



Sail-Drive

OPERATION MANUAL

SD20

SD50

SD50-4T

P/N: 0ASDM-G00101

YANMAR
®

**SAIL-
DRIVE**

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INTRODUCTION

This Operation Manual describes Sail-Drive Models SD20, SD50, SD50-4T. For engine handling and operation, refer to the respective operation manuals for Engine Models 1GM10C, 2YM15, 3YM20, 3YM30, 3JH4CE, 3JH5CE, 4JH4ACE, 4JH5CE and 4JH4-TCE. However, instructions for the marine gear box are not necessary as they are included.

Engines and Sail-Drive combinations are available as follows:

Engine model	Sail-Drive Model
1GM10C	SD20
2YM15	
3YM20, 3YM30	
3JH4CE	SD50
3JH5CE	
4JH4ACE	
4JH5CE	
4JH4-TCE	SD50-4T

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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.



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.

SAFETY PRECAUTIONS

DANGER

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

WARNING

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

CAUTION

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

NOTICE

Indicates a situation which can cause damage to the Sail-Drive, personal property and / or the environment or cause the equipment to operate improperly.

General Information

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

Before You Operate

DANGER

The safety messages that follow have DANGER level hazards. These safety messages describe a hazardous situation which, if not avoided, will result in death or serious injury.



NEVER permit anyone to install or operate the Sail-Drive without proper training.

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

Crush Hazard



NEVER stand under a hoisted Sail-Drive.

If the hoist mechanism fails, the Sail-Drive will fall on you.

When you need to transport a Sail-Drive for repair, have a helper assist you to attach it to a hoist and load it onto a truck.

NEVER support Sail-Drive with equipment not designed to support the weight of the Sail-Drive such as wood blocks or by only using a jack.

NEVER use the Sail-Drive lifting eye to lift the engine and Sail-Drive as an assembly. Use the engine lifting eyes to lift the engine and Sail-Drive. Only use the Sail-Drive lifting eye to lift the Sail-Drive as a separate component.

During Operation and Maintenance

DANGER

The safety messages that follow have DANGER level hazards.

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 flame and any other form of ignition out of the area.

Fire Hazard



Ensure that appropriate fire detection and extinguishing equipment are installed and checked periodically for proper operation.

WARNING

The safety messages that follow have WARNING level hazards.

These safety messages describe a hazardous situation which, if not avoided, *could* result in death or serious injury.

Fire Hazard



Undersized wiring systems can cause an electrical fire.

Sever Hazard



NEVER service the Sail-Drive while under tow or if the engine is running at idle speed. The propeller may rotate under these circumstances.

Alcohol and Drug Hazard



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

Entanglement Hazard



NEVER leave the key in the key switch when you are servicing the Sail-Drive. 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.

Burn Hazard



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

Sudden Movement Hazard

ALWAYS stop the engine before beginning service.

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.

⚠ CAUTION

The safety messages that follow have CAUTION level hazards.

These safety messages describe a hazardous situation which, if not avoided, *could* result in minor to moderate injury.

Poor Lighting Hazard

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

Tool Hazard

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

Exposure Hazard



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

NOTICE

These notices describe a situation which, if not avoided, can cause damage to the Sail-Drive, personal property and / or the environment or cause equipment to operate improperly.

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 Sail-Drive performance and can help extend the life of the Sail-Drive and engine.



ALWAYS be environmentally responsible.

Follow the guidelines of the EPA or other governmental agencies for the proper

disposal of hazardous materials such as lubrication oil, diesel fuel and engine coolant. Consult the local authorities or reclamation facility.

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

NEVER attempt to modify the Sail-Drive's design or safety features.

- NEVER release or modify the limiting devices such as the engine speed limit, fuel injection limit, etc.
- Modification will impair the safety and performance of the product and shorten product life.
- Modifications to the design, safety or limiting features will void the warranty.

If the Sail-Drive oil temperature is too high, stop engine immediately and check the Sail-Drive oil level and check the oil cooler for proper coolant and water flow.

The anode of the Sail-Drive is only calculated for the Sail-Drive. Changing the material of the propeller may require additional anodes to be installed on the sail-drive.

Failure to use the correct anode material may result in inadequate protection and excessive corrosion of underwater drive system components. Use only zinc or aluminum anodes in brackish and saltwater applications. In freshwater applications, use aluminum or magnesium anodes for best results. NEVER use magnesium anodes in brackish or salt water, as they will deteriorate rapidly, which will lead to severe damage to the drive system.

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PRODUCT OVERVIEW

OVERVIEW

Owner / Operator Responsibilities

The operator must, and assumes all responsibility to:

- Read and understand the operation manual prior to operating the sail-drive;
- Perform all safety checks as necessary to ensure safe operation;
- Comply with and follow all lubrication and maintenance instructions and recommendations; and
- Have an authorized Yanmar dealer / distributor perform periodic checkups.

Conducting normal maintenance service and replacing consumable parts as necessary is the responsibility of the owner / operator and necessary to provide the best durability, performance and dependability of the Sail-Drive while keeping your overall operating expenses to a minimum. Individual operating habits and usage may increase the frequency of performing maintenance service condition. Monitor conditions frequently to determine if the maintenance intervals suggested in the manual are frequent enough for your Sail-Drive.

New Sail-Drive Break-In:

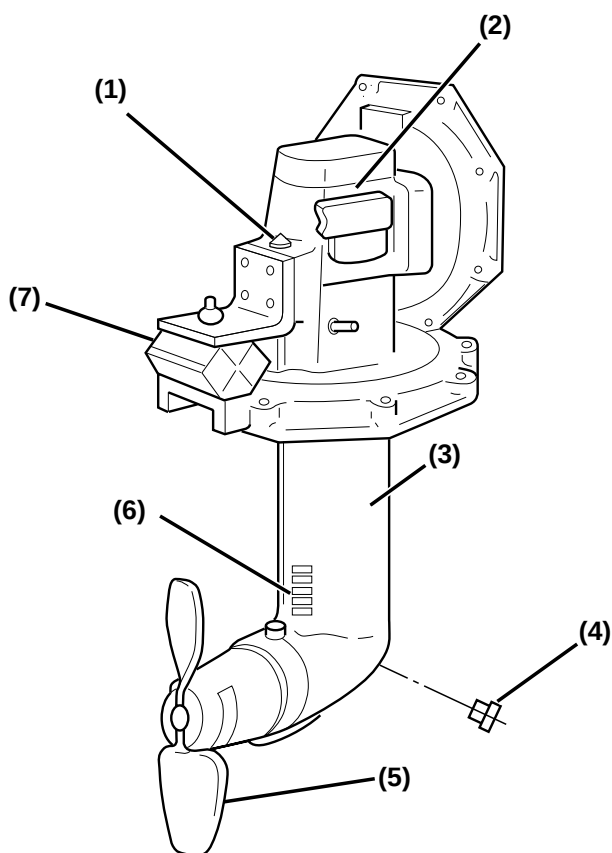
- On the initial engine start-up, allow the engine to idle for approximately 15 minutes while you check for proper Sail-Drive function and Sail-Drive oil leaks.
- During the break-in period, carefully observe Sail-Drive seal indicators for proper Sail-Drive function.
- During the break-in period, check the Sail-Drive oil levels frequently.

Dealer / Distributor Responsibilities

In general, a dealer's responsibilities to the customer include predelivery inspection and preparation such as:

- Ensure that the vessel is properly equipped.
- Prior to delivery, make certain that the Yanmar Sail-Drive and other equipment are in proper operating condition.
- Make all necessary adjustments for maximum efficiency.
- Familiarize the customer with the on-board equipment.
- Explain and demonstrate the operation of the Sail-Drive and vessel.

COMPONENT IDENTIFICATION



0006440

Figure 1

- | | |
|--------------------------------|--------------------|
| 1 – Dipstick | 5 – Propeller |
| 2 – Upper Gear Case | 6 – Seawater Inlet |
| 3 – Lower Gear Case | 7 – Flexible Mount |
| 4 – Lubricating Oil Drain Plug | |

GALVANIC CORROSION

Galvanic corrosion results whenever two or more dissimilar metals (like those found on the sail-drive) are submerged in a conductive solution, such as saltwater, polluted water or water with a high mineral content because a chemical reaction takes place causing electrical current to flow between the metals. The electrical current flow causes the metal that is most chemically active, or anodic, to erode. If not controlled, galvanic corrosion may corrode Sail-Drive components.

CORROSION CONTROL

It is the boat designer's responsibility and/or the re-powering engineer's responsibility to design the proper systems and equipment to control and reduce the possibility of galvanic corrosion.

However, it is essential that the owner/operator frequently monitor the anodes for wear, inspect the sail-drive for corrosion and replace the anodes often enough to provide a sacrificial surface for the electrical current to attack. Galvanic isolators and isolation transformers are also available from the aftermarket (not supplied by Yanmar). The Galvanic isolator is a device that is installed in series with the (AC) grounding (GREEN) conductor of the shore-power cable to effectively block low-voltage DC galvanic current flow but permit the passage of alternating current (AC) *.

The rate of corrosion depends on numerous factors, such as:

- the number, size and location of sacrificial anodes on the sail-drive and vessel;
- the marina environment, such as stray current in the water, fresh or salt water and use and isolation of shore power;
- improper application of marine paint or antifouling paint;
- failure to repaint damaged areas; and
- how the vessel is bonded.

Please check with the boat builder, dealer or other professional to determine if your vessel and/or Sail-Drive is adequately protected from galvanic corrosion.

NOTICE: *The anode of the Sail-Drive is only calculated for the Sail-Drive. Changing the material of the propeller may require additional anodes to be installed on the Sail-Drive.*

* "The Boatowner's Guide to Corrosion", by Everett Collier.

NOTICE: *Failure to use the correct anode material may result in inadequate protection and excessive corrosion of underwater drive system components. Use only zinc or aluminum anodes in brackish and saltwater applications. In freshwater applications, use aluminum or magnesium anodes for best results. NEVER use magnesium anodes in brackish or salt water, as they will deteriorate rapidly, which will lead to severe damage to the drive system.*

If sacrificial anodes erode quickly or if signs of corrosion are evident, the owner should take immediate corrective action. Yanmar recommends consulting an engineer specializing in marine electricity and corrosion control to determine the best way to correct the rapid erosion of the anodes.

SHORE POWER

Vessels that are connected to shore power require additional protection to prevent destructive low voltage galvanic currents from passing through the shore power ground wire. Galvanic isolators are available from the aftermarket (not supplied by Yanmar) to block these currents while still providing a path to ground for dangerous shock currents.

NOTICE: *If the AC shore power ground is not isolated from the boat ground, sacrificial anodes may be unable to neutralize the increased galvanic potential. Corrosion damage that results from the improper system design or application is not covered by the Yanmar Limited Warranty.*

UNDERWATER DRIVE COATING

The lower gear case coating may be damaged when hit by objects in the water, or when having deposits removed from it. The underwater coating must be inspected at least once per year and when it is believed that an object was hit that may have caused damage. Repair and repaint damaged areas immediately.

Observe the following precautions when applying antifouling or marine paint to the bottom of the boat hull:

- ALWAYS follow the paint/coating manufacturer's directions for surface preparation and application.
- ALWAYS use a high quality primer and topcoat paint specifically designed for aluminum outboards, Sail-Drives or Stern-Drives.
- NEVER paint the sacrificial anodes installed on the Sail-Drive.
- NEVER paint the Sail-Drive with a material that contains copper or tin.
- NEVER paint over drain holes, sacrificial anodes, or other items specified by the sacrificial anode Manufacturer.

Contact your authorized Yanmar Marine dealer or distributor for assistance.

NOTICE: *Galvanic corrosion damage, normal maintenance and consumable parts are not covered by the Yanmar Limited Warranty.*

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BEFORE YOU OPERATE

This section of the *Operation Manual* describes propeller selection, propeller fitting, lubricating oil specifications and how to replenish them. It also describes the daily instrument panel and remote-control device checks.

Before you operate the Sail-Drive, review the *Safety* section on page 3.

BEFORE YOU OPERATE

PROPELLER SELECTION

Recommended Propeller Size (Maximum)

Engine Model	Sail-Drive Model	Folding Type Diameter	2-Blade Fixed Type Diameter
1GM10C	SD20	14 in.	14 in.
2YM15		14.5 in.	15 in.
3YM20		15 in.	16 in.
3YM30		16 in.	16.5 in.
3JH4CE	SD50	18 in.	18 in.
3JH5CE			
4JH4ACE			
4JH5CE			
4JH4-TCE	SD50-4T	18 in.	18 in.

NOTICE: *Make sure the propeller (fixed or folding) has a rubber bushing. If a propeller is used without a rubber bushing, the shaft, bearing and gears of the Sail-Drive will be damaged.*

Fitting a Fixed Propeller (2-Blade)

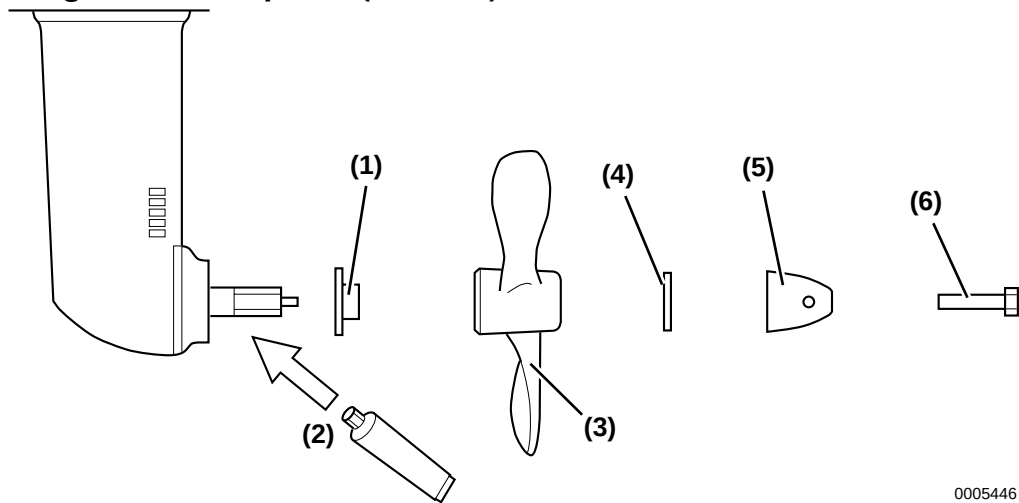


Figure 1

- 1 – Spacer
- 2 – Grease
- 3 – Propeller
- 4 – Washer
- 5 – Nut *
- 6 – Bolt **

	Size	Tightening Torque
*	M16 (SD20) M20 (SD50, SD50-4T)	60 to 70 N·m (44 to 52 lb-ft) 80 to 100 N·m (59 to 74 lb-ft)
**	M8 x 75 mm	11 to 15 N·m (8 to 11 lb-ft)

Locking Procedure for Fixed Propeller Nut (Optional)

When tightening the nut to 60 to 70 N·m (44 to 52 lb-ft) torque for the SD20, and 80 to 100 N·m (59 to 74 lb-ft) torque for the SD50 and SD50-4T, move the shift lever to ahead and hold the crankshaft V-pulley clamp nut with a wrench to stop the propeller rotating.

BEFORE YOU OPERATE

LUBRICATING OIL

The choice of lubricating oil is very important. If an unsuitable oil is used, or an oil change is neglected, it may result in damage and reduce the life of the Sail-Drive. When selecting a lubricating oil, use one of the following:

Lubricating Oil Chart

Engine series	GM, YM		JH3, JH4, JH5	
Engine model	1GM10C	2YM15, 3YM20, 3YM30	3JH4E, 3JH5E, 4JH4AE, 4JH5E	4JH4-TE
Sail-Drive model	SD20	SD20	SD50	SD50-4T
Lubricating oil for the Sail-Drive	API CC or greater and SAE 10W30	API GL4 or GL5 and SAE 80W90 or 90	QuickSilver® High Performance Gear Oil	

Use only oil of quality GL-4 or GL-5 in the API service, and SAE No. 90 or 80W90. (Except model SD20 x 1GM10C & SD50 / SD50-4T).

Use only oil of quality CC or greater in the API service, and SAE No. 10W30. (Applicable model: SD20 x 1GM10C).

