

# **INSTALLATION MANUAL**







**YANMAR** 

#### **Precautions:**

- The YANMAR Joystick Control System is designed to operate along with the Vessel Control System. There are many control functions and diagnostic functions that are integrated in the system to ensure the safe operation of vessels. If the system is not installed properly in accordance with the instructions in this manual or the system is modified in any way, YANMAR will not be responsible for any failures in the system operation or the vessel utilizing the system.
- The YANMAR Joystick Control System has many functions that must be configured.
  Also, the calibrations must be made before the vessel can be operated. Be sure to
  make an arrangement to have a YANMAR trained technician to inspect the vessel prior
  to the vessels operation.

#### **Disclaimers:**

All information, illustrations and specifications in this manual are based on the latest information available at the time of publishing. The illustrations used in this manual are intended as representative reference views only. YANMAR reserves the right to make any changes at any time without notice.

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INSTALLATION MANUAL	MODEL	JC30Z
	CODE	0FJCS-EN0060

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#### YANMAR MARINE INTERNATIONAL B.V.

#### ■ Yanmar Marine International B.V.

Brugplein 11, 1332 BS Almere-de Vaart, Netherlands Phone: +31-36-5493534 Fax: +31-36-5493219 https://www.yanmar.com/marine

#### **Overseas Office**

#### ■ Yanmar Asia (Singapore) Corporation Pte. Ltd. (YASC)

4 Tuas Lane, Singapore 638613 Phone: +65-6861-3855 Fax: +65-6862-5189 https://www.yanmar.com/sg/

#### ■ YANMAR Marine International Americas Division

5400 118th Avenue N., Clearwater, FL 33760, USA Phone: +1-727-803-6565 Fax: +1-727-527-7013 https://www.yanmar.com/marine

#### ■ Yanmar Engine (Shanghai) Co., Ltd.

Room 1101-1106, No.757 Mengzi Road, Huangpu District, Shanghai 200023 PRC Phone: +86-21-2312-0638 Fax: +86-21-6880-8090 https://www.yanmar.com/cn/

#### ■ Yanmar Marine International Asia Co., Ltd.

5-3-1, Tsukaguchi Honmachi, Amagasaki, Hyogo 661-0001, Japan Phone: +81-6-6428-3131 Fax: +81-6-6421-2201 https://www.yanmar.com/marine

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JC30Z

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# **CONTENTS**

FOR YOUR SAFETY	. 1
Safety Symbols	. 1
Safety Precautions	. 2
INTRODUCTION	. 4
SYSTEM COMPONENT	. 5
INSTALLATION (OF COMPONENTS)	. 8
CHECKING OF INSTALLATION	. 18
SETTING OF DISPLAY	. 19
AIR BLEEDING	. 26
CALIBRATING AND SETTING	. 28
Calibrating	
Calibrating of the Joystick Control	
TROUBLESHOOTING	. 35
Warning on the Display	
JC30Z DTCs (Diagnostic Trouble Codes) General Description	
Emergency Actions when the Electronic Helm Fails	. 52
In Case that the Engine in One Side Stops During the Joystick Control System Operation	. 54
TEMPLATE (REFERENCE)	. 55
AUTOPILOT SYSTEM	
Safety Precautions	
Introduction	
Installation	
Initial Setting of Autopilot System	. 64
Operating for Autopilot System	. 65
YANMAR POSITIONING ASSIST	.71
Safety Precautions	. 71
System Component	. 73
Installation	
Initial Setting of YANMAR Positioning Assist	
Operating for YANMAR Positioning Assist  Troubleshooting	
DTC List	



# FOR YOUR SAFETY

Following the precautions described in this manual will enable you to use this system with complete satisfaction. Failure to observe any of the rules and precautions, however, may result in damage or injury. 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.



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.

**A** DANGER

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

**WARNING** 

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

**CAUTION** 

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

**NOTICE** 

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

# **Safety Precautions**

The Joystick Control System is an appropriate system for cruising to dock and undock, and low-speed navigation in the marina and port. Be sure to comply with the precautions and navigate safely.

#### **■** Joystick operation

#### **A WARNING**

- Operating the Joystick Control System is difficult in stormy weather conditions. Do not operate in such conditions. It may result in accidents or cause injuries.
- Perform the initial setting and adjustment in an environment without obstacles to avoid unexpected accidents, such as collision with other boats or obstacles.
- During initial setting and adjustment (calibration), it is not possible to maneuver or operate the engine by using the control head. Take care to avoid unexpected accidents, such as collision with other boats or obstacles.
- Do not operate the boat near to swimmers.

#### **A** CAUTION

- During operation, pay attention to the effect on nearby boats and piers.
- During operation, it is not possible to navigate with the steering wheel and control head. Pay attention when navigating the boat.
- During operation, note that, the boat will continue to move in the direction that the joystick was tilted.
- Operation of this system is affected according to the strength of the waves and wind. Pay attention when navigating the boat.
- During slow-mode operation, the engine speed is lower than in fast-mode, and so the system is more likely to be affected by wind and waves. Pay attention when navigating the boat.
- Be sure to stop the engine before inspecting the system components.
- If you feel any abnormalities in the boat movement during the joystick operation, switch to the control head navigation.
- During operation, the boat can be moved sideways and diagonally, which is different from conventional boat movement. Care must be taken that passengers do not fall overboard due to sudden movement of the boat.
- During operation, set the rudder to the center position. If the rudder is not kept in the center, the direction of boat movement will not conform to the direction of joystick lever tilt.
- Always turn off the battery switch or detach the earth cable (-) before inspecting the thruster battery, cable, terminals, connectors and harness.

#### **■** Electronic helm operation

#### **A** CAUTION

In the Joystick Control System, the normal navigation of a boat is performed by the electronic steering system.

The electronic steering system consists of the electronic helm, solenoid valve, and cylinder.

Before sailing, start the engine, steer the steering fully on the right and left, and make sure that the drive moves in the intended direction.

\_\_\_\_

## NOTICE

Do not spray high-pressure water on electrical components (joystick, display etc.) when cleaning, etc.

\_\_\_\_

# INTRODUCTION

The Joystick Control System is a system that is used on boats equipped with twin engines and twin stern drives (it cannot be adapted to boats equipped with a single engine and single stern drive).

The Joystick Control System is added as a system component to boats equipped with twin engines and twin stern drives specification Vessel Control System.

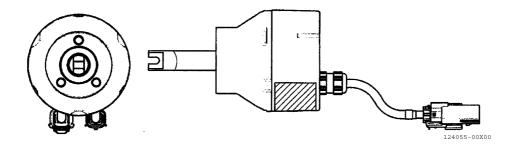
This control equipment consists of the electronic helm, the joystick, the ECU, the hydraulic valve unit, proportional solenoid valve driver, hydraulic cylinder, hydraulic hose, backup switch and the cable harness.

Note • For the Vessel Control System, refer to the Vessel Control System Installation Manual.

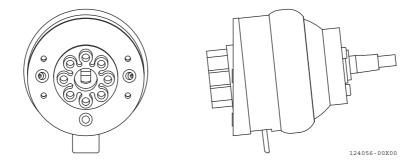
- And, refer to the Operation Manual of Engine and Stern Drive.
- All dimensions are in millimeter.

# **SYSTEM COMPONENT**

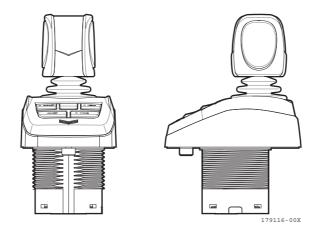
#### **■** Electronic helm



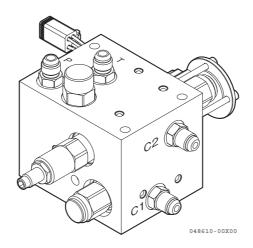
## ■ Tilt steering



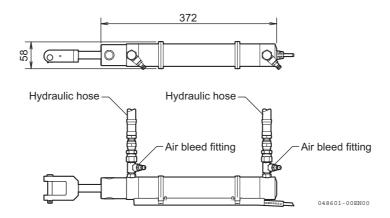
## ■ Joystick



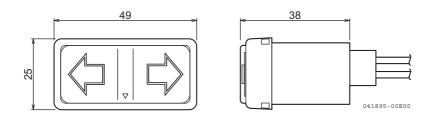
## **■** Hydraulic valve unit



#### ■ Hydraulic cylinder



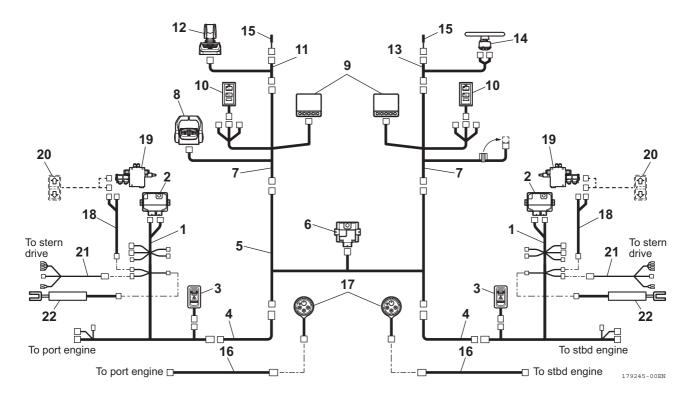
#### ■ The hydraulic valve unit back-up switch: 1 piece



Note • Hydraulic valve unit backup switch is not installed.

• Because this is an emergency device, be sure to store 1 piece in an accessible location on board away from seawater and rainwater.

## ■ Cable harness (for twin engines and one station connecting)



No.	Parts No.	Name	Note	
1	164300-2112X	Harness, main	Harness, main	
2	164300-1000X	Marine ECU	Marine ECU	
3	164100-3150X	Emergency stop switch	Emergency stop switch	
4	164300-2202X	Harness, ext.	3 m	
	164300-2203X	Harness, ext.	5 m	
	164300-2204X	Harness, ext.	10 m	
	164300-2205X	Harness, ext.	20 m	
5	164300-2109X	Harness, twin		
6	164300-1001X	Marine gateway ECU		
7	164300-2101X	Harness, station		
8	164200-4114X	Control head (SD, Twin)		
9	164300-5110X	Display		
10	164200-3721X	Switch panel		
11	164300-2211X	Harness, CAN T	1 m	
	164300-2212X	Harness, CAN T	2 m	
	164300-2213X	Harness, CAN T	Harness, CAN T 3 m	
12	164300-4200X	Joystick	Joystick	
13	164300-2102X	Harness, CAN EPS	Harness, CAN EPS	
14	164200-4320X	Electronic Helm		
15	164300-2900X	Adapter, terminal		
16	164000-2226X	Harness, ext.	5 m	
	164000-2227X	Harness, ext.	Harness, ext. 10 m	
17	164200-3000X	Back up panel		
18	164300-2312X	Harness, EPV unit		
19	164000-4504X	Hydraulic valve unit		
20	164000-3011X	Hydraulic valve unit back-up switch		
21	164000-2124X	Harness, SD For stern drive ZT H1		
22	164000-4502X	Hydraulic cylinder		

# **INSTALLATION (OF COMPONENTS)**

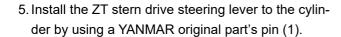
#### ■ Installation of the hydraulic cylinder

Install the hydraulic cylinder to the steering part of ZT stern drive.

- 1. Check that there is no breakage or dirt in the pushing part of the power steering and apply water resistant grease: UREA Grease Water Resistant Type NLG I #2.
- 2. Install the connecting part of the hydraulic cylinder.
- 3. Tighten the upper and lower pivot bolts (1) along with the lock tab washers (2).
  - Note Set the back side of the lock tab washer to the bolt head side.
    - Hand-tighten the pivot bolts (1) after applying grease and then tighten them to the specified torque.

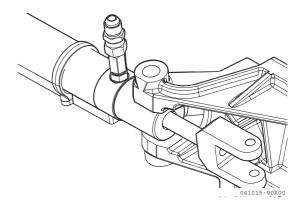
Specified tightening torque	35 N·m (26 Fb-lt)

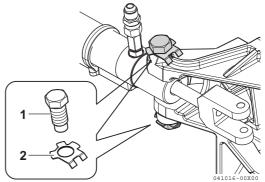
4. After tightening the pivot bolts, bend the tab (1) of the lock tab washer to the bolt side.

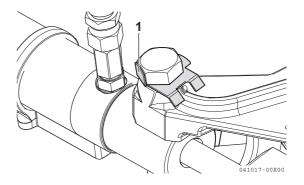


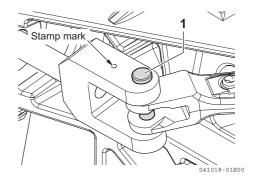
Note: When installing the pin of the fork of the cylinder and the steering lever, make sure that the stamp mark on the fork points up.

- 6. Check that there is no interference even when the cylinder is operated in full stroke.
- 7. Apply grease to the cylinder shaft.
- 8. Perform the same operation for the other stern drive.







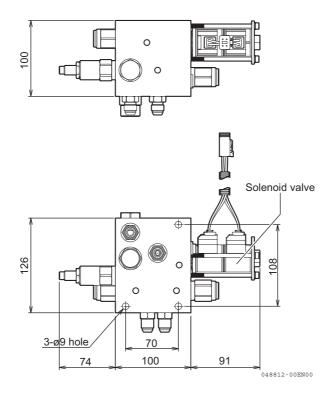


#### ■ Installation of the hydraulic valve unit

Install the hydraulic valve unit to a flat, solid location in the hull side free of rainwater and seawater splashes and reachable by each hydraulic hose under the steering oil tank.

Note • Be sure to install the hydraulic valve unit under the steering oil tank in order to easy air bleeding.

- Install the hydraulic valve unit to the direction where the hydraulic hose piping is possible and the solenoid valve can be checked and maintained.
- Install the hydraulic valve unit to the direction where the solenoid valve is installed horizontally.
- It is okay to install it on the mounting base.
- As the solenoid valve is breakable, handle it with care to avoid dropping it or stepping on it.
- Do not install on the engine.



#### ■ Piping of the hydraulic hose

Perform the piping of the hydraulic hose related to the hydraulic cylinder.

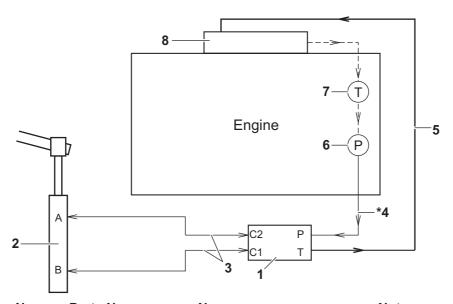
Note • Care must be taken not to let dirt enter the hose, hydraulic cylinder, and hydraulic valve unit when connecting the hydraulic hose piping.

- Care must be taken not to mistake the connection of each hydraulic hose of the hydraulic valve unit.
- Care must be taken not to damage the hydraulic hose. Do not let it touch any edges.
- In consideration of fluctuation of the hydraulic cylinder, piping of hydraulic hose for the hydraulic cylinder and hydraulic valve unit must have enough margin and the hydraulic cylinder must be securely tightened.

  Do not fix the hydraulic hose to the hydraulic cylinder less than 1 m from the terminal area of the hydraulic cylinder which works.
- The minimum bending radius of the hydraulic hose is 80 mm.
- Hose thread G3/8 (PF3/8) tightening torque: 34 N·m
- For 4LV engine, replace the elbow on the oil cooler with the elbow provided.

#### Piping around the engine and hydraulic cylinder (hydraulic valve unit and cylinder piping)

Note: The engines on both sides (starboard and port side) have the same piping.



<u>No.</u>	Parts No.	Name	Note Note
1	164000-45040	Hydraulic valve unit	
2	164000-45022	Hydraulic cylinder	
3	164000-45150	Hydraulic hose	Select Length: 4m
	164000-45120	Hydraulic hose	Select Length: 3m
	164000-45160	Hydraulic hose	Select Length: 2.5m
4	164000-45101	Hydraulic hose CMP	Select Length: 2.5m
5	164000-45090	Hydraulic hose B	Length: 3m
6	<del></del>	Power steering pump	
7	<del></del>	Steering oil tank	
8	<del></del>	Steering oil cooler	
			041003-01EN

Note: The hydraulic hose (\*4) must be replaced from the standard hydraulic hose installed in the engine to the one for Joystick Control System. You must replace the hoses in both engines.

The replacement procedure is shown as follows.

#### Replace the hydraulic hose

The hydraulic hose to be replaced is the one in the power steering pump outlet in the starboard side of the engine.

Replace the hose to the hydraulic hose for Joystick Control System in the following procedure:

1. Loosen and remove the mounting nut (2) or bolt (2) of the hydraulic hose (1).

#### 2. [4LV]

Remove the standard hydraulic hose (1) installed in the engine.

[8LV]

Remove the standard hydraulic hose (1) installed in the engine carefully from the pipe joint (4) while making sure that the O-ring (3) is not twisted.

Note: The remaining O-ring (3) is reused.

