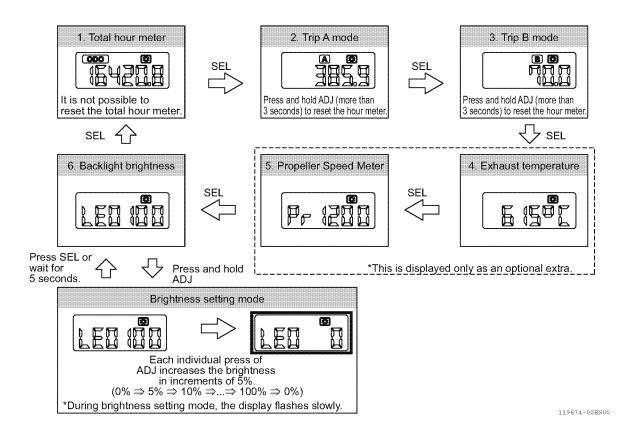
Do not subject the panel glass to force or impact. It may crack and cause injury.

LCD display

■ Operating the LCD display

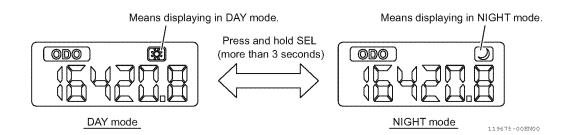
Switching screens

Press the SEL button to cycle through the screens as follows.



Switching backlight modes

Press and hold the SEL button (more than 3 seconds) to switch between DAY mode and NIGHT mode. At any point on any screen, it is possible to switch the backlight modes.



It is possible to set and save the brightness (0% to 100%) for DAY mode and NIGHT mode respectively. On the mode for which you want to adjust the brightness (DAY or NIGHT), switch the screen to "brightness setting mode".

• The default value is 100% for DAY mode and 50% for NIGHT mode.

■ LCD display items

		Name	Description	
1.	Engine total operating hours	119676-00X00	It displays the total engine operation time as a numeric value (hours). "ODO" is displayed at the top of the screen. Hours are accumulated in conjunction with engine operation. It serves as a guideline for when to perform periodic maintenance. Note: It is not possible to reset the total hour meter value.	
2.	Engine operating hours Trip A mode	119677-00X00	It displays the engine trip operation time after resetting as a numeric value (hours). "A" or "B" is displayed at the top of the screen.	
3.	Engine operating hours B mode	119678-00X00	Hours are accumulated in conjunction with engine operation. The operation hours for trip A mode and trip B mode can be configured separately according to your needs.	
4.	Exhaust temperature (Option)	119679-00X00	It displays the exhaust temperature as a numeric value (°C). Note: This is displayed only as an optional extra.	
5.	Propeller speed (Option)	119680-00X00	It displays the propeller speed as a numeric value (min ⁻¹). Note: This is displayed only as an optional extra.	
6.	Backlight brightness	119681-00X00	It displays the currently configured brightness level of the backlight (%).	

• When the backlight mode is in DAY mode, is displayed at the top of the screen. When in NIGHT mode, is displayed.

A CAUTION

If the "Err" message appears, consult your authorized YANMAR dealer or distributor for investigation and repair.

Sub-meters

Coolant temperature meter

It shows the coolant temperature by °C (centigrade).

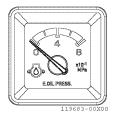
It serves as a guide for judging the condition of the engine temperature to prevent accidents.



· Engine lubricating oil pressure meter

It shows the engine oil pressure by 10⁻¹ MPa.

It serves as a guide for judging the condition of engine lubrication oil to prevent accidents.



· Boost pressure meter

It shows the air pressure that flows to the combustion chamber by 10-1 MPa

It serves as a guide for judging the condition of the turbocharger to prevent accidents.



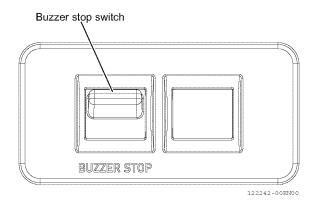
· Voltmeter (Option)

It indicates the power supply voltage.

It serves as a guide for judging the condition of the battery to prevent accidents.



4 Buzzer stop switch

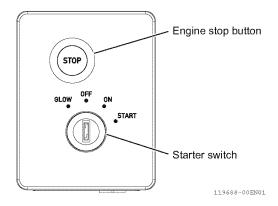


This switch temporarily stops the buzzer sound.

The buzzer goes off with a single operation of the switch. Also, the warning lamps stop flashing and remain continuously lit.

You release the switch, it goes back to original position automatically.

5 Engine stop button

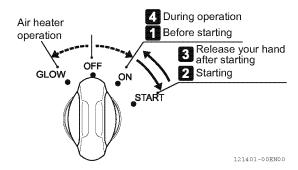


This red button stops the engine, and is located above the key switch. If you push the engine stop button, the stop device actuates, the fuel supply is cut, and the engine stops. Press and hold down the button until the engine comes to a complete stop.

A CAUTION

After the engine stops, when you do not use it for a long period, always turn off all starter switches. if any one of those is left in the ON position, the electrical system is not cut off and the engine cannot start because of the discharge of the battery.

Starter switch



The key switch starts/stops the engine. This is a three-step rotary switch which is operated by turning the key.

OFF: This is the stop position.

The electric system of the engine is cut off and that allows the key to be inserted and removed.

During engine operation, if the key is turned to the OFF position, the engine will stop.

If there are two or more instrument panels, turn all the key switches to the OFF position. When all of them are turned to the OFF position, the engine stops.

ON: This is the position during engine operation.

The meters and warning devices are on.

Do not leave the key switch turned to ON while the engine is stopped for long periods. This may cause the battery to discharge, resulting in the engine being unable to start.

START: Starts the engine.

The starter rotates and the engine starts.

After the engine starts and you release the key, it goes back to ON automatically.

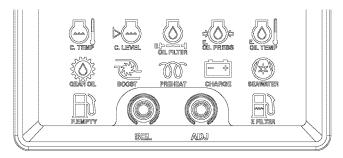
GLOW: Turns on the air heater. (option)

Increases the temperature of the intake air before engine start to assist the engine when starting in cold climates.

You release the key, it goes back to OFF automatically.

Alarm devices

When there is some problem during operation, the alarm buzzers and lamps will flash.



119673-00X0

Name	Lamp	Description	
Coolant temperature alarm lamp	C. TEMP	Flashes if the coolant temperature becomes abnormally high. Continuing operation at temperatures exceeding the maximum will result damage and seizure. Check the load and the water cooling system for any abnormalities.	
Coolant level alarm lamp	C. LEVEL	Flashes if the coolant level drops below the lower level. Continuing operation at below the lower coolant level will rise the coolar temperature and will result in damage and seizure. Check the coolant level. In addition, check that there is no leakage from the cooling system.	
Engine lubricating oil filter clogged alarm lamp		Flashes if the lubricating oil filter clogs. The alarm buzzer will not sound. Replace the filter element (cartridge) as soon as possible.	
Engine lubricating oil pressure alarm lamp	SIL PRESS	Flashes if the engine lubricating oil pressure drops below the lower level Continuing operation with insufficient oil will result in damage and seizur Check the level of the lubricating oil and refill if necessary.	
temperature alarm lamp Continuing operation at temperatures exceeding the damage and seizure.		Flashes that the engine lubricating oil temperature is abnormally high. Continuing operation at temperatures exceeding the maximum will result in damage and seizure. Check the seawater cooling system for abnormalities.	
Investure alarm lamp		Flashes if the marine gear lubricating oil pressure drops below the limit level Continuous operation with insufficient oil will result in damage and seizure. Check the marine gear lubricating oil level.	
Charge lamp Charge lamp CHARGE Check If the content of the con		Flashes if the charge is abnormal. The alarm buzzer will not sound. Check for failures such as a slip or broken V-belt in the alternator. If the charge lamp flashes quickly, this indicates that the voltage is out of the specified range. Check the battery.	

