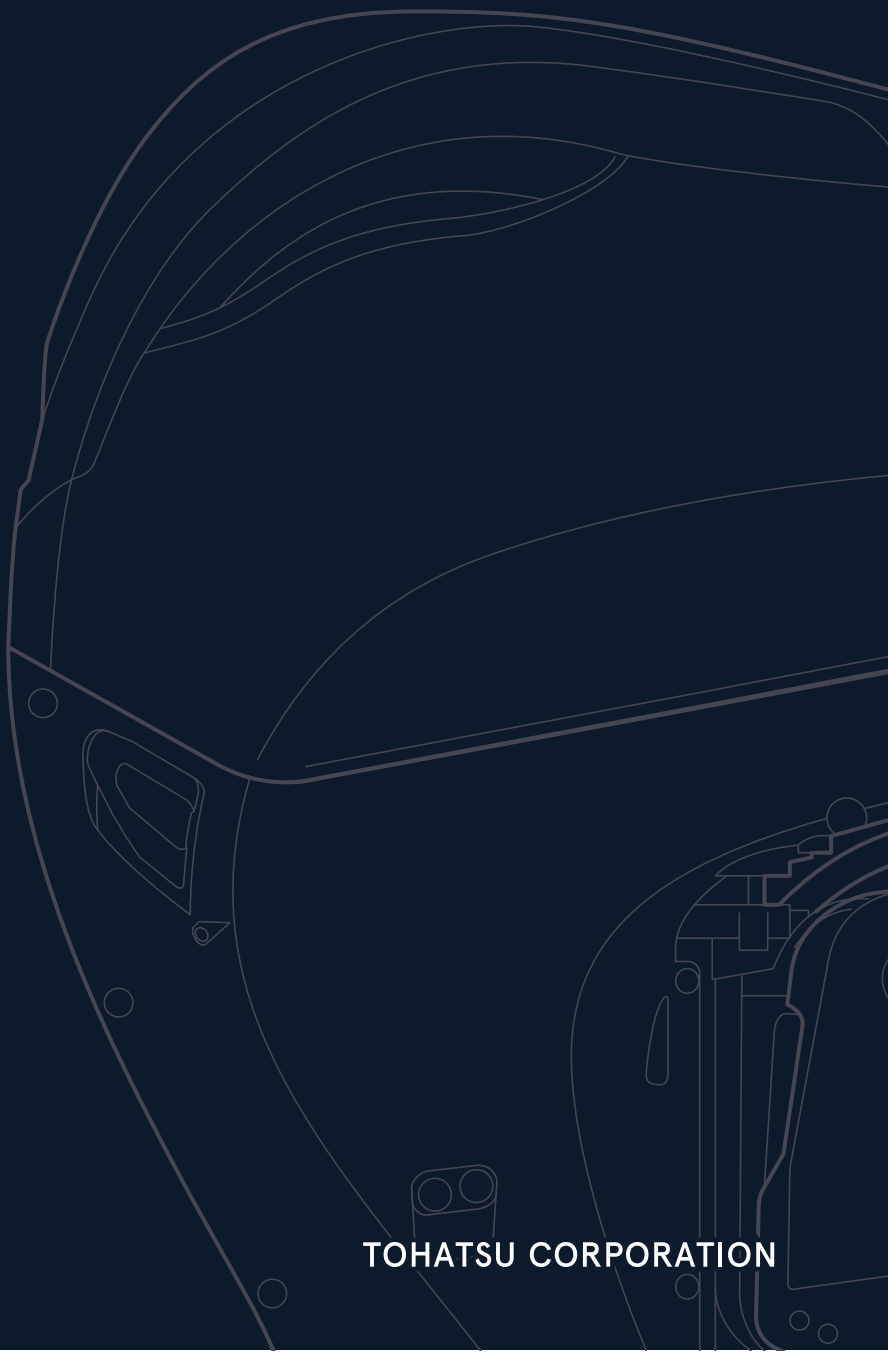
RIGGING MANUAL

TOHATSU

Feel the Wind™



OB No.003-31001-0BB1 | 09-22 NB

BACKS YOU UP™

TOHATSU CORPORATION

Introduction

Before reading this manual

This rigging manual provides information that is needed for initial set-up and rigging of applicable outboard motors. For our customers' safe and comfortable use of the products for long term, it is essential to maintain the performance and quality of the outboard motors. To ensure this, service has to be done properly by service technicians with fundamental knowledge and skiills. This manual is utilized so that our customers can always use their outboard motor with full satisfaction.

Safety Information

Safety Statements
The following safety statements are found throughout this manual and indicate information which, if ignored, could result in fatal safety hazards or property damage:

⚠ DANGER

Indicates the presence of a hazard which, if ignored, will result in severe injury or death.

⚠ WARNING

Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in severe injury or death.

⚠ CAUTION

Indicates the presence of a hazard or an unsafe activity which, if ignored, could result in minor personal injury or damage to the products or facilities.

Attention:

This manual uses SI unit system (International System of Units) for pressure, force (load), torque and stress. This manual adopts the international unit construction system (SI unit system) followed by the conventional imperial and metric systems enclosed by ( ) and [ ] as described below.

Example : <Pressure>

0.90 MPa (128 psi) [9.0 kgf/cm^2]

- [9.0 kgf/cm^2] — Conventional system (kilo-gram meter unit)
- (128 psi) — Conventional system (US pound inch unit)
- 0.90 MPa — SI unit (1 kgf/cm^2 = 0.0980665 MPa)

* Measurements are shown using SI unit followed by conventional units (US unit) and [Japanese domestic unit].

Example : <Torque>

18 N·m (13lb·ft) [1.8 kgf·m]
*

* The conventional unit for measurement of force uses "kgf (kilogram force)" to discriminate it from "kg (mass kilogram)" of SI unit system.

Example : <Volume>

900 cm^3 (30.4 fl.oz)

Example : <Length>

10 mm (0.39 in)

<Reference>

What is the SI unit system?

Although the measurement unit is standardized mostly with metric system in the world, the metric system includes different kinds of unit systems.

Though the metric system was established expecting that a single unit system would be used in the world, various physical units were established later, resulting in branching the metric system in different unit systems.

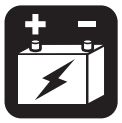
The new unit system is called "International System of Units" because it was established for the purpose of unifying the different unit systems.

Since the metric system was initially established in France, and International Bureau of Weights and Measures (IBWM) is located in Paris, General Conference of Weights and Measures (GCWM) passed a resolution of the international unit system as "Systéme International d'Unités (French)" that is abbreviated as "SI unit".

For example, conventional metric system uses the unit of mass (kg) and unit of force (kg or kgf) without discriminating them, but the SI unit system uses, for example, "kg" as the unit of mass, and "N" as the unit of force, aiming to apply a kind of unit for a kind of physical quantity.

Description of Pictograph

The following symbols represent the contents of individual chapters.

Service Information 	Service Data 	Inspections and Adjustments 	Fuel System (Fuel Injection) 
Power Unit 	Lower Unit 	Bracket 	Electrical System 
Troubleshooting 	Rigging 	Wiring Diagrams 	

The following symbols indicate items needed for the service.

Special Tool 	Lubrication Oil 	Engine RPM 	Tightening Torque 
Specified Electrical Value 	Specified Measurement Value 	Use Limit 	Test Run Adjustment 
Specified Part 			

The following symbols indicate a point to which lubrication oil, sealing agent or screw-locking agent is to be applied.

4 stroke engine oil 	Gear oil 	ATF DEXRON Ⅲ 	OBM Grease 
Teflon® Grease TEFLON 	Low Temperature Lithium Grease LITHIUM 	Oil Compound [Shietsu Silicon] S.O.C 	[Konishi Bond] • G17 
Molybudenium Greese •Moly Paste 500 	Screw Locking Agent [Loctite®] • 263 (271) 	Sealant [Loctite®] • 581 	Screw Locking Agent [Loctite®] • 1327 
Screw Locking Agent [Three Bond®] • 1342 	Screw Locking Agent [Three Bond®] • 1373B 	Screw Locking Agent [Three Bond®] • 1401 	Heat Resistant Grease •Liquid O-Ring 

MFS75A/90A/115A/140A

MFS40A/50A/60A

MFS25D/30D

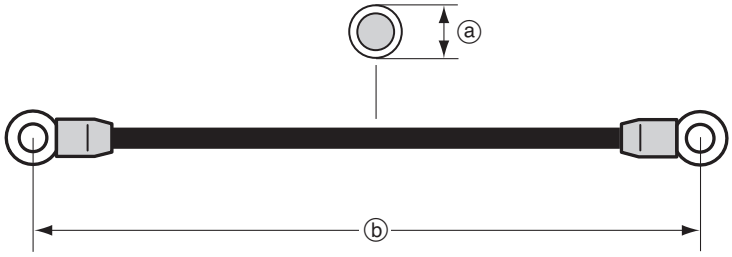
MFS9.9E/15E/20E

Wiring Diagram

BATTERY CABLE SIZE

Only use copper battery cables. Do not use aluminum cables for any outboard marine installations.
If longer battery cables are required, the cable size must increase.
The size of the cable is described as follows, but please select the cable size with plenty of room.
Also, please do not join cables.
In order to ensure the safety, be sure to comply with each regulation and standard.
Please perform the work with paying attention for safety.
Tohatsu is not responsible for any malfunction and accident caused by the changed cable.

Standard Battery Cable Size



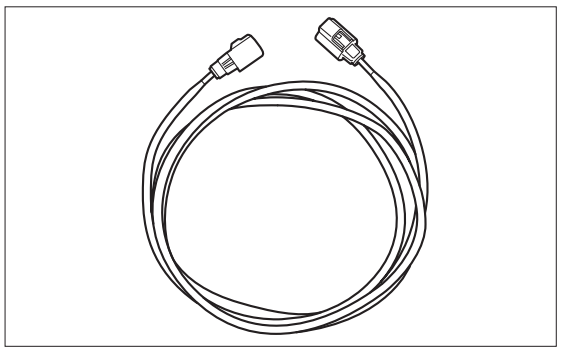
Model	Battery Cable part No.	Cable diameter ⓐ	Length ⓑ	SQ	AWG
MFS9.9E/15E/20E	3BH-76120-0	4.2 mm (0.17 in)	2500 mm (8.2 ft)	8	8
MFS25D/30D	3AC-76120-0				
MFS40A/50A/60A MFS75A/90A/115A/140A	3FW-76120-0	5.7 mm (1.01 in)	3000 mm (9.84 ft)	15	6

Extension of Starter Cable (for MFS75-140A only)

Standard Starter Cable

Part No.	Length
3SS-76141-0 + 3UG-76141-0	3,000 mm (9.84 ft)

When extending the starter cable, disconnect the connector and connect the following parts to extend the cable.



Extension Starter Cable

Part No.	Length
3SS-76144-0	3,000 mm (9.84 ft)

Recommended Extension Battery Cable Size

※SQ: square(Japanese Industrial Standards)

	9.9 - 30HP		40 - 140HP	
	SQ	AWG	SQ	AWG
7FT(2.1m)	8	8	-	-
8FT(2.4m)	8*	8*	-	-
9FT(2.7m)	14	6	-	-
10FT(3.0m)	14	6	15*	6*
11FT(3.4m)	14	6	22	4
12FT(3.7m)	14	6	22	4
13FT(4.0m)	14	6	22	4
14FT(4.3m)	22	4	22	2
15FT(4.6m)	22	4	22	2
16FT(4.9m)	22	4	22	2
17FT(5.2m)	22	4	22	2
18FT(5.5m)	22	4	38	2
19FT(5.8m)	22	4	38	2
20FT(6.1m)	22	4	38	2
21FT(6.4m)	22	4	38	2
22FT(6.7m)	38	2	38	1
23FT(7.0m)	38	2	38	1
24FT(7.3m)	38	2	38	1
25FT(7.6m)	38	2	38	1
26FT(7.9m)	38	2	38	1
27FT(8.2m)	38	2	38	1
28FT(8.5m)	38	1	60	1/0
29FT(8.8m)	38	1	60	1/0
30FT(9.1m)	38	1	60	1/0
31FT(9.4m)	38	1	60	1/0
32FT(9.8m)	38	1	60	2/0
33FT(10.1m)	38	1	60	2/0
34FT(10.4m)	60	1/0	60	2/0
35FT(10.7m)	60	1/0	80	3/0
36FT(11.0m)	60	1/0	80	3/0
37FT(11.3m)	60	1/0	80	3/0
38FT(11.6m)	60	1/0	80	3/0
39FT(11.9m)	60	1/0	80	3/0
40FT(12.2m)	60	1/0	80	3/0

*Standard cable size.

PROPELLERS

The propeller selection chart can be used to help you in selecting the correct propeller for your Tohatsu outboard. Remember that in any application, discrepancies in performance can result due to the different boat hull designs, the final carrying load and your particular needs.

Models (Maximum operating range)	Prop Type	Load	Dia (in/mm)	Pitch (in/mm)	# Blades	Standard Equip.	Part Number	Remarks
MFS75A/90A/115A/140A (5150-5850)	ALUMINUM	Light	13.2/335	21/533	3		3HKB64545-0	
			13.2/335	19/483	3		3HKB64541-0	
			13.3/337	17/432	3		3HKB64536-0	
		Moderate	13.5/343	15/381	3		3HKB64532-0	
			13.7/349	13/330	3		3HKB64527-0	
		Heavy	14/356	11/279	3		3HKB64523-0	
			14/356	9/229	3		3HKB64518-0	

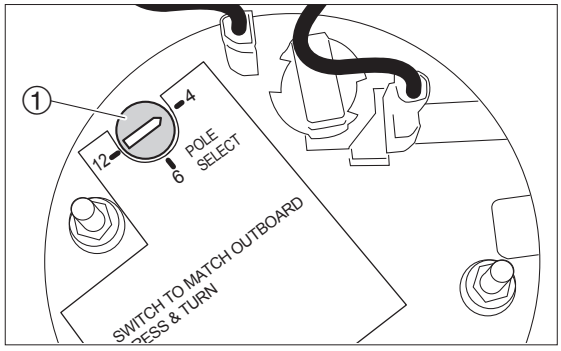
Models (Maximum operating range)	Prop Type	Load	Dia (in/mm)	Pitch (in/mm)	# Blades	Standard Equip.	Part Number	Remarks
MFS40A/50A/60A (5000-6000)	ALUMINUM	Light	11/280	17/432	3		3KYB64536-0	
			11/279	16/406	3		3KYB64534-0	
			11/278	15/381	3		3T5B64532-0	
			11/279	14/356	3	50/60	3T5B64529-1	
			11.1/277	13/330	3	40	3T5B64527-1	
		Moderate	11.4/283	12/305	3		3T5B64525-1	
			11.6/290	11/279	3		3T5B64523-1	
		Heavy	12.1/311	9/229	3		3T5B64518-1	
			11.4/290	7/180	4		348B64108-1	HIGH THRUST

Models (Maximum operating range)	Prop Type	Load	Dia (in/mm)	Pitch (in/mm)	# Blades	Standard Equip.	Part Number	Remarks
MFS25D (5000-6000) MFS30D (5500-6500)	ALUMINUM	Light	9.9/252	14/360	3		349B64529-1	
			9.6/244	13/330	3	25/30 S	3R0B64527-1	
		Moderate	9.8/249	12/305	3	25/30 L	3R0B64525-1	
			9.8/249	11/279	3		3R0B64523-1	
			9.7/247	10/254	3		3R0B64521-1	
		Heavy	9.7/247	9/229	3		3R0B64518-0	
			10.2/260	8/210	3		346B64106-5	