For SD20 (except if coupled with the 1GM10C)

Supplier	Brand Name	API Service	SAE No.
SHELL	Shell Spilax oil EP 90	GL-4	90
SHELL	Shell Spilax oil HD 90	GL-5	90
CALTEX	Multipurpose thuban EP	GL-4/GL-59	90
MOBIL	Mobilub HD 80W-90	GL-5	80W-90
ESSO	Esso gear oil GP 90	GL-4	90
ESSO	Esso gear oil GX 90	GL-5	90

Use QuickSilver® * High Performance Gear Oil for the SD50 / SD50-4T.

* QuickSilver® is a registered trademark of Brunswick Corporation.

FILLING WITH LUBRICATING OIL - SD20, SD50 AND SD50-4T

Sail-Drive model	SD20	SD50, SD50-4T
Standard unit	2.2 L (2.3 qt)	2.2 L (2.3 qt)
Long-reach unit	2.5 L (2.6 qt)	2.35 L (2.5 qt) Extension 58 2.45 L (2.6 qt) Extension 100

NOTICE: *The lubricating oil capacity of the standard unit is different from that of the long-reach unit. Confirm the capacity by means of the oil capacity nameplate.*

1. Remove the dipstick (yellow cap). Fill with approved lubricating oil.
2. Check the amount of lubricating oil by inserting the dipstick as far as possible. Do not screw the dipstick in **(Figure 3, (1))**. The oil level should reach the upper mark on the dipstick **(Figure 3, (2))**.

NOTICE: *It takes about 10 minutes to fill up the Sail-Drive with lubricating oil. Check the oil level 15 minutes after adding the specified quantity of oil.*

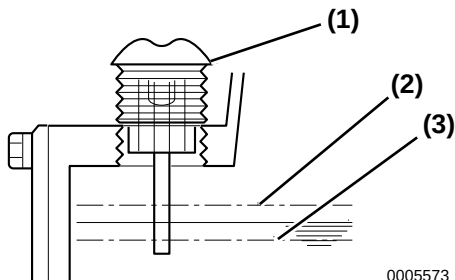


Figure 2

- 1 – Dipstick
- 2 – Upper Limit
- 3 – Lower Limit

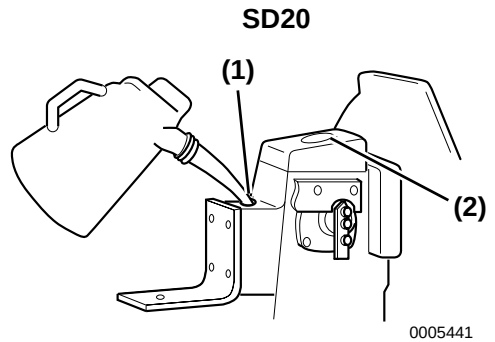


Figure 3

- 1 – Oil Supply Port
 - 2 – Oil Capacity Nameplate
- SD50/SD50-4T**

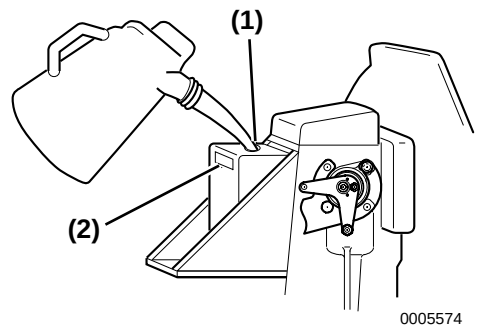


Figure 4

- 1 – Oil Supply Port
- 2 – Oil Capacity Nameplate

BEFORE YOU OPERATE

CHECKING THE INSTRUMENT PANEL ALARM SYSTEM

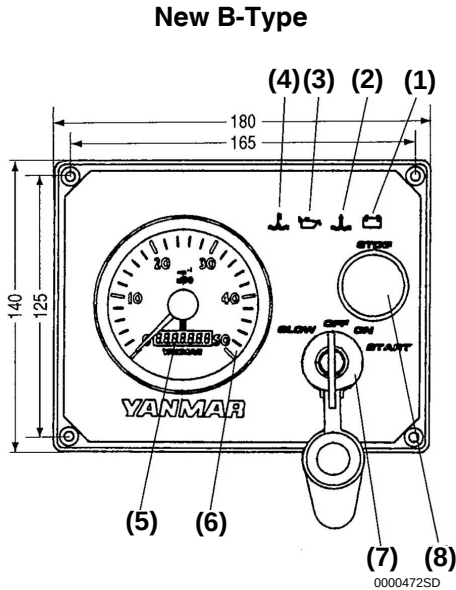


Figure 5

- 1 – Battery Low Charge Alarm
- 2 – Sail-Drive Seal Warning Lamp
- 3 – Engine Oil Low Pressure Lamp
- 4 – Coolant High Temperature Alarm
- 5 – Hour Meter
- 6 – Tachometer
- 7 – Key Switch
- 8 – STOP Button

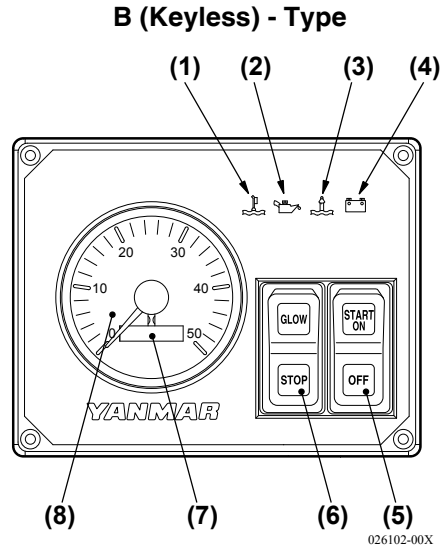


Figure 6

- 1 – Coolant High Temperature Indicator
- 2 – Engine Oil Low Pressure Indicator
- 3 – Water in Sail Drive Seal Indicator
- 4 – Battery Low Charge Indicator
- 5 – ON/OFF/START Switch
- 6 – GLOW/STOP Switch
- 7 – Hourmeter
- 8 – Tachometer

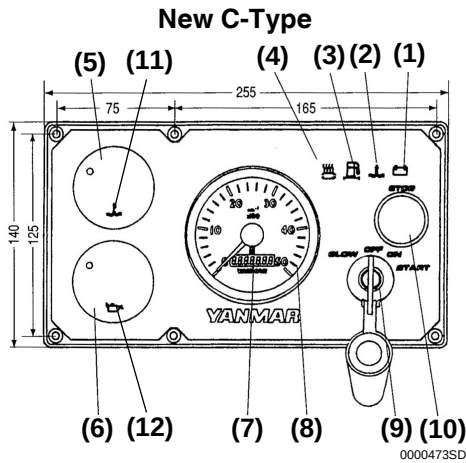


Figure 7

- 1 – Battery Low Charge Alarm
- 2 – Sail-Drive Seal Warning Lamp
- 3 – Fuel Filter Warning Lamp
- 4 – Seawater Insufficient Flow Alarm
- 5 – Coolant Temperature Gauge
- 6 – Engine Oil Pressure Gauge
- 7 – Hour Meter
- 8 – Tachometer
- 9 – Key Switch
- 10–STOP Button
- 11–Coolant High Temperature Warning Lamp
- 12–Engine Oil Low Pressure Warning Lamp

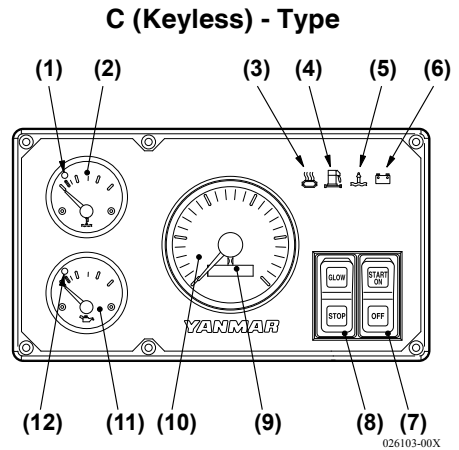


Figure 8

- 1 – Coolant High Temperature Indicator
- 2 – Coolant Temperature Gauge
- 3 – Not Used On This Engine
- 4 – Water in Fuel Filter Indicator
- 5 – Water in Sail Drive Charge Indicator
- 6 – Battery Low Charge Indicator
- 7 – ON/OFF/START Switch
- 8 – GLOW/STOP Switch
- 9 – Hourmeter
- 10–Tachometer
- 11–Engine Oil Pressure Gauge
- 12–Engine Oil Low Pressure Indicator

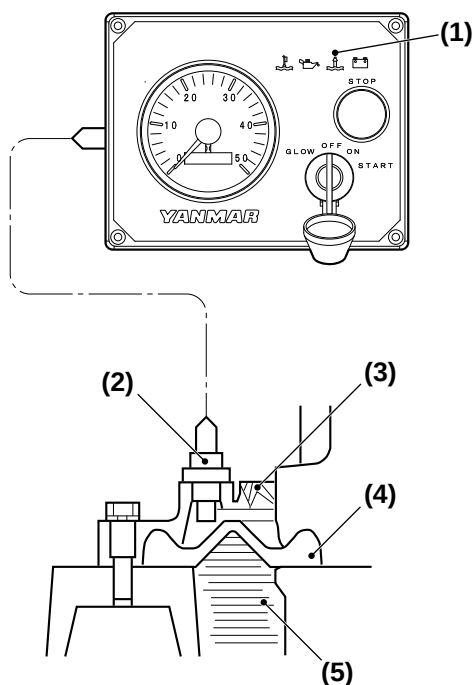
BEFORE YOU OPERATE

Turn the battery switch on. Turn the key to the ON position and check the lamps on the panel (**Figure 5, Figure 7**) with the engine off:

1. The lubricating oil warning lamp should be illuminated (**Figure 5, 3, Figure 7, 6**) .
2. The cooling water temperature warning lamp should be out (**Figure 5, 4, Figure 7, 5**) .
3. The charge warning lamp should be illuminated (**Figure 5, 1, Figure 7, 1**) .
4. The rubber seal warning lamp should be out (**Figure 5, 2, Figure 7, 2**) .
5. The warning buzzer should sound.

Note: All the above alarm signals will continue until you push the starting button or turn the key to the OFF position.

WARNING! The rubber seal alarm lamp warns of seawater entering the vessel. The watertight structure of the Sail-Drive is dual type. Even if the rubber diaphragm A (Figure 9, (5)) is damaged and seawater enters, the rubber diaphragm B (Figure 9, (4)) prevents it from entering the vessel. The rubber seal switch between the rubber diaphragms (Figure 9, (5)) and (Figure 9, (4)) sounds the warning buzzer and lights the rubber seal lamp on the instrument panel. If this happens, stop the engine and under sail, quickly return to the nearest port for repairs.



019410-01X

Figure 9

- 1 – ON (Rubber Seal Lamp)
- 2 – Rubber Seal Switch
- 3 – Diaphragm (B)
- 4 – Diaphragm (A)
- 5 – Seawater

DAILY CHECKS

Before starting the Sail-Drive, make sure it is in good operating condition. Make sure you check the following items:

Visual Checks

1. Check for damaged or missing parts.
2. Check for loose, missing or damaged fasteners.
3. Check oil level. *See Filling With Lubricating Oil - SD20, SD50 and SD50-4T on page 19.*
4. Open cooling water cock before operation. Drain cooling water and close cooling water cock after operation. *See Engine Cooling Water on page 29*

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

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SAIL-DRIVE OPERATION

Before you operate the Sail-Drive, read the following safety information and review the *Safety* section on page 3.

WARNING

The safety messages that follow have WARNING level hazards.

These safety messages describe a hazardous situation which, if not avoided, *could* result in death or serious injury.

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

Before starting the engine, ALWAYS make sure that all bystanders are clear of the area. Keep children and pets away while the engine is operating.

Avoid unexpected equipment movement. Shift the Sail-Drive into the NEUTRAL position any time the engine is at idle.

REMOTE CONTROL DEVICE CHECK

SD20

NOTICE: Before operating the engine, check Sail-Drive oil level. While cranking the engine slowly, shift the control handle of the remote-control head (single lever control) rapidly through NEUTRAL - AHEAD - NEUTRAL - ASTERN. If a shift operation is done slowly, the tip of the clutch dog is worn away by being hammered, and, consequently, the clutch fails to engage. Confirm that the operation lever of the Sail-Drive moves smoothly to AHEAD, ASTERN and NEUTRAL. Because the Sail-Drive SD20 uses a dog clutch, the clutch is not engaged unless the operation lever is moved to the NEUTRAL position.

NOTICE: When sailing, set the remote control lever in neutral. Not doing so *WILL* introduce slippage and void your warranty (**Figure 1, (2)**).

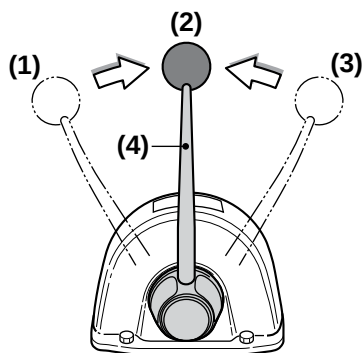
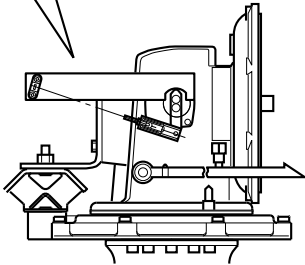
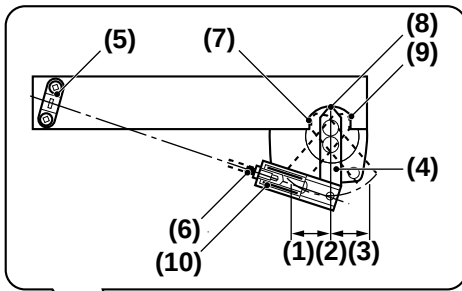


Figure 1

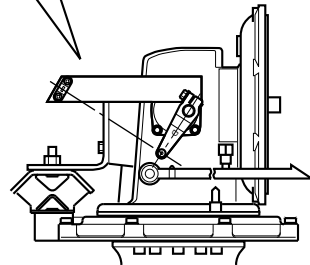
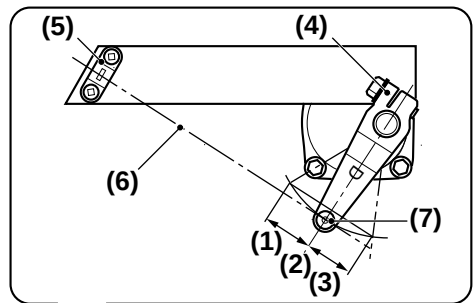
- 1 – Astern**
- 2 – Neutral**
- 3 – Ahead**
- 4 – Control Handle**



019719-00X

Figure 2

- 1 – Astern
- 2 – Neutral
- 3 – Ahead
- 4 – Operation Handle
- 5 – Cable Clamp
- 6 – Remote Control Cable
- 7 – Ahead Stop
- 8 – Neutral Position
- 9 – Astern Stop
- 10 – Spring Joint



019720-00X

Figure 3

- 1 – Astern
- 2 – Neutral
- 3 – Ahead
- 4 – Operation Lever
- 5 – Cable Clamp
- 6 – Remote Control Cable
- 7 – Pivot

SAIL-DRIVE OPERATION

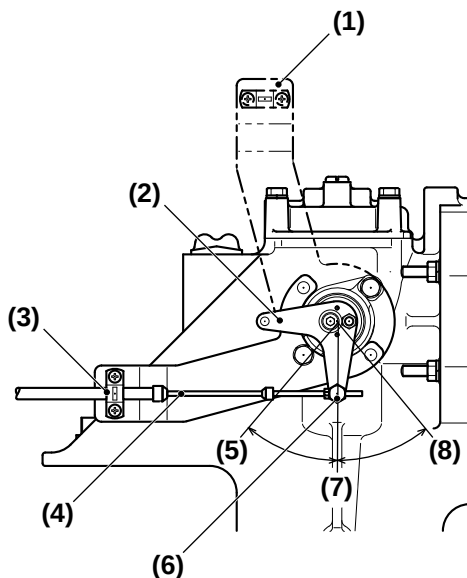
SD50 / SD50-4T

After starting the engine, check the shift action by using the control head to shift the AHEAD and ASTERN positions. The AHEAD / ASTERN clutch is a mechanical clutch called a cone clutch. Although a grinding noise is made when this type of clutch is engaged, it has no effect on the operation of the engine.