B Analog/CAN converter

Outputs CAN signal by converting from the analog input information.

NOTICE

Supported analog/CAN converter varies depending on the engine model. Be sure to use analog/CAN converter that was included with your engine. When storing, keep the converter separately from others if you have multiple models.

Rechecking after Starting

When a new engine is operated for the first time, the oil level of the oil pan will drop due to the engine oil circulating to the oil cooler, oil filter, etc.

Therefore, stop the engine after operating for two to three minutes.

Wait for about five minutes and then check the following items:

- Check the engine oil level with the dipstick, and add oil up to the upper level if necessary.
- Check the marine gear oil level with the dipstick, and add oil up to the upper level if necessary.
- Check the coolant level of the coolant reservoir and the coolant tank.

 Add coolant to the upper level if necessary.

▲ DANGER

Never remove the filler cap when the engine is hot (above 60 °C).

The coolant is under pressure and severe scalding could result.

OPERATION

Prior to starting the engine, check to see if there is nothing nearby the engine, particularly the rotating parts that may cause damage.

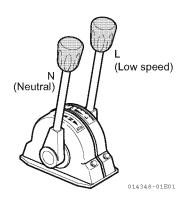
Starting

Electric starter motor starting

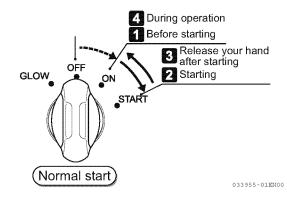
- 1. Move the shift handle to the neutral position "N".
- 2. Move the throttle handle to the position "L".
 - Before starting engine
 - 1- Turn ON the battery switch.
 - 2- Put the key in the starter switch. Turn the key from the OFF to ON position and check that alarm devices are shown in the table "Normal function of alarm devices" on page 31 are working properly.
 - The buzzer sounds briefly (for approx. 1 second).
 - · The battery charge lamp should sequentiallyflashed; other alarm lamps should lighted and off after approx. 2 seconds.
- 3. Turn it to the "START" position. Once the engine starts, release your hand from the key. Then it will return to the "ON" position automatically. With the key in the "ON" position, the power source of the instruments and warning devices is engaged.

NOTICE

- · If the engine did not start, do not continue cranking for longer than 15 seconds at any one attempt. Allow at least 30 seconds of rest between attempts. This will permit the battery to recover and prevent to over heat the starter.
- · When restarting, turn the starter switch after stopping the engine completely. If the starter switch is turned on before the engine comes to a complete stop, serious damage to the starting motor pinion and ring gear of flywheel may result.



Starter switch



- 4. Checking the alarm devices just after starting engine.
 - Turn the key from the START to ON position and check that alarm devices are shown in the table below "Normal function of alarm devices" are working properly.
 - The buzzer stops.
 - All alarm lamps go off.

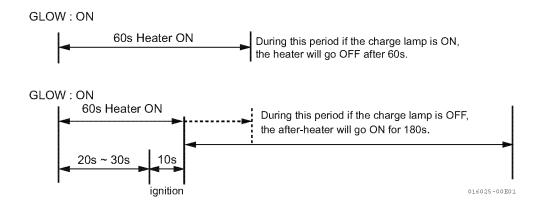
By performing these procedures, it can be determined whether or not the electric circuit of the buzzer and alarm lamps is in good working order. If there is any problem, consult your authorized YANMAR dealer or distributor for investigation and repair.

Normal function of ala	ormal function of alarm devices				
Starter switch	Before starting	After starting			
operation	OFF→ON	START→ON			
Buzzers	ON	OFF			
Alarm lamps					
Battery charge lamp	Temporarily lights up, then flashes	OFF			
Coolant temperature	Temporarily lights up	OFF			
Engine lubricating oil pressure	Temporarily lights up	OFF			
Marine gear lubricat- ing oil pressure	Temporarily lights up	OFF			
Coolant level	Temporarily lights up	OFF			
Lubricating oil filter clogged	Temporarily lights up	OFF			
Engine lubricating oil temperature	Temporarily lights up	OFF			

Cold start (option)

■ Air heater operation

- 1. When starting during cold condition, first turn the starter switch to GLOW (for a few moments) to activate the heater.
- 2. Next, after 20 30 seconds turn the starter switch to START. When the engine starts, the microcomputer catches the engine revolution and activates the after-heater which remains on for 3 minutes.
- 3. The heater will operate for a maximum of 1 minute before the after-heat mechanism is activated. During this period if the engine does not start, the after-heater will not be activated. Start the engine within 1 minute after turning the key to "GLOW".
- 4. When starting under normal conditions, the "GLOW" position is not used, and the heating mechanism is not activated.



■ Procedure

- 1. Put the shift handle in "N".
- 2. Put the throttle handle at low idle position.
- 3. Turn the starter switch key to "GLOW" (for a moment).
- 4. After 30 seconds, turn the key to "START", and the engine starts.
- 5. Release your hand from the key after starting; the key will return automatically to "ON".

Notice after starting

- With the shift handle in the neutral position, observe the following instructions after starting.
 - After starting, set the engine speed to 600 min⁻¹ (600 rpm).
 - Make sure that seawater is coming out from the cooling water (seawater) outlet.
 - Check that the battery charge warning lamp (CHARGE) turning off consequently.
 - Make sure that the coolant temperature gauge, on the instrument panel, reads 40 °C or more.

NOTICE

- Do not turn off the key in the starter switch and the battery switch in the "OFF" position when operating the engine.
- If you turn the key to the "OFF" position, the engine stop.

Air Motor Starting System (Option)

1. Make sure the air reservoir and the regulator valve are at the specified pressure.

Air reservoir: 2.45 - 2.94 MPa (25 - 30 kgf/cm²)

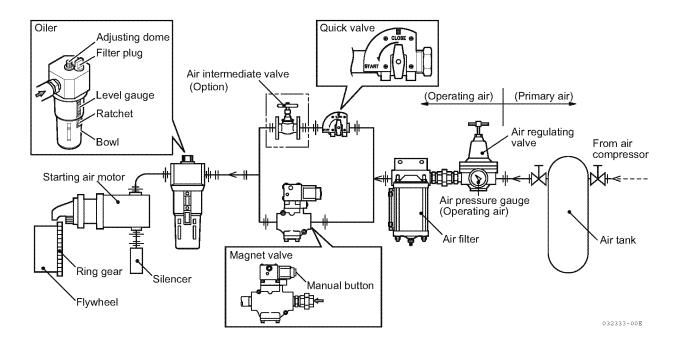
Regulator valve setting: 0.69 - 0.97 MPa (7.0 - 9.9 kgf/cm²)

- 2. Check the oil level in the oiler.
 - 1- When supplying oil, remove the filler plug and add oil until it reaches the upper limit of the level gauge. [capacity: 220 mL]
 - * When removing the bowl and supplying oil, loosen the filler plug to release the internal pressure.
 - 2- When starting the engine, make sure that the inside of the adjusting dome is brimming with oil while the air motor is running.
 - * The amount of oil to be applied to the air motor is adjusted by turning the adjusting dome. However, since the adjusting dome has already been adjusted when shipped from the factory (one turn back from the closed condition), it does not need to be adjusted. (Turning the adjusting dome counterclockwise allows the amount of oil increase.)

■ Local starting

• Manual starting version: Open the quick valve and then close it immediately after the engine starts.

• Remote automatic starting version: Press the manual button on the starter solenoid. Release the button immediately after the engine starts.



■ Air motor's oiler oil selection

• Selection of air motor's oiler oil is shown the following table. Oiler oil is based on the ambient temperature.

Temperature range	Lubricating oil type
5 to 60 °C	ISO VG32
5 10 00 C	(e.g. Turbine oil #90)
-15 to 5 °C	ISO VG15
-15 to 5 C	(e.g. #90 refrigerating machine oil)

Notice while Running with Load

While running the engine, pay attention to the following.