Models (Maximum operating range)	Prop Type	Load	Dia (in/mm)	Pitch (in/mm)	# Blades	Standard Equip.	Part Number	Remarks
MFS9.9/15/20E (5400-6100)	ALUMINUM	Light	9.3/236	11.5/299	3		3BAB64525-1	
			9.3/236	10/254	3		3BAB64521-1	
			9.3/236	9/229	3		3BAB64518-1	
		Moderate	9.2/234	8/203	3	9.9/15/20 S/L	3BAB64516-1	
		Heavy	9.2/234	7/178	3		362B64105-1	
			9.2/234	6/155	3		362B64107-1	
			10/256	7/178	4		3Y0B64514-0	HIGH THRUST

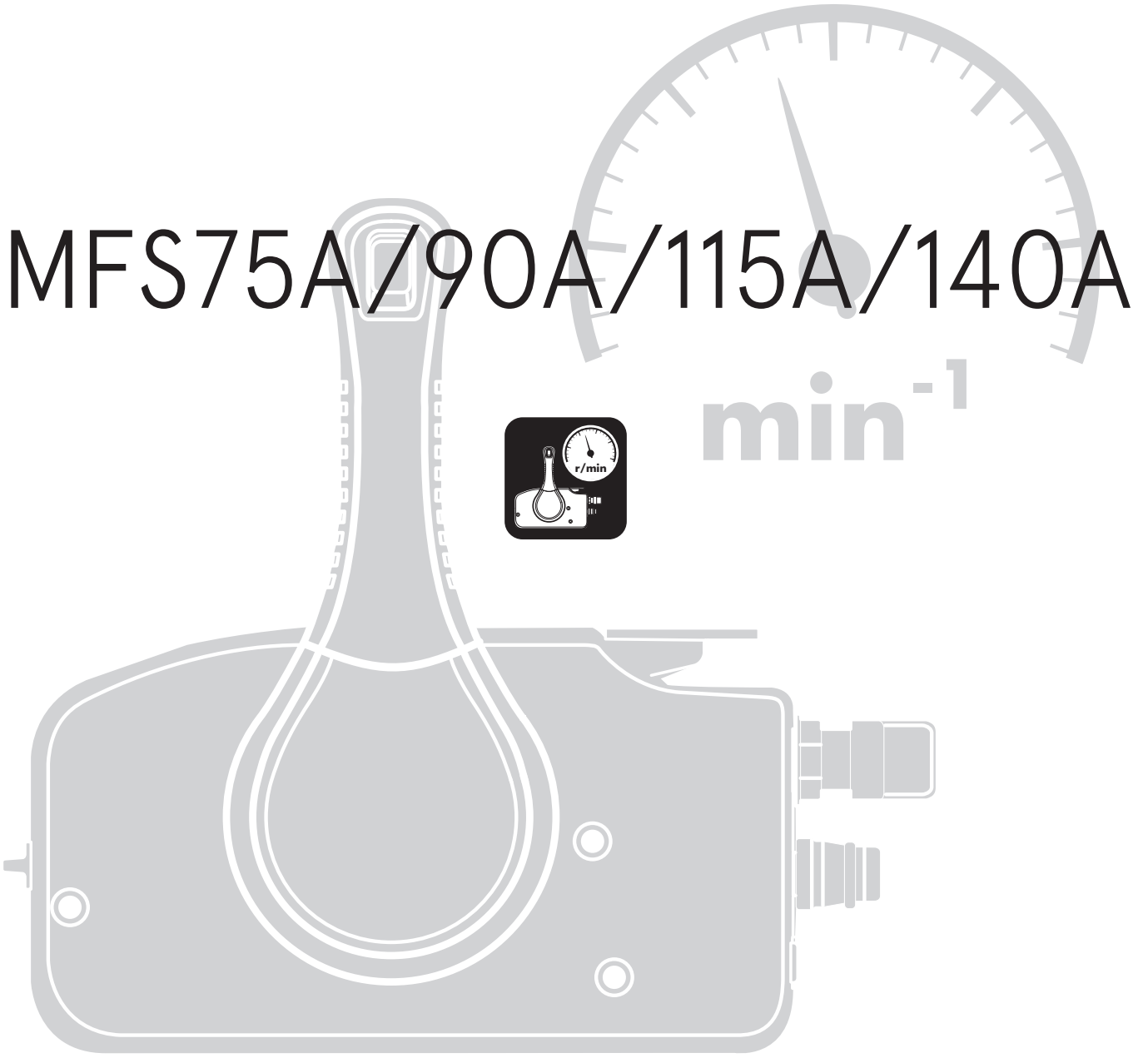
TACHOMETER

Models	# of Pole
MFS 75/90/115/140A	4
MFS 40/50/60A	4
MFS 25/30D	12
MFS 9.9/15/20E	12



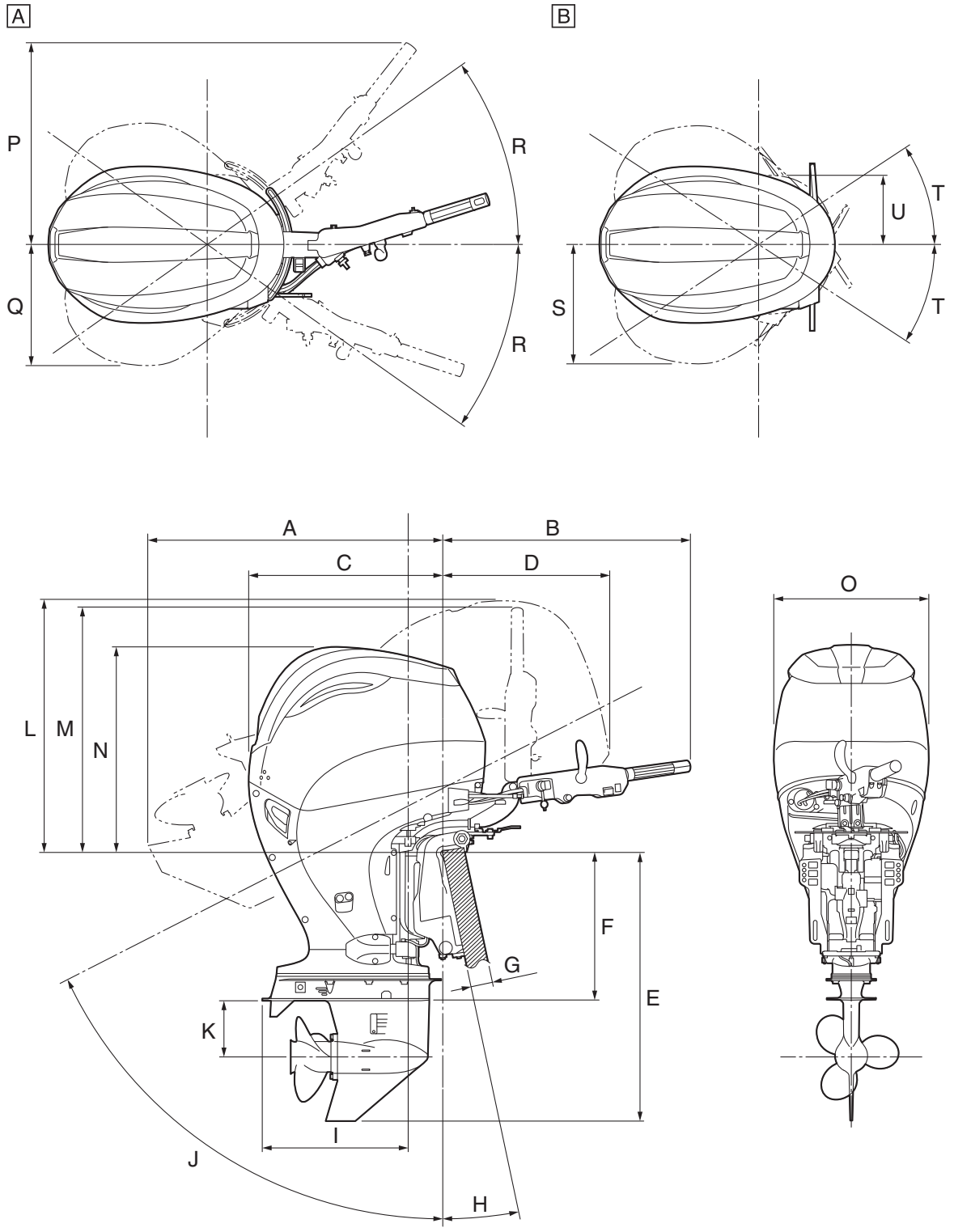
① Pole Selector

MFS75A/90A/115A/140A



1. Outline Dimensions

1) Engine Dimensions



A Tiller Handle Model

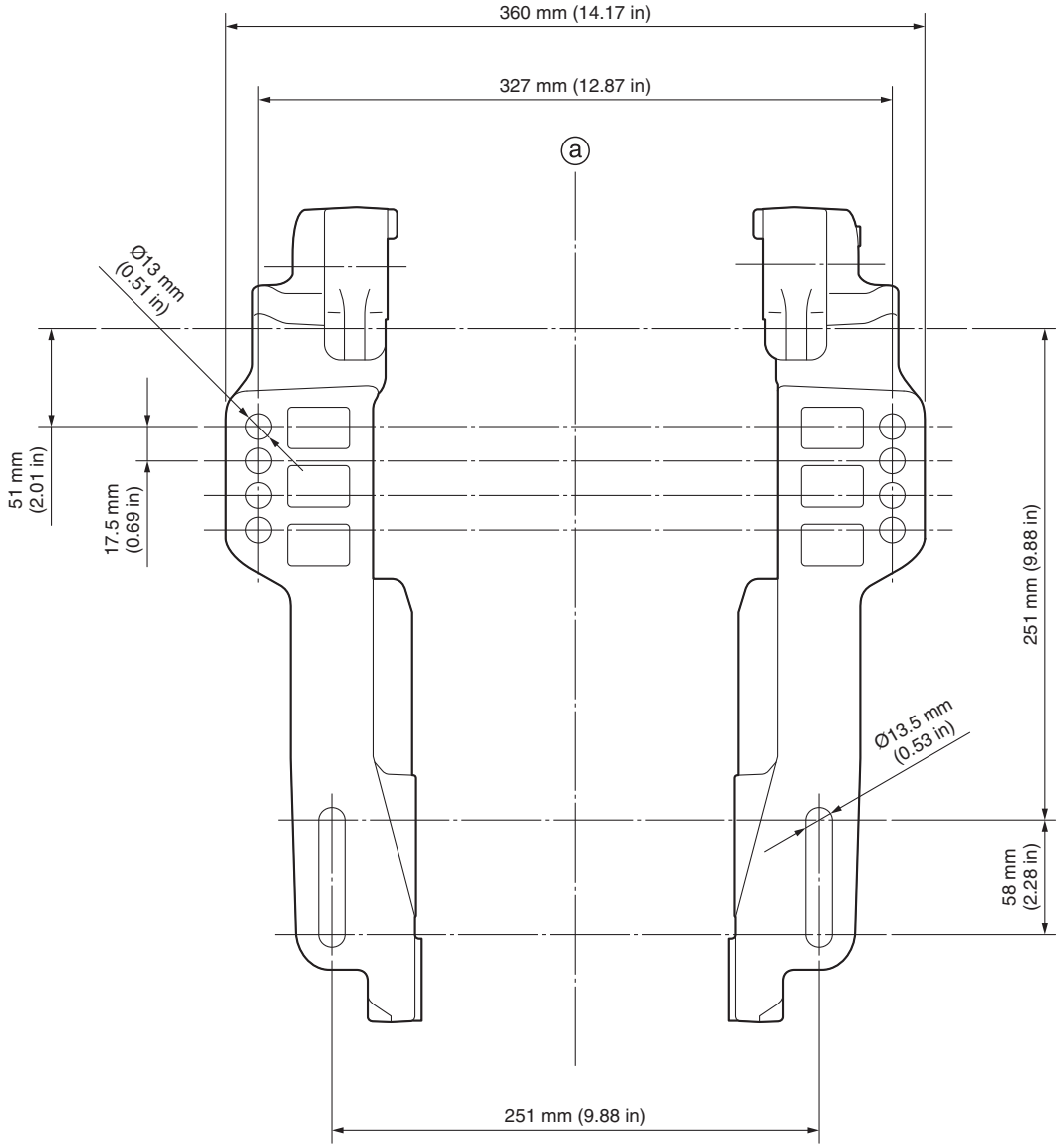
B Remote Control Model

Item	Type	Unit	mm	in
A	L	mm/in	1022	40.24
	UL	mm/in	1135	44.69
B		mm/in	864	34.02
C		mm/in	677	26.65
D		mm/in	578	22.76
E	L	mm/in	934	36.77
	UL	mm/in	1061	41.77
F	L	mm/in	517	20.35
	UL	mm/in	644	25.35
G		mm/in	31-70	1.22-2.76
H		deg.	12	
I		mm/in	511	20.12
J		deg.	63	
K		mm/in	194	7.64
L		mm/in	878	34.57
M		mm/in	851	33.50
N		mm/in	718	28.27
O		mm/in	540	21.26
P		mm/in	699	27.52
Q		mm/in	422	16.61
R		deg.	35	
S		mm/in	422	6.77
T		deg.	35	
U		mm/in	241	3.94
Trim Angle (Position)		deg. *1	–4 - +12 (2)	

*1: Transom angle is at -12°

2) Transom Bolts

IMPORTANT: This is not a drill template.
Found it on page 111.



ⓐ Center line

1. Service Information

The installer shall ensure the work environment is safe by paying adequate attention to the ventilation and fire prevention so as not to cause injuries and damage the product.

When performing a running test on the boat, read the owner's manual well and make sure the boat is controlled by someone familiar with the operating procedure.

2. Service Data

1) Boat Mounting Restriction

Be careful not to overload the boat or mount an engine with an output that is too large for the boat. A plate indicating the maximum permissible output and seating capacity set by the manufacturer according to specific standards is displayed on the boat. If you have any doubts or questions, consult your dealer or the boat manufacturer.

⚠ WARNING

Never mount an outboard motor exceeding the maximum output set by the boat manufacturer as the following problems may occur.

- **The boat may become uncontrollable.**
- **The design buoyancy characteristics of the boat may change by mounting an excessive weight on the transom.**
- **In particular, cracks or damage may occur in the boat around the transom area.**

An overpowered boat may cause serious injuries, death, or damage to the boat.