3. The hose joint (5) to be used depends on the engine model.

Engine	ngine Hose joint	
model	Inner diameter size	Parts No.
4LV	ø16.0	164000-45280
8LV	ø14.2	164000-45270

[4LV]

Install the hose joint (5) using the bolt (2). [8LV]

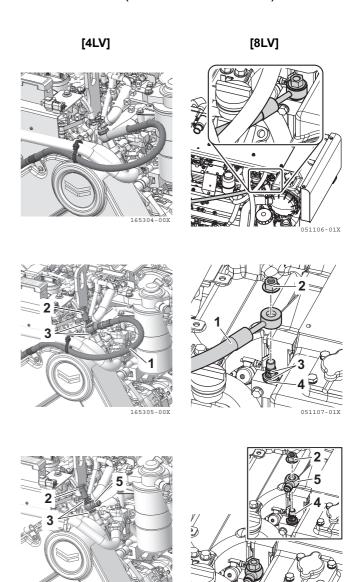
Install the hose joint (5) to the pipe joint (4) lightly, using the nut (2).

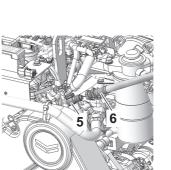
Note: When installing the hose joint, check the Oring and care must be taken for the up and down direction of the joint. The side with the smaller installation hole diameter of the hose joint is the top side.

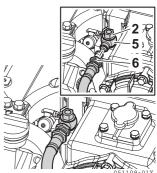
4. Decide the direction of the hydraulic hose (6) for Joystick Control System, tighten and lock it with the nut (2) or bolt (2).

Engine model	Tightening torque
4LV	54 N·m
8LV	93 N·m

5. Install the hydraulic hose (6) to the hose joint (5).

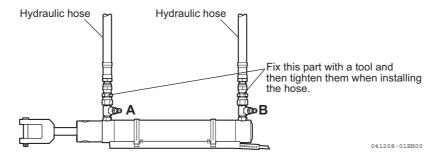






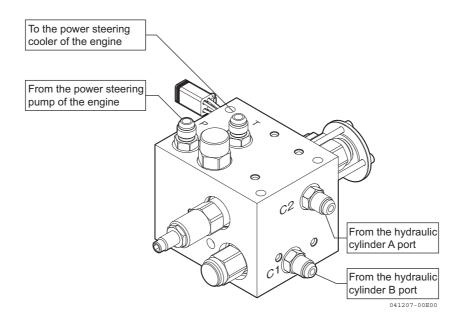
#### **12** — INSTALLATION (OF COMPONENTS)

1. Install the hose to the A/B piping joint of each hydraulic cylinder in the starboard side and port side.



Note: Do not fix the hydraulic hose less than 1 m from the terminal area of the hydraulic cylinder which works.

- 2. Install the hose to the power steering pump and steering oil cooler, which are attached to the engine.
- 3. Install each hydraulic hose to the hydraulic valve unit joint.
  - Install the hose from the hydraulic cylinder A to the C2 port (C2 marking) and B parts to the C1 port (C1 marking).
  - Install the hose from the power steering pump of the engine to the P port (P marking). Install the hose from the steering oil cooler to the T port (T marking).



#### ■ Installing tilt steering and electronic helm

Install the tilt steering and the electronic helm as described below.

Then install the steering wheel that is locally arranged.

#### **Before installing**

Make sure that you have sufficient space for electronic helm and its harness to be installed.

Note that you need sufficient space to adjust the mounting angle of the steering wheel as shown in Figure 1.

#### **NOTICE**

Compass safety distance for Electronic helm Follow the compass safe distances to prevent interference to a magnetic compass.

Magnetic compass
0.80 m

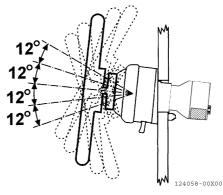
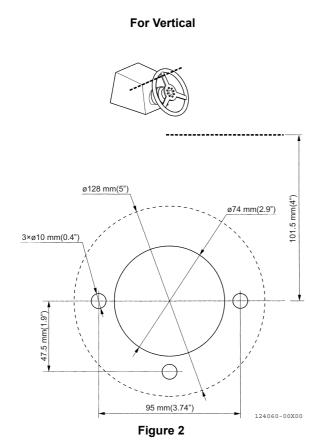
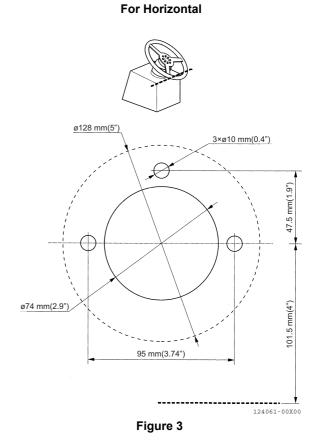


Figure 1

#### Installing

1. Define the tilt steering position and mounting direction with reference to Figure 2 and Figure 3, and make holes for the bracket. For the cutout template, refer to P55 TEMPLATE (Tilt steering).





2. Install the gasket (L) (3) and bracket (4) to the Instrument panel by using screws (5), washers (6) and nuts (7). referring to Figure 4.

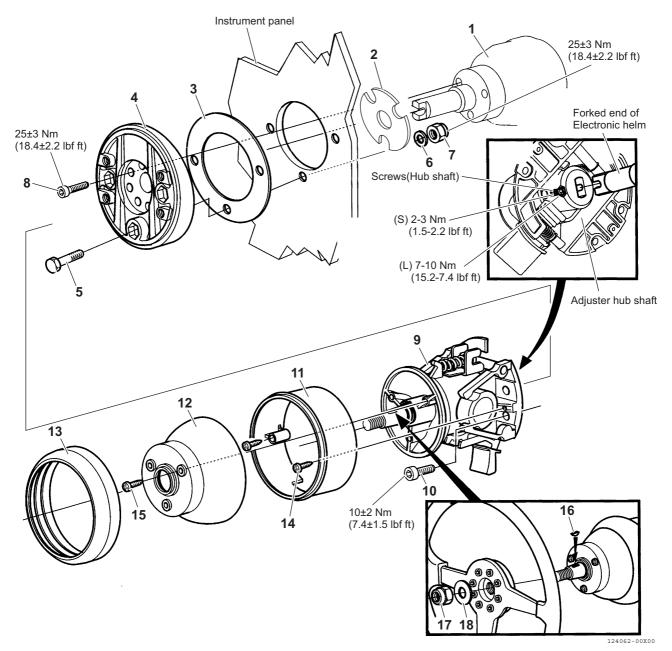


Figure 4

Name	QTY.	Pos. in fig	Name	QTY.	Pos. in fig
Electronic helm	1	1	Screw M6 × 16 Socket cap	4	10
Gasket (L)	1	2	Fix cover	1	11
Gasket (S)	1	3	Movable cover	1	12
Bracket	1	4	Seal Molding	1	13
Screw M8 × 45 Hex	3	5	Screw ST 3.5 × 25	2	14
Washer	3	6	Screw ST 3.5 × 16	3	15
Locknut M8	3	7	Woodruff key	1	16
Screw M8 × 45 Socket cap	3	8	Locknut M12	1	17
Adjuster	1	9	Washer	1	18

- 3. Attach the gasket (S) (2) on electronic helm (1) and install it to the bracket (4).
- 4. Install adjuster (9).
  - 1-Rotate the universal joint and loosen the hub shaft screws (S and L).
  - 2- Insert the forked end of the electronic helm shaft to the hub shaft and install the adjuster (9) to the bracket (4) by using screws (10).
  - 3-Tighten the hub shaft screws (S and L).
- 5. Install the fixed cover (11) by using screws (14).
- 6. Install the movable cover (12) and fix it by screws (15).
- 7. Install the seal molding (13) to the fixed cover (11).
- 8. Install the woodruff key (16) to the shaft of the electronic helm (1).
- 9. Install the steering wheel and fix it by locknut (17) and washer (18).

#### **NOTICE**

After installation, check for loose bolts.

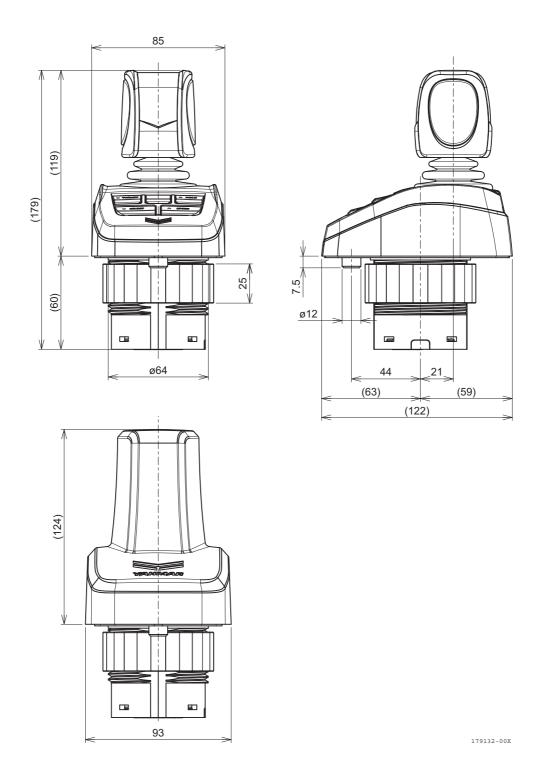
Make sure that there is no abnormality by operating tilt and steering wheel.

#### ■ Installation of the joystick

Like the electronic helm, install the joystick to the steering part.

Apply the sealing compound to the installation part as required.

Note: To enable the emergency stop for your safety, install the joystick near the engine switch panel.

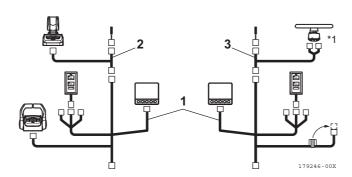


Note: For the cutout template, refer to P57 [Joystick].

#### **■** Connection of the wire harness

After the installation of the components, connect each wire harness.

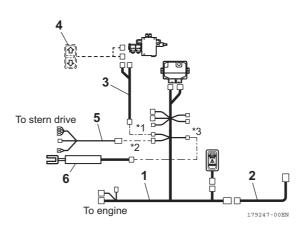
#### Connection around the helm, e.g. the joystick and electronic helm



No.	Parts No.	Name	Note
1	164300-2101X	Harness, station	
2	164300-2211X	Harness, CAN T	1 m
	164300-2212X	Harness, CAN T	2 m
	164300-2213X	Harness, CAN T	3 m
3	164300-2102X	Harness, CAN EPS	

Note: \*1 Connector with "EPS" label.

#### Connection of the hydraulic valve unit, hydraulic cylinder and drive unit



No.	Parts No.	Name	Note
1	164300-2112X	Harness, main	
2	164300-2202X	Harness, ext.	3 m
	164300-2203X	Harness, ext.	5 m
	164300-2204X	Harness, ext.	10 m
	164300-2205X	Harness, ext. 20 m	
3	164300-2312X	Harness, EPV unit	
4	164000-3011X	Hydraulic valve unit back-up switch	
5	164000-2124X	Harness, SD For stern drive ZT H1	
6	164000-4502X	Hydraulic cylinder	

Note • \*1 Connector with "EPV" label.

- \*2 Connector with "STRN DRV" label.
- \*3 Connector with "RUDDER" label.
- In case of emergency, connect the hydraulic valve unit backup switch, refer to P52 [Emergency Actions when the Electronic Helm Fails].

# **CHECKING OF INSTALLATION**

Inspect the system and check for abnormalities after the completion of the installation of components, hydraulic piping and wiring.

#### **■** Connection check

· Check that the connection part is securely connected without incorrect connection to the equipment, switches and controllers.

#### ■ Installation check

- · Check that the hose coupling is securely tightened installation of the hydraulic equipment, hose connection and untightened thread portion.
- Check that the steering wheel of the electronic helm is securely tightened.

#### ■ Circuit check

- Check that the display appears after turning ON the battery switch and the switch panel.
- Check that the button lamp lights by pressing the system start button of the joystick.

#### ■ Stern drive check

• Check that the drive is in the tilt-down condition.

# **SETTING OF DISPLAY**

Be sure to perform the initial setting of the display after the completion of the installation check.

Perform the settings of JC30Z and VC30 at the same time, as SETTING shows below.

If your boat has already installed VC20, refer to RECONFIGURATION on page 24 for adding JC30Z. (See VC30 Installation Manual.)

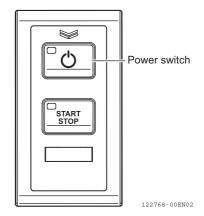
#### **■ SETTINGS**

Your Vessel control system is configured with the default settings at the factory. However, you need to change and set some of the defaults before the first engine running.

#### **Display Settings**

Note: Perform the following initial setups on all screens.

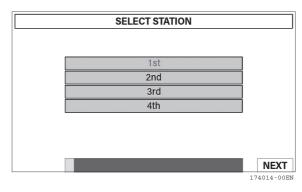
- When you turn on the switch panel, "SELECT STA-TION" automatically shows on.
- 2. Be sure to wait for 2 minutes because the initial startup for ECU takes some time.



#### 3. "SELECT STATION"

Select the station where the display is installed and press the enter button.

(Select one from "1st", "2nd", "3rd" and "4th".) Select "NEXT" and press the enter button.



#### 4. "CONFIRMATION"

Select "YES" and press the enter button. (Only needed 1 time per engine)

CONFIRMATION			
Continue to set system configuration?			
Ye	es		
No			
CURRENT	SETTINGS		
Number of Engines	Single		
Install Engine ECU	Not Installed		
Install Marine ECU	Installed		
Engine type	-		
Transmission Type	Others Non/MECH 0.00		
Display Instance	Single		

174015-00EN

#### 5. "NUMBER OF ENGINES"

Select the number of engines and press the enter button. Select "NEXT" and press the enter button.

# 6. "INSTALL ECU'S" - "ENGINE ECU & MARINE ECU"

Select "Installed" and press the enter button. Select "NEXT" and press the enter button.

#### 7. "SELECT DISPLAY"

Select the information to be indicated on the display.

"Single": To indicate the engine data of a boat

with single engine installation.

"Port": To indicate the port side engine data of

a boat with twin engine installation.

"Stbd": To indicate the starboard side engine

data of a boat with twin engine installa-

tion.

"Center": To indicate the center side engine data

of a boat with triple engine installation.

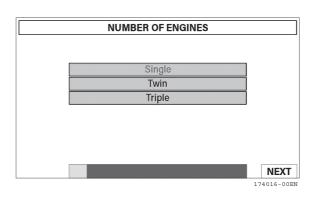
"P and S": To indicate both engine data of a boat

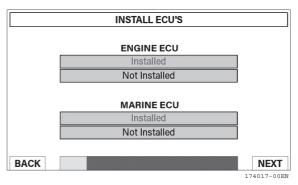
with twin engine installation on one dis-

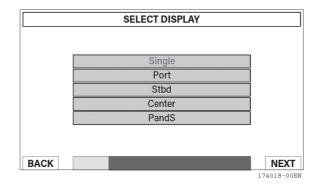
play.

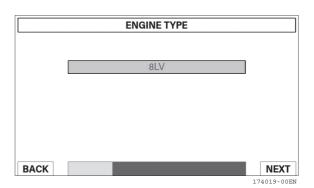
#### 8. "ENGINE TYPE"

Select "Engine type" and press the enter button. Select "NEXT" and press the enter button.









#### 9. "TRANSMISSION TYPE"

Select "ZT H1" and press the enter button. Select "NEXT" and press the enter button.

10. "TRANSMISSION TYPE" - "Reduction ratio"
Select "1.65" or "1.78" and press the enter button.
Select "NEXT" and press the enter button.

11. "TRANSMISSION TYPE" - "Confirmation" Make sure that the transmission type setting is completed.

Select "NEXT" and press the enter button.

#### 12. "Autopilot"

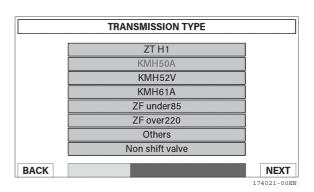
To use Autopilot, select "Yes" and press the enter

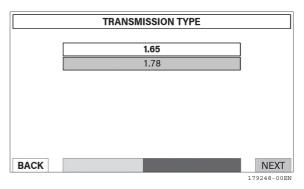
Select "NEXT" and press the enter button.

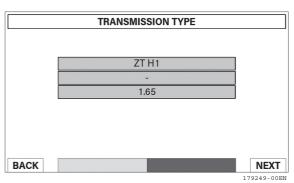
#### 13. "YPA"

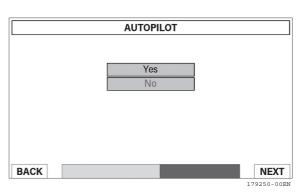
To use YANMAR Positioning Assist, select "Yes" and press the enter button.

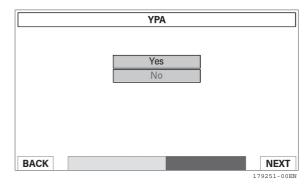
Select "NEXT" and press the enter button.











#### 14. "YANMAR E-KEY"

Selection to enable YANMAR E-key

"Yes": Use YANMAR E-key

"No": Don't use YANMAR E-key.

#### 15. "STATION CONFIG"

Select "Yes" and press the enter button. (Only needed 1 time per engine).

#### 16. "STATION SETTING"

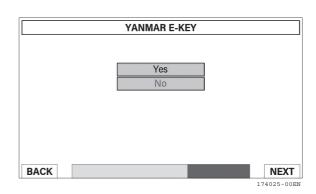
Select the number of the station you want to setup and press the enter button.