If problem occurs during operation, try to find the cause. If the cause cannot be found and the vessel is able to continue operation, return to port at a low speed. Consult your authorized YANMAR dealer or distributor after return.

■ Cooling water (seawater)

Make sure that water is coming out from the cooling water (seawater) outlet.

When water is coming out intermittently or in small volume, check the following.

- · Air in the cooling system.
- · Faulty cooling seawater pump impeller.
- · Clogged cooling seawater pipe and sea cock.

NOTICE

Never operate the engine if the seawater pump is not sucking up water.

The seawater pump impeller will seize and become impossible to use again.

■ Coolant

Normally, the coolant temperature during running with load is 75 - 85 °C.

If the temperature exceeds 85 °C, check the following.

- Water leakage (temperature and coolant level warning devices may activate)
- · Faulty water pump (coolant) or clogged coolant passage
- · Faulty seawater pump or clogged seawater passage
- · Insufficient coolant volume
- · Heat exchanger restriction

■ Color of exhaust gas

Black smoke is a sign that the engine is overloaded. Such operation will shorten the life of intake and exhaust valves, piston rings, cylinder liners, turbocharger and particularly fuel injection nozzles. Avoid continuing operation if black smoke is being emitted.

■ Water leakage, oil leakage and other operational conditions

Always check whether there are water leakage, oil leakage, gas leaks, loose fasteners, and abnormal noise or temperature, low oil pressure and vibration or not.

Avoid operating the engine speed at critical speed

Avoid operating the engine speed that produce resonance (critical speed). Depending on the construction of hull, the engine and ship resonate at a certain rate of revolutions, and vibration may suddenly become great.

■ Alarm devices

When the buzzer sounds during engine running, at first check which alarm lamp is on, immediately set the engine speed to low speed and stop the engine, and then try to find the cause.

■ Long time operation at low speed

When the engine is operated for more than 4 hours at low speed, set the shift handle to the "NEUTRAL" position, and increase the engine speed without load for 1 minute at about 1800 min⁻¹ (rpm) to discharge residue from cylinders every 4 hours operation.

■ Operation of shift handle

Be sure to operate the throttle handle at a low speed (less than 1000 min-1 (rpm)).

If the marine gear is engaged or disengaged during high-speed or if it is used under half-clutch, the marine gear will damage or its life will be shortened.

Stopping

To stop the engine, set the shift handle to the "NEUTRAL" position, and perform the after no-load running at a low speed (600 - 700 min⁻¹ (rpm)) for about five minutes.

NOTICE

If the engine stops at hot condition due to over heating, the temperature of the coolant and various engine parts will rise abruptly, and the engine may be damaged.

1. To stop the engine remotely, turn the key to the "OFF" position or press and hold the STOP button until the engine has stopped.

Alternatively, pull and hold the engine stop lever until engine has stopped.

- 2. When you press the STOP button to stop the engine, turn the starter switch to the "OFF" position.
- 3. Remove the key from the starter switch, and turn off the battery switch.
- 4. Close the fuel cock.
- 5. Close the sea cock.
- 6. While the engine is still warm, wipe off dust and dirt from the engine.

NOTICE

• Storing the engine without draining may cause the seawater left inside the engine to freeze and damage to parts (heat exchanger, seawater pump) in the cooling water passage.

•	Always use LLC in the coolant system.

Long-Term Storage

Storing engine for a long time

When the engine will not be used for a long term, perform the following.

Consult your authorized YANMAR dealer or distributors.

- Choose a dry, dust-free location for storage.
- In cold climate, make sure that you fully drain cooling coolant and seawater from both cooling systems.
- · Loosen the V-belt.
- Disconnect the battery terminals from the engine, and store the battery fully charged. Charge the battery once a month to compensate for the battery's self discharge.
- Remove any dirt, grime, or oil on the exterior and wipe it clean, and apply a coat of antirust agent or clean oil.
- · Cover the exhaust pipe, intake, and electric devices with vinyl sheets to guard against moisture and dust.

Operating after long-term storage

Follow the steps below when restarting an engine which has been stored for 6 months or longer.

- · Install full charged battery.
- · Refer to [RUNNING-IN] before starting.
- Remove the rocker cover, and apply lubricating oil to the rocker arms.
- Check the cracks of the V-belt and adjust the V-belt tension.
- Check the damage of the impeller of the seawater pump.
- Perform cranking before operation to distribute lubricating oil to all of the parts.

CHECKING AND SERVICING THE TURBOCHARGER

■ Wash the pre-filter

A pre-filter removes contaminations in the air and keeps the engine output in good condition.

- 1. Wash the pre-filter with a neutral detergent.
- 2. Wash the pre-filter with tap water, dry it sufficiently, and install.

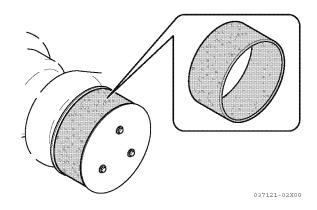
■ Wash the blower

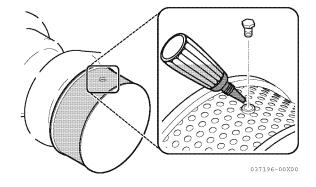
If the turbocharger blower is contaminated, the blower speed decreases and the boost pressure drops, causing the engine output to fall. Wash the blower, if the boost pressure drops (approx. 10% pressure drop compared with normal condition).

- 1. Prepare the blower wash fluid, freshwater, and oiler.
- 2. Remove the pre-filter from the intake silencer, and remove the water filler plug.
- 3. During the load operation, fill 50 cc of the blower wash fluid slowly from the water filler in approx. 10 seconds.
- 4. Approx. 3 minutes after filling the blower wash fluid, fill 50 cc of the freshwater from the water filler in approx. 10 seconds.
- 5. Continue the load operation for approx. 10 minutes to dry and check the output recovery.
- 6. Repeat the above washing operation for 3 to 4 times, if the performance is not recovered. Consult your authorized YANMAR dealer or distributor for repair.

NOTICE

Do not fill a large amount of the wash fluid and freshwater at once. It may result in a water hammer accident.





PERIODICAL MAINTENANCE

- · Periodical maintenance is an important factor in keeping the engine in the best condition. In accordance with operating hours given in the following maintenance schedule, perform periodic maintenance.
- When the parts are disassembled for checking and/or servicing, reassemble them properly.
- Please contact your authorized YANMAR dealer or distributor to inspect your engine or to replace any parts if you
- · Consult your authorized YANMAR dealers or distributor about scheduling the engine overhaul.

Periodic Maintenance Schedule

					Service period						
ltem			Daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 6 months	Every year	Remarks		
	Check fuel level and refill		0								
stem	Drain fuel tank deposit and water		(When r	O eplenished)							
Fuel system	Drain fuel filter and fuel-water separator deposit and water			0							
L.	Replace fuel fil element	lter and fuel/w	ater separator					•			
	Check oil press	sure		0							
	Check oil level (Engine and M			0							
	Replace oil filter			⊙ (1st time)		•					
Lubrication system	Clean by-pass filter			O (1st time)	0						
S ⊏	Clean oil coole	ir							•		
ig O		Standard	Gas (light) oil				•				
<u> </u>	Standard	Diesel (heavy) oil			•						
_	Replace oil Shallow	Gas (light) oil				•			Per 300 running hrs		
		Diesel (heavy) oil			0				Per 150 running hrs		
	YANMAR		Marine gear		⊙ (1st time)				•	Every 2000 hours	
	Check cooling	seawater disc	charging condition	0							
	Check and rep	lace zinc	Heat exchanger			0	•				
Sten	anodes Air cooler				0	•					
<u> </u>	Check and replace seawater pump impeller							•			
⁄⁄αετε	Check water leakage from water pump		0								
sea)	Check clogging	g of drain hole				0					
Cooling seawater system	Replace mech	anical seal							•	Replace if found wate leakage	
	Clean seawate		ger)						•		