CAUTION! *Because of the rubbing produced at the frictional face of the cone clutch, friction is decreased with use and periodic inspection and maintenance is necessary.*

NOTICE: *When sailing, set the remote control lever in neutral. Not doing so WILL introduce slippage and void your warranty.*

NOTICE: *Running for long periods at low rpm with the Sail-Drive engaged can cause slipping and premature wear of the cone clutch.*



003448-01X

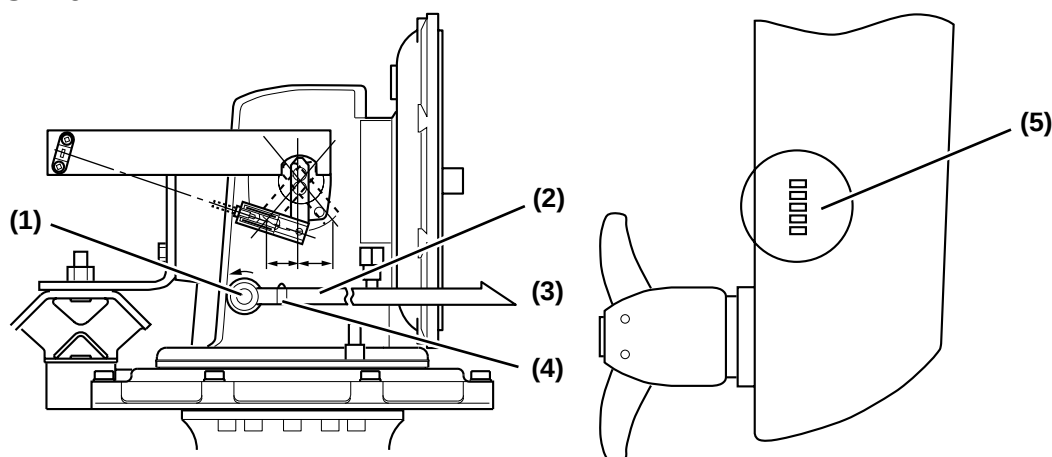
Figure 4

- 1 – Mounting Plate at 90° Angle**
- 2 – Operation Lever**
- 3 – Cable Clamp**
- 4 – Remote Control Cable**
- 5 – Propeller Shaft Clockwise**
- 6 – Pivot**
- 7 – Neutral**
- 8 – Propeller Shaft Counter-Clockwise**

ENGINE COOLING WATER

Opening or closing the cooling water system of the engine driving the Sail-Drive is done by the cooling water cock fixed on the upper case of the Sail-Drive. Be sure to open the cock **(Figure 5, (1))** and confirm that the cooling water has suction by cranking the engine before starting the vessel. The cooling water passes through the Sail-Drive case, cools the engine by the cooling water pump, and is then discharged.

SD20



0005447

Figure 5

- 1 – Cooling Water Cock**
- 2 – Cooling Water Hose**
- 3 – To Cooling Water Pump**

- 4 – Hose Clamp**
- 5 – Seawater Inlet**

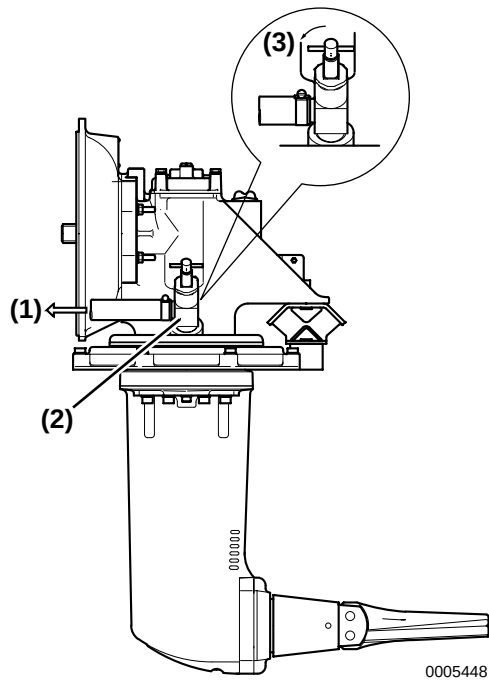


Figure 6

- 1 – To Cooling Water Pump
- 2 – Cooling Water Cock

- 3 – Open

PERIODIC MAINTENANCE

Before you perform maintenance on the Sail-Drive, read the following safety information and review the *Safety* section on page 3.

This section of the Operation Manual describes the procedures for proper care and maintenance of the Sail-Drive.

WARNING

The safety messages that follow have WARNING level hazards.

These safety messages describe a hazardous situation which, if not avoided, *could* result in death or serious injury.

Sever Hazard



NEVER wear jewelry, unbuttoned cuffs, ties or loose fitting clothing and ALWAYS tie long hair back when working near moving / rotating parts. Keep hands, feet and tools away from all moving parts.

Always remove any tools or shop rags used during maintenance from the area before operation.

NEVER service the Sail-Drive while under tow or if the engine is running at idle speed. The propeller may rotate under these circumstances.

ALWAYS stop the engine before you begin to service the Sail-Drive and secure the propeller so it will not turn.

⚠ WARNING

Electrical Shock Hazard



ALWAYS turn off the battery switch (if equipped) or disconnect the negative battery cable before servicing the Sail-Drive.

ALWAYS keep the electrical connectors and terminals clean. Check the electrical harnesses for cracks, abrasions, and damaged or corroded connectors.

⚠ CAUTION

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

These safety messages describe a hazardous situation which, if not avoided, *could* result in minor or moderate injury.

Slipping and Tripping Hazard



Ensure that adequate floor space is set aside for servicing Sail-Drive. The floor space must be clean, flat and free of spilled liquids and debris to prevent slipping or tripping.

NOTICE

These notices describe a situation which, if not avoided, *can* cause damage to the Sail-Drive, personal property and / or the environment, or cause equipment to operate improperly.

Always tighten components to the specified torque. Loose parts can cause equipment damage or cause it to operate improperly.

Only use replacement parts specified. Other replacement parts may affect warranty coverage.

NEVER attempt to modify the Sail-Drive's design or safety features. Failure to comply may impair the marine gear's safety and performance characteristics and shorten the Sail-Drive's life. Any alterations to this Sail-Drive may affect the warranty coverage of your Sail-Drive.

TIGHTENING FASTENERS

Use the correct amount of torque when tightening fasteners. Applying excessive torque may damage the fastener or component and too little torque may cause a leak or component failure.



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

Apply 60% torque to bolts that are not listed.

Apply 80% torque when tightened to aluminum alloy.

TORQUE CHARTS

Standard Torque Values

	M6 x 1.0	M8 x 1.25	M10 x 1.25 or 1.5	M12 x 1.25 or 1.5	M14 x 1.5	M16 x 1.5
Cast Iron or Steel	10.8 ± 1.0 N·m 8.0 ± 0.8 lb-ft	25.5 ± 2.0 N·m 18.8 ± 1.5 lb-ft	49.1 ± 4.9 N·m 36.2 ± 3.6 lb-ft	88.3 ± 10.0 N·m 65.1 ± 7.4 lb-ft	137.2 ± 4.9 N·m 101.2 ± 3.6 lb-ft	225.4 ± 10.0 N·m 166.2 ± 7.4 lb-ft
Aluminum	8.8 ± 1.0 N·m 6.5 ± 0.8 lb-ft	20.6 ± 2.0 N·m 15.2 ± 1.5 lb-ft	39.2 ± 2.0 N·m 28.9 ± 1.5 lb-ft	70.6 ± 4.9 N·m 52.1 ± 3.6 lb-ft	109.8 ± 4.9 N·m 81.0 ± 3.6 lb-ft	180.3 ± 10.0 N·m 133.0 ± 7.4 lb-ft

Standard Torque Chart

Thread size × Pitch mm		M6×1.0	M8×1.25	M10×1.5	M12×1.75	M14×1.5	M16×1.5
Tightening Torque	lb-in.	96.0 ± 9.0	-	-	-	-	-
	lb-ft	-	19.0 ± 2.0	36.0 ± 4.0	65.0 ± 7.0	101.0 ± 7.0	167.0 ± 7.0
	N·m	10.8 ± 1.0	25.5 ± 2.9	49.0 ± 4.9	88.3 ± 9.8	137.0 ± 9.8	226.0 ± 9.8
	kgf-m	1.1 ± 0.1	2.6 ± 0.3	5.0 ± 0.5	9.0 ± 1.0	14.0 ± 1.5	23.0 ± 2.0

Periodic Maintenance

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

The Importance of Periodic Maintenance

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

The Importance of Daily Checks

The Periodic Maintenance Table assumes that the daily checks are performed on a regular basis. Make a habit of performing daily checks before the start of each operating day. See *Filling With Lubricating Oil - SD20, SD50 and SD50-4T on page 19, Checking the Instrument Panel Alarm System on page 20 and Engine Cooling Water on page 29*, and refer to the *Operation Manual* for your engine.

Keep a Log of Sail-Drive Hours and Daily Checks

Keep a log of the number of hours the Sail-Drive is run each day and a log of the daily checks performed. Also note the date, type of repair (e.g., replaced bearings), and parts used for any service needed between the periodic maintenance intervals. Failure to perform periodic maintenance will shorten the life of the Sail-Drive.

Yanmar Replacement Parts

Yanmar recommends that you use genuine Yanmar parts when replacement parts are needed. Genuine replacement parts help ensure long Sail-Drive 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.

Daily and periodic maintenance is important to keep the Sail-Drive in good operating condition. The following is a summary of maintenance items by periodic maintenance intervals. Periodic maintenance intervals vary depending on Sail-Drive application and are hard to establish definitively. The following should be treated only as a general guideline.

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

PERIODIC MAINTENANCE

PERIODIC MAINTENANCE TABLE

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar Marine dealer or distributor								
	Daily (See Daily Checks on page 23.)	50 Hours Or After 1 Month	Every 100 Hours	Every 250 Hours	Every 500 hours	Every Year	Every 2000 Hours	Every 5 Years
Lubricating Oil								
Check Oil Level, Fill If Necessary	Before operation ○							
Change Lubricating Oil		First ◇	SD20 ◇	SD50, SD50- 4T ◇				
Cooling Water								
Open/Close Cooling Water Cock	Before / after operation ○							
Clean Cooling Water Suction Hole						○		
Drain Cooling Water	After operation ○							
Remote Control System								
Inspect Remote Control Device						○		
Cone Clutch and Shifter								
Inspect / replace or lap					●			
Replace the cone-clutch							●	
Anode								
Inspect And Replace Anode			◇					
Lower Case								
Repair Case Coating						●		
Boat Hull Water-Tightness								
Inspect Rubber Diaphragm						○		◇
Inspect Seal Sensor						○		

PERIODIC MAINTENANCE

○: Check or Clean ◇: Replace ●: Contact your authorized Yanmar Marine dealer or distributor

	Daily (See Daily Checks on page 23.)	50 Hours Or After 1 Month	Every 100 Hours	Every 250 Hours	Every 500 hours	Every Year	Every 2000 Hours	Every 5 Years
Flexible Mount								
Inspect and/or replace the flexible mount, mounting height						●		
Replace the flexible mount							●	

WHEN THE VESSEL IS OUT OF THE WATER, PERFORM THE FOLLOWING:

Removing Deposits From The Lower Gear Case

Remove seaweed, seashells and other marine growth from the lower gear case. Completely remove deposits around the cooling water intake **(Figure 1, (2))** since the engine may overheat if the cooling water intake amount is insufficient.

Repairing Damaged Coating

The lower gear case coating may be damaged when hit by objects in the water, or when having deposits removed from it. NEVER use paint containing copper or tin. This will damage the drive and void the warranty. Use a high quality primer and topcoat paint specifically designed for aluminum outboards or stern-drives. Follow the manufacturer's directions for surface preparation and application. Contact your authorized Yanmar Marine dealer or distributor for assistance.

Inspecting the Anode

See *Inspecting and Replacing the Anode* on page 48.

Inspecting The Folding Propeller

Confirm that the blade of the folding propeller opens smoothly. Inspect for wear on the blade-fixing pins, replacing them when wear is excessive. Apply seawater-proof grease to the pins in the blade gear and propeller shaft.

Draining Water

Drain the engine cooling water, together with the water in the Sail-Drive case. If this water is not drained, freezing may cause the engine block and / or the Sail-Drive case to crack.

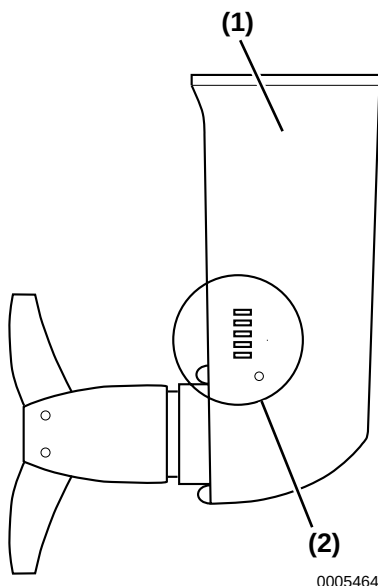


Figure 1

1 – Lower Gear Case

2 – Seawater Inlet

PERIODIC MAINTENANCE PROCEDURES

After Initial 50 Hours of Operation

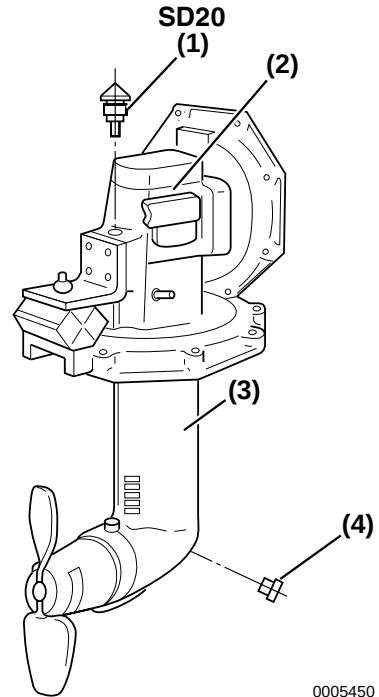
Perform the following procedures after the first 50 hours of operation.

- Draining and Replacing Lubricating Oil
- Inspecting and Replacing the Clutch Shifter

Draining and Replacing Lubricating Oil - SD20

When the vessel is out of the water, drain the oil by removing the lower gear case drain plug, and the upper gear case oil dipstick.

CAUTION! Let the drive unit cool at least 5 minutes after operation before removing the oil drain plug. Hot oil could spurt out forcefully if the drain plug is removed from the drive unit immediately after operation.



0005450

Figure 2

- 1 – Dipstick
- 2 – Upper Gear Case
- 3 – Lower Gear Case
- 4 – Lubricating Oil Drain Plug

Inspecting and Replacing the Clutch Shifter

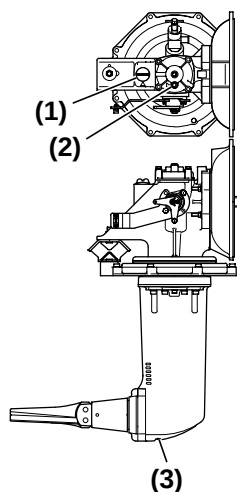
See your authorized Yanmar dealer or distributor for procedure.

PERIODIC MAINTENANCE

Draining and Replacing Lubricating Oil - SD50 / SD50-4T

Lubricating oil should be changed while the engine is still warm. **CAUTION! Let the drive unit cool at least 5 minutes after operation before removing the oil drain plug. Hot oil could spurt out forcefully if the drain plug is removed from the drive unit immediately after operation.**

SD50 / SD50-4T



0005451

Figure 3

- 1 – Dipstick
- 2 – Plug
- 3 – Drain Plug

Equipment Used

Description	Part Code	Quantity	Remarks
Bottle of Quicksilver® High Performance Gear Lube from MerCruiser®	MerCruiser® Part code 92-850743A1	2	Each bottle contains 0.946 L (1 qt) of oil. Mandatory for SD50, SD50-4T. For other models see p. 7.
Market pump from MerCruiser® on bottle	MerCruiser® Part code 91-85729A1	1	-
Adapter joint	196311-92960	1*	Thread std. M10 x 1.5 maximum length 12 mm.
O-ring for adapter	24311-000100	1*	-
Stiff rubber hoses	-	2	Inner diameter 14 to 16 mm (0.5 to 0.625 in.) plus hose clamps (If Yanmar part is used, part code is 196440-92970).
Compressor set	-	1	-
Hand pump	28210-000080	1	Optional parts

* When vessel is out of the water, 2 are required.