2) Mounting Dimensions

Transom Opening Smallest Dimension: ⓐ

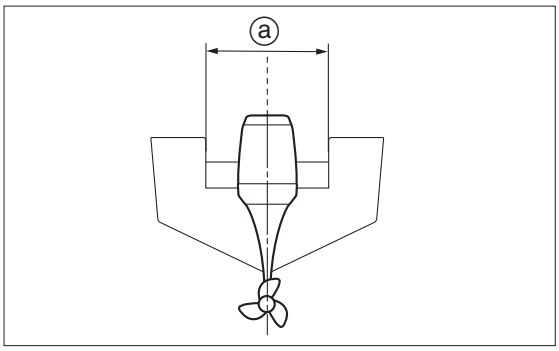
1-engine mounted 865 mm (34.06 in)

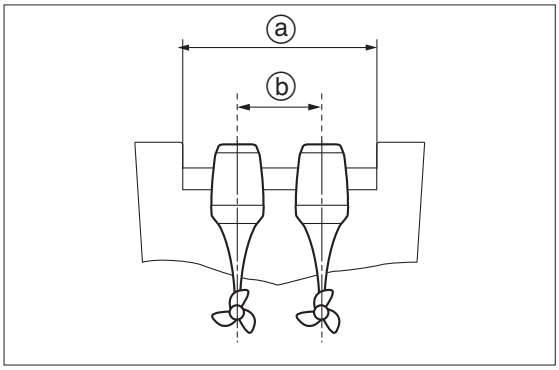
2-engine mounted 1,495 mm (58.86 in)

Minimum engine centerline distance when 2 engines are mounted: ⓑ

630 mm (24.81 in)

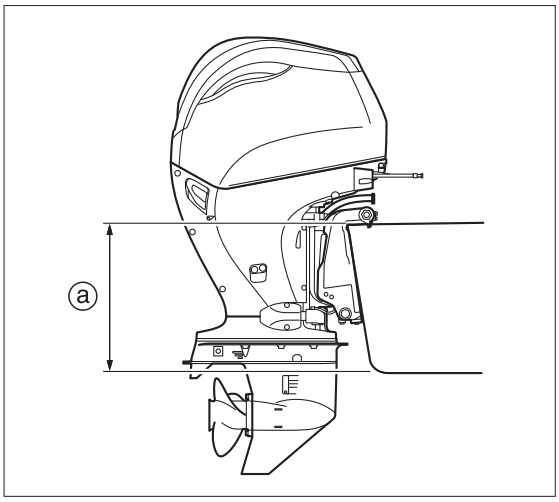
When the mounting height of the outboard motor is too high, the engine may overheat or the components of the gear case may be damaged.





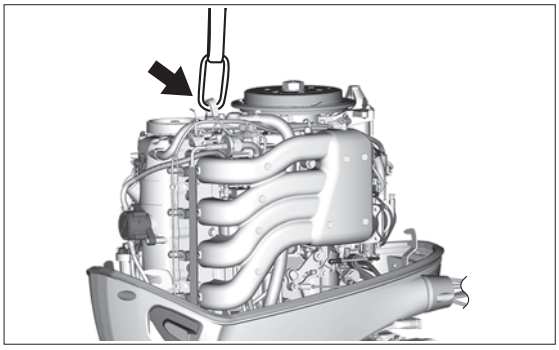
If the mounting height of the outboard motor is too high, the following situations may occur.
1) Air may be sucked in through the cooling water inlet port, and overheating may occur easily.
2) Steering performance deteriorates.
3) When planing, or when the load is heavy, the propeller tends to idle easily.

ⓐ: The mounting height of the outboard motor is the height from the bottom of the boat hull to the outboard motor transom bracket.



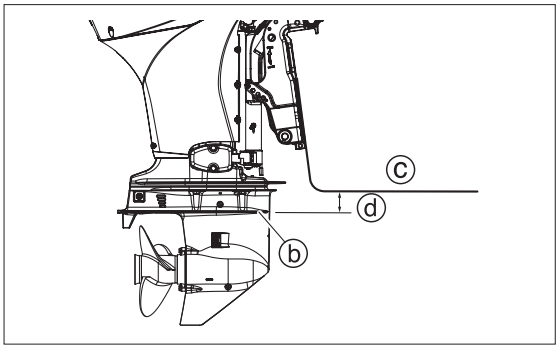
3) Lifting Up the Outboard Motor

Use the engine hanger.



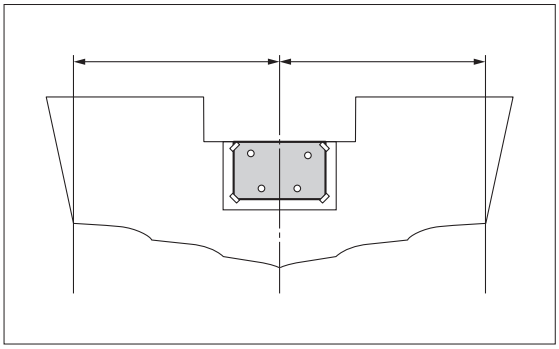
4) Installation of Outboard Motor

1. Install the outboard motor so that the interval ⓓ between the anti-ventilation plate ⓑ and the hull bottom ⓒ is 0 - 30 mm (0 - 1.2 in).

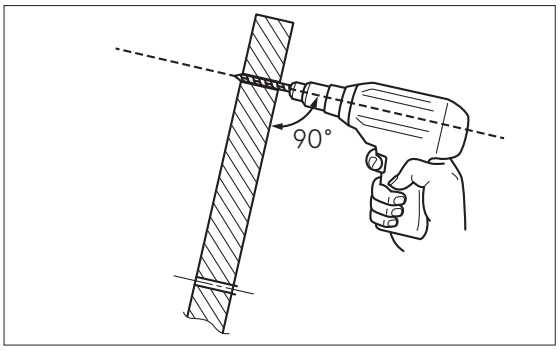


2. Paste an outboard motor mounting template on the boat transom (the template is shown on page 111).

Adjust the centerline of the template accurately to the center of the boat transom.



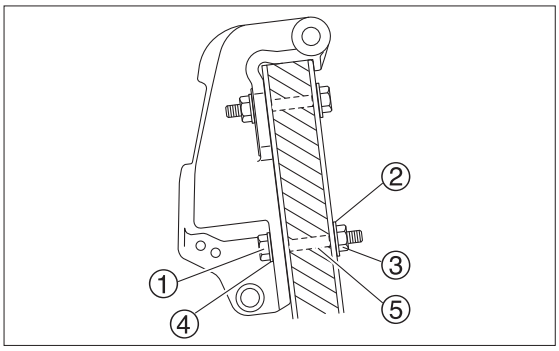
3. Mark the mount holes and drill 4 holes with a diameter of 12.5 mm (0.49 in).



To align correctly with the hole position of the outboard motor's transom bracket, make a hole that is perpendicular to the transom.

4. Refer to the "Installation Dimensions" to install the outboard motor at the recommended height.

5. Secure the outboard motor with the enclosed mounting bolts and nuts as shown in the diagram.
   ①: Bolt with a diameter of 12 mm (0.5 in) (4 pieces)
   ②: Flat washer large (4 pieces)
   ③: Lock nut (4 pieces)
   ④: Flat washer small (4 pieces)
   ⑤: Marine sealing agent: Avoid applying on the threaded section of the bolt.



3. Fuel System

It is recommended to install additional fuel/water separator on the boat to effectively remove water and foreign substances contained in the fuel. If the improper size fuel water separator is added to the fuel system this may prevent smooth flow of fuel which could lead to the engine stalling or resulting in damage to the engine due to fuel starvation. Use of a valve fitting can also cause similar troubles.

Filter requirements:
Flow Rate: 200 L/H (53 GPH) or more
Filter Rating: 10 Micron

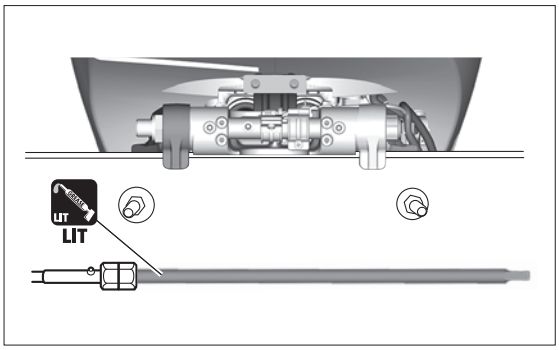
Recommended fuel filter water separator
Water/Fuel Separator Filter Kit :
P/N. 3KY-02230-0
Replacement 10 micron filter :
P/N. 3KY-02259-0

4. Connections to Outboard Motor

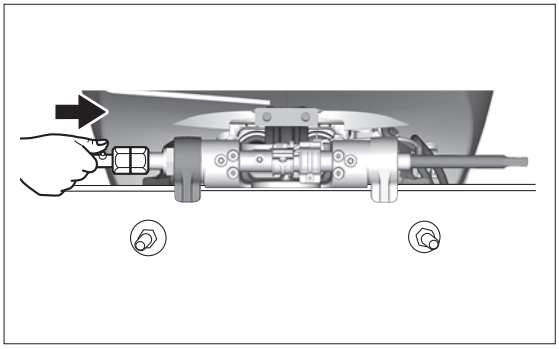
1) Mechanical Steering Cable Installation

Cable installed on the starboard side

1. Apply a thin coat of grease over the entire cable end.



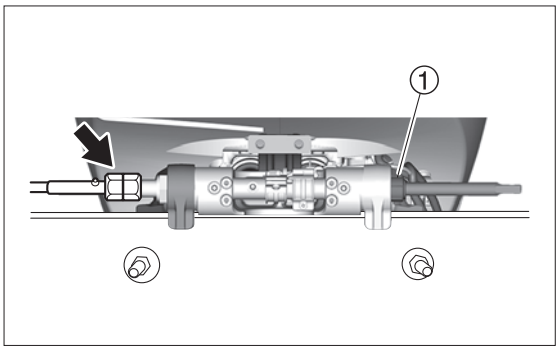
2. Insert the steering cable into the tilt tube.



3. Tighten the nut to the specified torque.

Nut:
48 N·m (35 lb·ft) [4.8 kgf·m]

Do not overtighten the drag link seal ring ① or it may deform and the telescopic shaft of steering cable will not be sealed properly.



2) Drag Link

1. Install the drag link as shown in the diagram below,

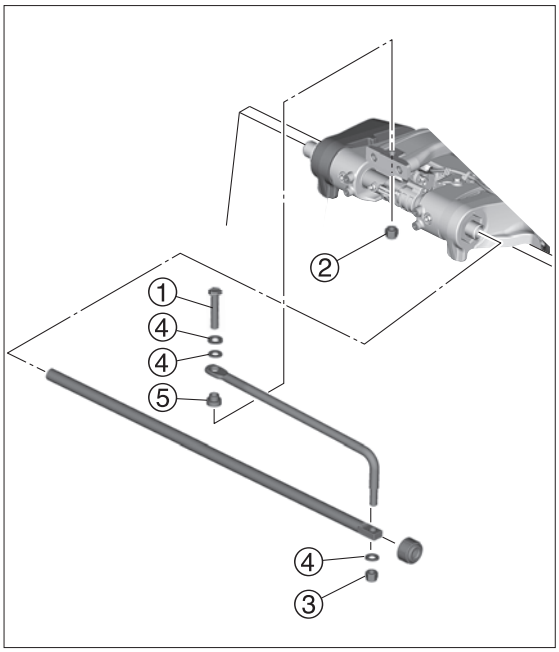
- Be sure to use special bolts ①, nylon nuts ②, ③, washers ④ and spacers ⑤ to install the drag link connecting the engine and steering cable. Do not replace these bolts and nuts with ordinary bolts and nuts (non-locking type) as the drag link may get loose or detached due to vibration etc.
- Do not reuse nylon nut. Be sure to replace with new one.

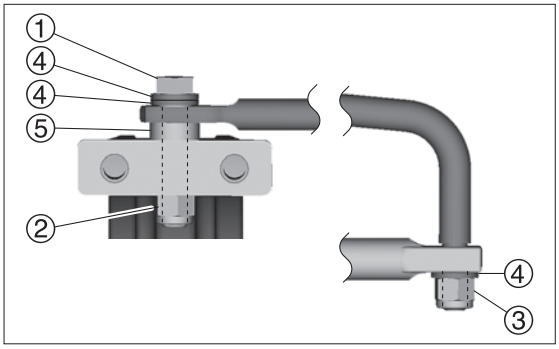
⚠ WARNING

When the drag link is detached, it may result in the boat making a sharp turn. As a result, the passengers may be ejected out of the boat, resulting in serious injuries or even death.

Bolt ①:
27 N·m (20 lb·ft) [2.7 kgf·m]
Nylon Nut ②:
Tighten until contact is made.
Nylon Nut ③:
Tighten until contact is made, then loosen 1/4 of a round.

Washer ④
Spacer ⑤

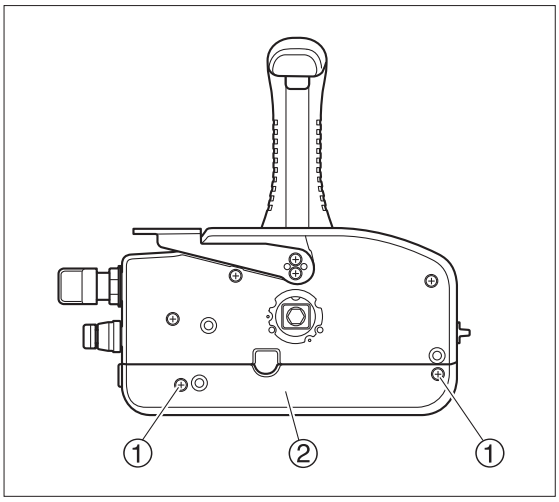




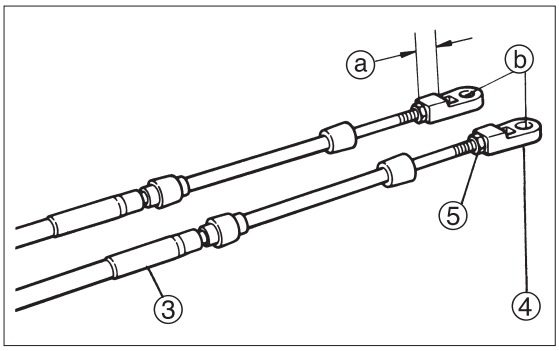
5. Remote Control Components

1) Installation of Remote Control Cable (Remote Controller Side)

1. Loosen the screws ① on the rear panel and remove the rear panel ②.



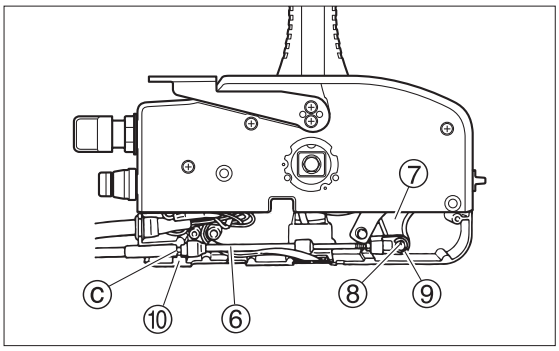
2. Screw in about 11 mm (0.43 in) of the enclosed terminal eye ④ into the threaded section at the end of the remote control cable ③, and secure it with a nut ⑤. Then, apply grease on the mounting hole ⓑ of the terminal eye tip.



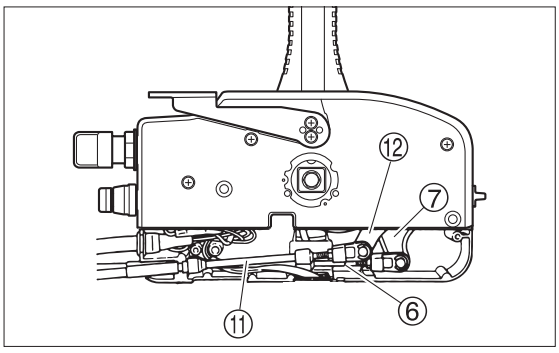
ⓐ Aprox. 11 mm (0.43 in)

3. Insert the outer groove ⓒ of the remote control cable for the shift ⑥ into the clamp groove of the housing. Next, insert the terminal eye into the pin ⑧ at the end of the shift arm ⑦, and secure it with the E-ring ⑨.