				·	ce period			aler or distributor.
	Item	Daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 6 months	Every year	Remarks
	Check coolant temperature	0						
E	Check coolant level and refill	0						
syst	Check water leakage from water pump	0						
Cooling coolant system	Replace mechanical seal						•	Replace if found water leakage
ŏ p	Change coolant						•	
8	Check and clean thermostat						•	
ပ 	Clean coolant system (Air cooler and Heat exchanger)						•	
	Check injection timing			• (1st time)		•		
Ē	Check deflector						•	
ZZ e	Check major parts						•	
Fuel injection pump and nozzle	Check injection pressure and spray form				• (1st time)	•		
Fuel	Check nozzle carbon				• (1st time)	•		
	Replace injection nozzle						•	
o G	Check oil leakage from oil seal	0						
Fuel feed pump	Replace oil seal						•	
Ξº	Check major parts						•	
	nten hose clips ubricating oil, coolant, breather and air line)		O (1st time)			0		
	rubber hoses ubricating oil, coolant, breather and air line)						0	
Check	and adjust remote control cables		O (1st time)			0		
Crank- shaft	Measure and adjust deflection						•	
der	Check and adjust valve clearance		• (1st time)			•		Every 1500 hours
Cylinde head	Check valve rotator, stem seal, valve spring						•	
	Check oil feeding condition of rocker arm			•				
е ў	Check pre-filter			0				
Silencer (Intake)	Replace pre-filter						•	
ē	Wash blower						0	Every year or 4500 hours
harg	Check air/gas leakage	0						
Turbocharger	Check looseness of bolts and nuts	0						
þ	Check rotation of tarbine shaft					•		
	Check play of tarbine shaft						•	
	air cooler						•	
Check	and replace the viscous damper			● (Check: 50	000 hours, R	eplace: 1000	00 hours)	

			Service period						
Item		Daily	Every 50 hours	Every 250 hours	Every 500 hours	Every 6 months	Every year	Remarks	
	Check battery electrolyte level and specific gravity			0					
a	Check battery terminals						0		
Electric device	Check alternator V-belt tension		O (1st time)		0		•		
ğ	Check tachometer	0							
ш	Check alarm lamp	0							
	Check wire harness					0			
	Check temperature and pressure switch						•		
₫	Check looseness of bolts and nuts	0							
Exterior	Check water/oil/gas leakage at various parts	0							
	Clean lubricating oil strainer (When replacing lubricating oil)		O (1st time)				0		
	Check and clean magnet plug		O (1st time)			0			
e gear	Check and replace zinc anodes of lubricating oil cooler				•				
<u>2</u> .	Check and clean lubricating oil cooler						•		
YANMAR Marine	Check and replace friction plate and bearing						•	Check: Every 2 year Replace: Every 5 year	
	Check and replace rubber block						•	Check: Every 2 year Replace: Every 5 year	

Fuel System

(For fuel system diagram, refer to [Bleed the fuel oil system] on page 15.)

■ Fuel level check

Service period Daily

Refill as required.

■ Fuel tank deposit draining

Open the drain cock on the tank to drain out sediment and water at the tank bottom.

Service period	Daily
•	_

■ Fuel filter and fuel/water separator draining

Remove the drain plug to drain water from the fuel filter and fuel/water separator.

■ Replace element of fuel filter and fuel/ water separator

Service period	Every 500 hours
•	,

Loosen the bolt in the center of the fuel filter and remove the filter case and element.

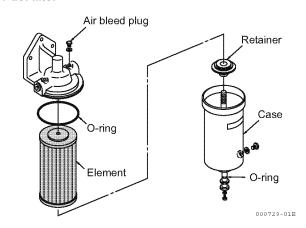
Replace the element with a new one.

When installing the new element and case, use new O-rings; tighten the center bolt securely.

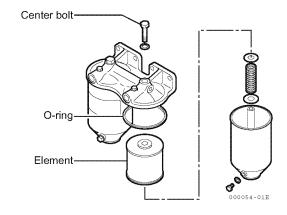
NOTICE

- Before installing the element, clean the inside of the filter case.
- Do not forget to install the spring, retainer and O-rings.
- After replacing the element, be sure to bleed air from the fuel system.

Fuel filter



Fuel/water separator



Lubricating Oil System

■ Oil level checking

Check the oil level with the dipstick. Oil level must be maintained between the upper and lower level marks on the dipstick. Add the recommended oil up to the upper level mark, if necessary.

Service period	Daily (prior to operation)
----------------	----------------------------

■ Replacement of oil filter

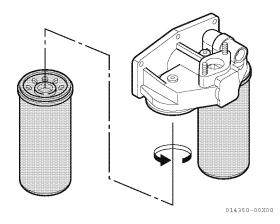
- 1. Remove the filter with the filter wrench. (Turn to the
- 2. Before installing the filter, carefully wipe the installation side and apply lubricating oil to the packing
- 3. Tighten the lubricating oil filter fully by hand, and then use a filter wrench to further tighten the filter. (Turn to the right.)
- 4. Check for oil leakage during operation.

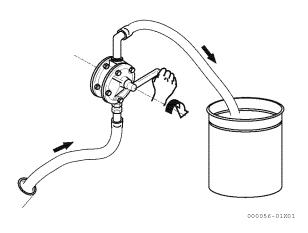
Service	1st time	50 hours
period	2nd time and after	Every 500 hours

■ Engine oil change

Wait for about one to two hours after stopping the engine, connect the end of the rotary pump rubber hose to the oil drain port, and drain oil. Fill the oil pan with recommended oil.

	1st	time	50 hours
Service period		Standard oil pan	Every 500 hours (gas oil)
			Every 250 hours (diesel oil)
periou		and after Shallow	Every 300 hours (gas oil)
		oil pan	Every 150 hours (diesel oil)





■ Cleaning of lubricating oil bypass filter

The lubricating oil system is equipped with a lubricating oil bypass filter.

NOTICE

Stop the engine before cleaning the bypass filter. If you disassemble the bypass filter while the engine is running, oil mist may be blown off, causing burns.

Disassembly and cleaning

Service	1st time	50 hours
period	2nd time and after	Every 250 hours

Disassembly

Disassemble and clean the lubricating oil bypass filter according to the following procedures.

- 1. Loosen the cap nut and then remove the cover.
- 2. Loosen the nut and remove the rotor body.
- 3. Loosen the lock nut and remove the rotor cover, then remove the insulator and spring.
- 4. Remove the sludge inside the rotor with a spatula.

NOTICE

Completely remove the sludge. Otherwise, residual sludge may cause an unbalance in rotation, resulting in damage to the bearing of the spindle shaft.

- 5. Check for clogging of the nozzle and clean the nozzle a brass wire brush.
- 6. Check each part and the O-rings. If any damage or excessive wear is found, replace the part.

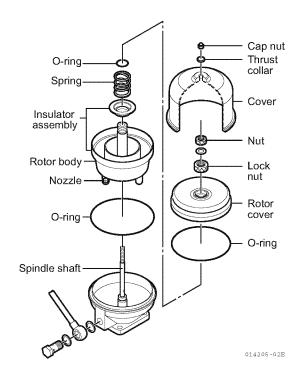
Assembly

Assemble the filter in the sequence reverse to disassembly while observing the following precautions.

1. Install the insulator spring into the rotor body and cover the rotor body with the rotor cover.

NOTICE

Ensure that the fitting of rotor and rotor cover is secure. When the fitting is not aligned, the rotor speed becomes unbalanced and it may damage the equipment.



2. Tighten the rotor cover to the rotor body with a lock nut.

Lock nut tightening torque	Hand-tighten
----------------------------	--------------

3. Insert the rotor to the spindle shaft and tighten the nut by hand-tighten.

Nut tightening torque	Hand-tighten
, , , , ,	, ,

4. Cover the cover, install the thrust collar (upper), and tighten the cap nut.

Bypass filter (Part No. 148620-35310) (E/#: to 7071)

Tightening torque of cap nut	9.8 N·m (1.0 kgf·m) or, after the tighten by hand fully,
	use a spanner for M12 and tighten for 1 to 1-1/4 turns.