PERIODIC MAINTENANCE

When Vessel Is In The Water

Preparing the Sail-Drive

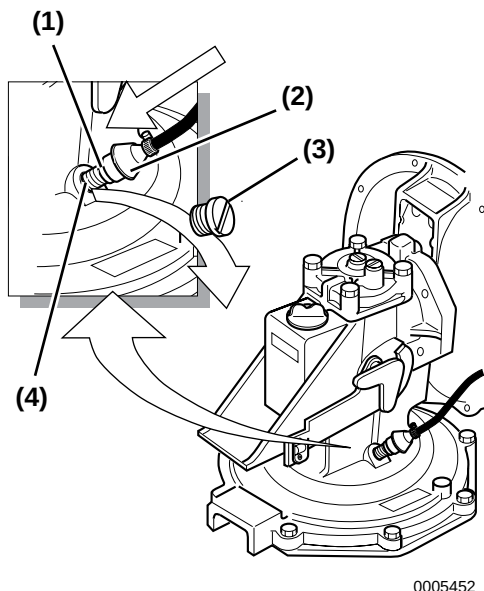


Figure 4

- 1 – O-Ring
- 2 – Adapter Joint
- 3 – Oil Changing Plug
- 4 – Thread M10x1.5

1. Remove the oil changing plug located under the shift lever.
2. Screw in an adapter joint with an O-ring. When using your own adapter joint, the maximum length of thread should be 12 mm.
3. Attach a stiff rubber hose (inner diameter 14 to 16 mm [0.5 to 0.625 in.]) with hose clamps to the adapter joint at the oil changing position (**Figure 4, (2)**). The hose must be long enough to reach the bucket or pump. If a Yanmar original rubber hose is to be used, the part number is 196440-92970.

Removing Oil

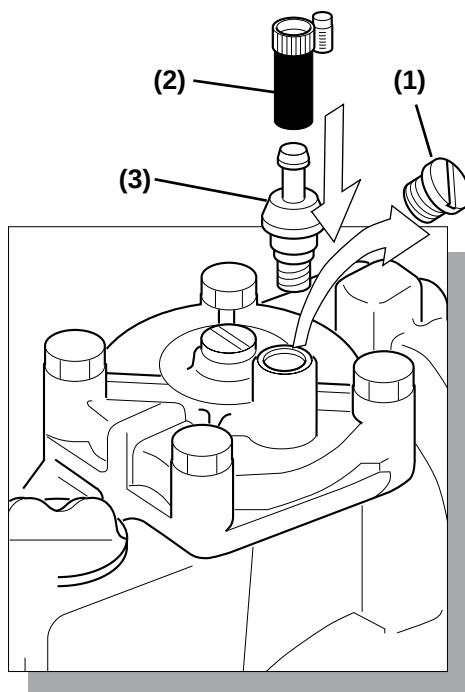


Figure 5

- 1 – Plug
- 2 – Air Pressure Hose
- 3 – Adapter Joint

Fastest Way: Blowing Out by using Air Pressure

*Note: Use Compressed Air (0.5 to 1 Bar [7.25 to 14.5 psi]) from main system, 12 V portable compressor or from portable hand pump or foot pump. **WARNING! ALWAYS wear safety glasses when using compressed air.***

1. Take out the plug from the upper case cover.
2. Screw in a second adapter joint with an O-ring at the oil inlet position. Screw in the oil plug at the dipstick position.
3. Connect the air pressure hose with hose clamps.

Option 1: Using Compressed air from main system or 12 V portable compressor.

1. Connect a hose to the top adapter joint and to a compressed air source (**Figure 5, (2)**). Within 10 to 15 minutes almost all oil will be blown out.

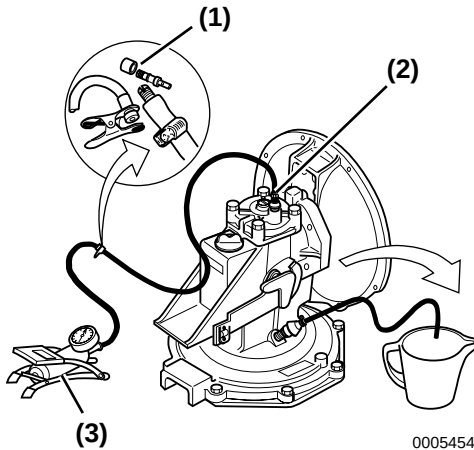


Figure 6

- 1 – One-Way (Non-Return) Valve
- 2 – Adapter Joint Screwed Into Cover
- 3 – Foot Pump

Option 2: Using Compressed air with help from a portable hand pump or foot pump

1. Install a one-way (non-return) valve (**Figure 6, (1)**) into the pressure line. This is done to maintain pressure during use of the pump.
2. Connect the hand pump or foot pump with pressure line to the adapter joint (**Figure 6, (2)**).
3. Pump out the oil until empty. The first 0.9 L (1 qt) will take approximately 3 minutes. The second part takes more time as mostly air will be pumped out; this will take approximately 12 minutes.

Using Yanmar Pump

Refer to *Preparing the Sail-Drive on page 42* and *Fastest Way: Blowing Out by using Air Pressure on page 42*.

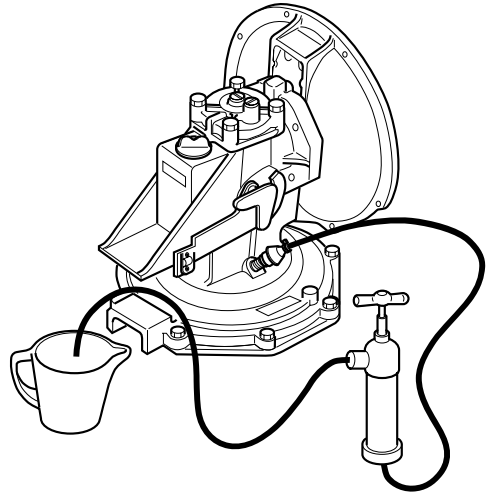


Figure 7

Connect the hand pump with hoses as shown above (**Figure 7**), and start pumping. Be aware that oil has to flow down through restricted parts of the casing and then back up again, so pressure will initially be high and pumping will be difficult. Pausing for a few minutes will help. After pumping out about 0.9 L (1 qt) of oil, mostly you will be pumping out air, but continuous pumping is necessary. Though approximately 100 to 200 ml (0.1 to 0.2 qt) of old oil will remain in the drive unit, it will not cause a problem when mixed with clean oil.

The hand pump and rubber hose are available from Yanmar, and are optional parts for SD50 / SD50-4T. Any type of hand pump or rubber hose (inner diameter 14 to 16 mm [0.5 to 0.625 in.]) available from your local supplier can be used.

PERIODIC MAINTENANCE

Replacing Oil

Refer to *Filling With Lubricating Oil - SD20, SD50 and SD50-4T* on page 19.

Fastest way: By using MerCruiser pump or simple market pump

Refer to *Preparing the Sail-Drive on page 42.*

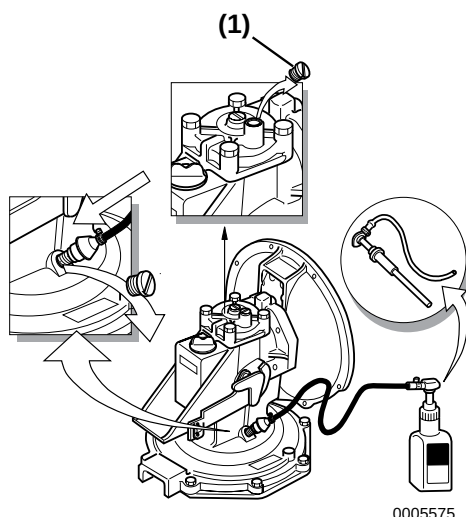


Figure 8

1 – Plug

1. Use a MerCruiser® pump like the one shown (**Figure 8**) or use a similar pump available locally.
2. Attach the pump to a new bottle of Quicksilver® High Performance Gear Lube from MerCruiser®.
3. Connect the hose with a hose clip to the adapter joint below the shift lever.
4. Remove the plug from the upper case cover (**Figure 8, (1)**).
5. Operate the pump to fill the Sail-Drive with oil. After bottle is empty, change the bottle while the pump and hose remain connected to the adapter joint.
6. After filling, first screw in and tighten the plug at the top cover (**Figure 8, (1)**). Then remove the oil bottle, pump, hose and adapter joint and screw in the oil plug with a gasket.

Using Yanmar Hand Pump

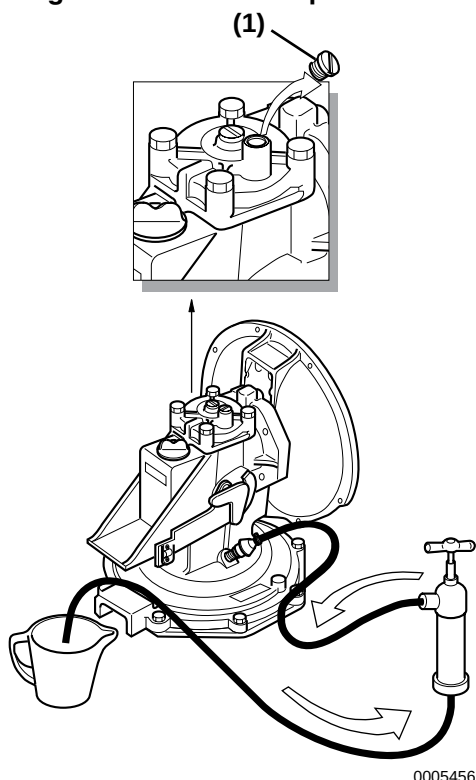


Figure 9

1 – Plug

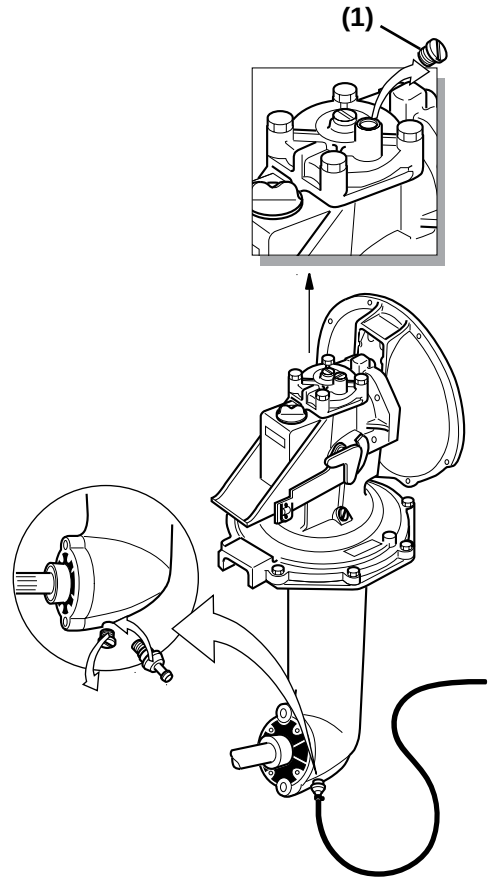
1. Connect the hoses as shown above (Figure 9).
2. Remove the plug from the upper case cover (Figure 9, (1)).
3. Operate the pump to fill the Sail-Drive with oil. Be aware that oil has to flow down through restricted parts of the casing and then back up again, so pressure will initially be high and pumping will be difficult. Pausing for a few minutes will help. The hand pump and rubber hose are available from Yanmar, and are optional parts for SD50 / SD50-4T. Any type of hand pump or rubber hose (inner diameter 14 to 16 mm [0.5 to 0.625 in.]) available locally can be used.
4. After filling, first screw in and tighten the plug at the top cover. Then remove the hand pump, hose and adapter joint and screw in the oil plug with a gasket.

Not Using Pump

Refer to *Filling With Lubricating Oil - SD20, SD50 and SD50-4T* on page 19.

When The Vessel Is Out Of The Water

Preparing The Sail-Drive



0005457

Figure 10

1 – Plug

1. Remove the bottom drain plug.
2. Screw in the adapter joint with the O-ring. When using own adapter joint, maximum length of thread is 12 mm.
3. Attach a stiff rubber hose with an inner diameter of 14 to 16 mm (0.5 to 0.625 in.) with hose clamps to the adapter joint at the oil drain position. The hose must be long enough to drain to the bucket.
4. Remove the dipstick and oil inlet plug from the upper case cover.

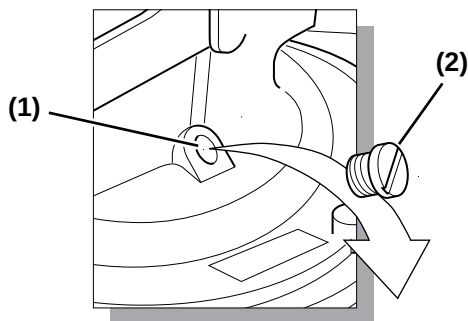
PERIODIC MAINTENANCE

Removing Oil By Draining

Refer to *Preparing The Sail-Drive on page 45*.

Oil draining is possible when the vessel is out of the water but will take a greater amount of time.

1. After approximately 0.6 L (0.6 qt) has been drained, remove the oil changing plug. If you remove the plug before this, oil may spill out because maximum oil level is higher than the plug.



0005458

Figure 11

- 1 – Thread M10x1.5
- 2 – Oil Changing Plug

Fastest way: Blowing out by using Air pressure

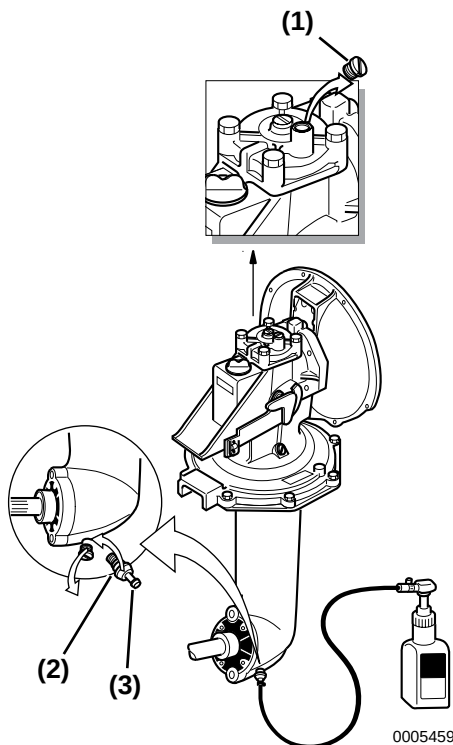
Refer to *Preparing the Sail-Drive on page 42*, then to *Fastest Way: Blowing Out by using Air Pressure on page 42*. Be aware that oil is divided into two channels connected by the lower gear and lower drain port.

Replacing Oil

Refer to *Filling With Lubricating Oil - SD20, SD50 and SD50-4T on page 19*.

Using MerCruiser® Pump or simple market pump

Refer to *Preparing The Sail-Drive on page 45*.



0005459

Figure 12

- 1 – Plug
- 2 – O-Ring
- 3 – Adapter Joint

1. Use a MerCruiser® pump with like the one shown above (**Figure 12**), or use a similar pump available locally.
2. Attach the pump to a new bottle of Quicksilver® High Performance Gear Lube from MerCruiser®.
3. Remove the oil changing plug from below the shift lever.
4. Connect the hose with a hose clip to the adapter joint at the drain position.
5. Take out the plug from the upper case cover.

6. Pump the oil into the drive. After the first bottle is empty, screw in the oil changing plug.
7. Change the bottle while the pump and hose remain connected to the adapter joint.
8. After filling, first screw in and tighten the plug at the top cover. Then remove the oil bottle, pump, hose and adapter joint and screw in the oil drain plug.

Using Yanmar Hand Pump

Refer to *Preparing The Sail-Drive on page 45*.