4. Insert the enclosed grommet ⑩ into the clamp groove.



5. Follow the same procedure as the remote control cable for the shift to install the remote control cable for the throttle ⑪ in the throttle arm ⑫.



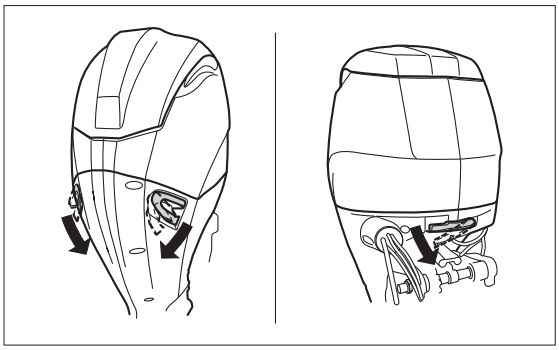
⑥ Remote Control Cable for Shift
⑦ Shift Arm

6. Fasten the rear panel securely with 2 screws.

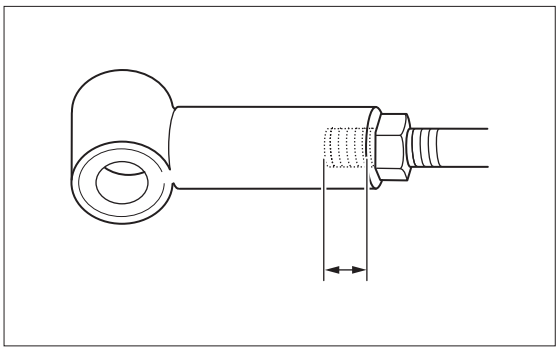
2) Installation of Remote Control Cable (Engine Side)

Remote Control Model

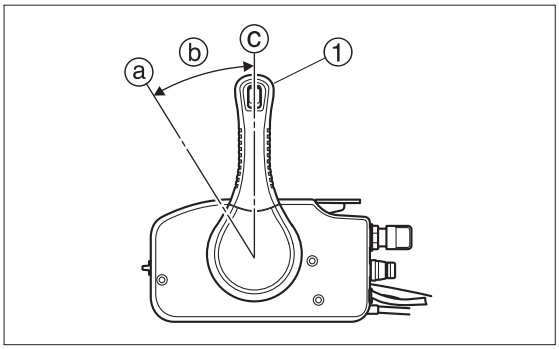
1. Turn the three levers of the top cowl to remove the top cowl.



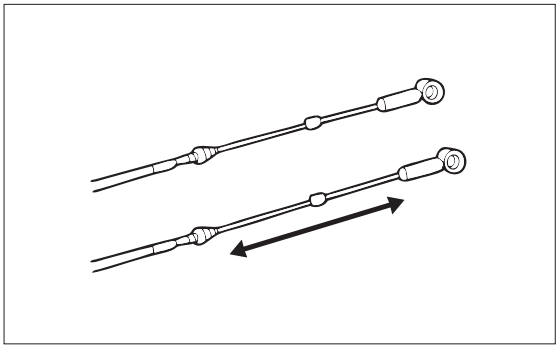
2. Screw about 17 mm (0.67 in) of the cable joint into the end of the remote control cable.



3. The shift cable is the one in which the remote control cable end is first moved when the remote control lever ① of the remote control box is lowered to the Forward (F) side ⓐ until the engine stops (at approx. 32°).



ⓑ Approx. 32°
ⓒ Neutral Position

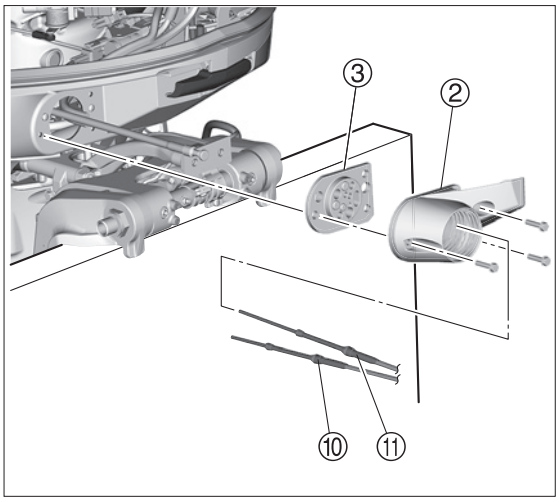


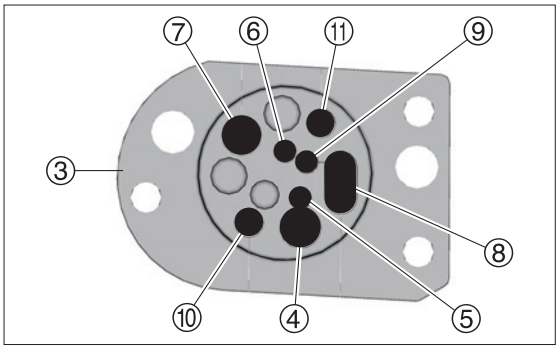
4. Remove the cover ② and grommet ③.

5. Pass the main harness ④, meter cable ⑤, trim sensor cable ⑥, fuel hose ⑦, battery cable ⑧, starter cable ⑨, shift cable ⑩ and throttle cable ⑪ through the cover, grommet and lower cowl.

> As shown in the diagram, pass the cords, cables and hoses through the grommet ③.

6. Install the grommet ③ and cover ②.



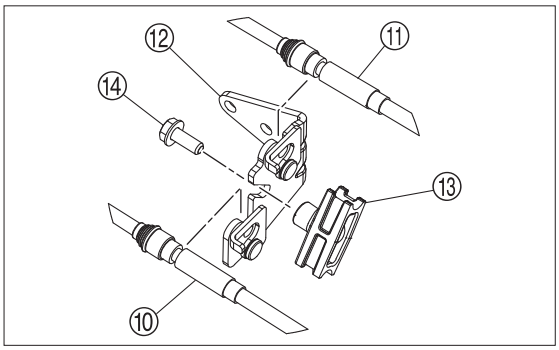


7. Install the shift cable ⑩ in the cable clip assembly ⑫.

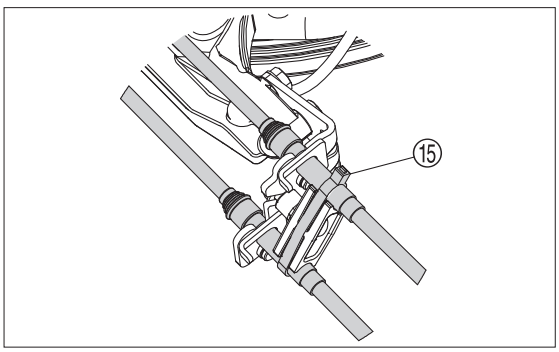
8. Assemble the bolt ⑭ temporarily in the cable holder ⑬.

9. Install the cable holder and throttle cable ⑪ in the cable clip assembly.

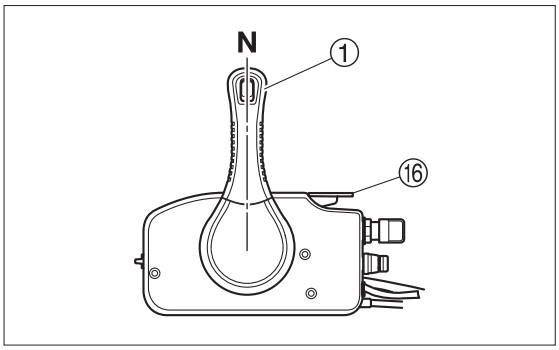
10. Tighten the bolt ⑭.



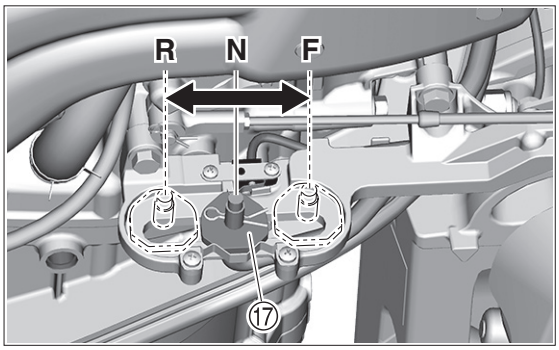
11. Secure the shift cable and throttle cable with a band ⑮.



12. With the control lever ① at the neutral position, check that the free acceleration lever ⑯ is at the fully closed position.

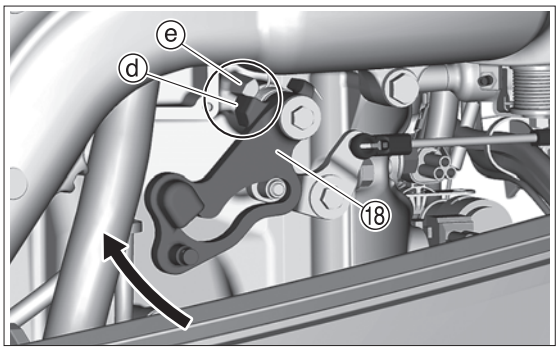


13. Set the shift arm ⑰ to the Forward (F) – Neutral (N) – Reverse (R) position and confirm the position first before setting it to the Neutral (N) position.



14. Fully close the throttle cam ⑱.

Move the throttle cam until the ⓓ section of the throttle cam comes into contact with the protrusion ⓔ.



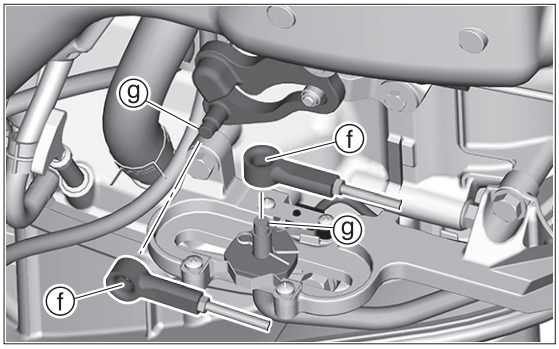
15. Adjust the screw-in amount of the cable joint so that the hole ⓕ of the cable joint is aligned with the throttle arm and pin ⓖ of the shift arm.

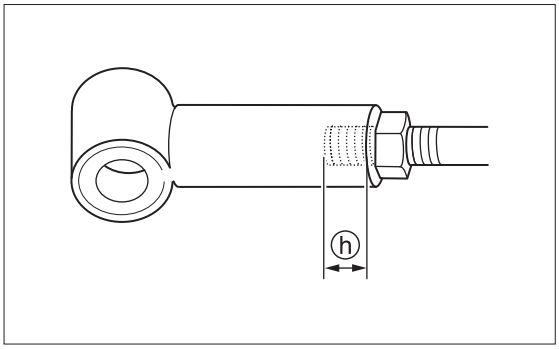
⚠ WARNING

The cable joint should be screwed in at least 10 mm.

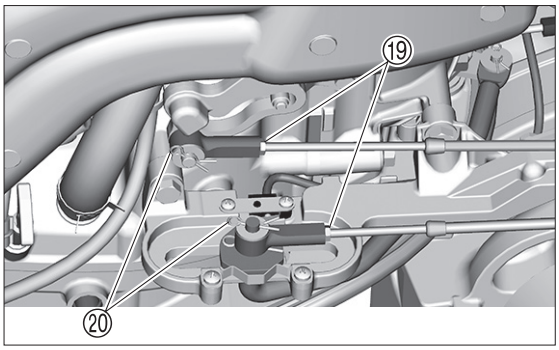
Cable Joint Screw-in Amount ⓗ:
17 mm (0.67 in)

- The cable joint is shipped together with the outboard motor in the packing box.
- When adjusting the cable joint, adjust it with the cable fully pushed in.

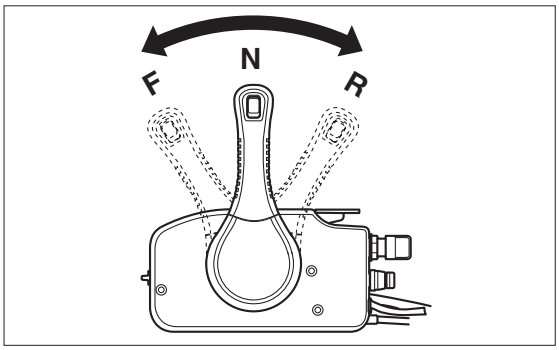




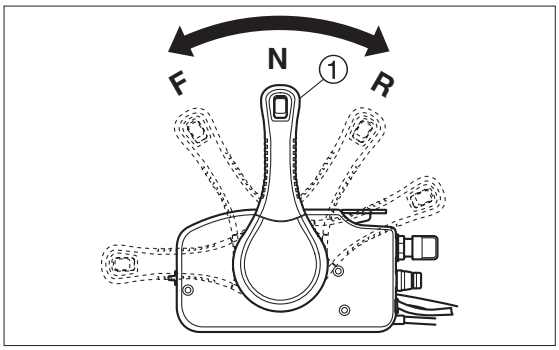
16. Tighten nut ⑲ and install the cable joint on the pin before securing it with the washer and R pin ⑳.



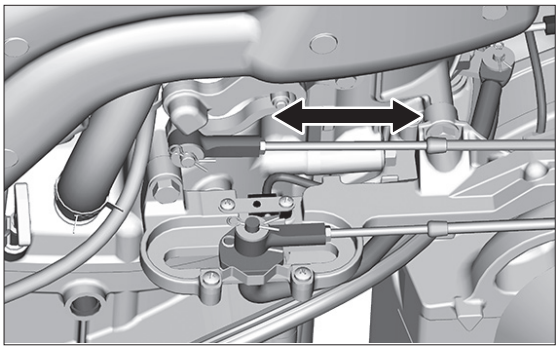
17. Operate the control lever and check if it moves from the Forward (F) to the Neutral (N) and to the Reverse (R) positions.
Rotate prop shaft when shifting the control either into (F) Forward or to (R) Reverse.



18. Check that the outboard motor shifts in when the control lever ① is lowered to the Forward (F) side until the control lever stops (at approx. 32°), and the throttle is activated and fully opened when it is lowered further.
Next, check that the throttle valve is fully closed when the control lever is returned to the neutral position (N). If the throttle valve is not fully closed, readjust the cable joint position on the outboard motor side and reinstall it.



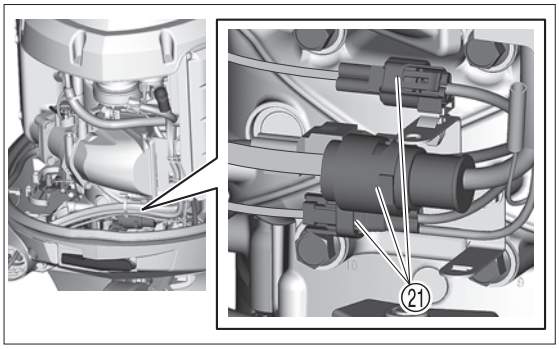
19. Check if the throttle operates smoothly, and repeat steps 12 to 18 as necessary.



20. Connect connector ㉑ of the main harness.

⚠ CAUTION

Never disconnect the main harness while the engine is in operation.