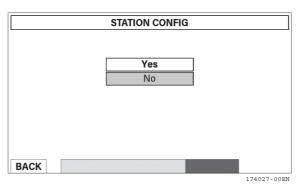
#### 17. (Select the devices)

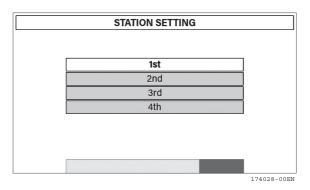
Select the devices that you want to register to the station.

The lamp lights up when the device is registered. After the registration is completed, select "NEXT" and press the enter button.

- If you have registered the wrong device, select "CLEAR" and press
- If you use the Option Control Head, "C/H type 2" is indicated on the display.



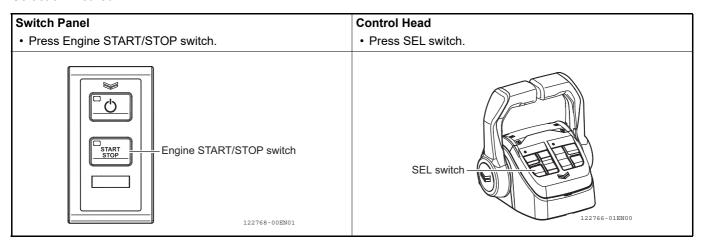


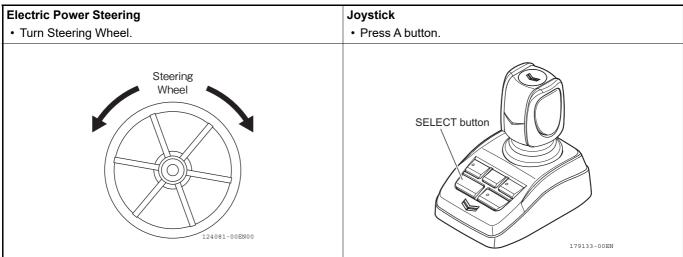


Press the blinking button of each devices to engage with St01		
SW panel	Selected	CLEAR
SW panel	Selected	CLEAR
C/H type 01	Selected	CLEAR
EPS	Selected	CLEAR
Joystick	Selected	CLEAR
1		
		NEXT
	1	79252-00E

#### **NOTICE**

#### Selection method



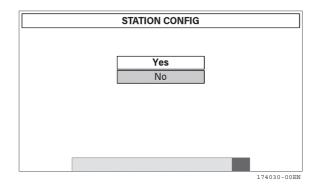


18. Select whether or not to continue setting the other stations.

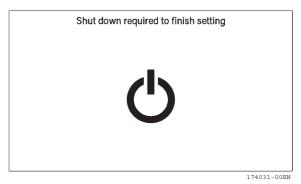
"Yes": To continue station settings.

(Return to step 16)

"No": Complete the station settings.



19. Turn off the power switch and reboot the system. Next, set the starboard engine. No need to repeat Station Config setting.



#### **■** RECONFIGURATION

If you add a new device to the system or replace a device, you must reconfigure it.

If the system detects an unregistered device when the power is turned on, "DETECT NEW PARTS" is displayed.

To perform the reconfiguration, enter the Service ID and switch to the Service mode display. Contact your YANMAR dealer or distributor with reference to Operating in Service Mode.

# **™** 496 kpa OK

#### **Display Settings**

1. Select the reset menu.

The reset menu has "Reboot - Station setting" or "Reboot - Initial setting".

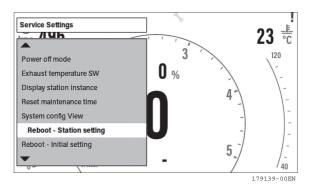
#### "Reboot - Station setting"

(Service Settings: Reboot - Station setting: YES) For example, when adding stations or replacing Control Head.

#### "Reboot - Initial setting"

(Service Settings: Reboot - Initial setting: YES) For example, when replacing Marine ECU.

2. A confirmation message is displayed. Select "OK" and press the enter button.





179140-00EN

3. Reconfigure according to SETTING OF DISPLAY.

#### Supported devices for reset menu

Reboot - Station setting	Reboot - Initial setting
Control Head	Marine ECU
Switch Panel	(Control Head*)
Joystick	(Switch Panel*)
EPS	(Joystick*)
	(EPS*)

\* If "Reboot - Initial setting" is selected, it will continue to "Reboot - Station setting".

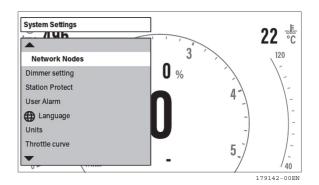
CONFIRMATION			
Continue to set system configuration?			
Yes			
N	0		
CURRENT SETTINGS			
Number of Engines	Single		
Install Engine ECU	Not Installed		
Install Marine ECU	Installed		
Engine type	-		
Transmission Type	Others Non/MECH 0.00		
Display Instance	Single		

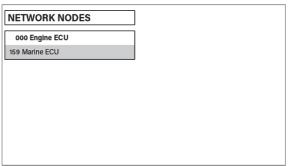
179141-00EN

#### **■** Operating in service mode

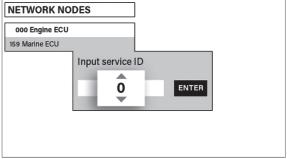
By switching to the Service mode screen, more functions than those indicated in P30 [About joystick], P31 [About EPS] can be used. However, for functions such as to delete the initial setting of the display setting, contact your YANMAR dealer or distributor for the required Service ID. Select network nodes (System Settings: Network nodes) and hold the display's menu button down for 5 seconds.

- Select a number from 0 to 9 with the ▼ ▲ buttons and enter the Service ID. When you press the enter button, the entered number is displayed as an asterisk and the next digit is highlighted.
- Press the enter button when all 4 digits are entered.
   This switches to Service mode.

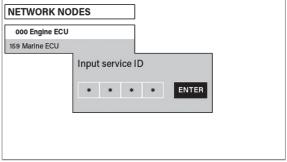




179143-00EN



179144-00EN



179145-00EN

# **AIR BLEEDING**

Fill the steering oil and perform the air bleeding of the piping system after setting the display.

If air enters the steering piping system, the boat cannot be navigated smoothly.

Perform an air bleeding of the oil not only at the time of initial installation, but also when doing maintenance of the power steering system and after the power steering oil ran out.

It is required to perform the air bleeding by each cylinder.

Note: Depending on the air condition, air bleeding may take time.

#### ■ Things to prepare

- Steering oil: Automatic Transmission Fluid (ATF DEXRON III)
   Prepare plenty of steering oil to allow for waste. We recommend that you prepare more than 3 liters of steering oil.
- Prepare a container to receive the leaked oil. Connect the transparent hose (inner diameter: 7 mm) to the air bleeding part of the hydraulic cylinder. Extend the hose to the container.
- · Inspection and preparation required for engine start.

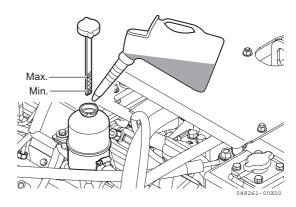
#### ■ Lubrication of steering oil

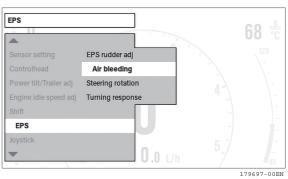
- Remove the dipstick cover on the power steering oil tanks attached to the both engines.
   Fill steering oil above the upper mark of the dipstick.
- 2. Start the engine.
  - When the engine operates, oil in the tank decreases. Stop the engine after a few minutes and check the oil level and refill up to the upper mark of the dipstick.
- 3. Repeatedly restart and stop the engine until the oil level is close to the upper mark.
- 4. Perform the same operation for the other engine.

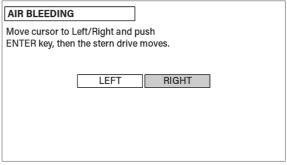
#### ■ Air bleeding

Perform the air bleeding to the port side and starboard side each for both stern drives.

- 1. Start the engine. Keep the engine at idle.
- 2. Set the display validation to [Service ID].
- 3. Select [EPS] and [Air bleeding] from [Service setting] of the display [Main menu].
- 4. When the Port and Starboard engine date is displayed on one display, select either Port or Starboard which is running.





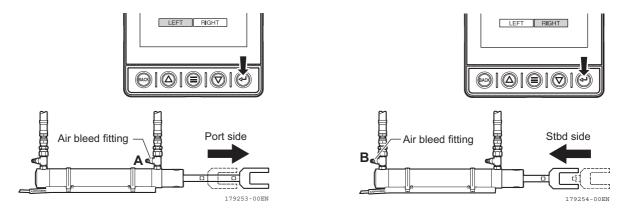


179698-00E

- 5. Loosen the air bleed fitting A by half a turn (counterclockwise), Select "Right" on the display and press the enter button. It makes the hydraulic cylinder to stretch to the port side, bleeding air and oil at the same time.
- 6. When the hydraulic cylinder is fully stretched to the port side, release the enter button, and close the air bleed fitting A.
- 7. Air bleeding lowers the oil level of the oil tank. Refill the steering oil.
- 8. Loosen the air bleed fitting B by half a turn (counterclockwise), select "Left" on the display and press the enter button. It makes the hydraulic cylinder to contract to the starboard side, bleeding air and oil at the same time.
- 9. When the hydraulic cylinder is fully contracted to the starboard side, release the enter button and close the air bleed fitting B.
- 10. Air bleeding lowers the oil level of the oil tank. Refill the steering oil.
- 11. Repeat the same air bleeding operation several times to check that the air does not come out.
- 12. Switch to the remaining stern drive and perform the same air bleeding.
- 13. When air bleeding for both port and starboard sides is complete, complete air bleeding (press the back button).
- 14. Check the oil level of the oil tank after the completion of air bleeding. If the level is lowered, refill oil.
- 15. Stop the engine and turn off the power.

Note • Be sure to perform the operation check of both stern drive steering parts after air bleeding.

• If the movement of either side differs (one side is slower, etc.), perform air bleeding again.



(The illustration is seen from the front)

#### **A** CAUTION

- Care must be taken not to get your hand caught around the hydraulic cylinder when you perform air bleeding. As the cylinder moves, you may get your hand caught and injured.
- Care must be taken not to get your hand caught around the engine turbocharger when you perform the air bleeding screw operation. Be careful of burns. The turbocharger is nearby and becomes hot.
- Keep the engine at low idle while air bleeding. Do not operate the shift or increase the engine speed.

  Unexpected accidents or injury may result to the person who is checking.

# **CALIBRATING AND SETTING**

When air bleeding of the steering oil is complete, perform the initial setting and adjustment required for the joystick and the electronic helm by using the display.

Note • Rudder auto setting must be done to make the steering wheel work.

• In case of multiple stations, it is acceptable to perform these settings and adjustments by only one station.

#### ■ Rudder auto setting

To synchronize the steering and the rudder operation, perform the auto setting of the rudder sensor and the proportional solenoid valve of the hydraulic unit. Perform the auto setting by each stern drive in the port side and the starboard side.

- 1. Start the engine. Keep the engine at idle.
- 2. Set the display validation to [Service ID].
- 3. Select [EPS] and [EPS rudder adj] from [Service setting] of the display [Main menu].
- 4. As "START" is highlighted, press the enter button to start the auto setting.

Note: It takes approximately 2 minutes until the setting is complete.

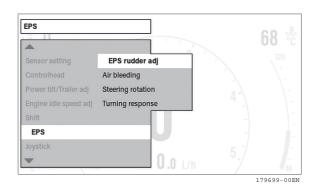
- [in process] is displayed during the setting. When the setting is complete, the value (setting value) is displayed.
- 6. Switch to the remaining stern drive and perform the same auto setting.
- 7. When the auto setting for both port side and starboard side is complete, auto setting is complete. (press the back button)
- 8. Stop the engine, turn off the power and restart.

Note: If you want to stop the auto setting during the auto setting in progress, press the enter button.

After the completion of rudder auto setting, operate the steering wheel to check that both left and right stern drive steering parts move identically.

#### **A** CAUTION

Check that there is nobody around. The drive (rudder) moves during the rudder auto setting in progress.



EPS RUDDER ADJ

AUTO SETTING MODE – Please be careful.
System automatically steer your stern drive for calibration.

START

MAIN SUB

Rudder right
Rudder left
Solenoid 01
Solenoid 02

550
MA

179700-00EN

# **Calibrating**

The Joystick Control System was configured at the factory with the default settings, but the steering wheel operation and the boat movement by the joystick may differ depending on the size, weight and shape of the boat. So, some defaults have to be changed.

Note: If there are multiple joysticks, calibration set in one joystick applies to all joysticks.

#### **WARNING**

- Perform the initial setting and adjustment in an environment without obstacles and do not interfere with other cruising boats, to avoid unexpected accidents, such as a collision with other boats or obstacles.
- During calibration, you cannot navigate or operate the engine with the steering wheel and control head and do not interfere with other cruising boats, to avoid unexpected accidents, such as collision with other boats or obstacles.

The default settings you can change from the display are as follows:

Note: If you change the settings, be sure to perform a check after making the change.

# ■ About joystick

Service ID	ID Display menu		Default	Setting content	
× (n/a)	System	Joystick monitor	YES	Enable/Disable displaying the navigation monitoring screen when switching to joystick operation. Yes/No	
×	setting	Joystick slow mode speed	1	Of the Slow mode, you can further change the speed in 3 steps.  1. Fast - 3. Slow	
			1300 min <sup>-1</sup> at Fast mode	You can set the maximum engine speed when navigating with the joystick.  Fast mode: 1800 min <sup>-1</sup> ,  Slow mode: 1000 min <sup>-1</sup> MAX ENGINE SPEED (FAST)	
(need)	Service setting Joystick	Max engine speed	800 min <sup>-1</sup> at Slow mode	Max	
0		Astern shift delay	0.5 sec.	You can change the shifting delay time to prevent shock when navigating with the joystick.  0 - 2.5 sec.    JOYSTICK ASTERN SHIFT DELAY	
0		Joystick throttle delay	0.5 sec.	You can change the throttle delay time to prevent shock when navigating with the joystick.  0 - 2.5 sec.    JOYSTICK THROTTLE DELAY	
0		Throttle response	2	You can adjust the engine speed startup condition during the joystick navigation.  1. Slow - 3. Quick	

#### **■** About EPS

Service ID	Displa	y menu	Default	Setting content	
			Throttle MIn. 1.5 Throttle Max. 3.0	You can adjust the rotation torque of the steering wheel. Specify the torque at the minimum, 50%, and maximum throttle. If the value of 50% is set, you can change the torque ratio at low speed or high speed. (Throttle Max. should have the biggest number.)	
O (need)	Service setting EPS steering	Rotation torque	Throttle 50% The default value is not set	ROTATION TORQUE  Input steering wheel rotation torque at each speed. 50% center point is arbitrary input.  Throttle Min Throttle Max Throttle 50%  179255-00EN	
0		Notch torque	0 No notch	You can set the notch in the center part during the steering rotation. You can adjust the feeling of the notch size. 0 (None) - 5	
0		End torque	1	You can change the braking force at the end of the steering rotation limit.  Non vibration, Pattern 1 (Min) - Pattern 3 (Max)	
			Hi speed 5.0	You can set the steering wheel rotation number between full stroke port and starboard.	
× (n/a)	Service setting EPS Steering rotation	Rotation number	Lo speed 3.0	Set the number when the engine speed is Low (2.0 - 4.0) or High (4.0 - 6.0).    STEERING ROTATION NUMBER   Input steering wheel rotation number between rotation limits at each speed   Hi speed   5.0 rev   Low speed   3.0 rev	
×		Response	0 No setting	Depending on the rotation speed of the steering wheel, change the rudder movement speed and adjust the steering response.  0 (Not in use) - 5 (Maximum)	
×	Service setting EPS	Turning response	0 No setting	Change the rudder control volume at the time of the steering wheel controlled variable and change the turnability (of the boat).  0 (Not in use) - 4 (Small turn)	

## **A** CAUTION

Be sure to check the boat (vessel) behavior under the changed setting condition after changing the settings for steering rotation number and response, and turning response.

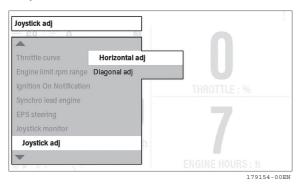
# Calibrating of the Joystick Control

Calibrate the boat in the sideways direction and diagonal direction. First, calibrate the boat in the sideways direction and then, in the diagonal direction.

Note: Calibrate the boat in a place where there is little wind and no tidal current.

#### ■ Calibrating in the sideways direction

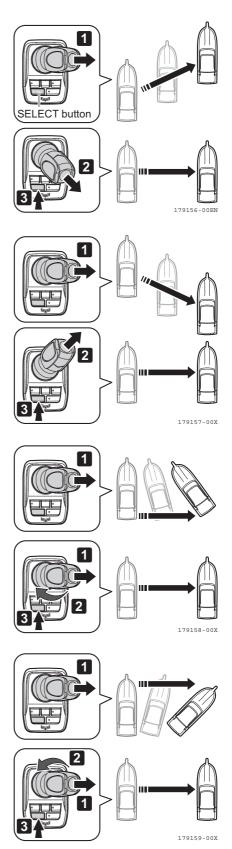
- Set the display validation to [Service ID].
   Select [Joystick] and [Joystick adj] from [Service setting] of the display [Main menu].
- Select [Horizontal adj] and calibrate in the sideways direction.