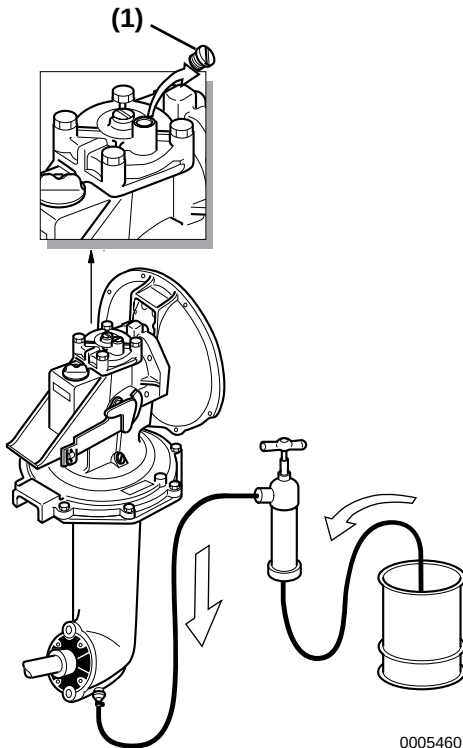
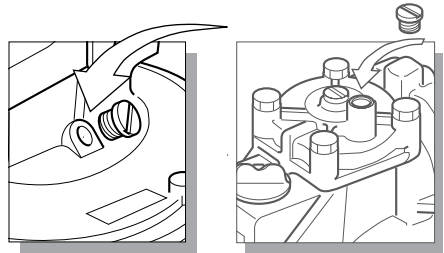


Figure 13

1 – Plug

1. Connect the hose from the bottom and a suction hose to the Yanmar pump with hose clip (**Figure 13**).
2. Take out the plug from the upper case cover (**Figure 13, (1)**).

3. Pump the oil into the drive. Be aware that oil has to flow up through restricted parts of the drive, so pumping will be hard. Waiting a few minutes will help. After pumping in about 1 L (1.1 qt) of oil, screw in the oil changing plug. Be aware that the drain hose can easily slip out of the bucket and cause oil spilling. The hand pump and rubber hose are available from Yanmar, and are optional parts for SD50 / SD50-4T. Any type of hand pump or rubber hose of inner diameter 14 to 16 mm (0.5 to 0.625 in.) available locally can be used.



0005461

Figure 14

4. After filling, first screw in and tighten the plug at the top cover. Then remove the pump, hose and adapter joint and screw in the oil drain plug.

By not using pump

Refer to *Filling With Lubricating Oil - SD20, SD50 and SD50-4T on page 19*.

Every 100 Hours of Operation

Perform the following maintenance every 100 hours of operation.

- Changing the Lubricating Oil (SD20)
- Inspecting and Replacing the Anode

Changing the Lubricating Oil (SD20)

See *Draining and Replacing Lubricating Oil - SD20* on page 39.

Inspecting and Replacing the Anode

To prevent corrosion of the Sail-Drive body by sea or lake water, replace the anode every 100 hours of operation, once every six months or when it has reduced to half of the original volume (size).

NOTICE: The anode of the Sail-Drive is only calculated for the Sail-Drive. Changing the material of the propeller may require additional anodes to be installed on the sail-drive.

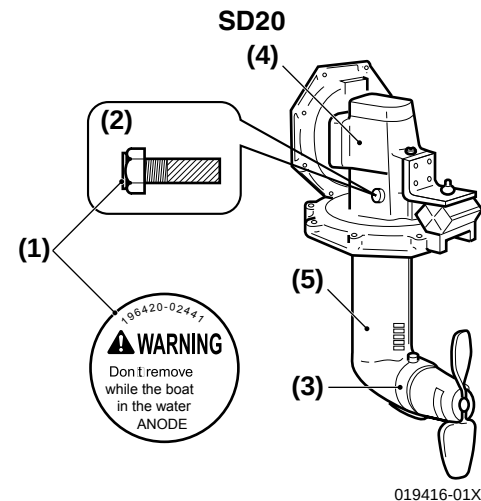


Figure 15

- 1 – Safety Label
- 2 – Anode
- 3 – Anode
- 4 – Upper Gear Case
- 5 – Lower Gear Case

SD50/SD50-4T

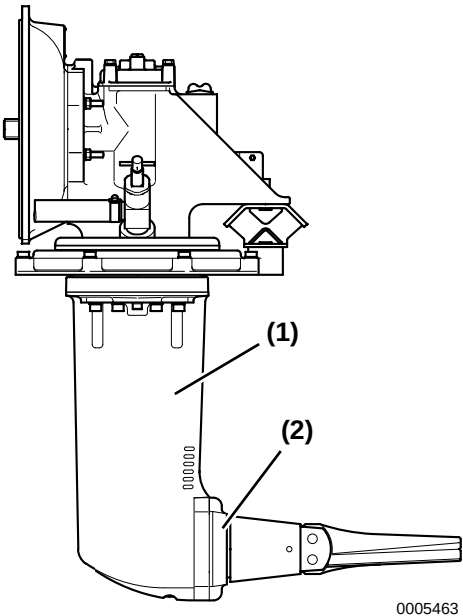


Figure 16

- 1 – Lower Gear Case
- 2 – Anode

An anode is provided on the lower gear case. To inspect and replace the anode on the lower gear case, the vessel must be removed from the water.

Note: An optional two-part anode is available from Yanmar for the lower gear case. This option may allow the anode in the lower gear case to be changed without removing the vessel from the water, or by an underwater diver.

Optional Two-Part Anode Information

Part Number	Description	Qty.
196440-02660	anode	2
196440-02690	mounting plate	2
196440-02700	flat head bolt	4
26453-080202	8 X 20 bolt	2

Every 250 Hours of Operation

Perform the following maintenance every 250 hours of operation.

- **Changing the Lubricating Oil (SD50, SD50-4T)**
- **Inspecting and Replacing the Clutch Shifter**

Changing the Lubricating Oil (SD50, SD50-4T)

See Draining and Replacing Lubricating Oil - SD50 / SD50-4T on page 40.

Inspecting and Replacing the Clutch Shifter

See your authorized Yanmar dealer or distributor for procedure.

Every 500 Hours of Operation

- **Inspecting and / or Replacing the Cone-Clutch**

Inspecting and / or Replacing the Cone-Clutch

See your authorized Yanmar dealer or distributor for procedure.

PERIODIC MAINTENANCE

Every Year

Perform the following maintenance every year of operation.

- **Cleaning Cooling Water Suction Hole**
- **Inspecting Remote Control Device**
- **Repairing Case Coating**
- **Inspecting and Replacing Rubber Diaphragm Seal Ring**
- **Inspecting Seal Sensor**
- **Inspecting and / or Replacing the Flexible Mount**

Cleaning Cooling Water Suction Hole

See *Removing Deposits From The Lower Gear Case* on page 38.

Inspecting Remote Control Device

See *Remote Control Device Check* on page 26.

Repairing Case Coating

See *Repairing Damaged Coating* on page 38.

Inspecting and Replacing Rubber Diaphragm Seal Ring

Rubber diaphragms (A) and (B) (SD20 & SD50, SD50-4T)

The rubber diaphragms (A) and (B) of the Sail-Drive are important parts for the hull and crew safety. Since rubber degenerates during use, be sure to inspect them every two years. The vessel must be lifted onto a block for this procedure. To replace, consult your Yanmar Marine dealer.

Inspecting Seal Sensor

See **(Figure 9)** on page 22. See your authorized Yanmar Marine dealer or distributor for inspection procedure.

Inspecting and / or Replacing the Flexible Mount

Replace if clearance is less than 1 mm **(Figure 17, (1))**. See your authorized Yanmar Marine dealer or distributor for procedure.

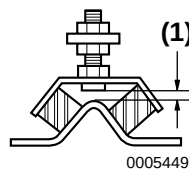


Figure 17

Every 2000 Hours of Operation

- **Replacing the Flexible Mount**
- **Replacing the Cone-Clutch**

Replacing the Flexible Mount

See your authorized Yanmar dealer or distributor for procedure. Flexible Mount must be replaced every 2000 hours.

Replacing the Cone-Clutch

See your authorized Yanmar dealer or distributor for procedure.

Every 5 Years

- **Replacing Rubber Diaphragm Seal Ring**

Replacing Rubber Diaphragm Seal Ring

To replace, consult your Yanmar Marine dealer.

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SPECIFICATIONS

Model		SD20	SD50	SD50-4T
Reduction Gear System		Constant mesh gear with dog clutch	Cone clutch	
Direction Of Rotation	Input Shaft	Counterclockwise viewed from stern		
	Propeller Shaft	Counter-clockwise viewed from stern	Counter-clockwise or clockwise viewed from stern	
Reduction Ratio	Ahead	2.64	2.32	
	Astern	2.64	2.32	
Propeller Speed (rpm)		1364	1293	1337
Lubrication System		Oil bath type		
Lubricating Oil Capacity	Standard Unit	2.2 L (2.3 qt)	2.2 L (2.3 qt), SD40 : 1.8L (1.9 qt)	
	Long-Reach Unit	2.5 L (2.4 qt)	2.35 L (Extension 58) [2.5 qt], 2.45 L (Extension 100) [2.6 qt]	
Dry Weight		30 kg (66 lb)	39 kg (86 lb)	41 kg (90 lb)
Remote-Control Device	Control Head	Single control lever		
	Cable	MORSE 33C (equivalent)		
Applicable Engine Model (Maximum Rated Output Power At Crankshaft)		1GM10C: 6.7 kW (9.1 hp) / 3600 rpm 2YM15: 10.3 kW (14 hp) / 3600 rpm 3YM20: 16.2 kW (22 hp) / 3600 rpm 3YM30: 22.1 kW (30 hp) / 3600 rpm	3JH4CE: 28.7 kW (39 hp) / 3000 rpm 4JH4ACE 39.6 kW (53 hp) / 3000 rpm 3JH5CE: 28.7 kW (39 hp) / 3000 rpm 4JH5CE: 39.6 kW (53 hp) / 3000 rpm	4JH4-TCE: 55.2 kW (75 hp) / 3200 rpm

Note: A propeller with rubber bushing must be used in all SD series Sail-Drives.

Note: 1 hp metric = 0.7355 kW

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SYSTEM DIAGRAMS

Color coding for wiring diagrams	
R	Red
B	Black
W	White
Y	Yellow
L	Blue
O	Orange
L/B	Blue/Black
W/L	White/Blue
Y/W	Yellow/White
W/R	White/Red
L/R	Blue/Red
W/B	White/Black
R/B	Red/Black

Allowable length by cross sectional area of battery cable	
Section of cable mm ² (in. ²)	Allowable length L = 1 + 2 + 3 m (ft)
15 (0.023)	< 0.86 (0.26)
20 (0.031)	< 1.3 (0.40)
30 (0.046)	< 2.3 (0.70)
40 (0.062)	< 2.8 (0.85)
50 (0.077)	< 3.5 (1.07)
60 (0.093)	< 4.1 (1.25)

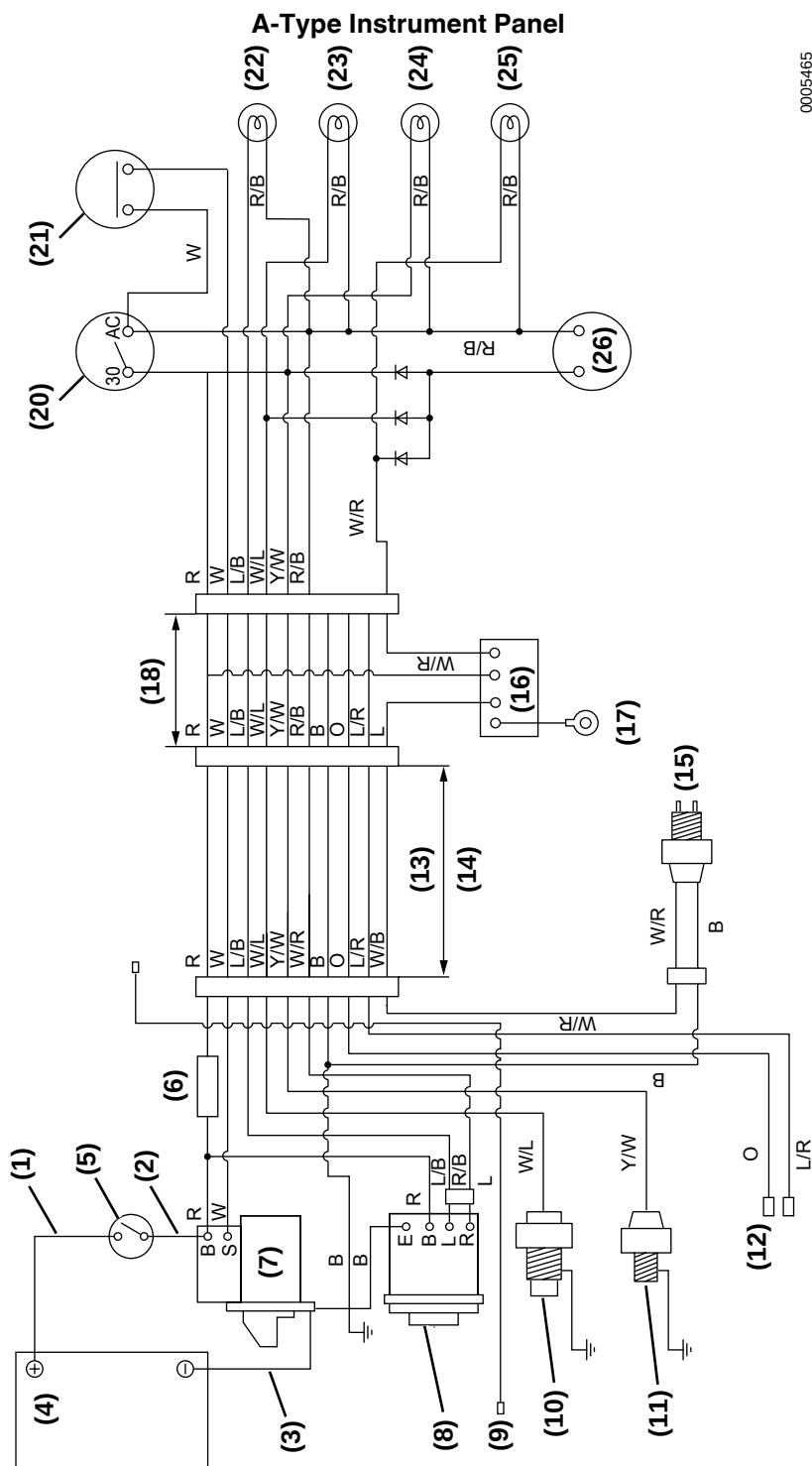


Figure 1

A-Type Instrument Panel	
Applicable Engine Model: 1GM10C	
1	Cable, battery to switch
2	Cable, switch to starter
3	Cable, battery to starter
4	Battery Recommended capacity GM, 12V-70AH 1GM, 12V-100AH (Minimum)
5	Battery switch
6	FUSE
7	Starter motor
8	Alternator
9	Not used
10	Cooling Water temp. switch
11	Engine Oil pressure switch
12	Spare connector
13	Extension cable 3 m [9.8 ft] (Standard)
14	The total length extension cable must be less than 6 m (19.7 ft)
15	Rubber seal switch (Sail-Drive)
16	Amplifier
17	Ground
18	Sail-Drive extension cable 0.3 m (1 ft)
19	Not used (Except 1GMC)
20	Key switch
21	Push button switch
22	Charge lamp
23	Cooling Water temp. lamp
24	Engine Oil pressure lamp
25	Rubber seal lamp (Sail-Drive)
26	Buzzer

Note: If the cross-sectional area of the wire being used is equal to or less than 20 mm² (approximately AWG 4), the combined lengths of items 1, 2 and 3 must be less than 2.5 m (8.2 ft).

If the cross-sectional area of the wire being used is equal to or less than 40 mm² (approximately AWG 1), the combined lengths of items 1, 2 and 3 must be less than 5 m (16.4 ft).

Note: Battery, battery switch and cables are not supplied by Yanmar.