6 Lower Unit

1) Installation of Propeller

⚠ WARNING

- **Before removing or installing the propeller, be sure to disconnect the battery cables from the battery and remove the stop switch lock plate.**
- **When removing or installing the propeller, do not handle the propeller with your bare hands.**
- **Put a piece of wooden block between the anti-ventilation plate and propeller to prevent propeller from rotating when removing or installing the propeller.**

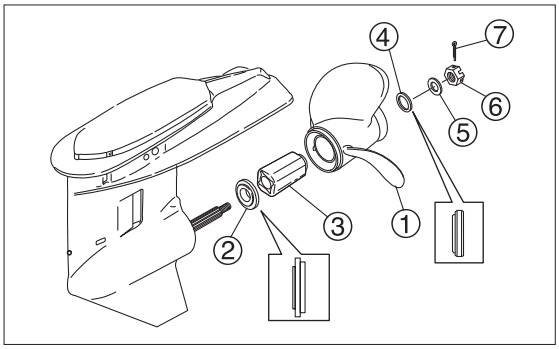
1. Set the shift lever to the Neutral (N) position.
2. Apply water-resistant grease on the propeller shaft.
3. Install the propeller on the propeller shaft as shown in the diagram.
4. Insert a piece of wood between the gear case and propeller, and tighten the nut to the specified torque.

Propeller Nut:
35 N·m (25 lb·ft) [3.5 kgf·m]

5. Insert a split pin into the nut and bend it.

⚠ CAUTION

If the propeller shaft pin hole and propeller nut pin groove are not aligned, tighten the nut further until the hole and groove are aligned.



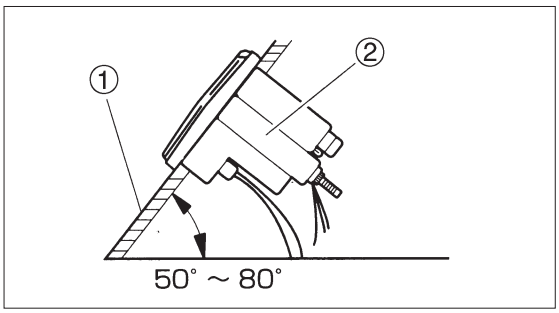
① Propeller
② Thrust Holder
③ Washer
④ Stopper
⑤ Washer
⑥ Nut
⑦ Split Pin

7. Installation of Meters and Battery

1) Installation of Meters

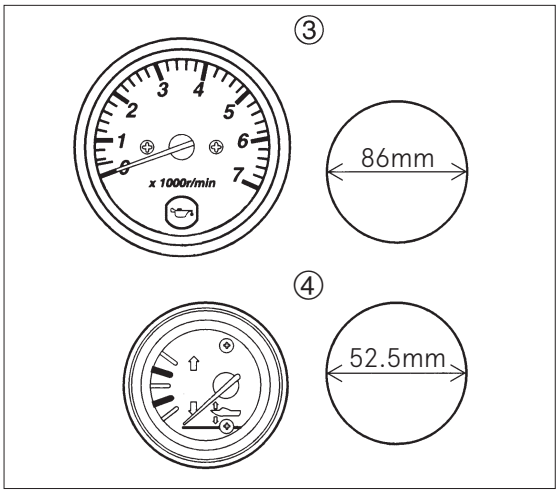
When installing meters, select a place on the dash board ① where operator can watch them easily and they are not exposed to direct water spray.

The meters can be installed on the dash board ① of 2 to 11mm thick. When the thickness is over 11 mm (0.43 in), cut fitting plate ② so that the meters can be installed.



・Angle of Installation

Install meters so that the angle is in between 50 to 80 degrees from horizontal plane.

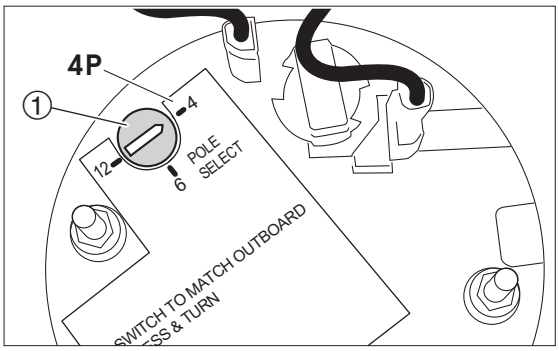


③ Large Sized Meters : Tachometer ③ and Speedometer
Installation Opening Diameter : 86mm (3-3/8 in)

④ Small Sized Meters : Trim Meter ④, Volt Meter, etc.
Installation Opening Diameter : 52.5mm (2-1/16 in)

・Tachometer

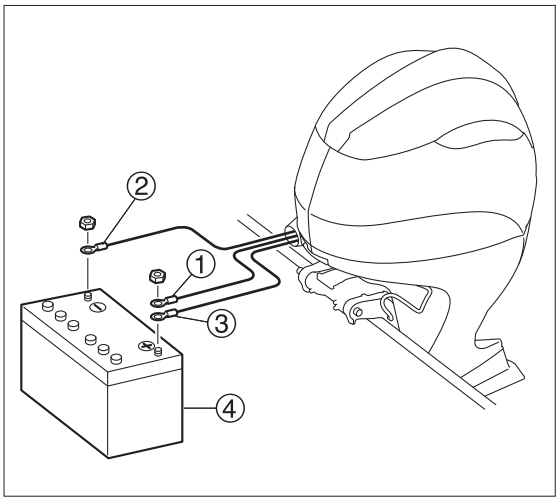
Set selector ① to "4P" on the back of the meter.



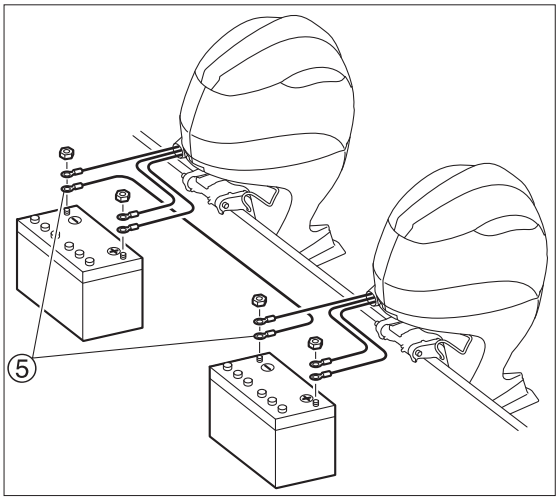
8. Electrical System

1) Connection of Battery Cable

1. 1-engine mounted
   ①: Red Sleeve Battery cable (+ Side)
   ②: Black Sleeve Battery Cable (- Side)
   ③: Starter Cable (+ Side)
   ④: Starting Battery



2. 2-engine mounted
   Be sure to connect the common earth ⑤ (cable size is the same as the main battery cable) between the negative (–) terminals of the batteries used for starting.

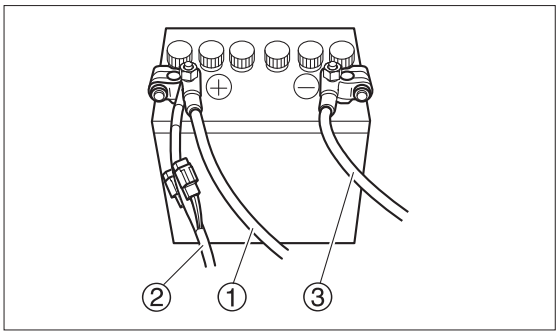


2) Installation of Battery

Minimum battery requirements:
512 Cold Cranking Amps(CCA), 70Ah/20HR
Larger capacity battery is required when it is using freezing condition.
Recommend connecting only the engine battery cables and starter cable to the starting battery.

1. The battery should be stored in a battery storage box away from sea spray and fixed securely to the hull to prevent it from falling down due to rolling or pitching or shock when the boat is running.

2. Connect the battery cable by connecting the battery (+) (red) terminal ① and starter cable (red) ② first before connecting the (–) terminal (black) ③. (Remove the (-) cable first when disconnecting)
   The cable with a red tube attached near the terminal is the (+) cable.



⚠ CAUTION

- **Before using battery, thoroughly read warning label.**
- **Do not disconnect battery cable during engine operation.**

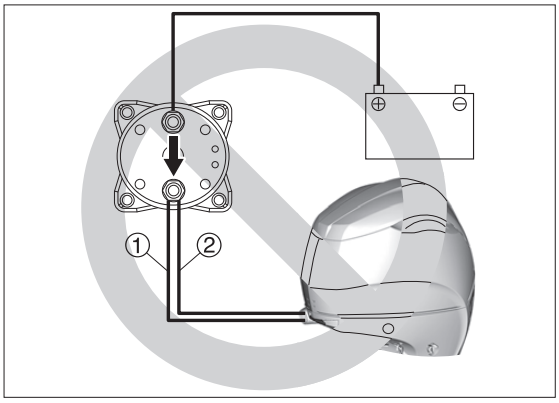
⚠ CAUTION

Do not use a wing/butterfly nut for installing the battery cable.
A wing/butterfly nut tends to get loose easily, resulting in electrical failures.
Recommend to fasten with correct hex-nut and if washer is needed possibly locking washer or star washer to prevent accidental loosening of nuts.

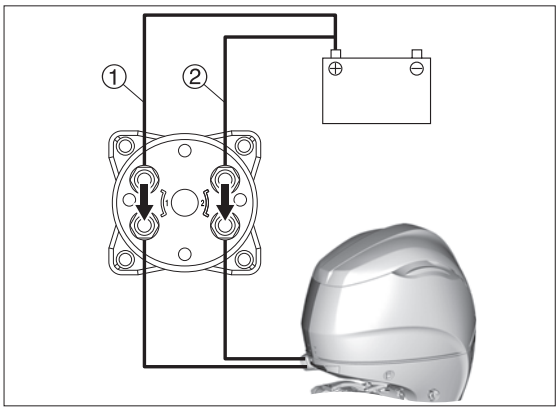
3) Installation of Battery Switch

When installing the battery switch, be sure to use a battery switch that can be turned ON/OFF separately by the battery cable (+) and starter cable.

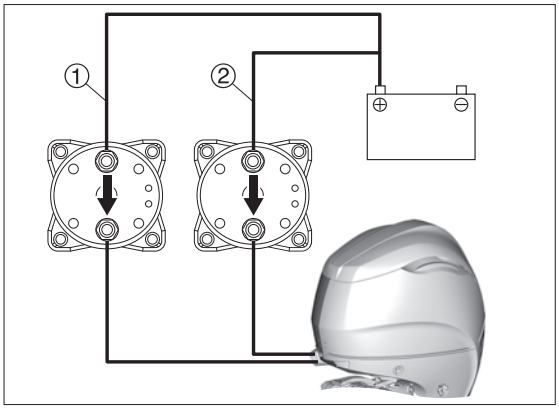
A temporary voltage drop occurs when the starter motor is started. As a result, the voltage supplied to the ECU may be insufficient, and the engine may not be able to start.



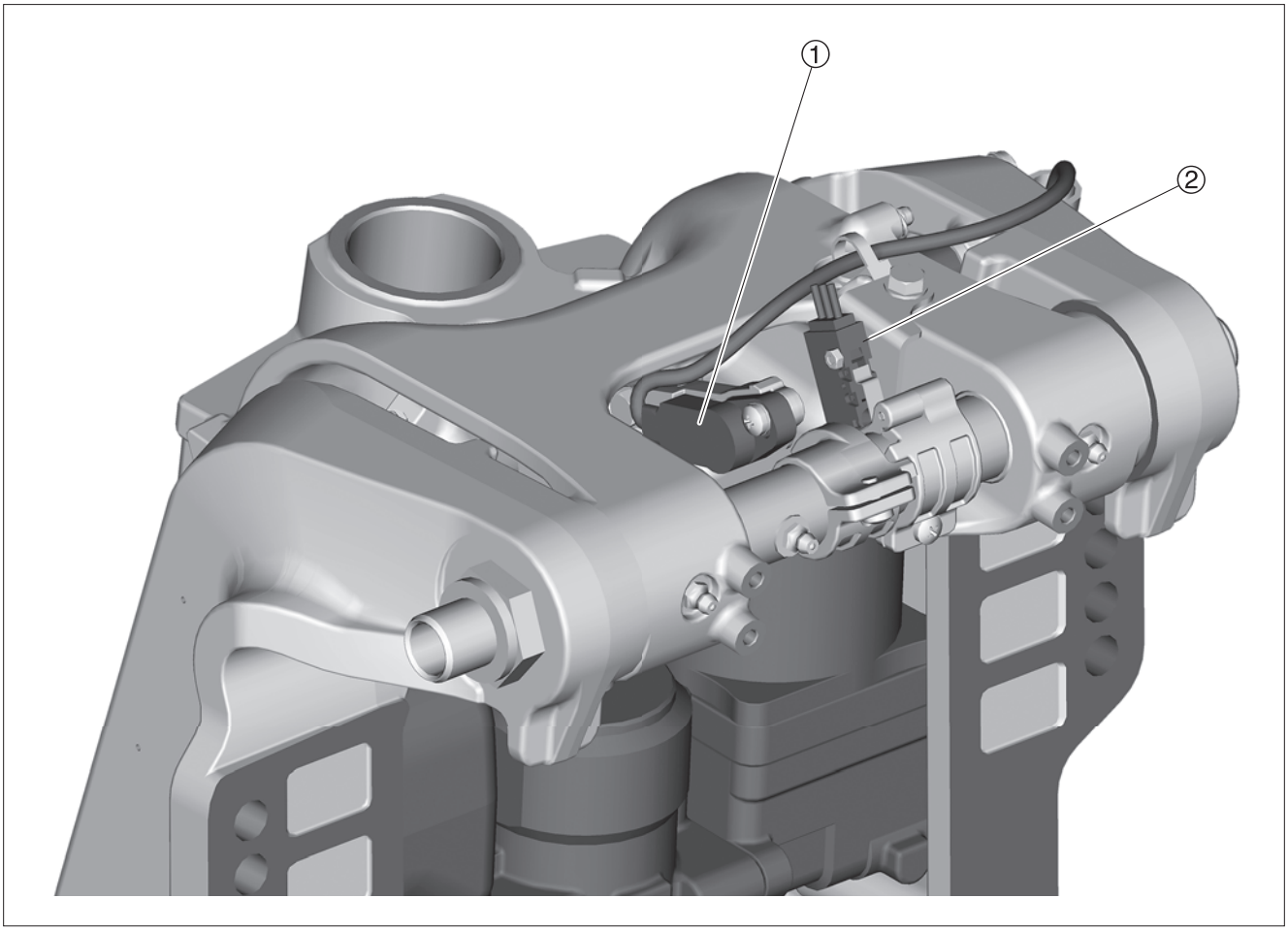
① Battery Cable
② Starter Cable
*Diagram shows only the + cables



If this cannot be obtained, 2 normal ON/OFF types may also be used.



4) Installation of Trim sensor Digital and Tilt Limit Switch



① Trim Sensor Digital (Optional)
② Tilt Limit Switch (Optional)

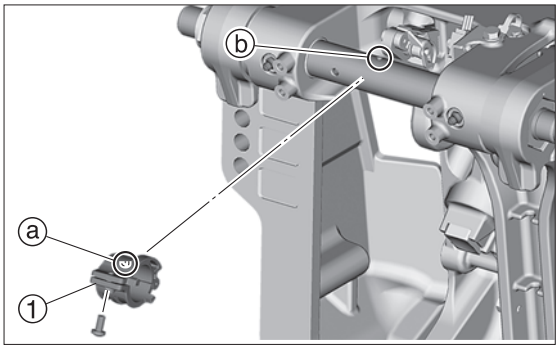
Trim Sensor Digital

Tilt up the outboard motor to where you can see the access hole of installation at starboard side of the swivel bracket.
Install the trim sensor digital to the swivel bracket.