Bypass filter (Part No. 148620-35311) (E/#: from 7072)

Tightening	16 ± 2 N·m (1.6 ± 0.2 kgf·m) or,
	after the cap nut is attached,
torque of	use a spanner for M12 and
cap nut	tighten for 1 to 1-1/4 turns.

NOTICE

Avoid overtightening the nut and cap nut. When the cap nut is overtightened, the tightening power is lost during loosening at the next time and it may cause the spindle shaft to loosen.

5. While operating the filter, make sure oil does not leak from connected sections. Also, make sure the filter is not vibrating abnormally.

Cooling Water System (Seawater and Coolant)

Seawater system

■ Discharging seawater

From time to time during operation, check if water is coming out of the seawater outlet pipe. If water comes out intermittently or its volume is low during a highspeed run, stop the engine immediately, and check for the cause.

Service period Daily (durings operation)
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■ Checking and replacement of zinc anodes

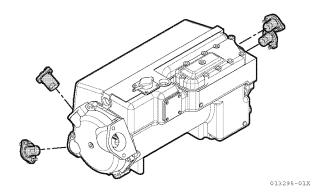
Remove the zinc anode and scrape or remove with a wire brush the coating on the zincs. If more than 50% of the zinc is corroded away, it should be replaced with new zinc.

Zinc anodes are built into the following places:

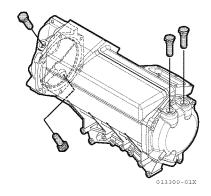
	Q'ty
Heat exchanger	4
Air cooler	4

Service	Checking	Every 250 hours
period	Replacement	Every 500 hours

Heat exchanger



Air cooler



■ Replacement of seawater pump impeller

- 1. Remove the seawater pump cover and pull out the impeller. Check the wear plate and cover for wear or damage.
- 2. If the wear plate and cover are excessively worn, replace them with new ones.
- 3. When reassembling the pump, apply grease to the fitting area of the pump shaft and impeller, both end faces of the impeller and the tip of impeller blades.
- 4. When installing the impeller, position blades of the impeller as shown in the illustration at right.

Service period	Every year
•	

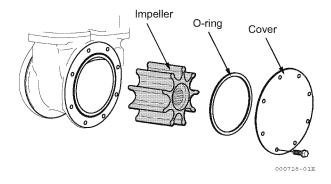
■ Seawater system cleaning

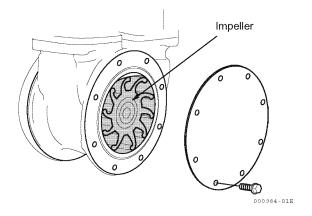
As the engine is used, coolers become foul, their cooling effect worsens, and coolant and intake air temperature becomes abnormally high.

Consequently, eliminate fouling of the seawater system, coolers in particular.

To clean the seawater system, consult your authorized YANMAR dealer or distributor.

Service period	Every year





Coolant system

■ Coolant level checking

Check the coolant level before starting the engine in the cold condition.

1. Remove the filler cap from the coolant tank, and check coolant level.

The level should be at the filler neck. If the level is low, add coolant up to the filler neck.

A DANGER

Do not remove the filler cap when the engine is hot (above 60 °C).

The coolant is under pressure and severe scalding could result.

2. On the coolant system with reservoir tank, check the coolant level in the reservoir tank. The level should be between the "FULL" and "LOW" level marks. Add coolant up to the "FULL" mark.

Service period	Daily
----------------	-------

■ Water pump (coolant) leakage checking

Leakage of coolant may cause serious problems, such as seizure of the engine, as the volume of coolant decreases.

If there is water leakage, consult your authorized YANMAR dealer or distributor.

Service period	Daily
----------------	-------

■ Coolant system cleaning

As the coolant system becomes dirty naturally, cooling efficiency worsens, and coolant temperature becomes abnormally high (above 85 °C) when the engine is operated for long time: clean the coolant system periodically. At the same time, clean the thermostats. As for periodic servicing, consult your authorized YANMAR dealer or distributor.

Service period	Every year

■ Coolant change

Service period	Every year
----------------	------------

NOTICE

- Be sure to replace the coolant at the specified time.
- Be sure to follow the correct mixture ratio for Long Life Coolant (LLC). (Refer to [Coolant])

Turbocharger

■ Clearing of pre-filter and turbocharger

Refer to [CHECKING AND SERVICING THE TURBO-CHARGER].

■ Checking each joint area

Check the turbocharger-to-charge air cooler and turbocharger-to-exhaust manifold connections for damage or leaks.

Service period	Daily
----------------	-------

Injection Nozzle

■ Replacement

Remove the injection nozzle, and replace it with a new one.

Consult your authorized YANMAR dealer or distributor.

|--|

Remote Control Cables

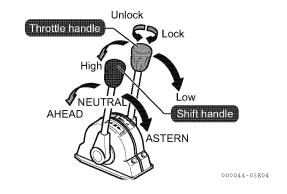
■ Throttle handle

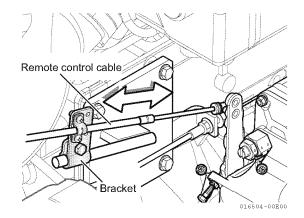
Operate the throttle handle from the position "L" to the position "H", and check if the governor lever at the governor moves into the correct position. If there is disalignment between the throttle handle and the governor lever in their position, adjust the control cable by changing the clamping position of the bracket.

■ Shift handle

Check if the control lever at the marine gear moves when the shift handle is operated in the ahead, neutral and astern positions. If there is a disalignment between the lever and the handle, adjust the control cable by changing the clamping position of the bracket.

Service	1st time	50 hours
period	2nd time	Every 6 months





Electrical Parts

■ Checking the alarm devices

Service period	Daily
<u> </u>	,

■ Checking the battery fluid level

Battery electrolyte decreases as charging and discharging are repeated. Check normal electrolyte level is 10 - 20 mm above the pole plates. If level is low, add distilled water, refer to the illustration at right.

Service period	Every 250 hours
Corrido poriod	

Insufficient





■ The alternator drive belt tension

		1st time	After 50 hours
Service period	Checking	2nd time and after	Every 500 hours
Replacing V-belt	Every year		

Squarely add load 7.5 N (for a new belt) to the center part of the belt span, and adjust for the deflection at that time to become 3.6 mm. (6.5 N when trying to put) (Adjust for the deflection to become 1.6 mm per 100 mm span length.)

Adjusting the V-belt

- 1. Loosen the lock bolt (1) of the alternator. Adjust the tension of the V-belt with the adjuster nut (2).
- 2. After you adjust, tighten the adjuster nut (2) and the lock bolt (1) of the alternator.
- 3. Replace the V-belt if it is damaged.

Valve Clearance Adjustment

Consult your authorized YANMAR dealer or distributor about adjusting the valve clearance.

Valve clearance	Intake	0.3 mm
valve clearance	Exhaust	0.5 mm
Service period	1st time	50 hours
	2nd time	Every 6 months

TROUBLESHOOTING AND COUNTERMEASURES

The causes of abnormalities and troubles are diverse, and they break out from composite factors. Catching a change in running performance and referring to the record of maintenance and servicing date and the history of part replacement, locate the cause early and take the proper countermeasures.

- Starting failure
 - Flywheel not turned
 - Flywheel turned, but ignition not taken place
- Rotational speed dropped spontaneously
- Output of each cylinder not in uniformity (Dispersion of the exhaust temperature is large among cylinders)
- Bad color of exhaust gas
- Lubricating oil pressure dropped below the specified pressure
- Unusual sounds heard (knocking occurred) during operation
- Coolant temperature too high
- Exhaust temperatures of all the cylinders too high
- Engine stopped suddenly

NOTICE

- · Although some failures can be solved by the user, others are not. For failures that require disassembly for repair and servicing or those that are not covered in this chapter, consult your authorized YANMAR dealer or distributor.
- If you judge that you can continue using the engine after inspection, cruise at a slow speed to return to port and, when landed, ask for repairs. If you cannot judge on your own, ask your authorized YANMAR dealer or distributor.
- Do not operate the engine if alarm devices are not working properly. Doing so may lead to a severe accident in case of a failure because you will not receive any alarm notifications.