B-Type Instrument Panel

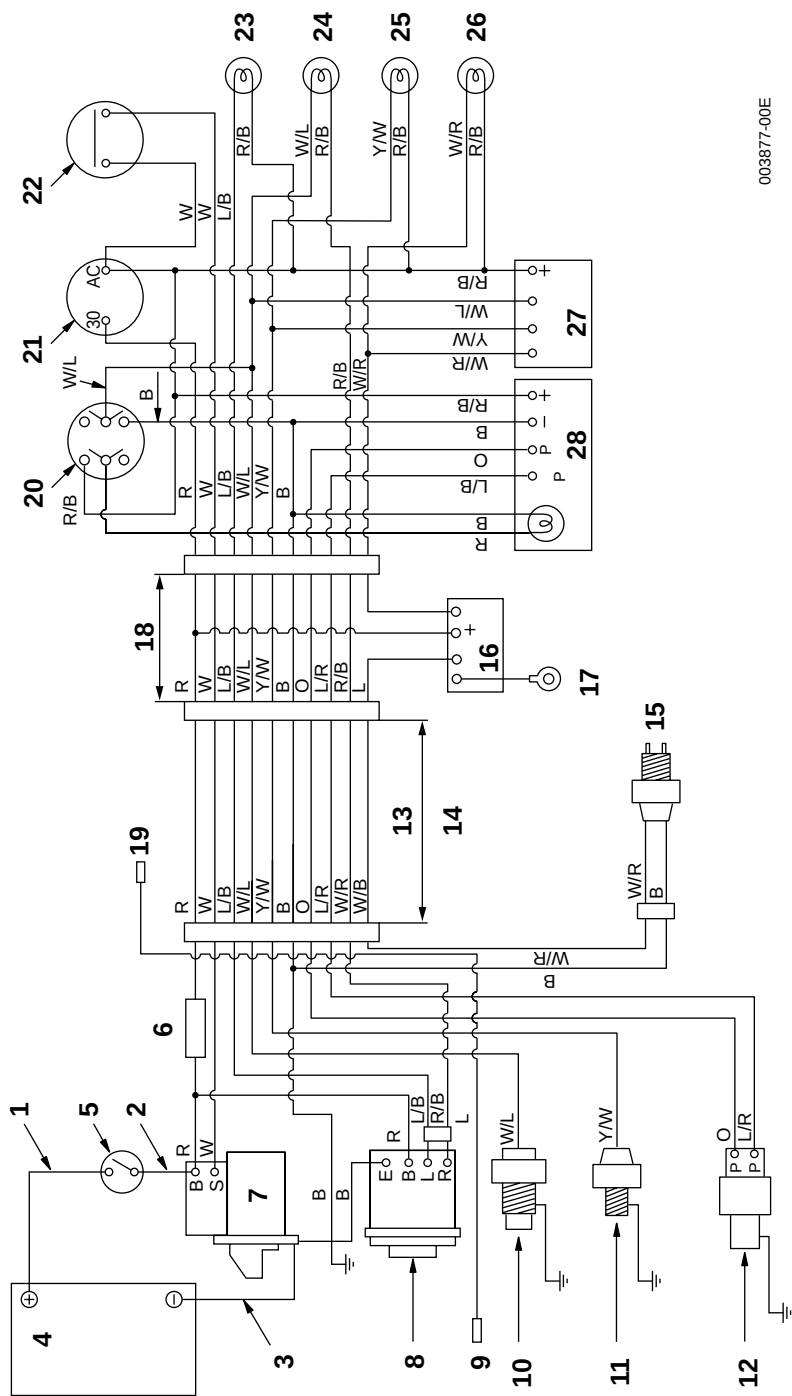


Figure 2

003877-00E

B-Type Instrument Panel	
Applicable Engine Model: 1GM10C	
1	Cable, battery to switch
2	Cable, switch to starter
3	Cable, battery to starter
4	Battery Recommended capacity GM, 12V-70AH 1GM, 12V-100AH (Mini.)
5	Battery switch
6	FUSE
7	Starter motor
8	Alternator
9	Not used
10	Cooling Water temp. switch
11	Engine Oil pressure switch
12	Tachometer sender
13	Extension cable 3 m. (Standard)
14	The total length extension cable must be less than 6 m.
15	Rubber seal switch (Sail-Drive)
16	Amplifier
17	Ground
18	Sail-Drive extension cable 0.3 m.
19	Not used (Except 1GMC)
20	Light switch
21	Key switch
22	Push button switch
23	Charge lamp
24	Cooling Water temp. lamp
25	Engine Oil pressure lamp
26	Rubber seal lamp (Sail-Drive)
27	Buzzer
28	Tachometer

Note: If the cross-sectional area of the wire being used is equal to or less than 20 mm² (approximately AWG 4), the combined lengths of items 1, 2 and 3 must be less than 2.5 m (8.2 ft).

If the cross-sectional area of the wire being used is equal to or less than 40 mm² (approximately AWG 1), the combined lengths of items 1, 2 and 3 must be less than 5 m (16.4 ft).

Note: Battery, battery switch and cables are not supplied by Yanmar.

4JH4-TE with B x B Type Panel

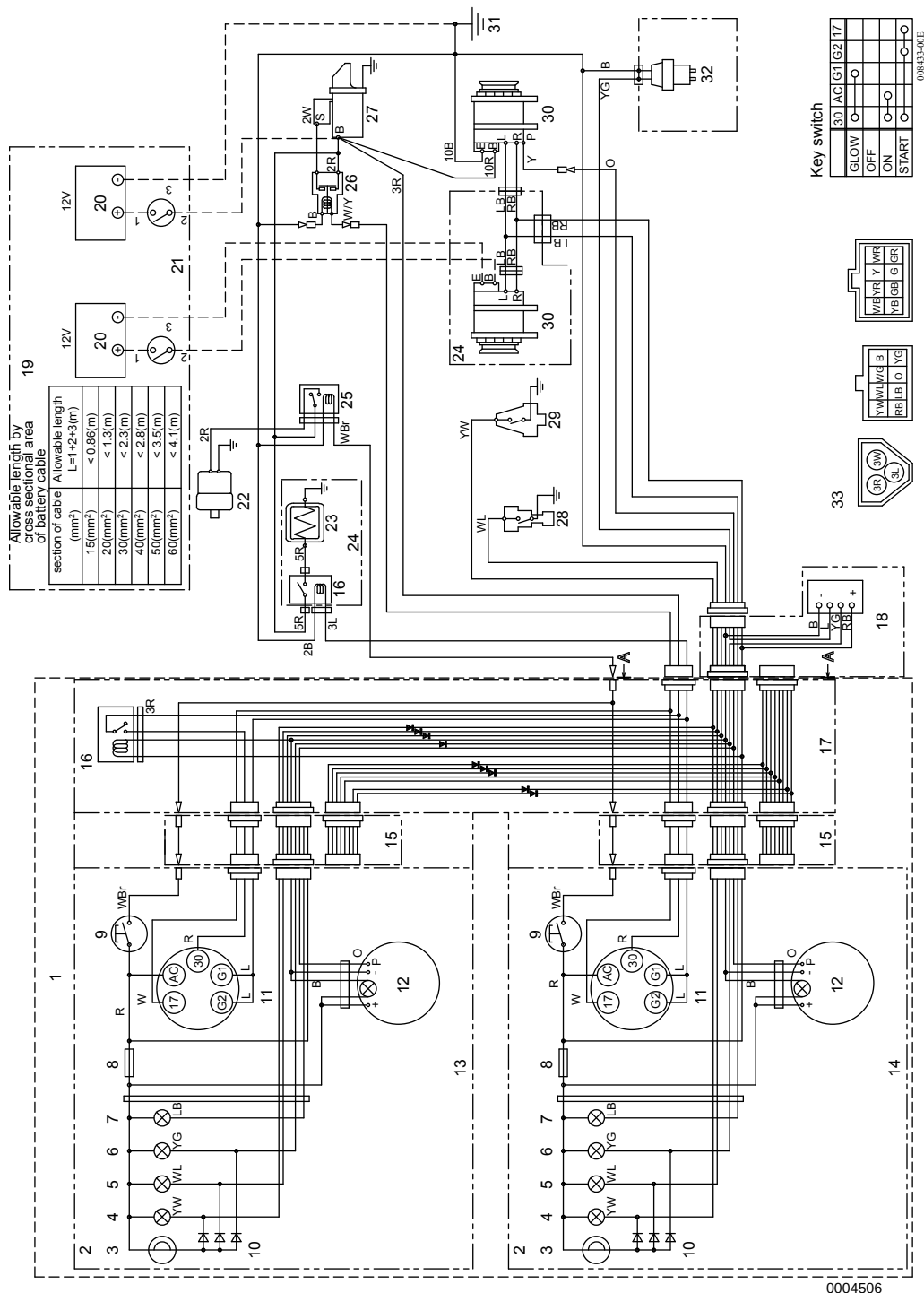


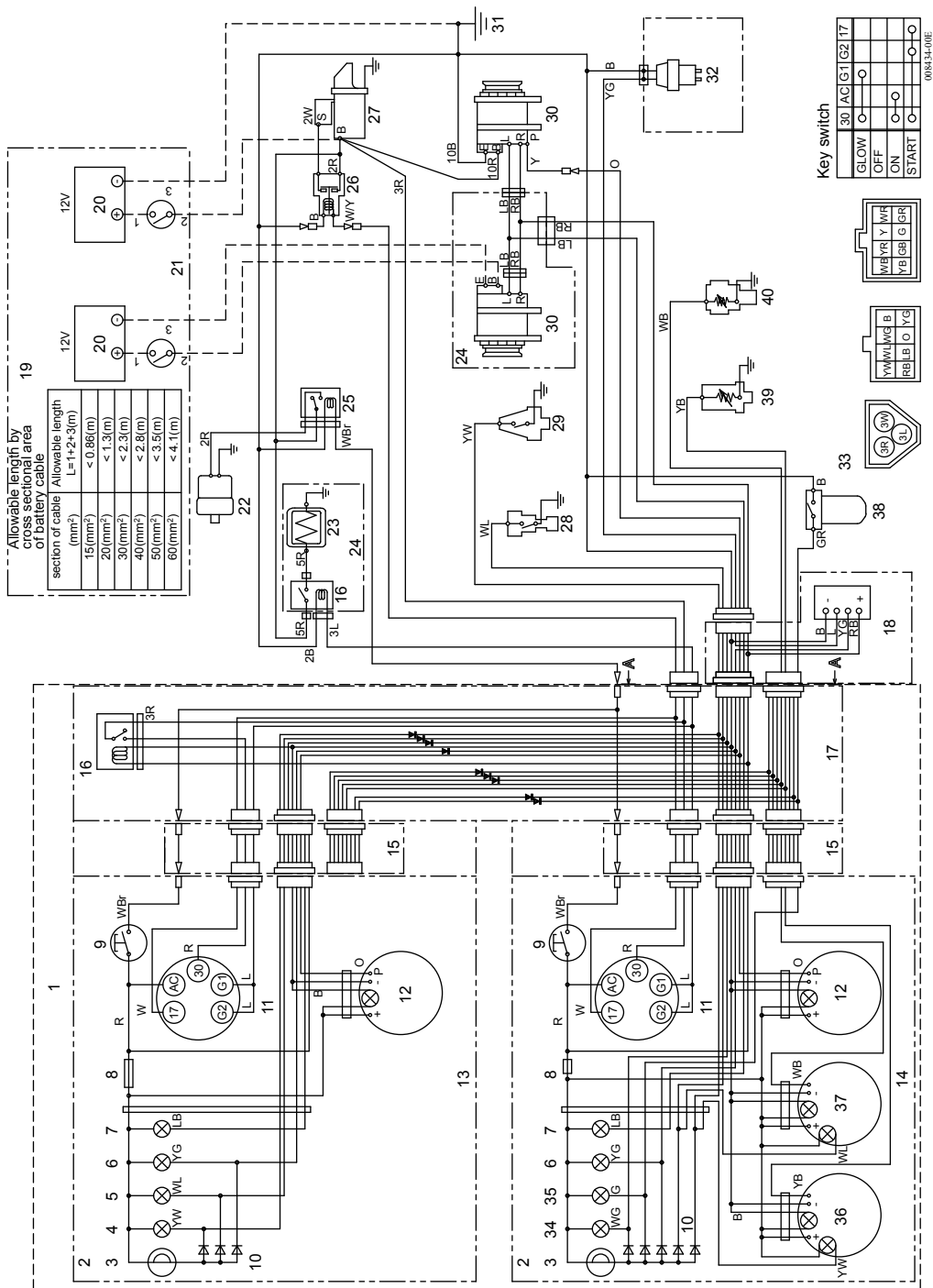
Figure 3

4JH4-TE with B x B Type Panel

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

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

4JH4-TE with C x B Type Panel



0004507

Figure 4

4JH4-TE with C x B Type Panel

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

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

B-Type Instrument Panel for 3YM30, 3YM20 and 2YM15

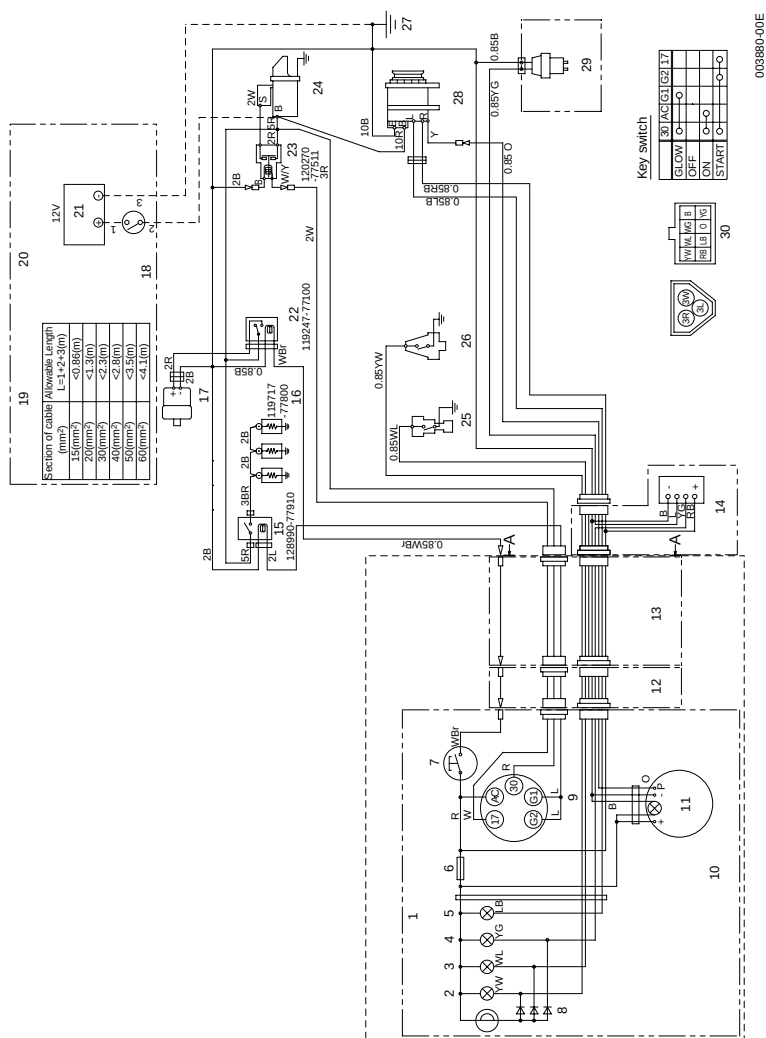


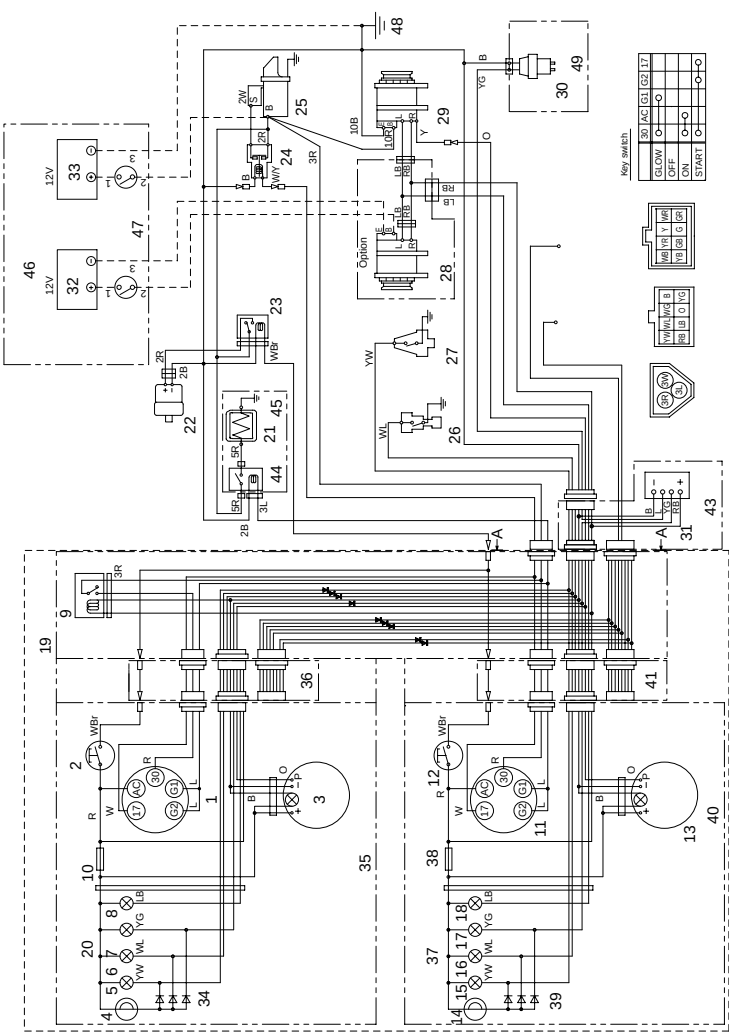
Figure 5

B-Type Instrument Panel for 3YM30, 3YM30, 3YM20 and 2YM15

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

1	Alarm Lamps
2	Buzzer Oil Pressure
3	Coolant Temperature
4	Sail-Drive Seal
5	Charge
6	Fuse (3A)
7	Stop Switch
8	Diodes
9	Key Switch
10	Instrument Panel
11	Tachometer Hour Meter
12	Wire Harness Option (L=3M)
13	Wire Harness Option (L=6M)
14	Amplifier (only for Sail-Drive)
15	Relay
16	Glow Plug
17	Engine Stop Solenoid
18	Battery Switch
19	Allowable Length by Cross Sectional Area of Battery Cable
20	Procured by Customer
21	Battery
22	Stop Relay
23	Starter Relay
24	Starter
25	Coolant Temperature Switch
26	Engine Oil Pressure Switch
27	Ground Bolt
28	Alternator
29	Sail-Drive Only
30	Coupler (View from A-A)