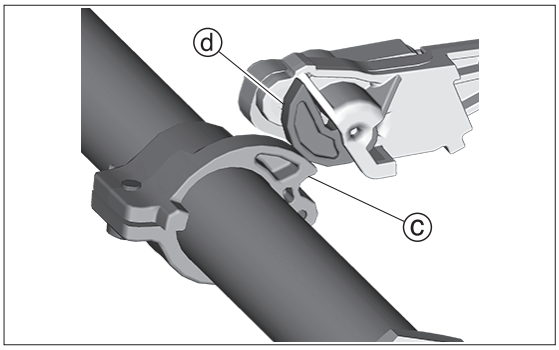
M6 L=16 mm :
5 N · m (5 lb · ft) [0.5 kgf · m]

Install the trim sensor cam ① so that align the protrusion ⓐ on the trim sensor cam to the hole ⓑ of the swivel bracket shaft and secure with the screw.

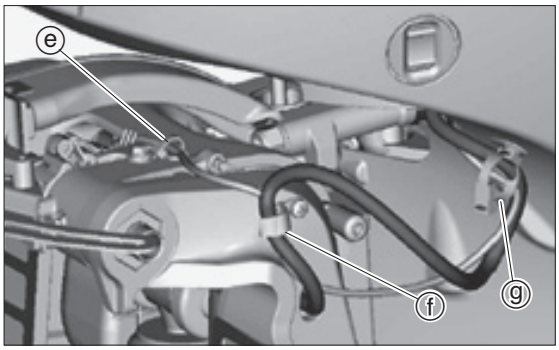
M6 L=16 mm :
5 N · m (5 lb · ft) [0.5 kgf · m]



Make sure the ⓒ section of the trim sensor cam come into contact with the lever ⓓ of the sensor.



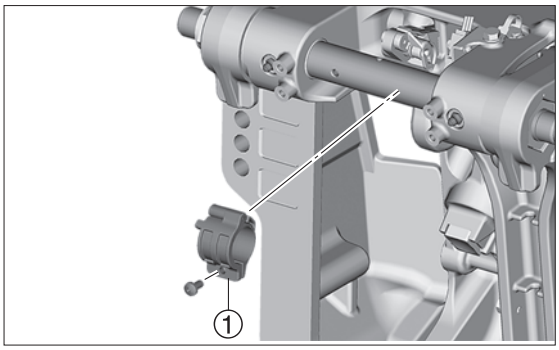
Install the band ⓔ to the hole on the swivel bracket and secure the cord.
Secure the cord with clamp for PTT motor cord ⓕ and band ⓖ.
Make sure the cord has some extra slack to allow for tilt movement.
Run the cord inside drive shaft housing cover through the grommet.



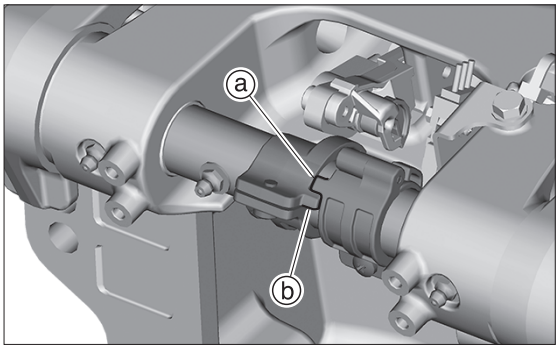
Remove the terminating resistor and connect trim sensor digital coupler.

Tilt Limit Switch

Temporarily install the tilt switch cam ① to the swivel bracket shaft.

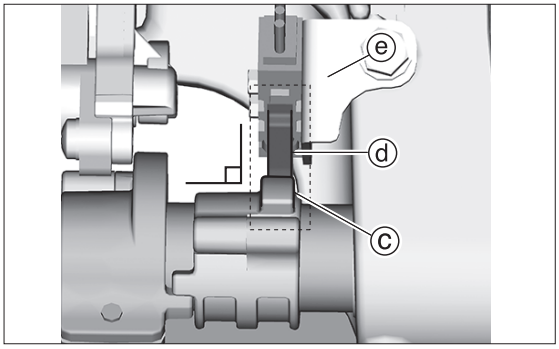


When tilt limit switch and trim sensor digital is installed together, bring the tilt switch cam come into closer to the trim sensor cam side and, let the protrusion ⓐ of the tilt switch cam come into contact with the upper side of the protrusion ⓑ of the trim sensor cam.

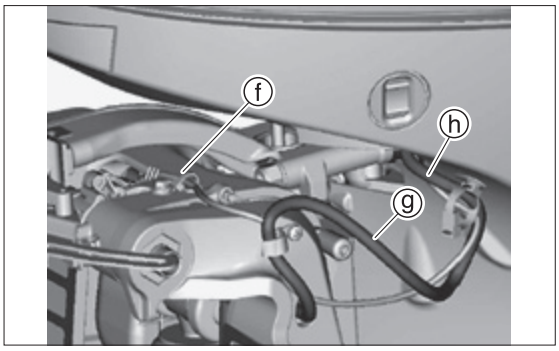


Install tilt limit plate with switch ⓔ to the swivel bracket so that cam of tilt limit switch ⓒ and lever of tilt limit switch ⓓ overlaps vertically.

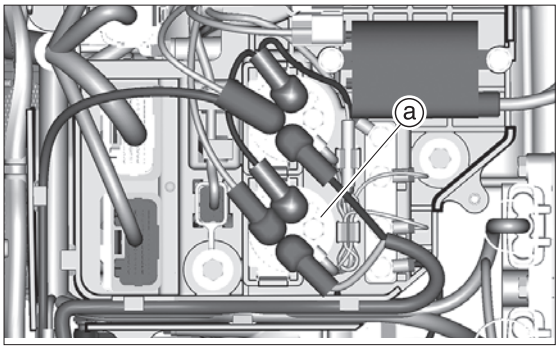
M6 L=12 mm :
6 N · m (5 lb · ft) [0.6 kgf · m]



Install the band ⓕ to the hole on the swivel bracket and secure the cord.
Secure the cord with clamp for PTT motor cord ⓖ and band ⓑ.
Make sure the cord has some extra slack to allow for tilt movement.
Run the cord inside drive shaft housing cover through the grommet.

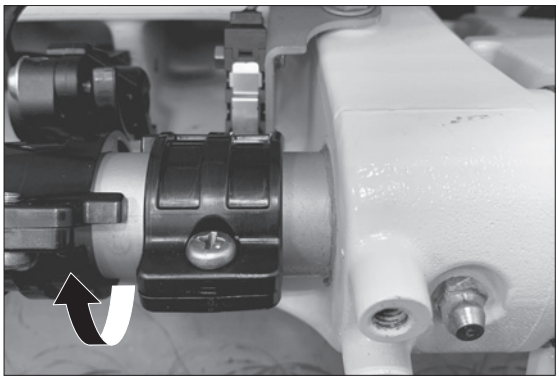


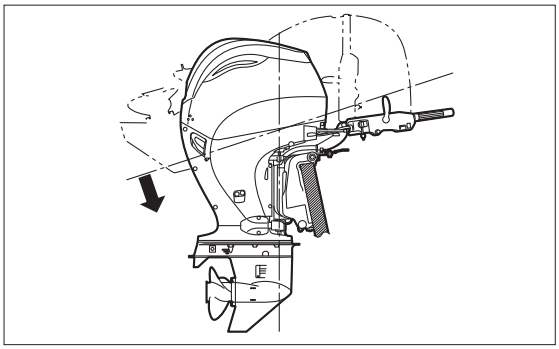
Disconnect connectors of PTT-UP solenoid ⓐ (sky blue). Connect tilt limit switch connectors to the connectors of PTT-UP solenoid.



Turn tilt limit cam to adjust so that the switch is activated at desired tilt angle, and then tighten the screw to the specified torque.

M6 L=16 mm :
5 N · m (5 lb · ft) [0.5 kgf · m]

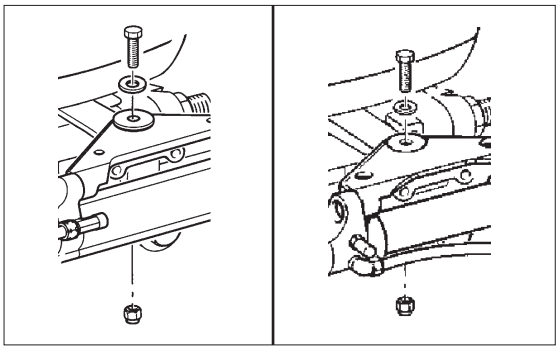




Hydraulic steering installation
BAYSTER, SEASTAR*

⚠ CAUTION

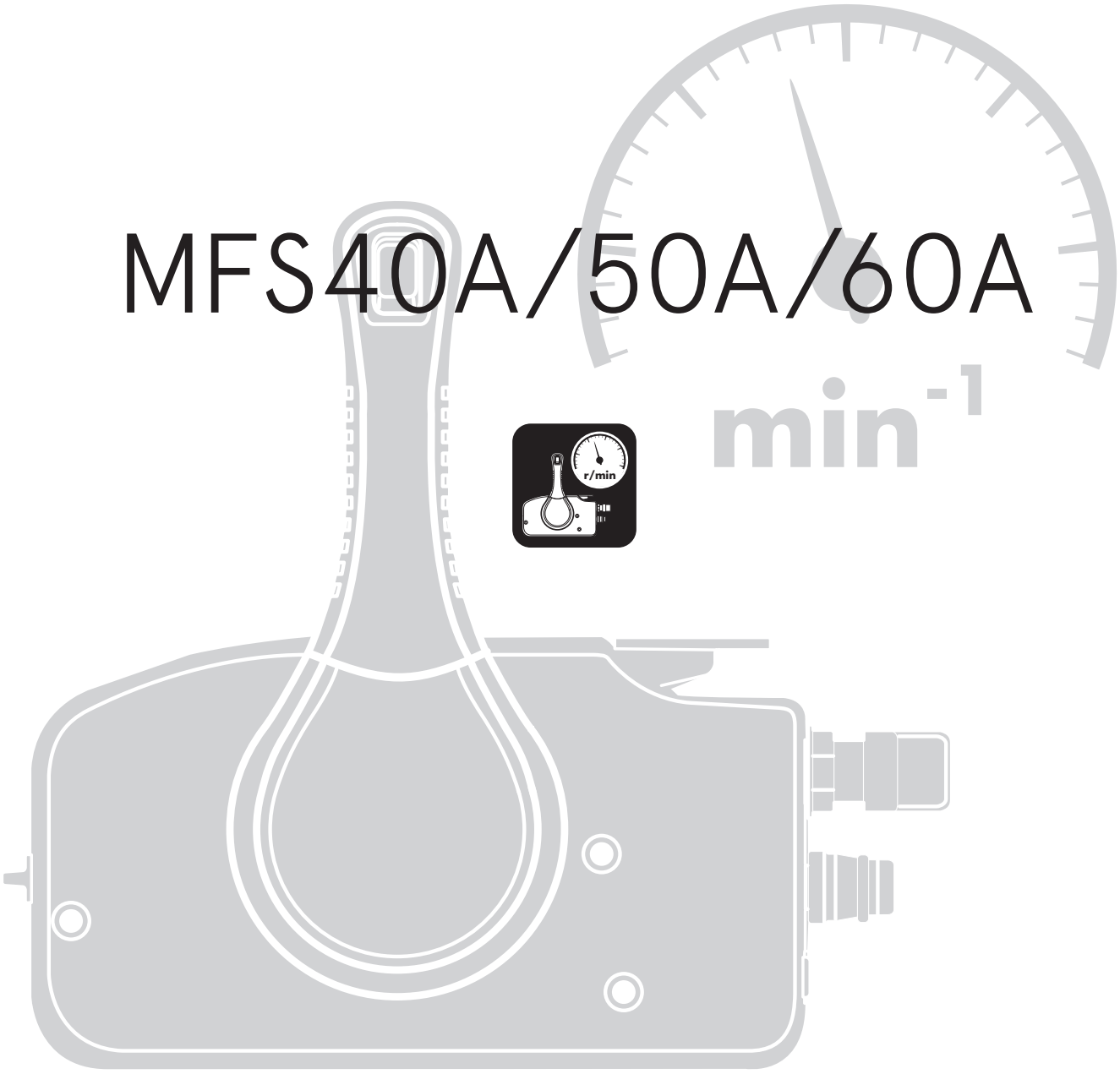
Sure to use the bolt, washer and nut supplied in the drag link assy. of the outboard motor when install the pivot plate to the steering arm.
Do not use the bolt supplied in the hydraulic steering kit.



BAYSTAR **SEASTAR**

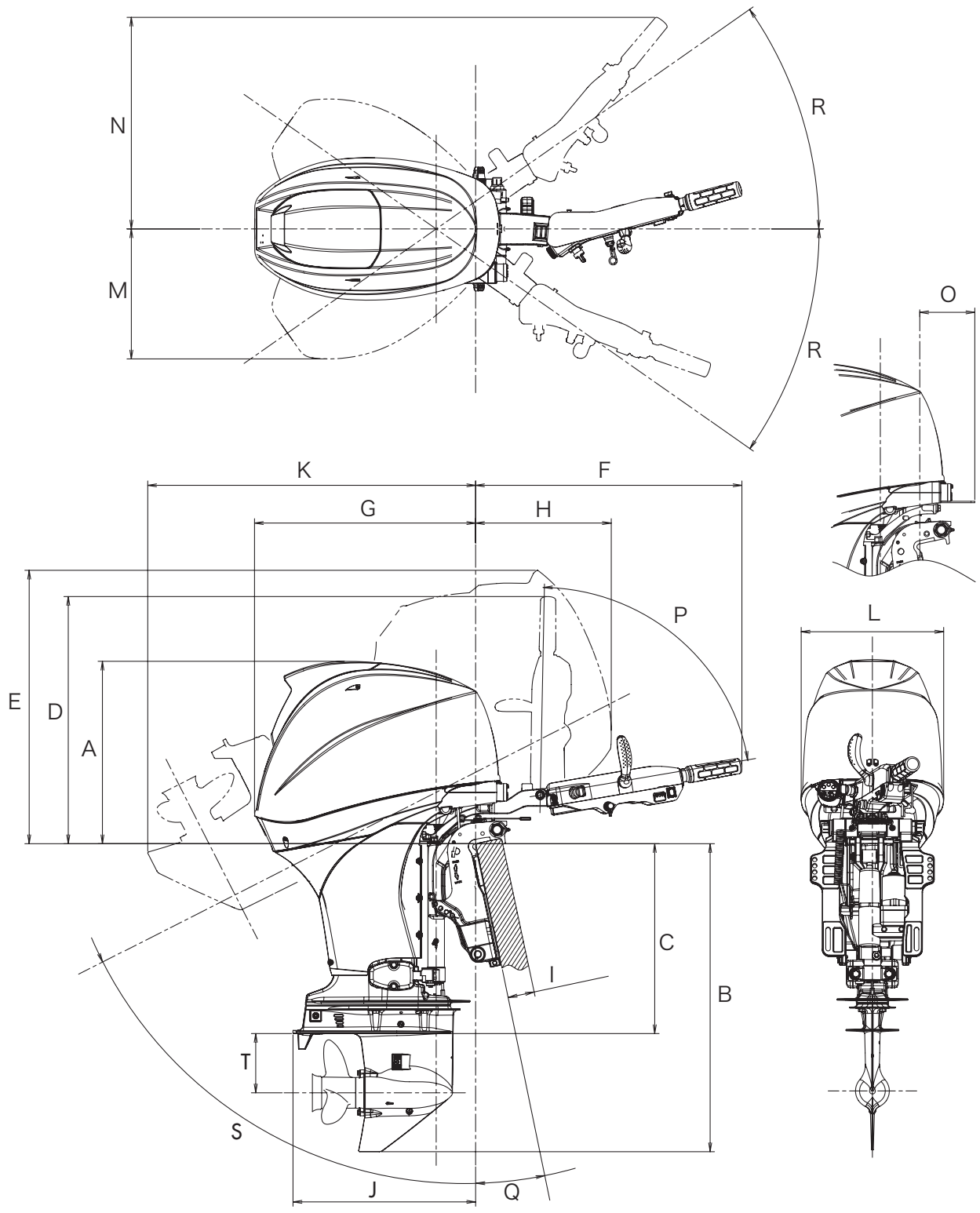
*SeaStar, and BayStar are all trademarks of DOMETIC.