Starting failure

Flywheel not turned

Cause	Countermeasure
1. Electric starting system	
Battery voltage drop	Charge the battery.
Failure of starter motor	Consult your authorized YANMAR dealer or distributor.
2. Air starting system	
 Clogging of air filter or silencer 	Check and clean the filter or silencer.
Failure of air starter	Consult your authorized YANMAR dealer or distributor.
3. Too high viscosity of lubricating oil	Change the correct lubricating oil with a low-viscosity one.
4. Seizure of moving part	
 Seizure of piston and cylinder liner 	Consult your authorized YANMAR dealer or distributor.
 Seizure of main bearing and/or camshaft bearing 	Consult your authorized YANMAR dealer or distributor.

Flywheel turned, but ignition not taken place

Cause	Countermeasure
Fuel oil not sent under pressure to fuel injection pump	
Fuel tank empty	Supply the fuel to the fuel tank.
Closing of fuel cock (valve)	Open fuel cock (valve).
Clogging of fuel filter	Replace the filter element.
Failure of fuel feed pump	Consult your authorized YANMAR dealer or distributor.
Air mixed in fuel system	Check and repair the fuel system, then bleed air.
2. Poor airtightness of intake/exhaust valve	
Inadequate intake/exhaust valve clearance	Consult your authorized YANMAR dealer or distributor.
Sticking of intake/exhaust valve	Consult your authorized YANMAR dealer or distributor.
Damage of seat of intake/exhaust valve	Consult your authorized YANMAR dealer or distributor.
3. Low cetane number of fuel oil	Use a high-quality fuel oil.

Rotational speed dropped spontaneously

Cause	Countermeasure
1. Clogging of fuel filter	Replace the filter element.
Seizure of moving part (piston, main bearing or turbocharger)	Consult your authorized YANMAR dealer or distributor.
3. Air mixed in fuel system	Check and repair the fuel system, then bleed air.
4. Moisture content in fuel system	Drain the filter, tank, etc.

Output of each cylinder not in uniformity (Dispersion of the exhaust temperature is large among cylinders)

Cause	Countermeasure
1. Air mixed in fuel system	Check and repair the fuel system, then bleed air.
2. Moisture content in fuel system	Drain the filter, tank, etc.
3. Fuel injection volume not in uniformity among cylinders	Consult your authorized YANMAR dealer or distributor.

Bad color of exhaust gas

Cause	Countermeasure
1. Inadequate fuel injection timing	Consult your authorized YANMAR dealer or distributor.
Inadequate intake/exhaust valve clearance or damage of intake/exhaust valve seat	Consult your authorized YANMAR dealer or distributor.
3. Sticking of intake/exhaust valve	Consult your authorized YANMAR dealer or distributor.
4. Damage of intake/exhaust cam	Consult your authorized YANMAR dealer or distributor.
5. Defect of turbocharger	
Clogging of pre-filter	Wash the pre-filter.
 Fouling of the blower side or turbine side 	Wash the turbocharger/blower.
6. Fouling of charge air cooler (too high temperature of boost air)	Consult your authorized YANMAR dealer or distributor.
7. Low-quality of fuel oil	Use a high-quality fuel oil.
8. Overload	Reduce the load.

Lubricating oil pressure dropped below the specified pressure

Cause	Countermeasure
Looseness of lubricating oil pipe	Check and repair the lubricating oil pipe.
2. Clogging of lubricating oil filter	Replace the lubricating oil filter.
3. Excessive clearance of crankshaft bearing	Consult your authorized YANMAR dealer or distributor.
Sticking of lubricating oil pressure regulating valve or loose adjusting bolt	Consult your authorized YANMAR dealer or distributor.
5. Sticking of lubricating oil safety valve	Consult your authorized YANMAR dealer or distributor.
6. Too high temperature of lubricating oil	
Shortage of cooling water volume	Check the water pump (coolant).
Fouling of lubricating oil cooler	Consult your authorized YANMAR dealer or distributor.
Excessive blow-bye (gas leak) into the crankcase	Consult your authorized YANMAR dealer or distributor.
7. Air sucked in lubricating oil pump (shortage of lubricating oil volume)	Replenish the lubricating oil.

Unusual sounds heard (knocking occurred) during operation

Cause	Countermeasure
Inadequate intake/exhaust valve clearance	Consult your authorized YANMAR dealer or distributor.
2. Inadequate fuel injection timing	Consult your authorized YANMAR dealer or distributor.
3. Loosen some parts	Check and fix.

Coolant temperature too high

Cause	Countermeasure
Shortage of cooling water volume	
 Clogging of seawater inlet passage 	Check and clean the seawater strainer, sea cock and pipes.
 Failure of seawater pump impeller 	Check and repair the impeller.
 Failure of water pump (coolant) 	Consult your authorized YANMAR dealer or distributor.
2. Coolant level is low	Refill with coolant.
3. Coolant is leaking	Check and tighten the leaking part.
4. Sticking of coolant thermostatic valve	Consult your authorized YANMAR dealer or distributor.

Exhaust temperature of all the cylinders too high

Cause	Countermeasure
1. Charge air temperature too high	
 Shortage of charge air cooler cooling water volume 	Check and repair the seawater pump.
 Fouling of charge air cooler (cooling water side and air side) 	Consult your authorized YANMAR dealer or distributor.
Engine room temperature too high	Check and service the engine room ventilation equipment.
2. Boost pressure too high	
 Engine room put under a negative pressure 	Check and service the engine room ventilation equipment.
3. Unsuitable properties of fuel oil	Use a high-quality fuel oil.
4. Overload	Reduce the load.

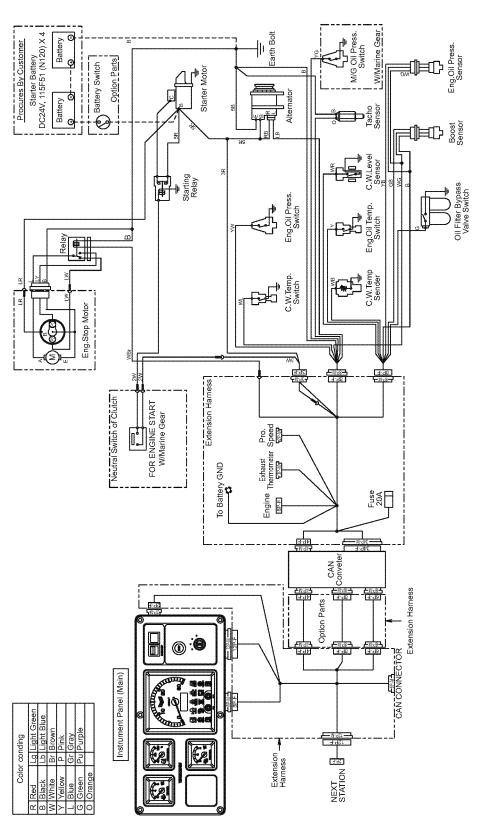
Engine stopped suddenly

Cause	Countermeasure
1. Fuel tank empty	Replenish the fuel oil.
2. Air mixed in fuel system	Bleed air from the fuel system.
3. Clogging of fuel filter	Replace the filter element.
4. Seizure of moving part (piston, main bearing, crank-pin	Consult your authorized YANMAR dealer or distributor.
bearing, timing gear, etc.)	