B-Type Instrument Panel for 3JH4E



003881-00E

Figure 6

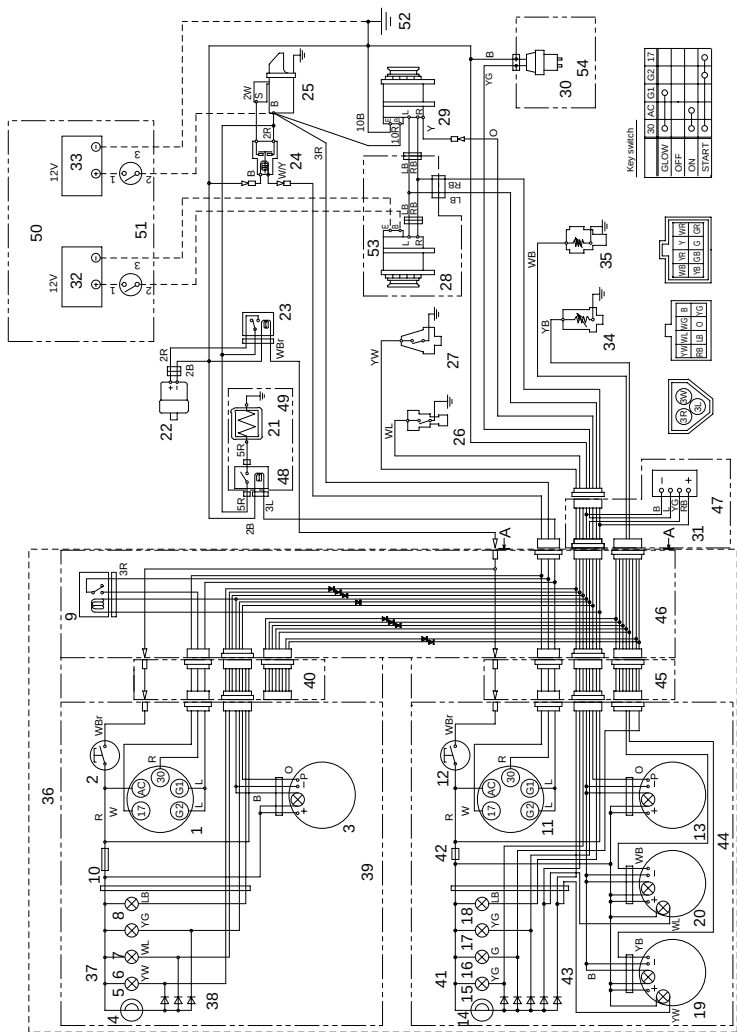
B-Type Instrument Panel for 3JH4E

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

1	Starter Switch
2	Stop Switch
3	Tachometer / Hour Meter
4	Buzzer
5	Lubricating Oil Low Pressure Alarm
6	Coolant High Temperature Alarm
7	Water in Sail-Drive Seal Alarm
8	Battery Low Charge Alarm
9	Relay (for 2 Station: Option)
10	Fuse (3A)
11	Starter Switch
12	Stop Switch
13	Tachometer / Hour Meter
14	Buzzer
15	Engine Oil Low Pressure Alarm
16	Coolant High Temperature Alarm
17	Water in Sail-Drive Seal Alarm
18	Battery Low Charge Alarm
19	Option
20	Alarm Lamps
21	Air Heater (Option)
22	Engine Stop Solenoid
23	Stop Relay
24	Starter Relay
25	Starter
26	Coolant High Temperature Switch

27	Engine Oil Low Pressure Switch
28	Alternator (Option)
29	Alternator
30	Water in Sail-Drive Seal Sensor (on Sail-Drive)
31	Water in Sail-Drive Seal Sensor Amplifier (Sail-Drive Only)
32	Battery (Option)
33	Battery
34	Diodes
35	Instrument Panel (Sub Station) (Option)
36	Wire Harness
37	Alarm Lamps
38	Fuse (3A)
39	Diodes
40	Instrument Panel (Main Station) (Option)
41	Wire Harness
42	Wire Harness for Sub Panel
43	Only for Sail-Drive
44	Relay
45	Option
46	Procured by Customer
47	Battery Switch
48	Ground Bolt
49	Only for Sail-Drive

C-Type Instrument Panel for 3JH4E



003882-00E

Figure 7

C-Type Instrument Panel for 3JH4E

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

1	Starter Switch
2	Stop Switch
3	Tachometer / Hour Meter
4	Buzzer
5	Lubricating Oil Low Pressure Alarm
6	Coolant High Temperature Alarm
7	Water in Sail-Drive Seal Alarm
8	Battery Low Charge Alarm
9	Relay (for 2 Station: Option)
10	Fuse (3A)
11	Starter Switch
12	Stop Switch
13	Tachometer / Hour Meter
14	Buzzer
15	Lubricating Oil Low Pressure Alarm
16	Coolant High Temperature Alarm
17	Water in Sail-Drive Seal Alarm
18	Battery Low Charge Alarm
19	Engine Oil Pressure Meter
20	Coolant Temperature Meter
21	Air Heater (Option)
22	Engine Stop Solenoid
23	Stop Relay
24	Starter Relay
25	Starter
26	Coolant High Temperature Switch

27	Engine Oil Low Pressure Switch
28	Alternator (Option)
29	Alternator
30	Water in Sail-Drive Seal Sensor (on Sail-Drive)
31	Water in Sail-Drive Seal Sensor Amplifier (Sail-Drive Only)
32	Battery (Option)
33	Battery
34	Engine Oil Pressure Sensor (Option)
35	Coolant Temperature Sensor (Option)
36	Option
37	Alarm Lamps
38	Diodes
39	Instrument Panel (Sub Station) (Option)
40	Wire Harness
41	Alarm Lamps
42	Fuse (3A)
43	Diodes
44	Instrument Panel (Main Station) (Option)
45	Wire Harness
46	Wire Harness for Sub Panel
47	Only for Sail-Drive
48	Relay
49	Option
50	Procured by Customer
51	Battery Switch
52	Ground Bolt
53	Option
54	Only for Sail-Drive

B-Type Instrument Panel for 4JH4AE

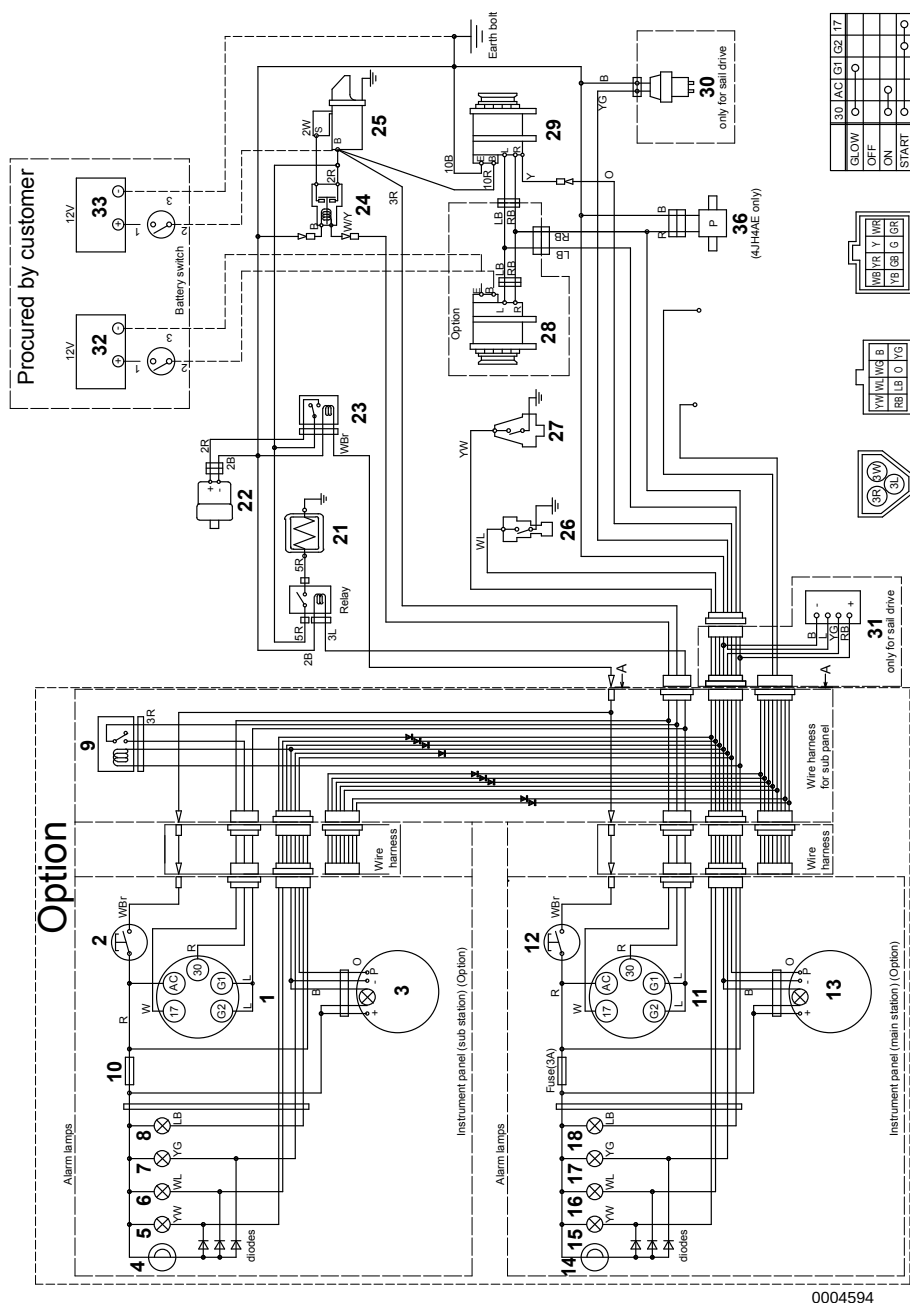


Figure 8

B-Type Instrument Panel for 4JH4AE

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

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

C-Type Instrument Panel for 4JH4AE

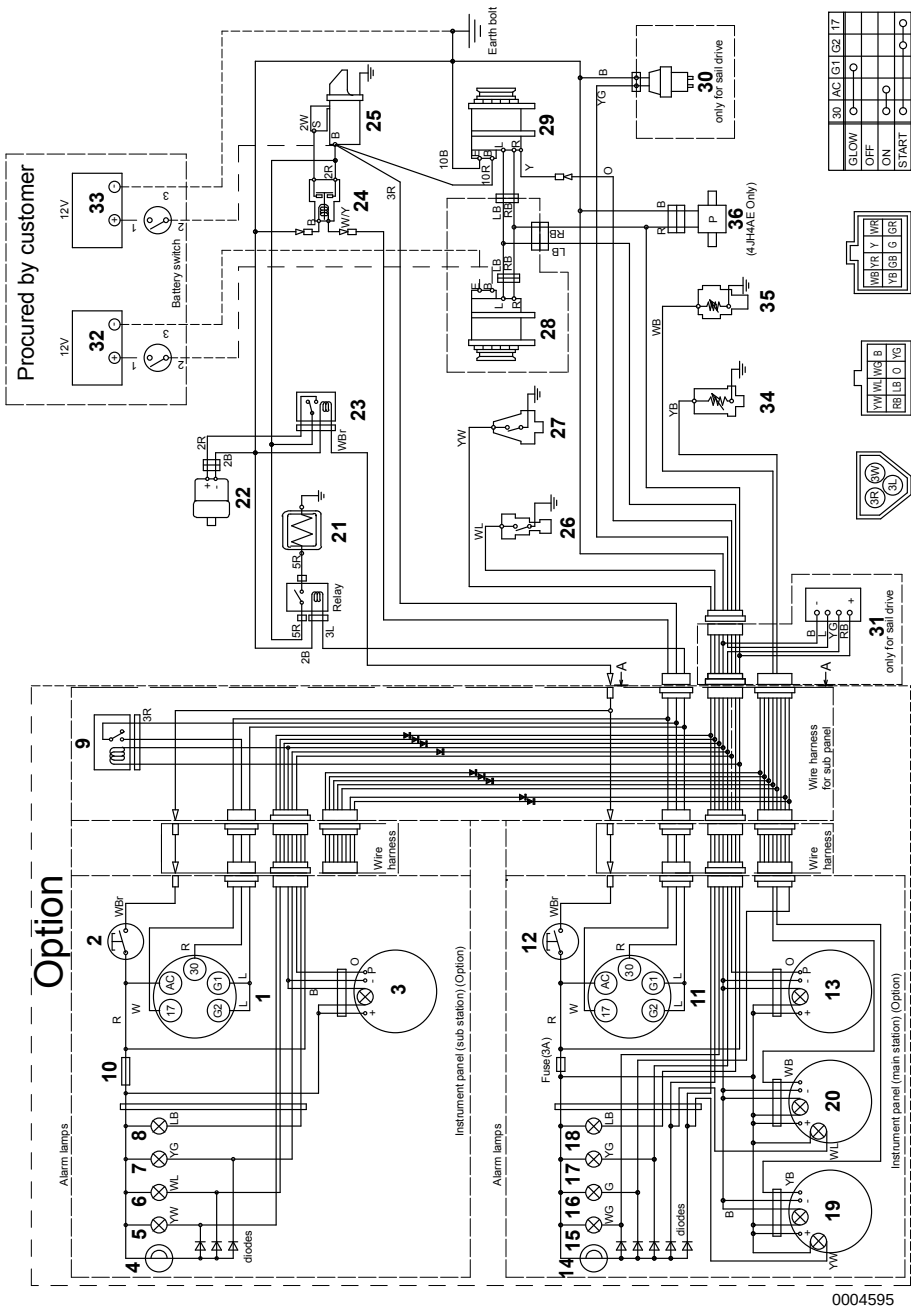


Figure 9

C-Type Instrument Panel for 4JH4AE

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

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

2YM15, 3YM20, 3YM30 - B (Keyless) - Type Instrument Panel (optional)