MFS40A/50A/60A



1. Outline Dimensions

1) Engine Dimensions

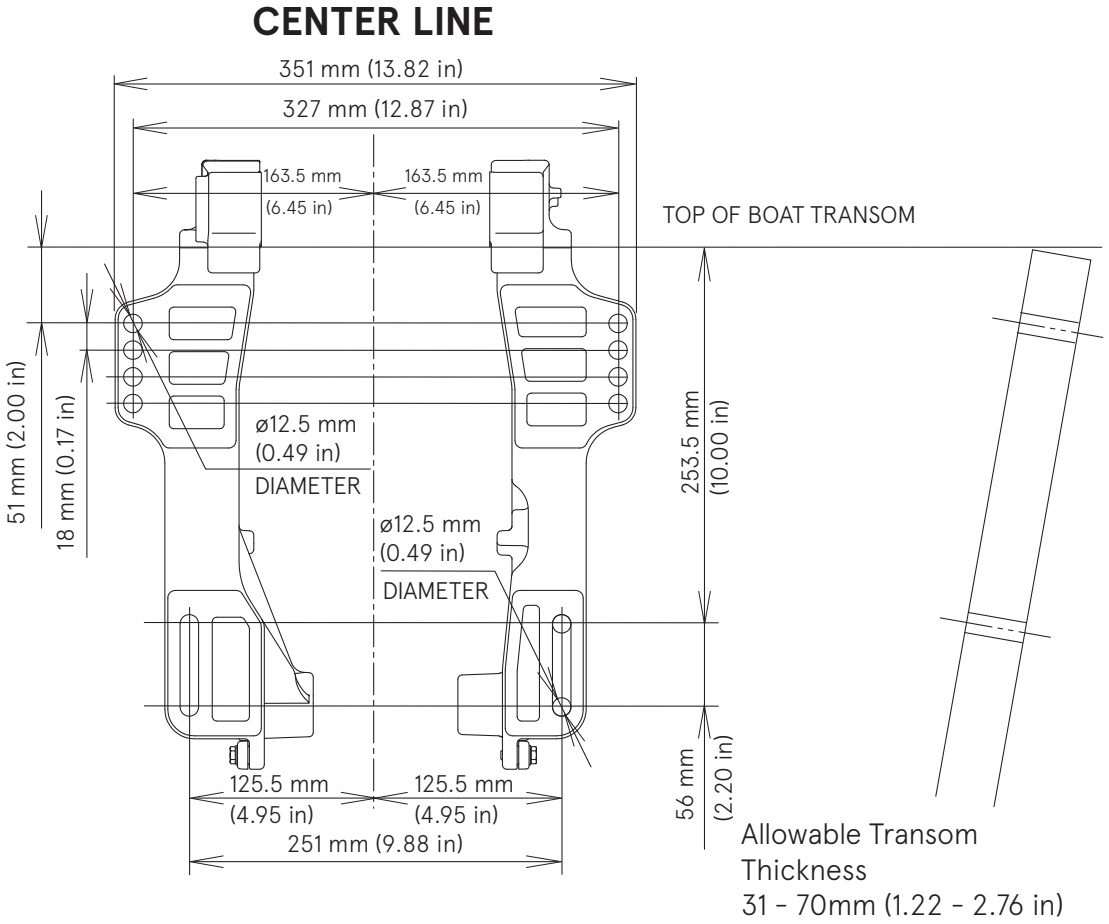


Item	Type	Unit	ET (with Remote Control)		ET (with Multi Tiller Handle)		EG (with Multi Tiller Handle)	
			mm	in	mm	in	mm	in
A		mm/in	517	20.35	517	20.35	517	20.35
B	S	mm/in	740	29.13	740	29.13	740	29.13
	L	mm/in	873	34.37	873	34.37	873	34.37
	UL	mm/in	987	38.86	987	38.86	987	38.86
C	S	mm/in	405	15.94	405	15.94	405	15.94
	L	mm/in	538	21.18	538	21.18	538	21.18
	UL	mm/in	652	25.67	652	25.67	652	25.67
D		mm/in	701	27.60	701	27.60	701	27.60
E		mm/in	775	30.51	775	30.51	775	30.51
F		mm/in	—	—	755	29.72	755	29.72
G		mm/in	627	24.68	627	24.68	627	24.68
H		mm/in	385	15.16	385	15.16	385	15.16
I		mm/in	31 – 70	1.22 – 2.76	31 – 70	1.22 – 2.76	31 – 70	1.22 – 2.76
J		mm/in	518	20.39	518	20.39	518	20.39
K	S	mm/in	811	31.93	811	31.93	811	31.93
	L	mm/in	930	36.61	930	36.61	930	36.61
	UL	mm/in	1031	40.59	1031	40.59	1031	40.59
L		mm/in	404	15.91	404	15.91	404	15.91
M		mm/in	369	14.53	369	14.53	369	14.53
N		mm/in	600	23.62	600	23.62	600	23.62
O		mm/in	156	6.14	—	—	—	—
P		deg.	—		80		80	
Q		deg.	12		12		—	
R		deg.	35		35		—	
S		deg.	62		62		56	
T		mm/in	168	6.61	168	6.61	168	6.61
Trim Angle (Position)		deg. *1	-4 to +16 (4)		-4 to +16 (4)		-4 to +16 (4)	

*1: The angle to the horizontal when 12 deg. transom

2) Clamp Dimensions

IMPORTANT: This is not a drill template.
Found it on page 111.



2. Service Information

The persons who perform the rigging should take sufficient care for prevention of damage to himself or herself and the product, prevention of fire, and ventilation of the shop.

The persons who operate the boat equipped with this product for test run should read the operating instructions of the outboard, and be familiar with the operating procedure.

3. Service Data

1) Load Limit of Boat

Do not over-power the boat and take care not to over-load the engine. Boat manufacturers specify the maximum allowable engine power and complement of their boat in accordance with certain standards and show the data on the plate attached to the boat. For unknown matters, if any, inquire to the manufacturer of the boat.

⚠ WARNING

Never use boat equipped with an outboard motor(s) that outputs power exceeding the maximum allowable limit specified by the manufacturer of the boat, or the following problems can occur.

- **The boat can go out of control.**
- **The buoyancy property of the boat varies from the designed value if the boat is overloaded especially at the transom.**
- **The boat may crack or be damaged around the transom.**

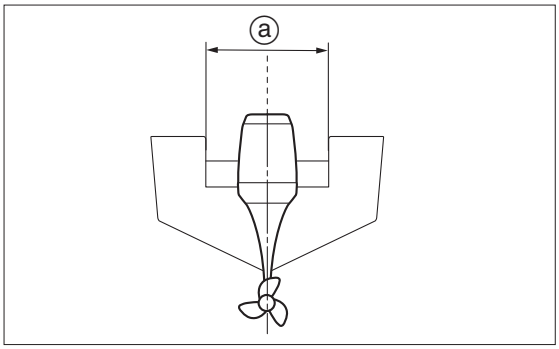
Over-powering boats can cause serious injury, fatal accident and/or serious damage to the hull.

2) Installation Dimensions

Minimum allowable size of transom opening : ⓐ

Single engine installation (Remote control models)

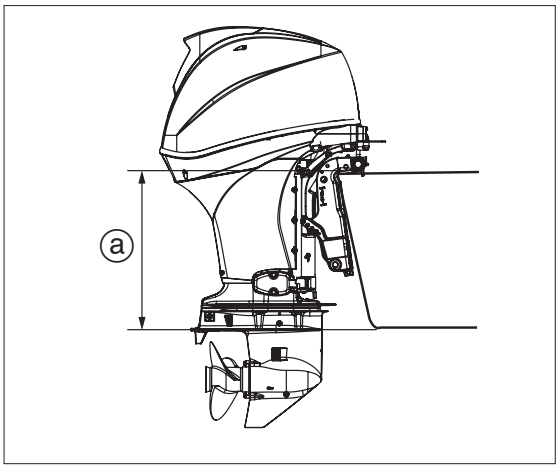
850 mm (33.46 in)



Installation of an outboard motor at too high of a position can cause the matters described below.

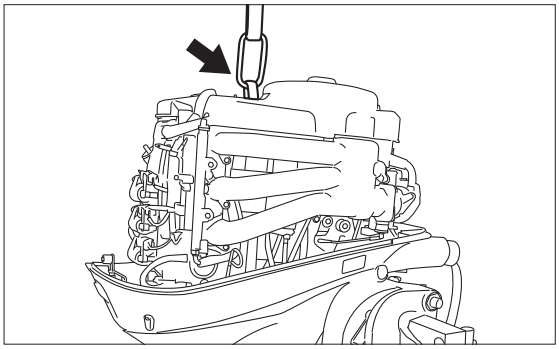
1) Sucking in air from the cooling water inlet causing an overheat
2) Possible loss of steering control.
3) Propeller can easily run above water surface (over-revs) during planing or when the boat is turning causing a loss of control.

ⓐ : Outboard installation height is the distance from the boat's bottom to upper edge of outboard motor transom bracket.



3) Hanging Outboard Motor

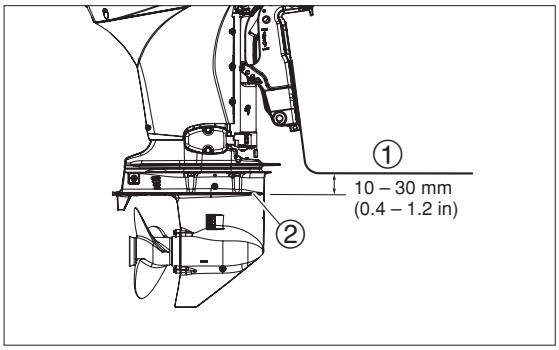
Use hanger installed on the engine.



4) Installation of Outboard Motor

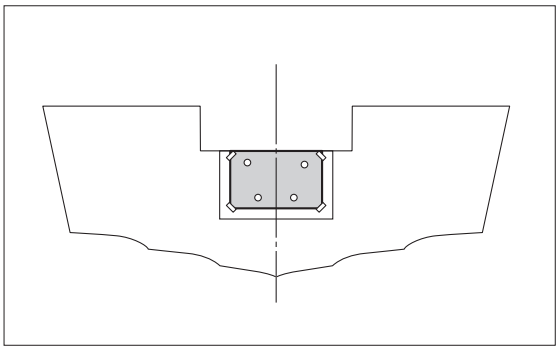
1. Besure that the antiventilation plate of the outboard motor is 10 – 30 mm (0.4 – 1.7 in) below the bottom of hull.

① : Bottom of hull
② : Anti ventilation plate



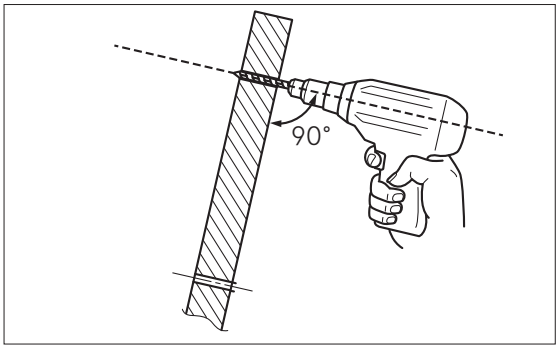
2. Put the outboard motor installation template on the transom (the template is shown on page 111).

Align center line of template with center line of transom accurately.

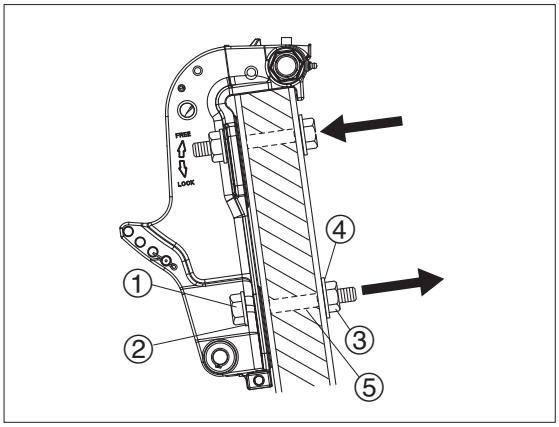


3. Mark up the transom with four 12.7 mm (1/2 in) mounting holes and drill.

Drill at right angle to transom surface to align the transom holes with outboard motor's transom bracket holes accurately.



4. Secure the outboard motor by using fasteners contained in the package of the product.
   ① : 12mm diameter, Bolts (4 pcs.)
   ② : Flat Washers (4 pcs.)
   ③ : Nuts (4 pcs.)
   ④ : Flat Washers (4 pcs.)
   ⑤ : Marine Sealant : Apply to the bolts' surface excluding their threaded area.



4. Fuel System

It is recommended to install additional fuel/water separator on the boat to effectively remove water and foreign substances contained in the fuel. If the improper size fuel/water separator is added to the fuel system this may prevent smooth flow of fuel which could lead to the engine stalling or resulting in damage to the engine due to fuel starvation. Use of a valve fitting can also cause similar troubles.

Filter requirements:
Flow Rate: 200 L/H (53 GPH) or more
Filter Rating: 10 Micron

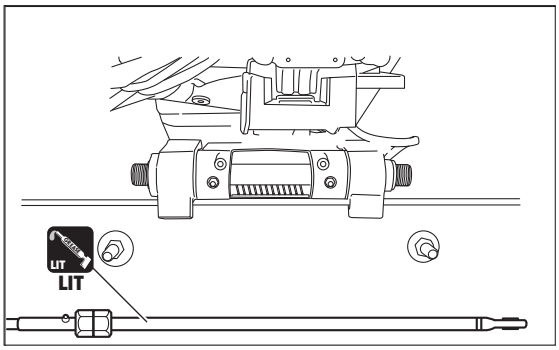
Recommended fuel filter water separator
Water/Fuel Separator Filter Kit :
P/N. 3KY-02230-0
Replacement 10 micron filter :
P/N. 3KY-02259-0

5. Connections to Outboard Motor

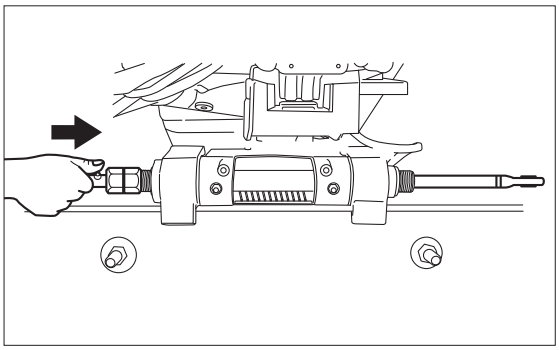
1) Steering Cable

Cable arranged on the starboard side

1. Apply thin coat of grease to entire area of cable end.



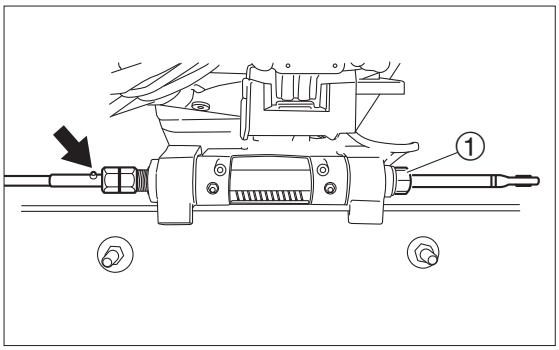
2. Insert the steering cable end into the tilt tube.