- A beep sounds continuously, the SELECT button flashes and you can calibrate in the sideways direction.
   A beep sounds continuously during calibration and it stops when the calibration is done.
- Move the joystick lever to the sideways.
   The SELECT button changes from flashing to lighting and it is ready to calibrate.

Note: You cannot calibrate in the sideways direction in the other directions (forward, backward, and diagonal).

- If the boat moves in the sideways direction (where the joystick lever is moved), press the SELECT button and finish the sideways calibration.
- If the boat does not move in the sideways direction, operate the joystick lever as shown in the right illustrations. While keeping the movable condition to the sideways direction, press the SELECT button to confirm.
  - Note When pressing the SELECT button to complete the calibration, hold the lever in the desired direction. If the lever is released, the calibration value is not recorded correctly.
    - If you calibrate in one sideways direction (left or right), you don't need to calibrate in the opposite sideways direction.

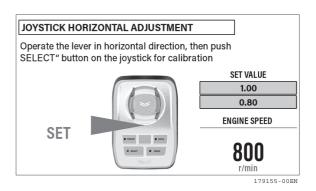


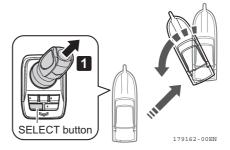
The calibration condition is shown on the display.
 If you move the joystick within the settings range,
 the Green Zone is shown and you can calibrate.
 If you move the joystick outside the range, the Red Zone is shown. In this case, you cannot calibrate.
 To show the Green Zone, move the joystick in the sideways direction.

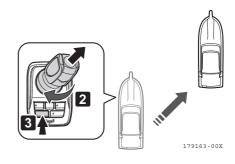
### ■ Calibrating in the diagonal direction

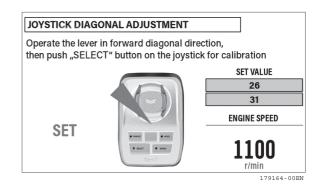
Select [Diagonal adj] and calibrate in the diagonal direction.

- A beep sounds continuously and the SELECT button flashes and you can calibrate in the diagonal direction. A beep sounds continuously during calibration and it stops when the calibration is done.
- Move the joystick lever 30 degrees diagonally forward (left or right). The SELECT button changes from flashing to steady lighting and the system is ready to calibrate.
  - Note: You cannot calibrate other directions (forward, backward, and sideways) in the diagonal direction.
- If the boat moves in the diagonal direction without slewing, press the SELECT button and finish the calibration.
- If the boat slews while moving, twist the top of the joystick to the opposite direction of slewing and while maintaining the non-slewing condition, press the SELECT button to confirm.
  - Note When pressing the SELECT button to complete the calibration, hold the lever in the desired direction. If the lever is released, the calibration value is not recorded correctly.
    - If you calibrate in one diagonally forward direction (left or right), you don't need to calibrate in the opposite diagonally forward direction.
- The calibration condition is shown on the display.
   If you move the joystick within the settings range,
   the Green Zone is shown and you can calibrate.
   If you move the joystick outside the range, the Red Zone is shown. In this case, you cannot calibrate.
   To show the Green Zone, move the joystick 30 degrees in the forward direction.









# **■** Canceling the calibration

To cancel the calibration, return the joystick lever to the center position and press the SELECT button.

The beep stops and calibration is canceled.

### ■ Re-calibration

If the boat does not move in the direction of steering after finishing calibration, re-calibrate the boat. You may need to calibrate the boat multiple times before it is stable.

# **TROUBLESHOOTING**

Symptom	Possible causes	Measures
The button lamp does not turn on when you press the SELECT button on the joystick.	<ul> <li>The engines in the both sides are not operating</li> <li>Joystick wiring failure</li> <li>Joystick lamp and internal connection failure</li> </ul>	<ul> <li>Operate the engines in the both sides</li> <li>Inspect and replace</li> <li>Inspect and replace</li> </ul>
The beep does not sound when you press the SELECT button.	Display buzzer and internal connection failure	Inspect and replace
Press the joystick SELECT button and the lamp lights, but the joystick cannot be operated.	Joystick setting is not ON     The control head shift lever is not in the neutral position     Stern drive is in the tilt-up position     There is no steering oil     Joystick failure     Hydraulic valve unit failure     Hydraulic piping failure     Electronic hydraulic cylinder failure     Stern drive forward/backward failure     Joystick Control System wiring failure	<ul> <li>Turn ON the setting</li> <li>Place the shift lever in the neutral position</li> <li>Tilt-down</li> <li>Inspect and refill</li> <li>Inspect and replace</li> <li>Inspect and repair</li> <li>Inspect and repair</li> <li>Inspect and repair</li> <li>Inspect and replace</li> <li>Inspect and repair</li> <li>Inspect and replace</li> <li>Inspect and replace</li> <li>Inspect and repair</li> </ul>
The boat moves only slightly when you operate the joystick lever.	<ul> <li>Joystick is in the slow-mode operation</li> <li>Insufficient steering oil</li> <li>Electronic hydraulic cylinder failure</li> <li>Hydraulic piping failure</li> <li>The boat is too heavy</li> </ul>	<ul> <li>Switch to the fast-mode operation</li> <li>Inspect and refill</li> <li>Inspect and repair</li> <li>Inspect and repair</li> </ul>
There is a difference between the joystick lever operation direction and the boat movement.	Calibration is required     Electronic hydraulic cylinder failure     One side engine is stopped	<ul><li>Calibrate</li><li>Inspect and repair</li><li>Restart the stopped engine</li></ul>
Electronic helm does not turn on.	Joystick Control System is operating     Electronic helm failure     Marine ECU failure	<ul> <li>Canceling the Joystick Control System operation</li> <li>Inspect and replace</li> <li>Inspect and replace</li> </ul>
The boat cannot be operated with the steering for electric helm.	Electronic helm failure	Inspect and replace
The joystick monitor screen does not appear.	The monitoring screen display setting is not turned ON	Turn ON the setting
Response of the joystick is too fast (too slow) in the Standard mode.	The joystick throttle response (acceleration) is not appropriate	Change and adjust the joystick throttle response (acceleration)
Response of the joystick is abnormal.  During the Joystick Control System operation, "ALARM" and "WARNING" appear on the display.	Joystick failure     Joystick failure     Electronic helm failure     Electronic hydraulic cylinder failure     Hydraulic valve unit failure     One side engine is stopped     Others	<ul> <li>Inspect and repair</li> <li>Restart the stopped engine</li> <li>Inspect and repair</li> </ul>
The button lamp does not turn on when you press the SPEED button on the joystick.	Not in joystick mode     Joystick lamp and internal connection failure	Switch to joystick mode     Inspect and replace
The button lamp does not turn on when you press the HOLD button on the joystick.	YPA is not set up     Joystick lamp and internal connection failure	Check the YPA settings     Inspect and replace

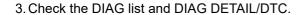
# Warning on the Display

If any error occurs, a warning or notice will appear on the display and a buzzer will sound.

Check the warning details on the display. Then stop operation and consult your authorized YANMAR dealer or distributor.

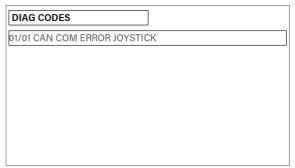
### ■ Check warning detail on the display

- 1. Warnings will be shown in a pop-up window on the display.
- 2. Select "Detail" and press the enter button on the display.





179166-00EN



179167-00EN



179168-00EN

# JC30Z DTCs (Diagnostic Trouble Codes) General Description

# **■** DTC list

DTC	FMI	SPN	Description	Detail	DTC list
B1040	3	504050	JOYSTICK X-AXIS SENSOR CIRCUIT	Joystick X-axis sensor input - Too high	
B1046	4	521252	JOYSTICK X-AXIS SENSOR CIRCUIT	Joystick X-axis sensor input - Too low	
B1044	3	504050	JOYSTICK Y-AXIS SENSOR CIRCUIT	Joystick Y-axis sensor input - Too high	
B1047	4	521253	JOYSTICK Y-AXIS SENSOR CIRCUIT	Joystick Y-axis sensor input - Too low	
B1045	3	504054	JOYSTICK Z-AXIS SENSOR CIRCUIT	Joystick Z-axis sensor input - Too high	
B1048	4	521254	JOYSTICK Z-AXIS SENSOR CIRCUIT	Joystick Z-axis sensor input - Too low	P40
B1038	3	520734	JOYSTICK SELECT-SWITCH CIRCUIT	Joystick SELECT button - Failure	F40
B1039	3	520735	JOYSTICK SPEED-SWITCH CIRCUIT	Joystick SPEED button - Failure	
B1104	3	2688	CAN JOYSTICK HOLD-SWITCH CIR- CUIT	Joystick HOLD button - Failure	
P1694	12	516904	JOYSTICK NVRAM ERROR	Joystick NVRAM error	
U1205	9	522004	CAN COM ERROR JOYSTICK	CAN communication error - Joystick	
B1062	9	523770	STEERING UNIT CH1 BRAKE ERROR	Steering unit Ch1 brake-coil error	
B1063	9	523771	STEERING UNIT CH2 BRAKE ERROR	Steering unit Ch2 brake-coil error	
B1064	11	523772	STEERING UNIT CH1 SENSOR ERROR	Steering unit Ch1 sensor error	
B1065	11	523773	STEERING UNIT CH2 SENSOR ERROR	Steering unit Ch2 sensor error	
B1066	2	523774	STEERING UNIT SETTING ERROR	CAN ID setting error	
B1067	9	523775	STEERING UNIT CH1 CAN COM ERROR	Steering unit Ch1 CAN communication error	P44
B1068	9	523776	STEERING UNIT CH2 CAN COM ERROR	Steering unit Ch2 CAN communication error	
B1069	12	523777	STEERING UNIT CH1 EEPROM ERROR	Steering unit Ch1 EEPROM error	
B1070	12	523778	STEERING UNIT CH2 EEPROM ERROR	Steering unit Ch2 EEPROM error	
P1823	5	521947	RUDDER CONTROL SOLENOID-1 CIR- CUIT	Proportional valve solenoid-1 Disconnection	
P1818	6	521947	RUDDER CONTROL SOLENOID-1 CIR- CUIT	Proportional valve solenoid-1 Over current	
P1821	6	522011	RUDDER CONTROL SOLENOID-1 CIR- CUIT	Proportional valve solenoid-1 Short circuit	
P1824	5	521948	RUDDER CONTROL SOLENOID-2 CIR- CUIT	Proportional valve solenoid-2 Disconnection	
P1819	6	521948	RUDDER CONTROL SOLENOID-2 CIR- CUIT	Proportional valve solenoid-2 Over current	P48
P1822	6	522012	RUDDER CONTROL SOLENOID-2 CIR- CUIT	Proportional valve solenoid-2 Short circuit	P40
C1051	3	521240	RUDDER ANGLE SENSOR HIGH RANGE	Rudder sensor - High input	
C1051	4	521240	RUDDER ANGLE SENSOR LOW RANGE	Rudder sensor - Low input	
C1056	3	521256	SUB RUDDER ANGLE SENSOR CIR- CUIT	Sub rudder sensor - High input	
C1060	4	521256	SUB RUDDER ANGLE SENSOR CIR- CUIT	Sub rudder sensor - Low input	

# — TROUBLESHOOTING

DTC	FMI	SPN	Description	Detail	DTC list
C1057	11	522000	RUDDER ANGLE SENSOR FAULT	There is too much difference between rudder sensor and sub rudder sensor input values	
P1820	7	522001	RUDDER CYLINDER CONTROL FAIL- URE	Hydraulic cylinder failure	P48
P1825	7	522016	RUDDER CYLINDER CONTROL PRE- FAILURE	Minor hydraulic cylinder failure before get- ting to the P1820 error code	
C1052	13	521996	RUDDER ANGLE CALIBRATION ERROR	Rudder sensor calibration error	
U1206	11	522031	AUTOPILOT FAILURE	Autopilot system failure	
U1227	9	516913	CAN COM ERROR MARINE-ECU TO AUTOPILOT KEY	CAN communication error - AP key	
C1058	11	522003	AUTOPILOT KEY WRONG ASSEMBLY	Autopilot key wrong assembly	P66
P0604	12	516901	AUTOPILOT KEY RAM ERROR	Autopilot key RAM error	
P0605	12	628	AUTOPILOT KEY ROM ERROR	Autopilot key ROM error	
P062F	12	8621	AUTOPILOT KEY NVRAM ERROR	Autopilot key NVRAM error	
C1064	11	522056	GPS SENSOR ERROR FOR YPA	GNSS antenna failure	
U1228	9	516914	CAN COM ERROR MARINE-ECU TO YPA KEY	CAN communication error - YPA key	
U1209	9	522046	CAN COM ERROR MARINE-ECU TO GPS	CAN communication error - GPS	P81
C1058	11	522003	YPA KEY WRONG ASSEMBLY	YPA key wrong assembly	
P0604	12	516901	YPA KEY RAM ERROR	YPA key RAM error	
P0605	12	628	YPA KEY ROM ERROR	YPA key ROM error	
P062F	12	8621	YPA KEY NVRAM ERROR	YPA key NVRAM error	

# **■** Description items

Ì	DTC	FMI	SPN	Description
	Code No.	Code	Code	DTC name

### **DTC** detect condition

1 - Detection, 2 - Judgment, 3 - Time to detect, 4 - Etc.	Check points
1. Precondition for error detection	Check points to specify the cause of error
2. Error detection condition	occurrence.
3. Time taken to detect error	Refer to "Diagnosis procedure" for
4. Display indication and etc	details.

#### Movement at error occurrence

Fail mode	Engine operation at the time of error detection is listed.
Limited operation	Yes/No: Details of limited operation at the time of error are listed.
Fail release	Yes/No: Requirement for releasing fail mode is listed.
Remarks	Notes and the like are listed.

### Probable cause of trouble and abnormal condition

From the detected DTC, probable place of error and cause of error (e.g. disconnection of sensor wiring or the like), or abnormal condition of system (e.g. abnormal increase of coolant temperature or the like) are listed.

Note: Error related to the detected DTC is listed.

### **Diagnosis procedure**

Method and procedure of failure diagnosis are listed.

Be sure to re-check after key of after diagnosis.

# **■ JOYSTICK error**

# **Description items**

DTC	FMI	SPN	Description	Detail
B1040	3	521252	JOYSTICK X-AXIS SENSOR CIRCUIT	Joystick X-axis sensor input - Too high
B1046	4	321232	JOYSTICK X-AXIS SENSOR CIRCUIT	Joystick X-axis sensor input - Too low
B1044	3	521253	JOYSTICK Y-AXIS SENSOR CIRCUIT	Joystick Y-axis sensor input - Too high
B1047	4	321233	JOYSTICK Y-AXIS SENSOR CIRCUIT	Joystick Y-axis sensor input - Too low
B1045	3	521254	JOYSTICK Z-AXIS SENSOR CIRCUIT	Joystick Z-axis sensor input - Too high
B1048	4	321234	JOYSTICK Z-AXIS SENSOR CIRCUIT	Joystick Z-axis sensor input - Too low
B1038	3	520734	JOYSTICK SELECT-SWITCH CIRCUIT	Joystick SELECT button - Failure
B1039	3	520735	JOYSTICK SPEED-SWITCH CIRCUIT	Joystick SPEED button - Failure
B1104	3	2688	CAN JOYSTICK HOLD-SWITCH CIRCUIT	Joystick HOLD button - Failure
P1694	12	516904	JOYSTICK NVRAM ERROR	Joystick NVRAM error
U1205	9	522004	CAN COM ERROR JOYSTICK	CAN communication error - Joystick

# **DTC** detect condition

# (■ Joystick error)

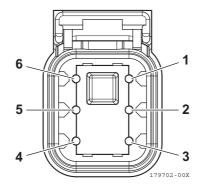
DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
B1040	3	521252	<ol> <li>When operating Joystick in the X-axis.</li> <li>X-axis signal &gt; 4.8 V or central signal &gt; 4.0 V</li> <li>The above state continues for 0.5 seconds.</li> <li>Displays "JOYSTICK X-AXIS SENSOR CIRCUIT".</li> </ol>	Joystick internal failure  • Short circuit between X-axis signal line and 5 V line  • Open circuit of GND line  • Short circuit between central tap signal line and 5 V line
B1046	4	521252	1. When operating Joystick in the X-axis. 2. X-axis signal < 0.2 V 3. The above state continues for 0.5 seconds. 4. Displays "JOYSTICK X-AXIS SENSOR CIRCUIT".	Joystick internal failure  • Short circuit between X-axis signal line and GND line  • Open circuit of X-axis signal line  • Open circuit of 5 V line
B1044	3	521253	1. When operating Joystick in the Y-axis. 2. Y-axis signal > 4.8 V or central signal > 4.0 V 3. The above state continues for 0.5 seconds. 4. Displays "JOYSTICK Y-AXIS SENSOR CIRCUIT".	Joystick internal failure  • Short circuit between Y-axis signal line and 5 V line  • Open circuit of GND line  • Short circuit between central tap signal line and 5 V line
B1047	4	521253	1. When operating Joystick in the Y-axis. 2. Y-axis signal < 0.2 V 3. The above state continues for 0.5 seconds. 4. Displays "JOYSTICK Y-AXIS SENSOR CIRCUIT".	Joystick internal failure  • Short circuit between Y-axis signal line and GND line  • Open circuit of Y-axis signal line  • Open circuit of 5 V line
B1045	3	521254	1. When operating Joystick in the Z-axis. 2. Z-axis signal > 4.8 V or central signal > 4.0 V 3. The above state continues for 0.5 seconds. 4. Displays "JOYSTICK Z-AXIS SENSOR CIRCUIT".	Joystick internal failure  • Short circuit between Z-axis signal line and 5 V line  • Open circuit of GND line  • Short circuit between central tap signal line and 5 V line

DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
B1048	4	521254	1. When operating Joystick in the Z-axis. 2. Z-axis signal < 0.2 V 3. The above state continues for 0.5 seconds. 4. Displays "JOYSTICK Z-AXIS SENSOR CIRCUIT".	Joystick internal failure  • Short circuit between Z-axis signal line and GND line  • Open circuit of Z-axis signal line  • Open circuit of 5 V line
B1038	3	520734	<ol> <li>1. —</li> <li>2. SELECT button ON</li> <li>3. The above state continues for 20 seconds.</li> <li>4. Displays "JOYSTICK SELECT-SWITCH CIRCUIT".</li> </ol>	Joystick internal failure Short circuit of SELECT button
B1039	3	520735	1.— 2. SPEED switch ON 3. The above state continues for 20 seconds. 4. Displays "JOYSTICK SPEED-SWITCH CIRCUIT".	Joystick internal failure Short circuit of SPEED switch
B1104	3	2688	<ol> <li>1.—</li> <li>2. HOLD switch ON</li> <li>3. The above state continues for 20 seconds.</li> <li>4. Displays "CAN JOYSTICK HOLD-SWITCH CIRCUIT".</li> </ol>	Joystick internal failure Short circuit of HOLD switch
P1694	12	516904	1.— 2. NVRAM error detected. 3.— 4. Displays "JOYSTICK NVRAM ERROR".	Joystick internal failure
U1205	9	522004	<ol> <li>1.—</li> <li>2. Communication from Joystick to Marine ECU is not received.</li> <li>3. Not received within 300 msec.</li> <li>4. Displays "CAN COM ERROR JOYSTICK".</li> </ol>	Connection of Joystick

# **Electrical circuit chart**

Connector at the bottom of the joystick

Pin	SIGNAL
1	Power
2	CAN_H
3	CAN_L
4	GND
5	Not connected
6	Shield



# Movement at error occurrence

# (■ Joystick error)

Fail mode	Warning
Limited operation	B1040, B1046, B1044, B1047, B1045, B1048:
Fail release	<ul> <li>B1040 : The input signals (X-axis and center) during operating JOYSTICK keep within the normal range for 0.5 seconds or more</li> <li>B1046 : The input signal (X-axis) during operating JOYSTICK keep within the normal range for 0.5 seconds or more</li> <li>B1044 : The input signals (Y-axis and center) during operating JOYSTICK keep within the normal range for 0.5 seconds or more</li> <li>B1047 : The input signal (Y-axis) during operating JOYSTICK keep within the normal range for 0.5 seconds or more</li> <li>B1045 : The input signals (Z-axis and center) during operating JOYSTICK keep within the normal range for 0.5 seconds or more</li> <li>B1048 : The input signal (Z-axis) during operating JOYSTICK keep within the normal range for 0.5 seconds or more</li> <li>B1038 : The signal is turned off, and then turned on again</li> <li>B1039 : The signal is turned off, and then turned on again</li> <li>B104 : Replace the JOYSTICK, and set again</li> <li>U1205 : The signal to MARINE-ECU was received</li> </ul>
Remarks	0 1200 . The signal to MARKINE-EGO was received

### **Contents of trouble**

### (■ Joystick error)

- 1. Open or short circuit of wire harness.
- 2. JOYSTICK damage.
- ${\it 3.\,JOYSTICK\,\,switch\,\,damage\,\,(SELECT,\,SPEED,\,THRUST,\,HOLD)}.$

### **Corrective action**

1. Initial diagnosis with	Check the fault indication.
the diagnosis tool	Check the input voltage to JOYSTICK.



2. Check of connectors/	Before working, make sure to turn off the power switch.	
wiring	Check that the connector of JOYSTICK.	



3. Failure diagnosis work	Check the input voltage to JOYSTICK.
	Make sure that the wire harness is connected properly.

# **■** EPS error

# **Description items**

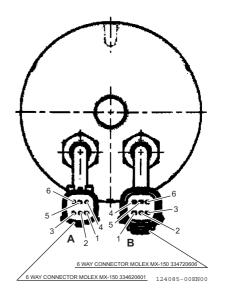
DTC	FMI	SPN	Description	Detail
B1062	9	523770	STEERING UNIT CH1 BRAKE ERROR	Steering unit Ch1 brake-coil error
B1063	9	523771	STEERING UNIT CH2 BRAKE ERROR	Steering unit Ch2 brake-coil error
B1064	11	523772	STEERING UNIT CH1 SENSOR ERROR	Steering unit Ch1 sensor error
B1065	11	523773	STEERING UNIT CH2 SENSOR ERROR	Steering unit Ch2 sensor error
B1066	2	523774	STEERING UNIT SETTING ERROR	CAN ID setting error
B1067	9	523775	STEERING UNIT CH1 CAN COM ERROR	Steering unit Ch1 CAN communication error
B1068	9	523776	STEERING UNIT CH2 CAN COM ERROR	Steering unit Ch2 CAN communication error
B1069	12	523777	STEERING UNIT CH1 EEPROM ERROR	Steering unit Ch1 EEPROM error
B1070	12	523778	STEERING UNIT CH2 EEPROM ERROR	Steering unit Ch2 EEPROM error

### **Electrical circuit chart**

### PIN-OUT:

CONNE	CONNECTOR "A" SHALL HAVE THE		
FOLLO	FOLLOWING PIN-OUT		
Pin	FUNCTION		
1	Not connected		
2	Secondary CAN_H		
3	Secondary CAN_L		
4	Not connected		
5	Ground		
6	Power		

CONNECTOR "B" SHALL HAVE THE FOLLOWING PIN-OUT		
Pin	FUNCTION	
1	Primary CAN_L	
2	Primary CAN_H	
3	Not connected	
4	Power	
5	Ground	
6	Not connected	



# **DTC** detect condition

# (■ EPS error)

DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
B1062	9	523770	1. — 2. When receiving errors such as an abnormal voltage of EPS brake-coil CH1 too high or low, abnormal current too low and abnormal temperature. 3. — 4. Displays "STEERING UNIT CH1 BRAKE ERROR".	
B1063	9	523771	<ol> <li>1.—</li> <li>2. When receiving errors such as an abnormal voltage of EPS brake-coil CH2 too high or low, abnormal current too low and abnormal temperature.</li> <li>3.—</li> <li>4. Displays "STEERING UNIT CH2 BRAKE ERROR".</li> </ol>	EPS internal failure
B1064	11	523772	<ol> <li>1.—</li> <li>2. When the angle error of EPS steering sensor CH2 is received.</li> <li>3.—</li> <li>4. Displays "STEERING UNIT CH1 SENSOR ERROR".</li> </ol>	EPS internal failure
B1065	11	523773	<ol> <li>1.—</li> <li>2. When the angle error of EPS steering sensor CH1 is received.</li> <li>3.—</li> <li>4. Displays "STEERING UNIT CH2 SENSOR ERROR".</li> </ol>	EPS internal failure
B1066	2	523774	1.— 2. When two or more EPS of the same SA exists on local bus. 3.— 4. Displays "STEERING UNIT SETTING ERROR".	EPS internal failure
B1067	9	523775	<ol> <li>1.—</li> <li>2. When a CAN communication error is detected.</li> <li>3.—</li> <li>4. Displays "STEERING UNIT CH1 CAN COM ERROR".</li> </ol>	CAN communication error EPS EPS internal failure
B1068	9	523776	<ol> <li>1.—</li> <li>2. When a CAN communication error is detected.</li> <li>3.—</li> <li>4. Displays "STEERING UNIT CH2 CAN COM ERROR".</li> </ol>	CAN communication error EPS EPS internal failure
B1069	12	523777	1.— 2. When an error code from EPS steering sensor CH1 is received. 3.— 4. Displays "STEERING UNIT CH1 EEPROM ERROR".	EPS internal failure
B1070	12	523778	<ol> <li>1.—</li> <li>2. When an error code from EPS steering sensor CH2 is received.</li> <li>3.—</li> <li>4. Displays "STEERING UNIT CH2 EEPROM ERROR".</li> </ol>	EPS internal failure

### Movement at error occurrence

# (■ EPS error)

Fail mode	Warning
	B1062 : The EPS torque becomes half.  If both CH1 and CH2 have errors, all engines slow down and neutral, autopilot is forcibly put into standby, and positioning is OFF.
	B1063 : The EPS torque becomes half.  If both CH1 and CH2 have errors, all engines slow down and neutral, autopilot is forcibly put into standby, and positioning is OFF.
	B1064 : No limited operation  If both CH1 and CH2 have errors, all engines slow down and neutral, autopilot is forcibly put into standby, and positioning is OFF.
Limited operation	B1065 : No limited operation  If both CH1 and CH2 have errors, all engines slow down and neutral, autopilot is forcibly put into standby, and positioning is OFF.
	B1066 : All engines slow down and neutral, autopilot is forcibly put into standby, positioning is OFF B1067 : No limited operation
	If both CH1 and CH2 have errors, all engines slow down and neutral, autopilot is forcibly put into standby, and positioning is OFF.
	B1068: No limited operation  If both CH1 and CH2 have errors, all engines slow down and neutral, autopilot is forcibly put into standby, and positioning is OFF.
	B1069 : All engines slow down and neutral, autopilot is forcibly put into standby, positioning is OFF. B1070 : All engines slow down and neutral, autopilot is forcibly put into standby, positioning is OFF.
	B1062 : When the error is corrected. B1063 : When the error is corrected.
	B1064 : When the error is corrected. B1065 : When the error is corrected.
Fail release	B1066 : When the error is corrected.
	B1067 : When the error is corrected. B1068 : When the error is corrected.
	B1069 : When the error is corrected.
	B1070 : When the error is corrected.
Remarks	

### **Contents of trouble**

- 1. Open or short circuit of wire harness.
- 2. Missing connect of connector.

The connectors don't engage correctly.

3. EPS internal failure.

# **Corrective action**

# (■ EPS error)

1. Initial diagnosis with	Check the fault indication.
the diagnosis tool	



2. Check of connectors/	Before beginning your work, be sure to turn off the power switch.
wiring • Make sure that the EPS connector is inserted correctly.	
Check if there are disconnected EPS wires or peeled wire coatings.	



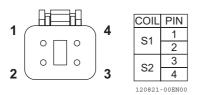
Γ	3. Failure diagnosis work	Check the input voltage of the EPS.
		Check the CAN communication data of the EPS.
		Check the steering angle data of the EPS by the SA-D.
		Check the steering torque data of the EPS by the SA-D.
		Check the EPS operation by swapping to another EPS.

# ■ Hydraulic valve unit, Hydraulic cylinder error

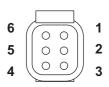
### **Description items**

DTC	FMI	SPN	Description	Detail
P1823	5	521947	RUDDER CONTROL SOLENOID-1 CIRCUIT	Proportional valve solenoid-1 Disconnection
P1818	6	521947	RUDDER CONTROL SOLENOID-1 CIRCUIT	Proportional valve solenoid-1 Over current
P1821	6	522011	RUDDER CONTROL SOLENOID-1 CIRCUIT	Proportional valve solenoid-1 Short circuit
P1824	5	521948	RUDDER CONTROL SOLENOID-2 CIRCUIT	Proportional valve solenoid-2 Disconnection
P1819	6	521948	RUDDER CONTROL SOLENOID-2 CIRCUIT	Proportional valve solenoid-2 Over current
P1822	6	522012	RUDDER CONTROL SOLENOID-2 CIRCUIT	Proportional valve solenoid-2 Short circuit
C1051	3	521240	RUDDER ANGLE SENSOR HIGH RANGE	Rudder sensor - High input
C1051	4	521240	RUDDER ANGLE SENSOR LOW RANGE	Rudder sensor - Low input
C1056	3	521256	SUB RUDDER ANGLE SENSOR CIRCUIT	Sub rudder sensor - High input
C1060	4	521256	SUB RUDDER ANGLE SENSOR CIRCUIT	Sub rudder sensor - Low input
C1057	11	522000	RUDDER ANGLE SENSOR FAULT	There is too much difference between rudder sensor and sub rudder sensor input values
P1820	7	522001	RUDDER CYLINDER CONTROL FAILURE	Hydraulic cylinder failure
P1825	7	522016	RUDDER CYLINDER CONTROL PRE-FAILURE	Minor hydraulic cylinder failure before getting to the P1820 error code
C1052	13	521996	RUDDER ANGLE CALIBRATION ERROR	Rudder sensor calibration error

### **Electrical circuit chart**



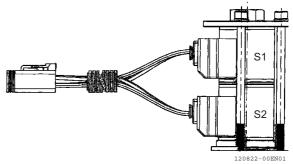
The connection: If it is in S1 and the S2 each coil, both of the connection of + - are also acceptable.



PIN	SIGNAL	COLOR
1	5V-1	VIOLET
2	SIG-1	WHITE
3	GND-1	BLUE
4	5V-2	RED
5	SIG-2	GREEN
6	GND-2	BLACK

120823-01EN

Hydraulic cylinder (164000-45022) SIG-1 Rudder angle Main sensor SIG-2 Rudder angle Sub sensor



Hydraulic valve (164000-45040) S1: SOLENOID VALVE 1 (Cylinder extension side) S2: SOLENOID VALVE 2 (Cylinder shrinkage side)

# **DTC** detect condition

# (■ Hydraulic valve unit, Hydraulic cylinder error)

DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
P1823	5	521947	1. The rudder control is enabled. 2. Detection current < 100 mA with instruction current > 500 mA 3. Continues for 0.5 seconds. 4. Displays "RUDDER CONTROL SOLENOID-1 CIRCUIT".	Open circuit of SOLENOID VALVE-1 power line
P1818	6	521947	1.— 2. Short circuit. 3.— 4. Displays "RUDDER CONTROL SOLENOID-1 CIRCUIT".  1. The rudder control is enabled. 2. Detection current > 2000 mA 3. > 0.1 sec (Less than 0.1 seconds). 4. Displays "RUDDER CONTROL SOLENOID-1 CIRCUIT".	
P1821	6	522011	Backup SW is unused.     Detection current > 500 mA with instruction current < 100 mA     Continues for 0.5 seconds.     Displays "RUDDER CONTROL SOLENOID-1 CIRCUIT".	Short circuit of SOLENOID     VALVE-1     EPV driver damage by burning out
P1824	5	521948	The rudder control is enabled.     Detection current < 100 mA with instruction current > 500 mA     Continues for 0.5 seconds.     Hosplays "RUDDER CONTROL SOLENOID-2 CIRCUIT".	Open circuit of SOLENOID VALVE-2 power line
P1819	6	521948	1. — 2. Short circuit. 3. — 4. Displays "RUDDER CONTROL SOLENOID-2 CIRCUIT".  1. The rudder control is enabled.	Short circuit of SOLENOID VALVE-2 power line
			<ul><li>2. Detection current &gt; 2000 mA</li><li>3. &gt; 0.1 sec (Less than 0.1 seconds).</li><li>4. Displays "RUDDER CONTROL SOLENOID-2 CIRCUIT".</li></ul>	Damage of EPV driver shunt resistance 2 by burning out
P1822	6	522012	Backup SW unused.     Detection current > 500 mA with instruction current < 100 mA     Continues for 0.5 seconds.     Displays "RUDDER CONTROL SOLENOID-2 CIRCUIT".	<ul> <li>Short circuit of SOLENOID VALVE-2 power line</li> <li>EPV driver damage by burning out</li> </ul>
C1051	3	521240	<ol> <li>The rudder control is enabled, and 3 seconds has elapsed since power-on.</li> <li>Main-sensor &gt; 4.8 V</li> <li>Continues for 0.5 seconds</li> <li>Displays "RUDDER ANGLE SENSOR CIRCUIT"</li> </ol>	Short circuit between main sensor and 5 V line
C1051	4	521240	1. The rudder control is enabled, and 3 seconds has elapsed since power-on.  2. Main-sensor < 0.5 V  3. Continues for 0.5 seconds  4. Displays "RUDDER ANGLE SENSOR CIRCUIT"	Open circuit of main sensor     Short circuit between main sensor and GND line
C1056	3	521256	<ol> <li>The rudder control is enabled, and 3 seconds has elapsed since power-on.</li> <li>Sub-sensor &gt; 4.8 V</li> <li>Continues for 0.5 seconds.</li> <li>Displays "SUB RUDDER ANGLE SENSOR CIRCUIT".</li> </ol>	Short circuit between sub sensor and 5 V line
C1060	4	521256	1. The rudder control is enabled, and 3 seconds has elapsed since power-on. 2. Sub-sensor < 0.5 V 3. Continues for 0.5 seconds. 4. Displays "SUB RUDDER ANGLE SENSOR CIRCUIT".	Open circuit of sub sensor     Short circuit between sub sensor and GND line

DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
C1057	11	522000	<ol> <li>The rudder control is enabled, 3 seconds have elapsed since power-on, and there is no abnormality of the main sensor.         There is no abnormality of the sub sensor.         The rudder angle difference between the main and sub sensor is 10 deg or more.         Continues for 0.1 seconds.         4. Displays "RUDDER ANGLE SENSOR FAULT".     </li> </ol>	
P1820	7	522001	The rudder control is enabled.     The difference between the upper limit value and the lower limit value of the ladder angle is 10 deg or less.     The difference between the upper limit value and the lower limit value of the ladder angle is 10 deg or less.     The rudder control is enabled.  Any abnormalities of control is enabled.	
P1825	7	522016	<ol> <li>The rudder control is enabled, and no abnormalities of the cylinder occur.</li> <li>Solenoid valve 1 or solenoid valve 2 is energized.</li> <li>Continues for 20 seconds or more.</li> <li>Displays "RUDDER CYLINDER CONTROL PRE-FAILURE".</li> </ol>	Any abnormalities of rudder control
C1052	13	521996	1. The rudder control is enabled. 2. The calibration value is abnormal. 3. — 4. Displays "RUDDER SENSOR CALIBRATION ERROR".	Rudder sensor calibration

### Movement at error occurrence

# (■ Hydraulic valve unit, Hydraulic cylinder error)

Fail mode	Warning
Limited operation	P1823 : All engines slow down and neutral, Autopilot is standby, Positioning stop P1818 : All engines slow down and neutral, Autopilot is standby, Positioning stop P1821 : All engines slow down and neutral, Autopilot is standby, Positioning stop P1824 : All engines slow down and neutral, Autopilot is standby, Positioning stop P1819 : All engines slow down and neutral, Autopilot is standby, Positioning stop P1822 : All engines slow down and neutral, Autopilot is standby, Positioning stop C1051 : Continue the operation by the sub rudder sensor C1056 : If C1051 is occurring, all engines slow down and neutral, Joystick disable C1060 : If C1051 is occurring, all engines slow down and neutral, Joystick disable C1057 : All engines slow down and neutral, Autopilot is standby, Positioning stop P1820 : All engines slow down and neutral, Autopilot is standby, Positioning stop, Reduce the upper limit (or lower limit) value of the rudder control to a position 5 deg inside the rudder angle at the time of occurrence of an error
	P1825 : No limited operation C1052 : No limited operation
Fail release	P1823 : Doesn't release P1818 : Doesn't release P1821 : Doesn't release P1824 : Doesn't release P1819 : Doesn't release P1822 : Doesn't release C1051 : Main sensor remains within the normal range for 0.5 seconds C1056 : Sub sensor = State within the normal range is continued for 0.5 seconds C1060 : Sub sensor = State within the normal range is continued for 0.5 seconds C1057 : Doesn't release P1820 : Doesn't release P1825 : Doesn't release C1052 : Doesn't release
Remarks	

### **Contents of trouble**

#### (■ Hydraulic valve unit, Hydraulic cylinder error)

- 1. Open or short circuit of wire harness.
- 2. Missing connect of connector.

The connectors don't engage correctly.

- 3. Sensor of Hydraulic cylinder failure.
- 4. Marine ECU failure.
- 5. Garbage mixes with the power steering oil.
- 6. Solenoid valve fire damaging of Hydraulic valve unit.
- 7. Mis-connection and oil leakage of oil pressure hose.

#### **Corrective action**

1. Initial diagnosis with	Check the fault indication.
the diagnosis tool	Check the hydraulic cylinder operation.
	Check the hydraulic cylinder damage.



2. Check of connectors/	Before working, make sure to turn off the power switch.
wiring	Make sure that the rudder sensor connectors are correctly inserted.
	Check if there are disconnected rudder sensor wires or peeled wire coatings.



3. Failure diagnosis work
Check the input data of the rudder sensor (Main, Sub) by the SA-D.
Check the input and output voltage of the rudder sensor (Main, Sub)

# **Emergency Actions when the Electronic Helm Fails**

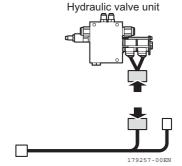
If the electronic helm has a malfunction, you can no longer navigate the boat. In such an emergency, use the hydraulic valve unit backup switch to bring both stern drives in a straight position. Then you can navigate the boat by changing the speed of the port or starboard engine and return to port.

Connect the hydraulic valve unit backup switch stored in the boat with the following procedure to bring both stern drives in a straight position.

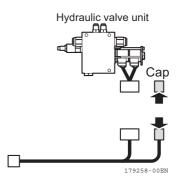
- Note Do not use the hydraulic valve unit backup switch if only one stern drive has a failure, because the other stern drive can be used for navigation.
  - Do not use the backup switch except in an emergency.
  - The switch must be stored in an easily accessible location on board away from seawater and rainwater within the vessel operator can move to and operate the vessel via the backup switch.

# ■ How to handle the hydraulic valve unit backup switch (for both stern drives)

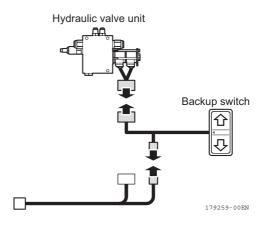
- 1. Stop the engines in both stern drives and turn off the power.
- 2. Disconnect the harness on port or starboard.



3. Remove the cap of the three pins connector from the harness.



- 4. Connect the harness for the hydraulic valve unit backup switch stored in the boat to the hydraulic valve unit and the three pins connector with the removed cap.
- 5. Turn on the engine only in the side where the hydraulic valve unit backup switch is connected, and start the engine.



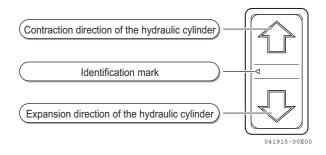
- Press the arrow switch of the hydraulic valve backup switch to adjust the cylinder and bring the stern drive in a straight condition (center).
- 7. After adjusting the cylinder, stop the engine, and turn off the power. And remove the backup switch. After that, reinstall the cap.
- 8. And then carry out same procedure for other side drive also.
- Disconnect the harness of the backup switch and connect the harness to the hydraulic valve unit as original condition and then attach the cap for both side.

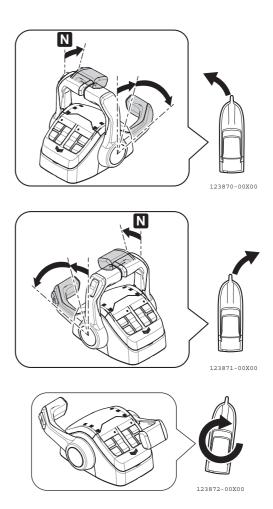
Note: If you connect the backup switch in case of emergency, be sure to remove it after the adjustment. Do not reconnect the backup switch to the original harness until the repair is complete.

- 10. Check whether both stern drives are in a straight condition. Then start the engines in the both sides. Navigate the boat by changing the speed of the port or starboard engines.
  - If you want to move to the right and left, move the both stern drives forward and increase the engine speed in the direction you want to move and the opposite side, you can move in that direction.
  - To turn the boat, move the stern drive in the direction you want to turn to backward and the opposite stern drive to forward.

### **A** CAUTION

- In such an emergency, you cannot navigate
  the boat in the same way as you do with the
  steering wheel. Be sure to operate the engine
  at a speed of 2000 min-1 or less. Navigate the
  boat very carefully. Be sure to decrease the
  speed and move slowly when you turn or
  navigate in narrow passages.
- Be sure to contact your YANMAR dealer or distributor for repair immediately after returning to port.





# In Case that the Engine in One Side Stops During the Joystick Control System Operation

When the engine in one side stops due to any failures during the Joystick Control System operation, the buzzer sounds and the alarm screen is displayed for 2 seconds.

In this case, you can operate the boat in forward and reverse direction. However, the boat moves unintended directions when you operate the boat in sideways and diagonal direction, or turn the boat on the spot.

Restart the stopped engine, then you can operate the usual Joystick Control System operation.

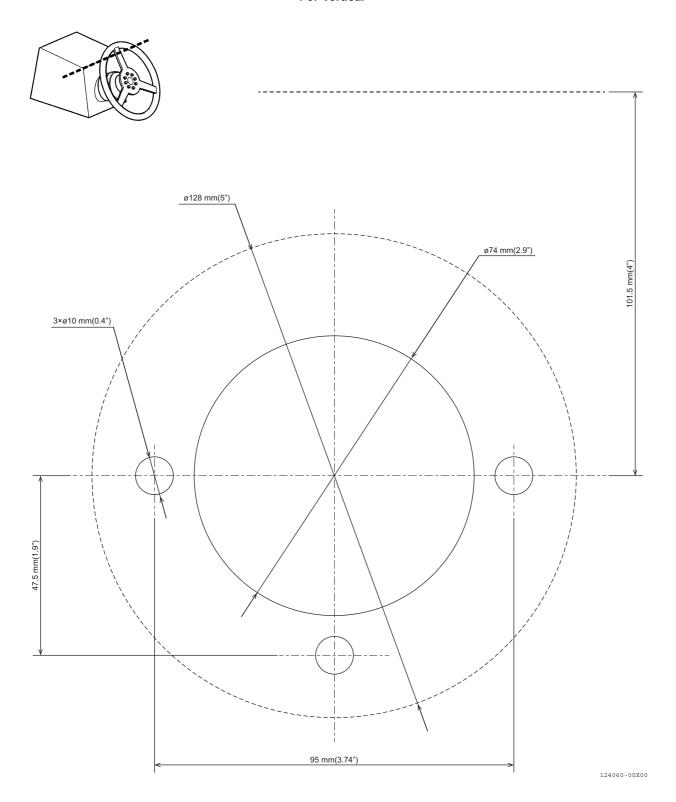
In addition, when you press the "SEL" switch on the control head, the boat is operated by the steering wheel. The boat cannot be operated by the joystick system unless the stopped engine is restarted.

# TEMPLATE (REFERENCE)

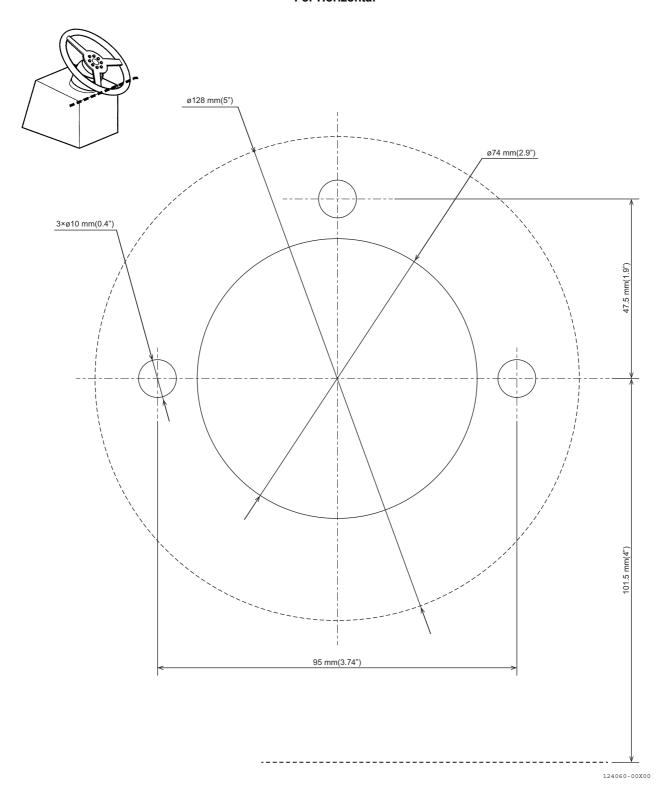
# **■** Tilt steering

If this template has been downloaded electronically or copied from another document, please verify all template dimensions prior to cutting as different printers/copiers may scale differently.

#### For Vertical

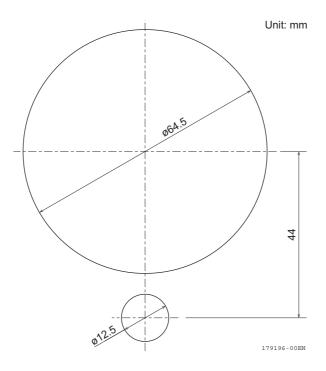


### For Horizontal



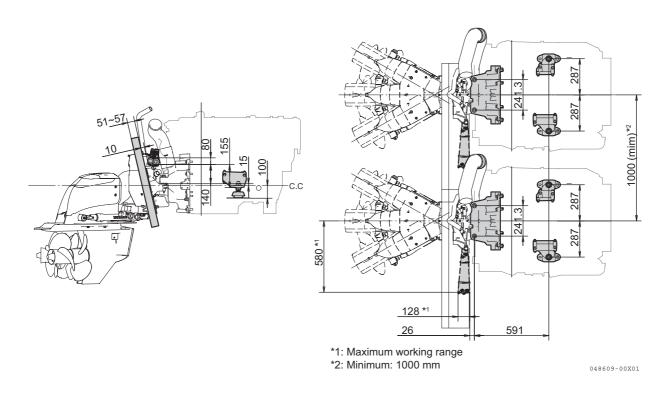
# **■** Joystick

If this template has been downloaded electronically or copied from another document, please verify all template dimensions prior to cutting as different printers/copiers may scale differently.



# ■ Movable scope of the hydraulic pressure cylinder (reference)

The cylinder body fluctuates by the steering control. Check the dimensions during the installation.



# **AUTOPILOT SYSTEM**

# **Safety Precautions**

Safety precautions are important and warnings are necessary to operate this system safely.

### **A WARNING**

- The autopilot system continuously adjusts the steering of your boat to hold a constant heading when it's activated. Read the manual of your autopilot system carefully and learn to operate it in calm and open waters.
- The vessel operator has a responsibility of safety operating your boat. Avoid navigational hazards and never leave the helm unattended. Always be prepared to quickly regain manual control of your boat.
- Never operate the autopilot system near hazards in the water, such as docks, pilings, and other boats.

#### NOTICE

Read the installation instructions and owner's manual of your autopilot system carefully.

# Introduction

The autopilot system is a system that is used on boats equipped with the joystick control system (JC30Z).

The joystick control system is equipped with twin engines and twin stern drives specification vessel control system (VC30).

The following models are applicable as YANMAR Autopilot System. Please ensure the appropriate autopilot system manual is included with your purchase.

Manufacturer	Model	Note
	GHP™ 20 Marine Autopilot System	The software version should be 2.3
Garmin Ltd.	with GHC™10 helm control unit	or more
Garmin Ltd.	GHP Reactor™ 40 Steer-by-wire	
	with GHC™20 helm control unit	_
Daymarina Ltd	Evolution Autopilot EV-DBW (Parts No. T70164)	
Raymarine Ltd.	with P70R control head	_
FURLING ELECTRIC C. LTD	NAVpilot-711C	-
FURUNO ELECTRIC Co.,LTD	NAVpilot-300	-
Simrad <sup>®</sup>	Autopilot Controller (AP™ 44 or AP 48)	
Simrage	with NAC™-D	_

Note • The autopilot systems where JC30Z can be adapted are as above.

- Refer to the installation instructions and owner's manual of your autopilot system.
- For the vessel control system, refer to the vessel control system installation manual.
- Prior to installing the autopilot system, please make sure that the applicable software is installed in each component of VC30 and JC30Z to ensure proper functionality. Contact your YANMAR dealer or distributor for details.

# Installation

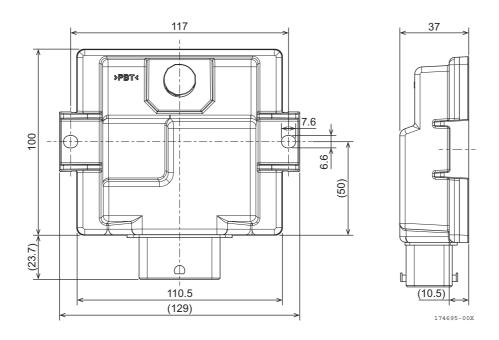
### ■ Installation of the ID key for autopilot system

The ID key is a part required for the recognition of the autopilot system and the joystick control system.

The system does not run if this key is not installed.

Be sure to install the ID key for the autopilot system.

Dimension: mm



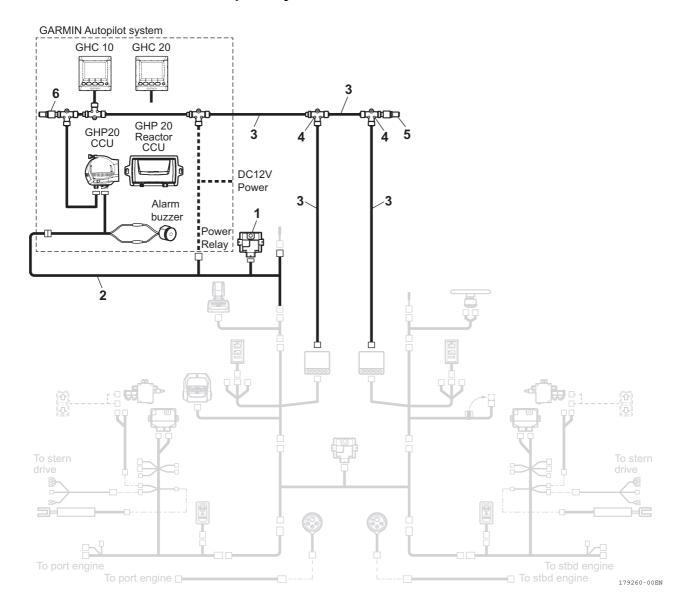
Note • Mount vertically with the connectors facing down.