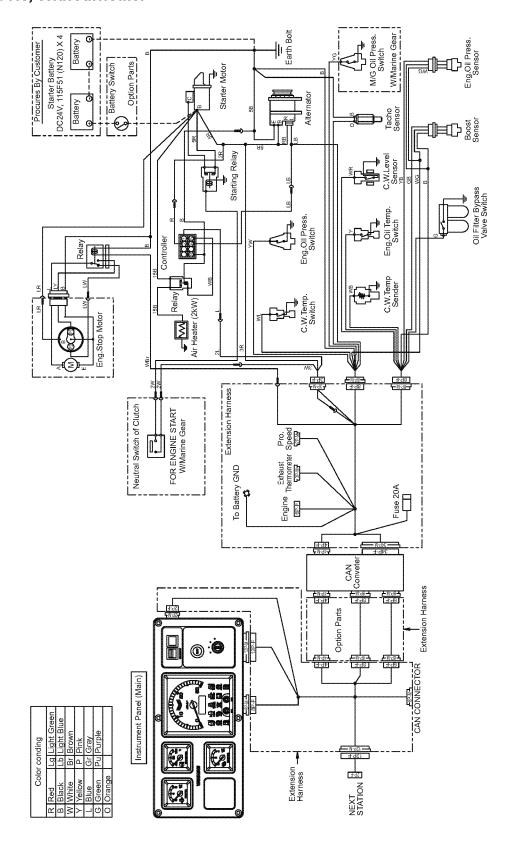
WIRING DIAGRAMS

1 Station

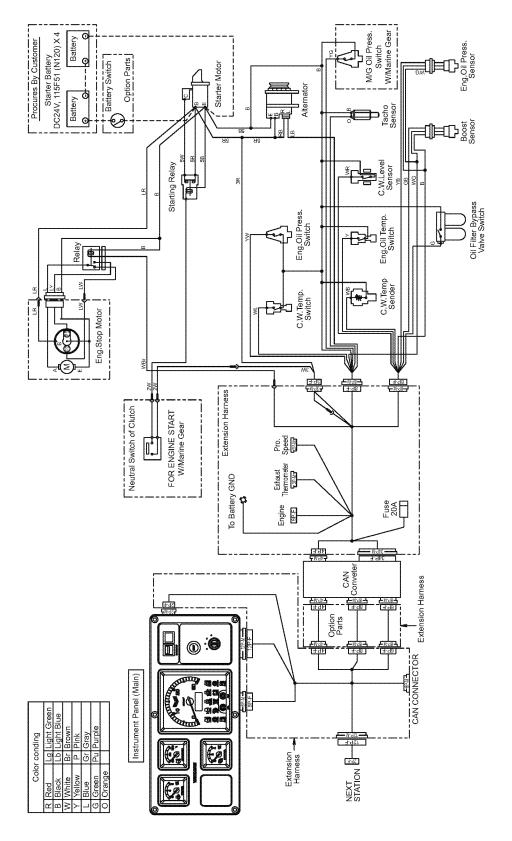
■ 1 pole, Without Airheater



■ 1 pole, With Airheater

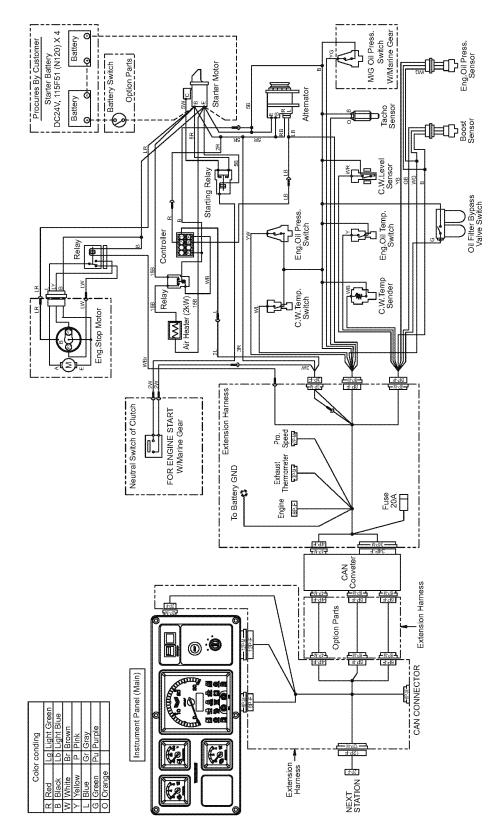


■ 2 pole, Without Airheater



ONE OF PARTS

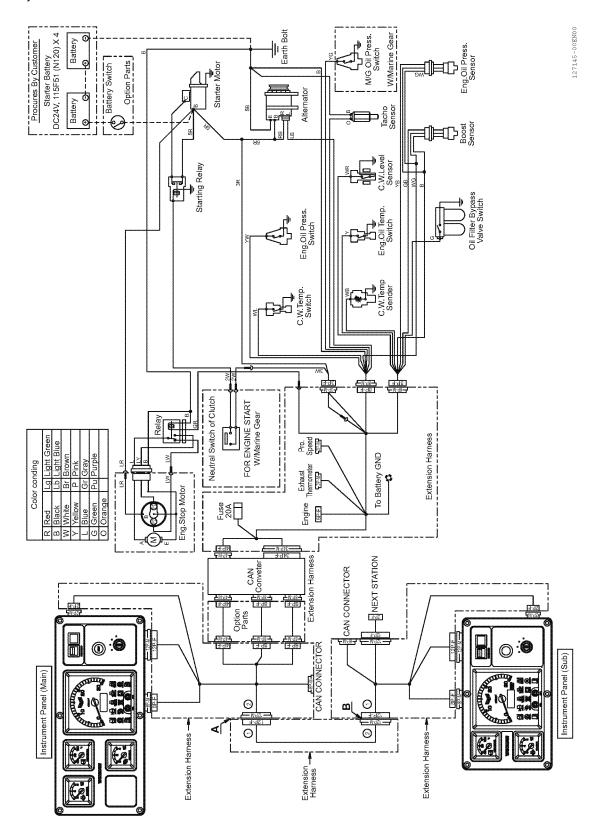
■ 2 pole, With Airheater



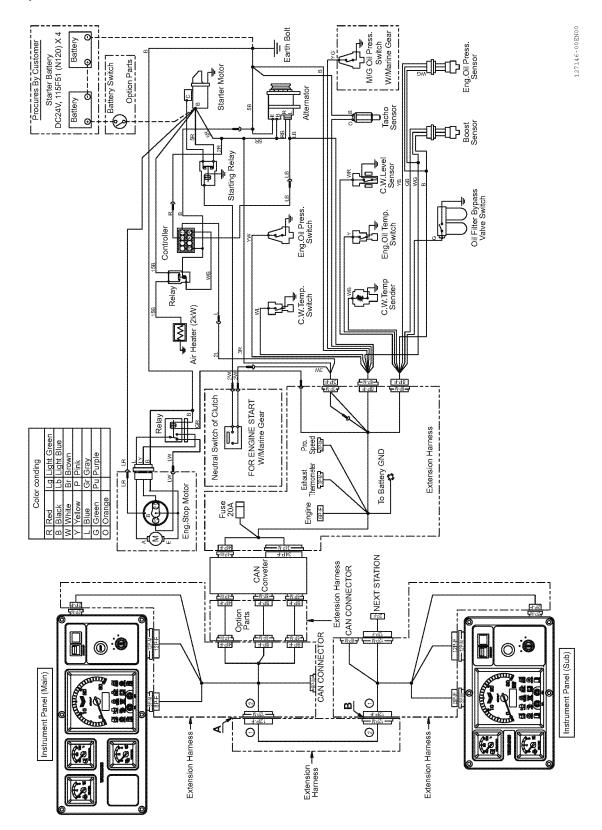
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2 Station (Panel D + Panel C)