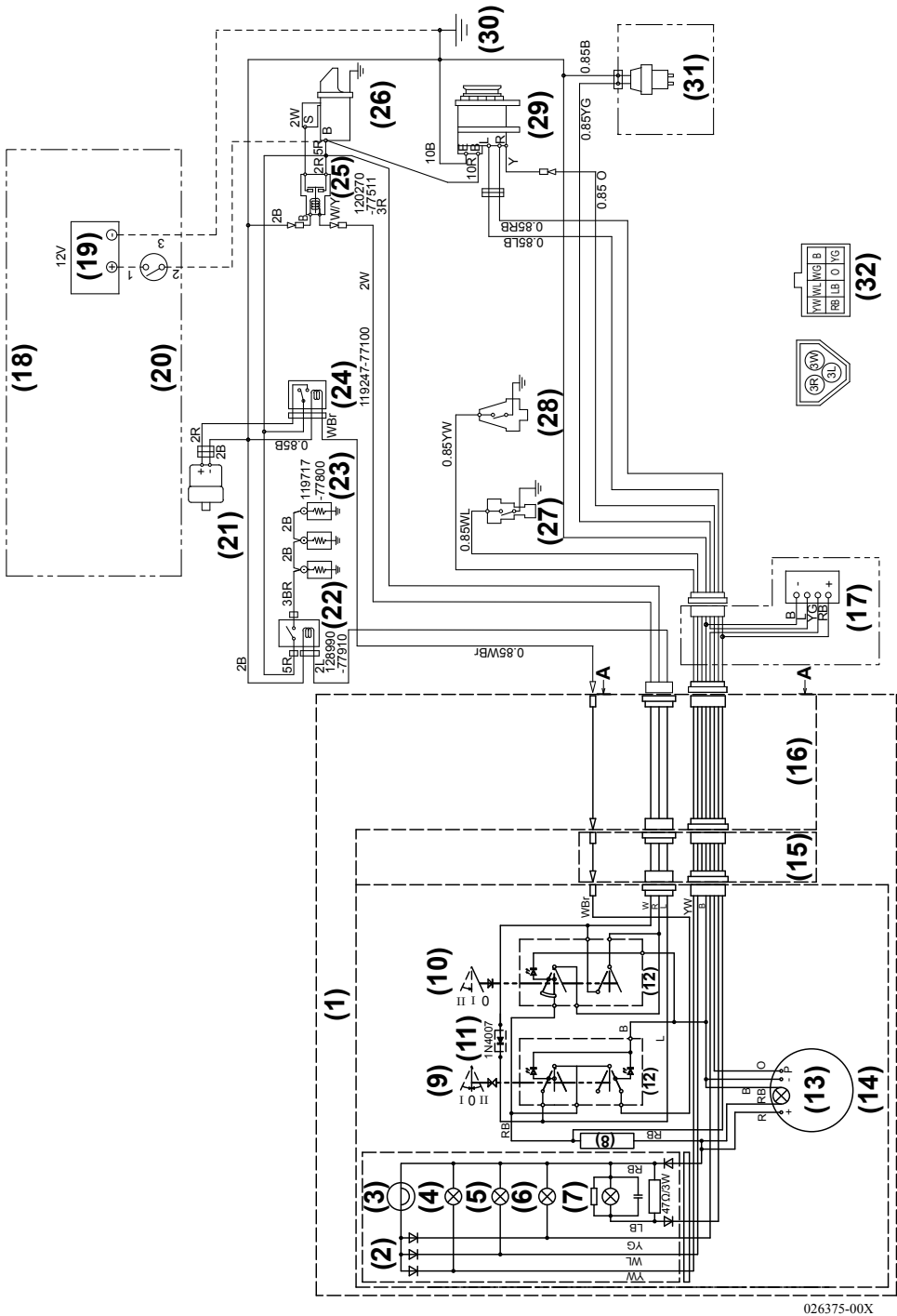


Figure 10

**2YM15, 3YM20, 3YM30 - B (Keyless) -
Type Instrument Panel (optional)**

1	Optional
2	Diodes
3	Buzzer
4	Engine Oil Low Pressure Alarm
5	Coolant High Temperature Alarm
6	Water in Sail-Drive Seal Alarm
7	Battery Low Charge Alarm
8	Fuse (3A)
9	SWITCH GLOW (I) / OFF (0) / STOP (II)
10	SWITCH START (II) / ON (I) / OFF (0)
11	Diode
12	Switch
13	Tachometer / Hourmeter
14	Instrument Panel (Main Station) (Option)
15	Wire Harness
16	Wire Harness for Sub Panel
17	Water in Sail-Drive Seal Sensor Amplifier (Sail-Drive Only)
18	Procured by Customer
19	Battery
20	Battery Switch
21	Engine Stop Solenoid
22	Relay
23	Glow Plug
24	Stop Relay
25	Starter Relay
26	Starter
27	Coolant High Temperature Switch
28	Engine Oil Pressure Switch
29	Alternator
30	Ground Bolt
31	Sail-Drive Only for Sail-Drive
32	Coupler (View from A-A)

3JH5E / 4JH5E with Keyless B and B x B Type Instrument Panel (optional)

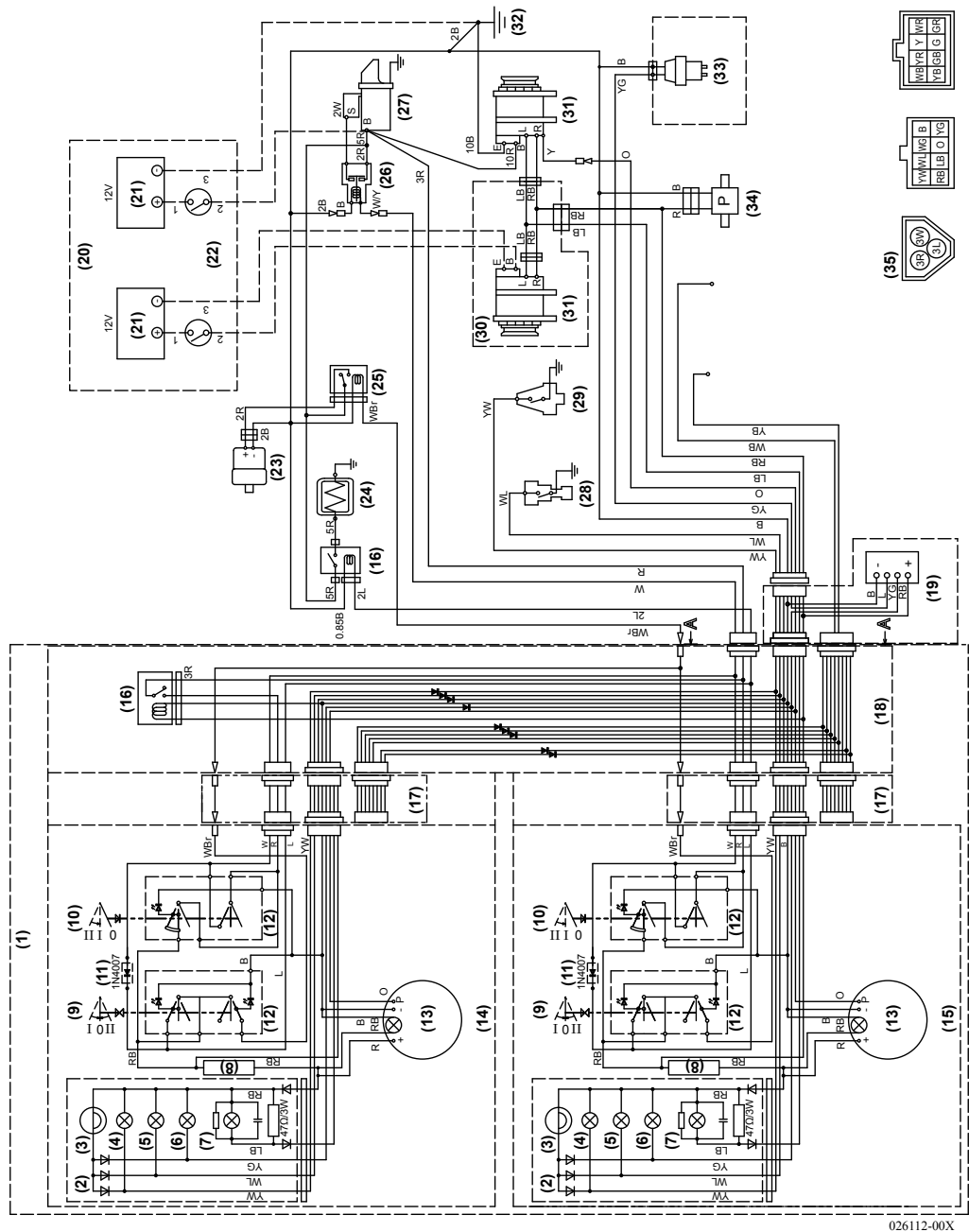


Figure 11

3JH5E / 4JH5E with Keyless B and B x B Type Instrument Panel (optional)

Color coding	Description	Engine Har-ness
R	Red	+
B	Black	-
W	White	Ignition
L	Blue	Air Heater / Glow (option)
RB	Red / Black	Alternator Exciter
LB	Blue / Black	Alternator Charge Alarm
YW	Yellow / White	Engine Oil Pressure Alarm
YB	Yellow / Black	Engine Oil Pressure
YG	Yellow / Green	Sail-Drive Seal
WL	White / Blue	Water Temperature Alarm
WB	White / Black	Water Temperature
WG	White / Green	Seawater Flow Alarm
GR	Green / Red	Fuel Filter Alarm
O	Orange	Pulse For Tachometer
WBr	White / Brown	Electric Stop

1	Option
2	Diodes
3	Buzzer
4	Engine Oil Low Pressure Alarm
5	Coolant High Temperature Alarm
6	Water in Sail-Drive Seal Alarm
7	Battery Low Charge Alarm
8	Fuse (3A)
9	SWITCH GLOW (I) / OFF (0) / STOP (II)
10	SWITCH START (II) / ON (I) / OFF (0)
11	Diodes
12	Switch
13	Tachometer / Hourmeter
14	Instrument Panel (Sub Station) (Option)
15	Instrument Panel (Main Station) (Option)
16	Relay
17	Wire Harness
18	Wire Harness for Sub Panel
19	Water in Sail-Drive Seal Sensor Amplifier (Sail-Drive Only)
20	Procured by Customer
21	Battery
22	Battery Switch
23	Engine Stop Solenoid
24	Air Heater
25	Stop Relay
26	Starter Relay
27	Starter
28	Coolant High Temperature Switch
29	Engine Oil Pressure Switch
30	Option
31	Alternator
32	Ground Bolt
33	Water in Sail-Drive Seal Sensor (Sail-Drive Only)
34	Fuel Feed Pump
35	Details of Coupler (View from A-A)

3JH5E / 4JH5E with Keyless C x B Type Instrument Panel (optional)

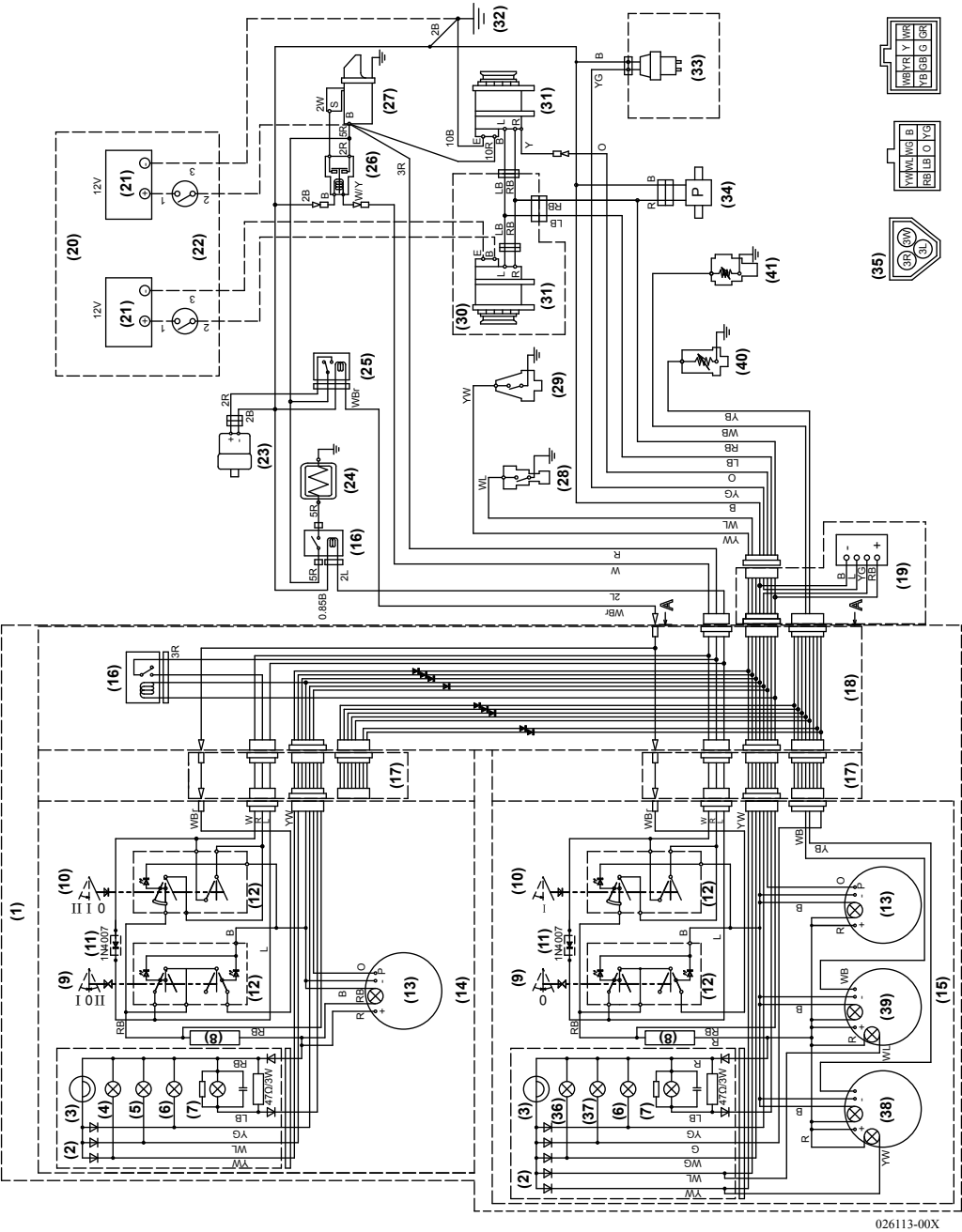


Figure 12

3JH5E / 4JH5E with Keyless C x B Type Instrument Panel (optional)

Color coding	Description	Engine Har-ness
R	Red	+
B	Black	-
W	White	Ignition
L	Blue	Air Heater / Glow (option)
RB	Red / Black	Alternator Excit-er
LB	Blue / Black	Alternator Charge Alarm
YW	Yellow / White	Engine Oil Pres-sure Alarm
YB	Yellow / Black	Engine Oil Pres-sure
YG	Yellow / Green	Sail-Drive Seal
WL	White / Blue	Water Tempera-ture Alarm
WB	White / Black	Water Tempera-ture
WG	White / Green	Seawater Flow Alarm
GR	Green / Red	Fuel Filter Alarm
O	Orange	Pulse For Tach-ometer
WBr	White / Brown	Electric Stop

1	Option
2	Diodes
3	Buzzer
4	Engine Oil Low Pressure Alarm
5	Coolant High Temperature Alarm
6	Water in Sail-Drive Seal Alarm
7	Battery Low Charge Alarm
8	Fuse (3A)
9	SWITCH GLOW (I) / OFF (0) / STOP (II)

10	SWITCH START (II) / ON (I) / OFF (0)
11	Diodes
12	Switch
13	Tachometer / Hourmeter
14	Instrument Panel (Sub Station) (Op-tion)
15	Instrument Panel (Main Station) (Op-tion)
16	Relay
17	Wire Harness
18	Wire Harness for Sub Panel
19	Water in Sail-Drive Seal Sensor Am-plifier (Sail-Drive Only)
20	Procured by Customer
21	Battery
22	Battery Switch
23	Engine Stop Solenoid
24	Air Heater
25	Stop Relay
26	Starter Relay
27	Starter Relay
28	Coolant High Temperature Switch
29	Engine Oil Pressure Switch
30	Option
31	Alternator
32	Ground Bolt
33	Water in Sail-Drive Seal Sensor (Sail-Drive Only)
34	Fuel Feed Pump
35	Details of Coupler (View from A-A)
36	Seawater Flow
37	Fuel Filter
38	Engine Oil Pressure Meter / Alarm
39	Water Temperature Meter / Alarm
40	Engine Oil Pressure Sender
41	Coolant Temperature Sender

MAINTENANCE LOG

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SYSTEM DIAGRAMS

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