- Free from direct exposure to wind blow, rain or washing water and seawater splash.
- Free from powerful vibration and electric high-tension power source.
- Mount to a flat and solid surface like a bulkhead but not directly on the engine.

### **■** Connection of the wire harness

After the installation of the ID key, connect each cable harness as follow.

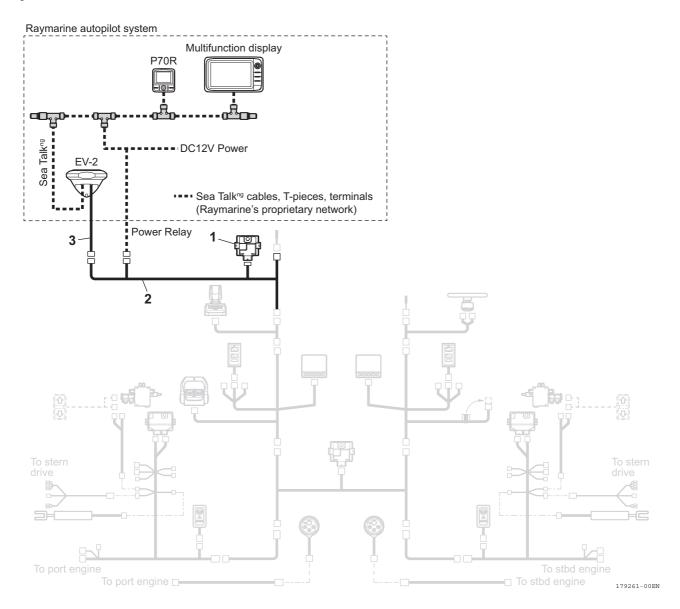
# Garmin/GHPTM 20 Marine Autopilot System



No.	Parts No.	Name	Note
1	164300-1003X	Controller ASSY, AP	
2	164300-2118X	Harness, Autopilot	
3	164100-666**	Cable harness	NMEA 1 m - 10 m
4	164100-66720	Connector T NMEA	
5	164100-66740	Terminal female NMEA	
6	164100-66730	Terminal male NMEA	

Note: In case Power Relay connector is not installed, alarm may sound on the Autopilot display when the engine system is turned off.

# Raymarine/EV-DBW



No.	Parts No.	Name	Note
1	164300-1003X	Controller ASSY, AP	
2	164300-2118X	Harness, Autopilot	
3	164100-666**	Cable harness	NMEA 1 m - 10 m

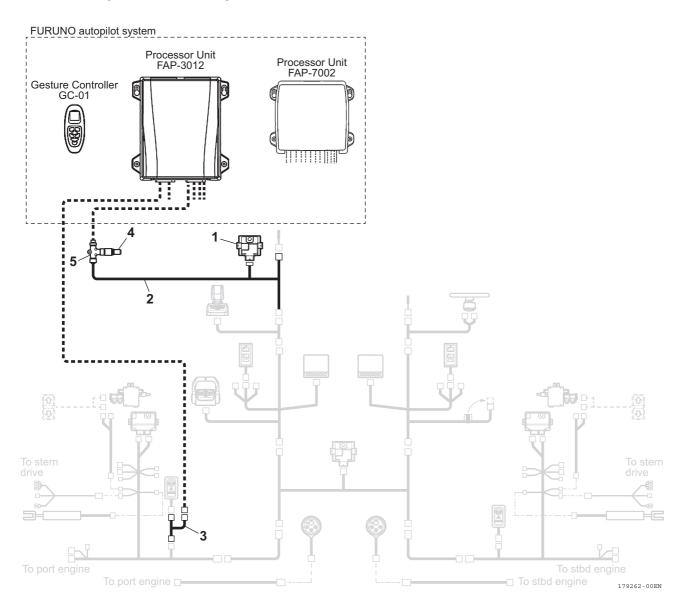
Note: In case Power Relay connector is not installed, alarm may sound on the Autopilot display when the engine system is turned off.

### **■** Checking of installation

Inspect the system and check for abnormalities after the completion of the installation of the ID key, autopilot unit and wiring.

- Check that the ID key and autopilot unit is securely tightened installation.
- Check that each cable harness and parts are securely connected without incorrect connection to the equipment.

# FURUNO/NAVpilot-711C, NAVpilot-300



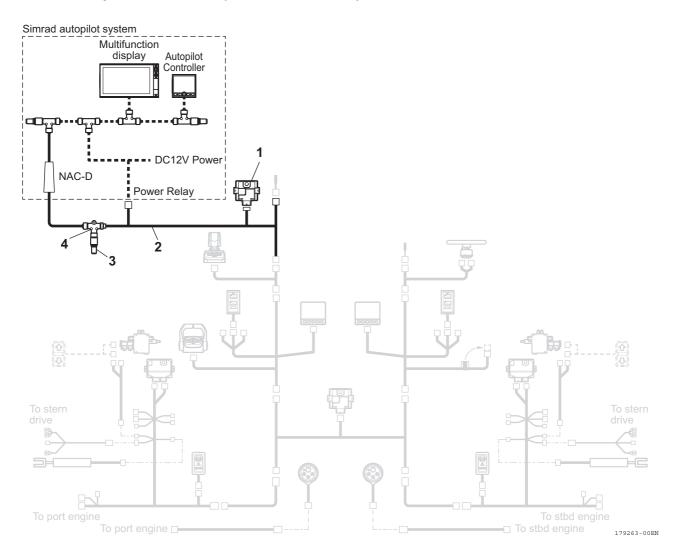
No.	Parts No.	Name	Note
1	164300-1003X	Controller ASSY, AP	
2	164300-2118X	Harness, Autopilot	
3	164300-2317X	Harness, AP power F	
4	164100-66730	Terminal male NMEA	
5	164100-66720	Connector T NMEA	

### **■** Checking of installation

Inspect the system and check for abnormalities after the completion of the installation of the ID key and wiring.

- Check that the ID key is securely tightened installation.
- Check that each cable harness and parts are securely connected without incorrect connection to the equipment.

# SIMRAD/Autopilot Controller (AP™ 44 or AP 48)



No.	Parts No.	Name	Note
1	164300-1003X	Controller ASSY, AP	
2	164300-2118X	Harness, Autopilot	
3	164100-66730	Terminal male NMEA	
4	164100-66720	Connector T NMEA	

Note: In case Power Relay connector is not installed, alarm may sound on the Autopilot display when the engine system is turned off.

### **■** Checking of installation

Inspect the system and check for abnormalities after the completion of the installation of the ID key and wiring.

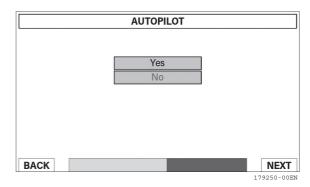
- Check that the ID key is securely tightened installation.
- Check that each cable harness and parts are securely connected without incorrect connection to the equipment.

# **Initial Setting of Autopilot System**

### ■ Initial setting of control system

Complete the setting in accordance with Vessel Control System and Joystick Control System manual.

1. To use Autopilot System, select [Yes] for [AUTOPILOT].

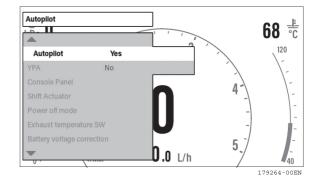


### ■ Second setting of display setting

If you need to re-set a display that was once set, carry it on in service mode.

1. Select [Autopilot] and [Yes] from [Service setting] of the display [Main menu].

Note: Enter [Yes] for [Autopilot] and then, turn off the power. Turn on the power again to enable the change.



# **Operating for Autopilot System**

### ■ Check on the YANMAR Vessel Control System display before operation

When operating the autopilot system, confirm that the autopilot icon appears on the YANMAR Vessel Control System display. Then, operate the autopilot from the autopilot system side.

### ■ Troubleshooting

When the poor operation or abnormalities of the autopilot system should arise, the alarm buzzer of the autopilot system sounds, and the alarm "Marine ECU detect Failure" appears on the YANMAR Vessel Control System display. At this time, engine will be in the neutral of idling automatically and the autopilot operation is canceled, and then is changed to the normal steering operation.

Be sure to consult with the dealer of the autopilot system for repair.

Symptom	Possible causes	Measures
Alarm on the YANMAR Vessel Control System display.	Wiring failure	Inspect the cables, connections
1. Alarm "Marine ECU detect Failure" appeared.	ID key failure	and components.
2. Highlight "DETAIL" and press the enter button.	Communication failure	
3. If the display indicates "AUTOPILOT FAILURE", the	Others	Consult authorized YANMAR
autopilot operation will be canceled.		Marine dealer or distributor in the
WARNING MARINE ECU DETECT FAILURE		case of ID key failure.  Consult with the dealer of the
Close Detail 7/ 179265-00EN		autopilot system.
Autopilot system alarm buzzer sounds.		

#### • DTC diagnosis is the following.

DTC	SPN	FMI	DTC description	Alarm message on the display	Detail
U1206	522031	11	AUTOPILOT FAILURE	Marine ECU detect Failure	Autopilot system failure

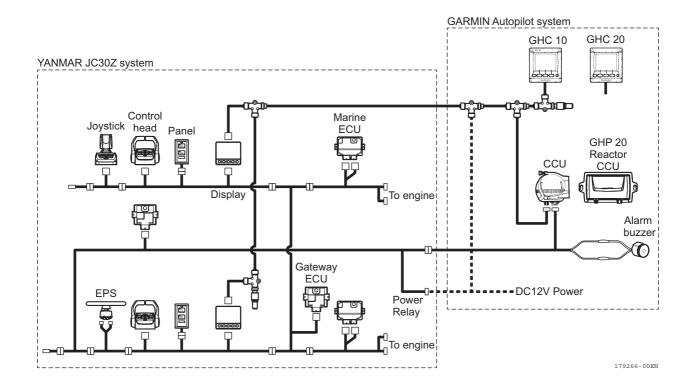
# ■ Autopilot error

### **Description items**

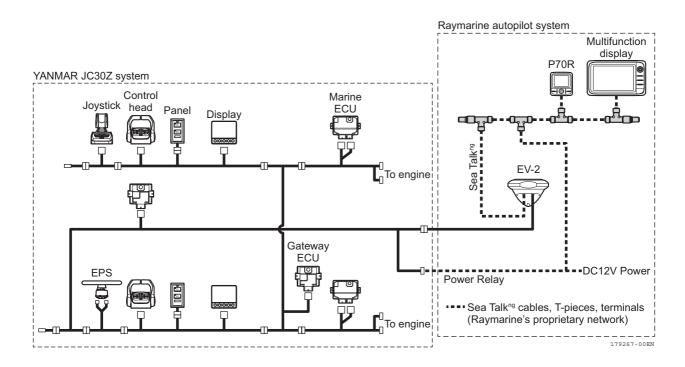
DTC	FMI	SPN	Description	Detail
U1206	11	522031	AUTOPILOT FAILURE	Autopilot system failure
U1227	9	516913	CAN COM ERROR MARINE-ECU TO AUTOPILOT KEY	CAN communication error - AP key
C1058	11	522003	AUTOPILOT KEY WRONG ASSEMBLY	Autopilot key wrong assembly
P0604	12	516901	AUTOPILOT KEY RAM ERROR	Autopilot key RAM error
P0605	12	628	AUTOPILOT KEY ROM ERROR	Autopilot key ROM error
P062F	12	8621	AUTOPILOT KEY NVRAM ERROR	Autopilot key NVRAM error

### **Electrical circuit chart**

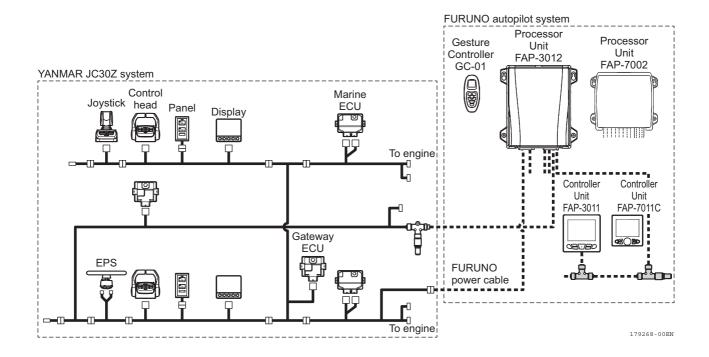
Garmin/GHP™ 20 Marine Autopilot System Garmin//GHP Reactor™ 40 Steer-by-wire



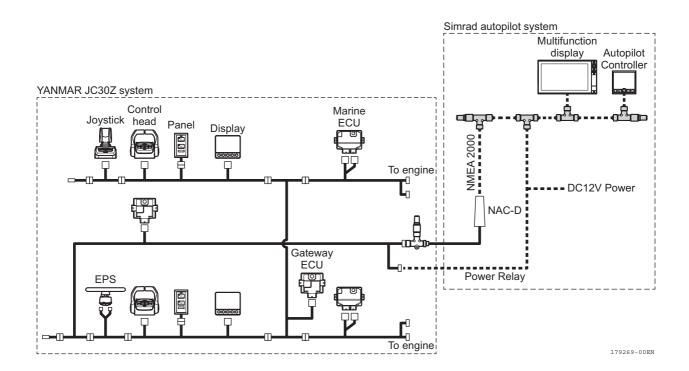
### Raymarine/EV-DBW



### FURUNO/NAVpilot-711C, NAVpillot-300



### Simrad/Autopilot controller



### **DTC** detect condition

# (■ Autopilot error)

DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
U1206	11	522031	<ol> <li>CAN communication data (PGN127245) from CCU has been received at least once.</li> <li>Marine ECU communication error has not occurred in all engines.</li> <li>The communication data value of the actual rudder angle is not invalid and abnormal.</li> <li>Communication from CCU cannot be received within 300 msec.</li> <li>—</li> <li>Displays "AUTOPILOT FAILURE".</li> </ol>	Open circuit of CCU communication line     Heading sensor error
U1227	9	516913	<ol> <li>1.—</li> <li>2. Communication from Autopilot key to Marine ECU is not received.</li> <li>3. Not received within 300 msec.</li> <li>4. Displays "CAN COM ERROR MARINE-ECU TO AUTOPILOT KEY".</li> </ol>	CAN communication error between Marine ECU and Auto- pilot key
C1058	11	522003	<ol> <li>1.—</li> <li>Wrong input for Autopilot key identification terminal</li> <li>3.—</li> <li>Displays "AUTOPILOT KEY WRONG ASSEMBLY".</li> </ol>	Incorrect connection of Autopilot key
P0604	12	516901	<ol> <li>1.—</li> <li>2. RAM error detected.</li> <li>3.—</li> <li>4. Displays "AUTOPILOT KEY RAM ERROR".</li> </ol>	Autopilot key internal failure
P0605	12	628	1.— 2. ROM error detected. 3.— 4. Displays "AUTOPILOT KEY ROM ERROR".	Autopilot key internal failure
P062F	12	8621	1.— 2. NVRAM error detected. 3.— 4. Displays "AUTOPILOT KEY NVRAM ERROR".	Autopilot key internal failure

# Movement at error occurrence

# (■ Autopilot error)

Fail mode	Warning
Limited operation	U1206: When autopilot activates, engines derate and stop. Autopilot is forcibly put into standby.  U1227: When autopilot activates, engines derate and stop. Autopilot is forcibly put into standby.  C1058: Cannot switch to autopilot.  P0604: Cannot switch to autopilot.  P0605: Cannot switch to autopilot.  P062F: Cannot switch to autopilot.
Fail release	U1206 : Communication is received again. U1227 : Communication is received again. C1058 : When the error is corrected. P0604 : When the error is corrected. P0605 : When the error is corrected. P062F : When the error is corrected.
Remarks	

### **Contents of trouble**

### (■ Autopilot error)

- 1. Open or short circuit of wire harness.
- 2. Missing connect of connector.
  - The connectors don't engage correctly.
- 3. Damage of Autopilot device.
- 4. Damage of ID key.

### **Corrective action**

1. Initial diagnosis with	Check the fault indication.
the diagnosis tool	Check for autopilot abnormality.
	Check for autopilot damage and connection.



	2. Check of connectors/	Before working, make sure to turn off the power switch.
ı	wiring	Make sure that the autopilot connector is correctly inserted.
l		Check whether the autopilot wiring is disconnected or the wiring coating is peeled.



3. Failure diagnosis work	Make sure the wire harness of the autopilot is connected correctly.
	Refer to the autopilot manual.

# YANMAR POSITIONING ASSIST

# **Safety Precautions**

Safety precautions are important and warnings are necessary to operate this system safely.

There are safety precautions specialized for the YANMAR positioning assist.

When test-operating after the installation is completed or when a user's operation lecture is held, you should always explain to the operator about these safety precautions.

You will also explain to the operator on replacing the warning labels when it is damaged or the words become unclear to read.

## **WARNING**

### Stay out of water, propellers are spinning



· When this function is activated, the propellers are rotating and your boat will start moving. Therefore, always make sure there is nobody under water near your boat, and that there are no other boats or other objects around. Also, you must explain to your passengers about the risk of using this function.