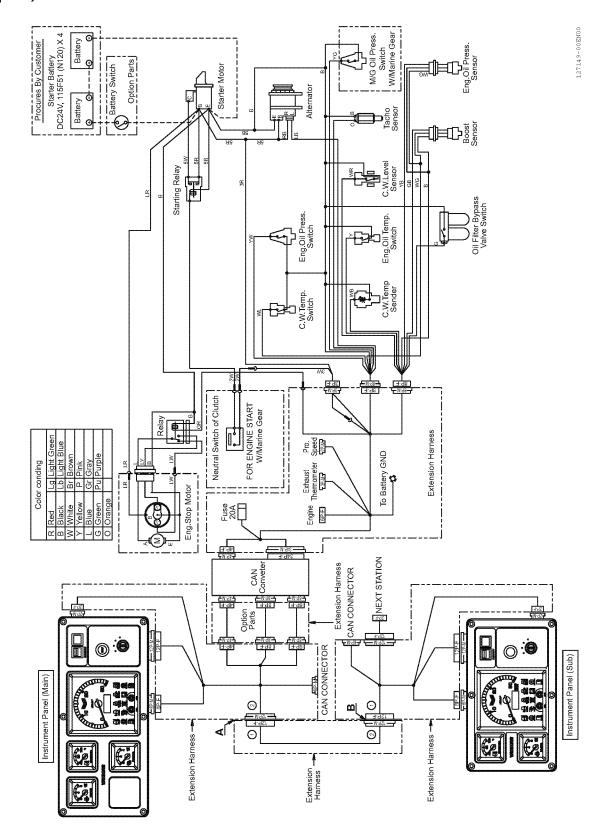
■ 1 pole, Without Airheater



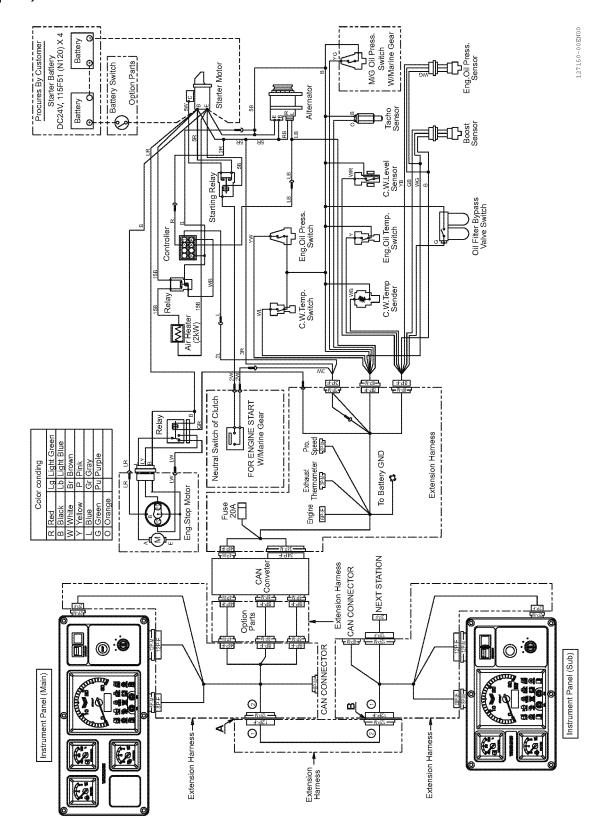
■ 1 pole, With Airheater



■ 2 pole, Without Airheater

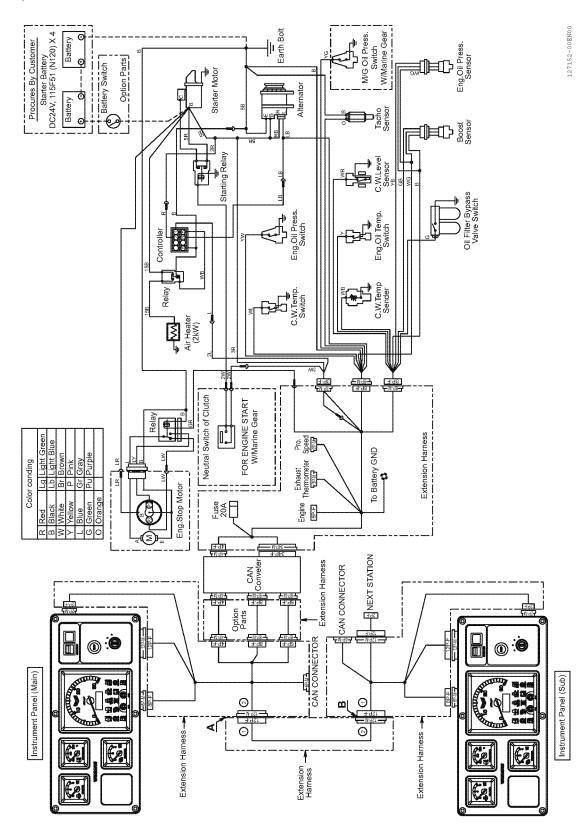


■ 2 pole, With Airheater

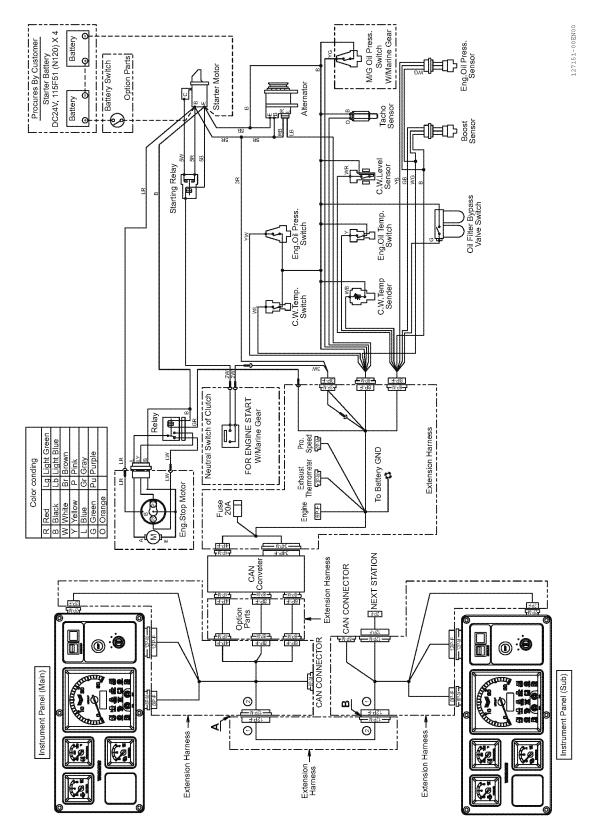


2 Station (Panel D + Panel D)

■ 1 pole, With Airheater



■ 2 pole, Without Airheater



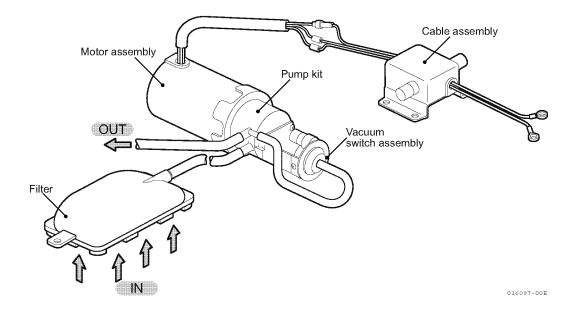
YANMAR STANDARD MOTOR-DRIVEN **BILGE PUMP (OPTION)**

■ Features

- Since parts of this bilge pump that come in contact with bilge are made of polyvinyl chloride (PVC) and acid and alkali resistant materials, you may use this pump without worrying about its wearing out.
- There is no need to worry about idling or seizure of this bilge pump because it is equipped with a protective device which brings about an automatic stop when bilge is gone and the pump does not lift anything.

■ Method of fitting and use

- Connect the red wire to positive (+) and black wire to negative (-) respectively, avoid mis-wiring.
- · Install the pump body where it can be used easily with the battery and operating switch as the pump body is connected with 3 m long cord.
- Fit the strainer part of the bilge pump to the ship bottom by use of metal fittings.



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:

Deration anual YANMAR

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As of March 1st, 2020

OPERATION MANUAL

6AYM-WGT, 6AYM-WET, 6AYM-WST

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