# Boat is considered under way (the propellers are rotating and the boat is moving). Keep proper lookout



- This function is only an auxiliary function for operating the boat. The operator must keep in mind that the boat is in an operating state (the propellers are rotating and the boat is moving) while this function is activated, and never leave the operator's seat. The person responsible for the operation of the boat shall be responsible for this function with the same responsibility.
- The accuracy of keeping the same position performed by this function will be affected by waves and winds, tide, and signal quality from the satellite. Depending on the above-mentioned conditions your boat may move. While this function is activated, your boat must stay away from swimmers, boats, and other objects around and maintain enough distance to avoid them (at least 2 boat lengths).
- · While this function is in use, the engine speed and the propeller speed change, creating noises and waves. You must make sure that your boat does not affect the surroundings.



### Hold on to prevent falling, boat may move suddenly

· Your boat may suddenly move while this system is activated. The operator and passenger must hold on to something to prevent falling or being thrown into water.



# Read operation manual for safe use of the system

· Before activating this function, read the operation manual throughly, understand the details, and handle this safely.

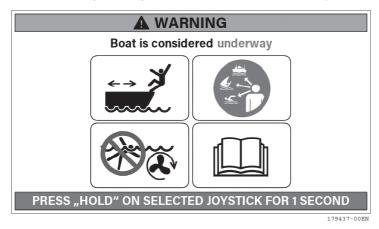
### **A WARNING**

### Read warning message and labels for safety

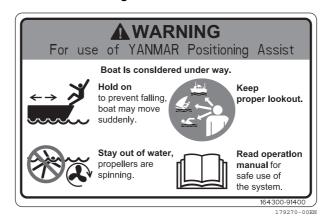
· Before activating this system, the operator and passenger must read the warnings displayed on the screen carefully and the warning labels attached to the boat such as on the helm station or swim platform, and follow the safety cautions.

If you lose a warning label, or it is damaged and cannot be read, please contact your authorized YANMAR dealer or distributor for a new label and replace it.

#### Warning message on the Position control display



#### Warning label for helm station



#### Warning label for swim platform



179271-00

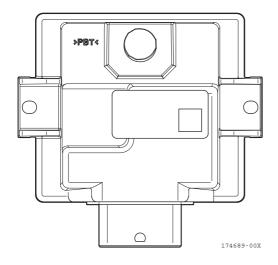
# **System Component**

 $YANMAR\ Positioning\ Assist\ is\ used\ on\ boats\ equipped\ with\ the\ Joystick\ Control\ System\ (JC30Z).$ 

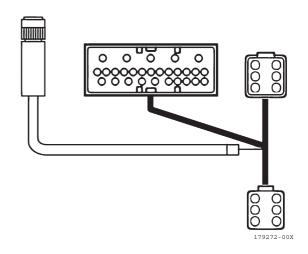
The parts needed to configure the YANMAR Positioning Assist for JC30Z system are as follows.

Note: Prior to installing YANMAR Positioning Assist, please make sure that the applicable software is installed in each component of VC30 and JC30Z to ensure proper function.

### **■** Controller ASSY, YPA (164300-1004X)



### **■** Harness, YPA (164300-2110X)

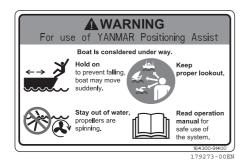


## ■ Warning label (164300-91400, 164300-91410)

Paste theses labels on places where anyone can see.

- Label (164300-91400) should be near the display at the operator's seat.
- Label (164300-91410) should be at the swim platform or the transom deck.

#### Label for helm station (164300-91400)



#### Label for swim platform (164300-91410)



### **■** GNSS antenna (locally procured parts)

The following model is applicable for YANMAR Positioning Assist.

Please ensure the appropriate antenna manual is included with your purchase.

Manufacturer	Model
Hemisphere	Vector™ V123™ GNSS Compass

# **NOTICE**

This is the only antenna for YANMAR Positioning Assist. Do not use other antennas.
 If you use other antennas, the accuracy of keeping the same position may change.
 Also if you connect antennas that are used for chart plotters, the signals mix up and can cause problems on the control.

• Read the installation instructions and owner's manual of your GNSS antenna carefully.

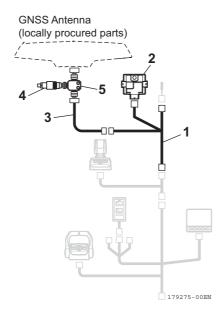
# Installation

### **■** Install the GNSS antenna

Refer to the installation instructions of the GNSS antenna and install.

### **■** Connection of the wire harness

After the installation of the components, connect each wire harness.



No.	Parts No.	Name	Note	
1	164300-2110X	Harness, YPA		
2	164300-1004X	Controller ASSY, YPA		
3	164100-666**	Cable harness	NMEA 1 m - 10 m	
4	164100-66730	Terminal male NMEA		
5	164100-66720	Connector T NMEA		

Note • \* NMEA2000 connecting cable and connectors are not contained in a kit, it needs to be prepared separately.

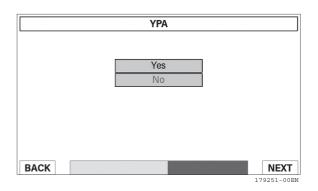
<sup>• \*\*</sup> Selected cable length.

# **Initial Setting of YANMAR Positioning Assist**

## ■ Initial setting of control system

Complete the setting in accordance with Vessel Control System and Joystick Control System manual.

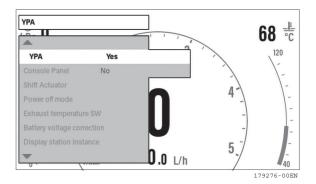
1. To use YANMAR Positioning Assist, select [Yes] for [YPA].



## ■ Second setting of display setting

If you need to re-set a display that was once set, carry it on in service mode.

1. Select [YPA] and [Yes] from [Service setting] of the display [Main menu].



# **Operating for YANMAR Positioning Assist**

# ■ Checkup before starting YANMAR Positioning Assist

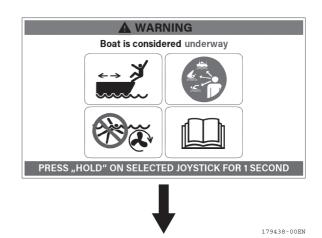
Pursuing to the instructions in the Operation Manual of the engine and the JC30Z go through inspection before activating YANMAR Positioning Assist.

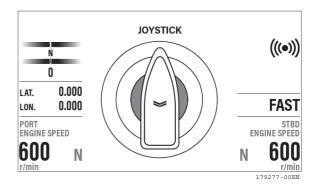
## ■ How to operate YANMAR Positioning **Assist**

- 1. Make sure there is nobody under water near your boat, and that there are no other boats or other objects around and maintain enough distance to avoid them (at least 2 boat lengths).
- 2. Follow the "HOW TO OPERATE" part of the JC30Z Operation Manual and change to joystick mode.
- 3. Set the joystick of the selecting station to center position (neutral position).
- 4. Confirm the warning message and press HOLD on the joystick for 1 second or more.
- 5. Press HOLD on the joystick, and turn "ON" YANMAR Positioning Assist.
  - · You can switch to YANMAR Positioning Assist state by pressing HOLD on the joystick.
  - The system is working properly if you hear two short beeps every 2 seconds while YANMAR Positioning Assist is on.
  - Indication will be switched to [AUTO] while YAN-MAR Positioning Assist is on.
  - You cannot switch to the information display page while YANMAR Positioning Assist is on.

### **A** CAUTION

If any other sound is continuously heard from the display, something abnormal is happening. Please operate the boat manually.





- 6. Your boat will attempt to stay in the direction and position at the point when YANMAR Positioning Assist was turned ON.
- 7. When you want to change the keeping position, tilt the joystick and move your boat (override mode). In the OVERRIDE mode, the display changes from [AUTO] to [OVERRIDE].

Your boat will attempt to stay in the direction and position at the point when the joystick was in the center position (neutral position) again.

- 8. How to stop/cancel YANMAR Positioning Assist.
  - Press HOLD on the joystick again.
  - Press the "SEL" switch of the control head.
  - · Move the control head handle of the selecting station from the neutral position.
  - · Stop the engine.

## **A** CAUTION

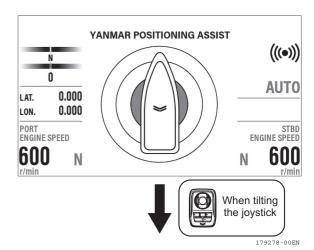
The accuracy level is only a guide. Despite the high accuracy, wave, wind, or tide can effect the boat's movement suddenly.

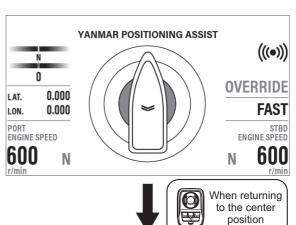
When you use this system in a region where accurate GNSS signal cannot be received, or when it is effected by electromagnetic waves from radar or radio, or large structures and terrain surrounding the device, the accuracy of keeping the same position may change.

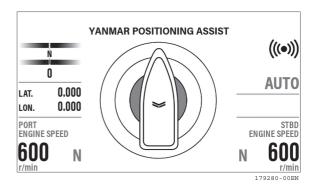
### **NOTICE**

In the following situations, ALARM and NOTICE will be displayed on the screen, and YANMAR Positioning Assist cannot be started.

- If it is under a situation where the position cannot be detected.
  - · GNSS antenna is still warming up
  - · Not enough number of acquired satellites
  - · High latitude area where accuracy cannot be obtained (Antarctica, Arctic)
  - Area where GNSS signal cannot be received (Obstacle above)
- The boat speed is faster than 2 m/s (≈ 3.9 knot)
- · Either of the engines is stopped
- · A failure that effects YANMAR Positioning Assist is occurring







179279-00EN

# **Troubleshooting**

As inspection for failure measures, repair, and replacement require a specialized expertise, contact your authorized YANMAR dealer or distributor.

Symptom	Possible causes	Measures
Cannot start the YANMAR Posi-	GNSS antenna is still warming up	Wait in a place where GNSS communica-
tioning Assist control		tion can be received
("Notice" indication appears	Joystick of the station is not selected	Select the joystick of the station
once and then disappears)	Either of the engine is stopped	Start the engine, and then both the star-
		board and port engines run
	Boat speed is faster than 2 m/s	Slow down the boat speed
	Joystick is being calibrated	Complete the joystick calibration
	Station protecting	Unlock the station protection
	The latitude of the current area is over 80°	This cannot be used in latitude over 80°
	Error occurring on the VC30 system side	Remove the error on the VC30 system side
Cannot start the YANMAR Posi-	System line is cut, and cannot CAN com-	Inspect and replace
tioning Assist control	municate	
("ALARM STOP POSITION	GNSS antenna failure	Inspect and replace
KEEPING" is displayed on the		
display)		
Cannot start the YANMAR Posi-	Display is not connected	Connect the display
tioning Assist control	Marine ECU is not applicable	Inspect and replace
(Other cases)	Joystick failure	Inspect and replace
Accuracy of the YANMAR Posi-	Joystick calibration is not done correctly	Calibrate the joystick
tioning Assist control is low	Effected by wind and wave	Check at places where wind and wave are
		calm
	Error is occurring to the engine or drive	Inspect and replace
	system, or the boat body	
	Reception state of the GNSS signal is not	Make sure that the attaching state of the
	good	GNSS antenna is following the manual,
		and then move to an open space, turn on
		the power, and wait for a while.
There is no sound during the	The buzzer for the display is broken	Inspect and replace
YANMAR Positioning Assist con-	<u> </u>	
trol		

# **DTC List**

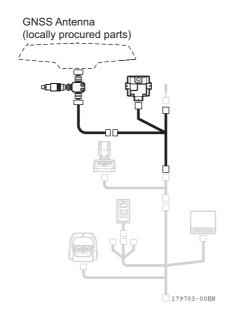
	DTC	FMI	SPN	Description	Detail
	C1064	11	522056	GPS SENSOR ERROR FOR YPA	GNSS antenna failure
	U1228	9	516914	CAN COM ERROR MARINE-ECU TO YPA KEY	CAN communication error - YPA key
Ŋ	U1209	9	522046	CAN COM ERROR MARINE-ECU TO GPS	CAN communication error - GPS
WARNING	C1058	11	522003	YPA KEY WRONG ASSEMBLY	YPA key wrong assembly
WA	P0604	12	516901	YPA KEY RAM ERROR	YPA key RAM error
	P0605	12	628	YPA KEY ROM ERROR	YPA key ROM error
	P062F	12	8621	YPA KEY NVRAM ERROR	YPA key NVRAM error
	_	_	_	STOP POSITION KEEPING	GNSS value undetectable
ALARM	_	_	_	OUT OF CONTROL LIMIT	Control range exceeds the limit
A A	_	_	_	UNSTABLE CONDITION	Pitching or Rolling signal is unstable
	_	_	_	ATTITUDE UNDETECTABLE	Attitude data can not be detected
	_	_	_	GPS IS WARMING UP	GNSS antenna is now in preparation
	_	-	_	JOYSTICK UNSELECTED	Joystick mode is not selected
兴	_	_	_	NOT SLOW SPEED	The boat is moving faster than 2 m/s
NOTICE	_	_	_	IN CALIBRATING JOYSTICK	Joystick system is under calibration
ĮΣ	_	-	_	THIS STATION IS PROTECTED	Station protect is active
	_	-	_	HIGH LATITUDE AREA	The boat is in high latitudes
	_	_	_	NO ENGINE OPERATION	The engine is stopped

# ■ Positioning error

# **Description items**

DTC	FMI	SPN	Description	Detail	
C1064	11	522056	GPS SENSOR ERROR FOR YPA	GNSS antenna failure	
U1228	9	516914	CAN COM ERROR MARINE-ECU TO YPA KEY	CAN communication error - YPA key	
U1209	9	522046	CAN COM ERROR MARINE-ECU TO GPS	CAN communication error - GPS	
C1058	11	522003	YPA KEY WRONG ASSEMBLY	YPA key wrong assembly	
P0604	12	516901	YPA KEY RAM ERROR	YPA key RAM error	
P0605	12	628	YPA KEY ROM ERROR	YPA key ROM error	
P062F	12	8621	YPA KEY NVRAM ERROR	YPA key NVRAM error	

# **Electrical circuit chart**



### **DTC** detect condition

# (■ Positioning error)

DTC	FMI	SPN	1 - Detection, 2- Judgment, 3 - Time to detect, 4 - Etc.	Check points
C1064	11	522056	<ol> <li>Position keeping system is enabled.</li> <li>Abnormal position data is received.</li> <li>—</li> <li>Displays "GPS SENSOR ERROR FOR YPA".</li> </ol>	GNSS antenna malfunction
U1228	9	516914	1.— 2. Communication from YPA key to Marine ECU is not received. 3. Not received within 300 msec. 4. Displays "CAN COM ERROR MARINE-ECU TO YPA KEY".	CAN communication error between Marine ECU and YPA key
U1209	9	522046	<ol> <li>Position keeping system is enabled.         The position data has been received at least once.     </li> <li>Cannot receive the position data.</li> <li>Continues for 300 msec.</li> <li>Displays "CAN COM ERROR MARINE-ECU TO GPS".</li> </ol>	CAN communication error between Marine ECU and GNSS antenna
C1058	11	522003	1.— 2. Wrong input for YPA key identification terminal 3.— 4. Displays "YPA KEY WRONG ASSEMBLY".	Incorrect connection of YPA key
P0604	12	516901	1.— 2. RAM error detected. 3.— 4. Displays "YPA KEY RAM ERROR".	YPA key internal failure
P0605	12	628	<ol> <li>1.—</li> <li>2. ROM error detected.</li> <li>3.—</li> <li>4. Displays "YPA KEY ROM ERROR".</li> </ol>	YPA key internal failure
P062F	12	8621	<ol> <li>1.—</li> <li>NVRAM error detected.</li> <li>3.—</li> <li>Displays "YPA KEY NVRAM ERROR".</li> </ol>	YPA key internal failure

### Movement at error occurrence

# (■ Positioning error)

Fail mode	Warning
Limited operation	C1064: When positioning activates, engines derate and stop. Positioning is OFF. U1228: When positioning activates, engines derate and stop. Positioning is OFF. U1209: When positioning activates, engines derate and stop. Positioning is OFF. C1058: Cannot switch to positioning. P0604: Cannot switch to positioning. P0605: Cannot switch to positioning. P062F: Cannot switch to positioning.
Fail release	C1064 : Communication is received again. U1228 : Communication is received again. U1209 : Communication is received again. C1058 : When the error is corrected. P0604 : When the error is corrected. P0605 : When the error is corrected. P062F : When the error is corrected.
Remarks	

### **Contents of trouble**

- 1. Open or short circuit of wire harness.
- 2. Missing connect of connector.

The connectors don't engage correctly.

3. Damage of GNSS antenna.

### **Corrective action**

1. Initial diagnosis with	Check the fault indication.		
the diagnosis tool	Check the abnormality of the GNSS antenna.		
	Check the damage and dropout of wire harness for GNSS antenna.		



2. Check of connectors/	Before working, make sure to turn off the power switch.		
wiring	Make sure that the connector of the GNSS antenna is correctly inserted.		
	Check if there are disconnected GNSS wires or peeled wire coatings.		



3. Failure diagnosis work • Make sure the wire harness of GNSS antenna is connected correctly.