3. Tighten nut to specified torque.

Nut :
48 N · m (35 lb · ft) [4.8 kgf · m]

Do not overtighten the drag link seal ring ① or it may deform and the telescopic shaft of steering cable will not be sealed properly.



2) Drag Link

1. Attach drag link as shown.

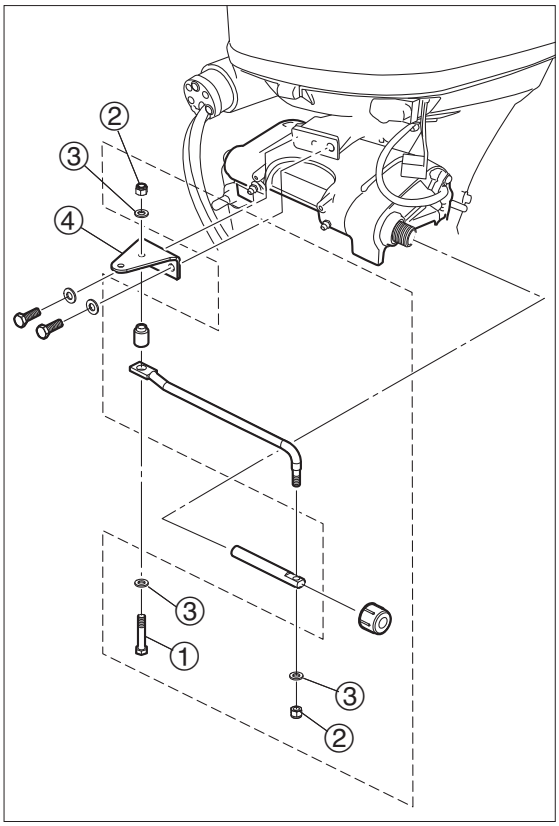
When installing the drag link that connects engine and steering cable, be sure to use special bolt ①, nylon lock nuts ② washer ③ and collar ④. Do not not use regular bolts and non-lock type nuts in place of these bolts and lock nuts, or the nuts may be loosened due to mechanical vibration resulting in disconnection of the link rod.

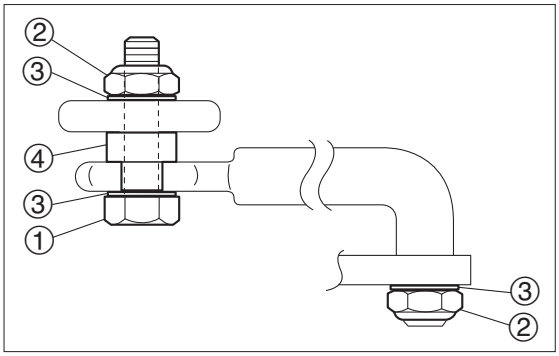
⚠ WARNING

Disconnection of the drag link will cause the boat to turn accidentally. The sudden turn of the boat may cause the passenger to be thrown overboard, leading to serious injury or fatal accident.

Bolt ① :
27 N · m (20 lb · ft) [2.7 kgf · m]
Nylon Nuts ② :
Fully tighten, and then loosen 1/4 of a turn.

Washer ③
Collar ④

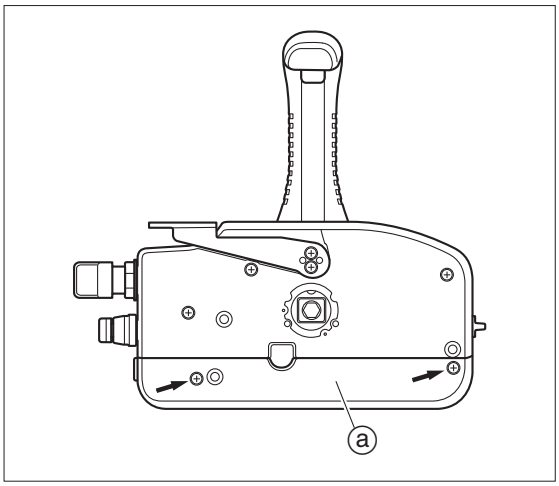




3) Installation of Remote Control Cable (Remote Control Head Side)

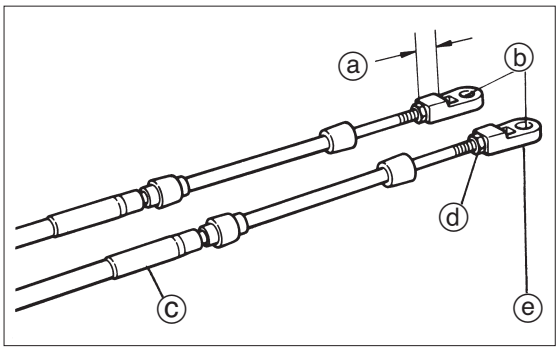
1. Unscrew two screws from the rear panel, then detach the rear panel.

   ⓐ Rear Panel



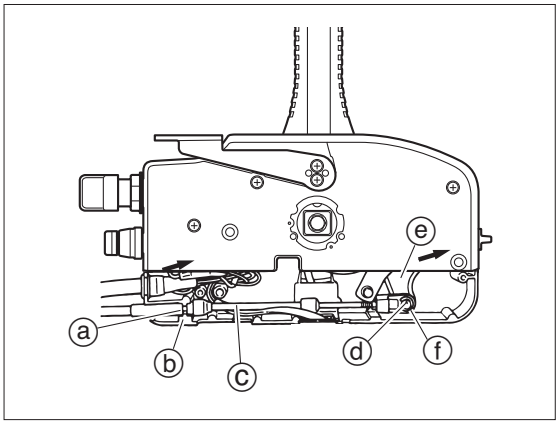
2. Thread the tip of the remote control cable into the cable joint up to approx. 11 mm, then lock them with a lock nut. Here, apply grease to the hole of the cable joint.

   ⓐ Approx.11mm (0.43inch)
   ⓑ Apply Grease
   ⓒ Remote ControL Cable
   ⓓ Lock Nut
   ⓔ Cable Joint



3. Engage the outer groove of the shifting remote-control cable with the clamp groove of the housing.
   Then, insert the end pin of the shift arm into the cable joint, and lock them with E-ring.

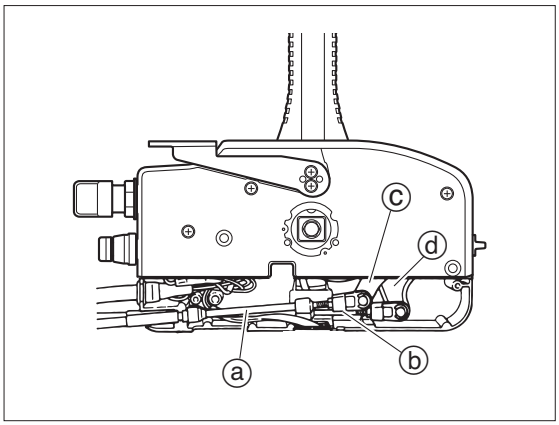
   ⓐ Outer Groove
   ⓑ Grommet
   ⓒ Remote Control Cable for Shift
   ⓓ Shift Arm Pin
   ⓔ Shift Arm
   ⓕ E-Ring



4. Insert an associated grommet into the clamp groove.

5. Similar to the remote-control cable for shifting. attach the remote-control cable for throttling to the throttle arm.

ⓐ Remote Control Cable for Throttle
ⓑ Remote Control Cable for Shift
ⓒ Throttle Arm
ⓓ Shift Arm

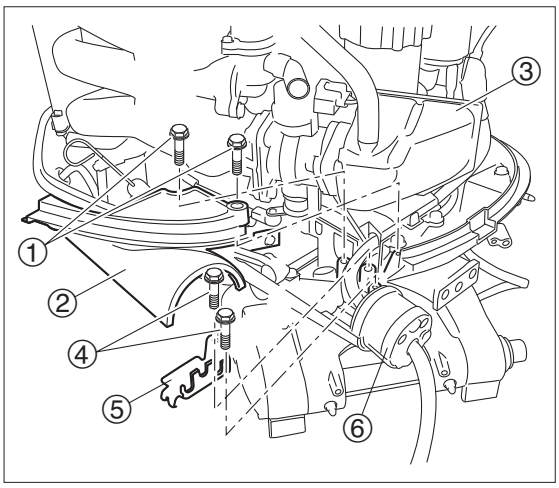


6. Fix the rear panel securely with two screws.

(Engine Side)

1. Remove bolts ① and then remove remote control cable stay cover ②.

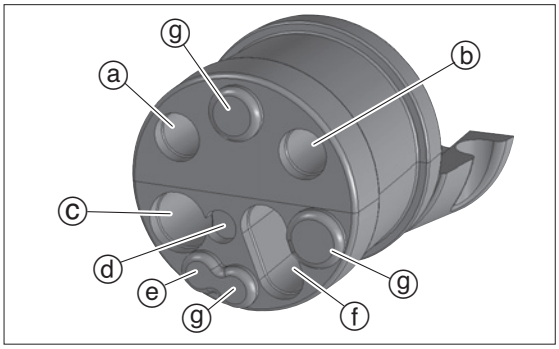
Remove air silencer ③ to easily remove bolts ①.



2. Remove bolts ④ and then remove cable clip ⑤.

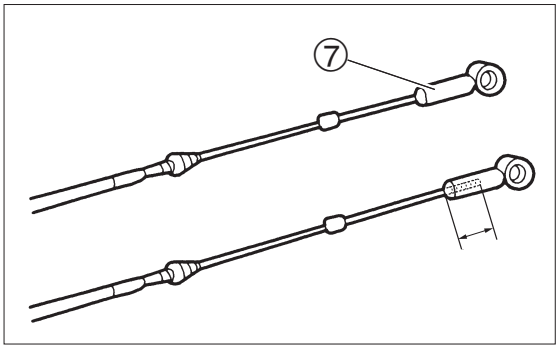
3. Remove grommet ⑥.

ⓐ Shift cable
ⓑ Throttle cable
ⓒ Main harness
ⓓ Meter cord Ass'y
ⓔ Trim sensor
ⓕ Battery cables
ⓖ Spare hole

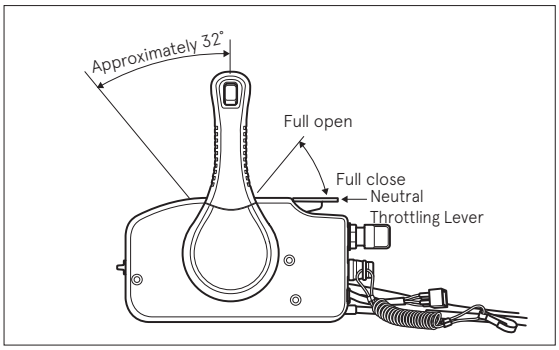


4. Pass through cord Ass'y, hose and control cable into the specified hole of cord grommet, as shown.

5. Screw cable joint ⑦ on the tip of remote control cable by approximately 0.47 in (12 mm), equivalent to 11 threads. Open the cut of grommet and run meter cord ass'y and Main harness attached to remote control box from front of lower motor cover. Then, run two remote control cables.



6. Shift cable is the one of which tip is moved when remote control lever is set to forward (F) side until it stops once (approx. 32 degrees).

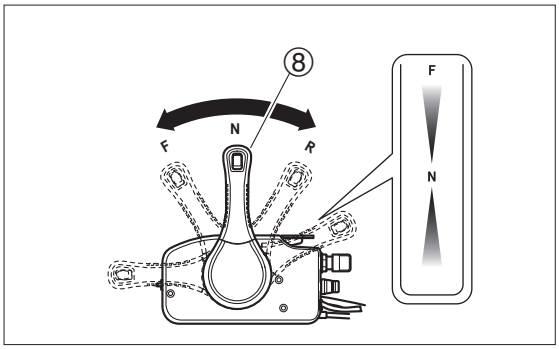


7. Set remote control lever to neutral (N), and check that neutral throttling lever is at full close position.

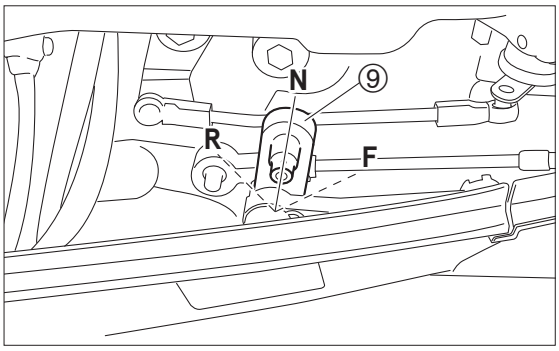
8. Place shift lever ⑧ at neutral position.

⚠ CAUTION

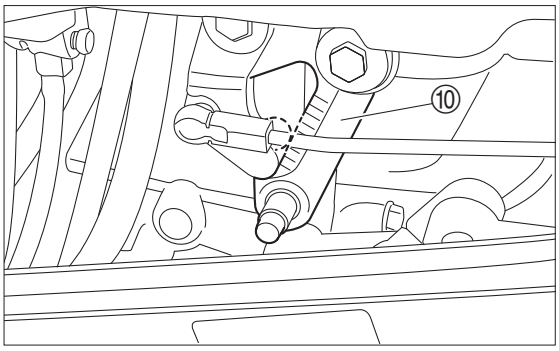
Shift lever cannot work unless throttle is fully closed. Do not force the shift.



9. Set shift arm ⑨ to forward (F), neutral (N), reverse (R) and then to neutral (N) positions.



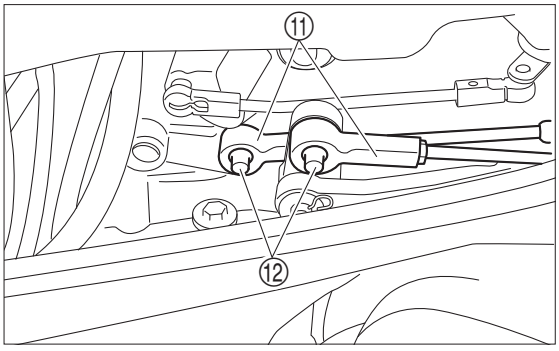
10. Set throttle cam ⑩ to full close position.



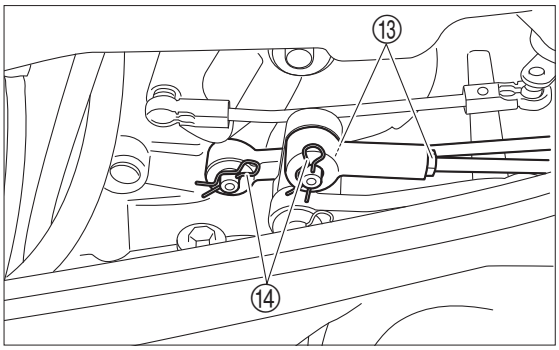
11. Adjust screw-in length of cable joint ⑪ so that hole of cable joint is brought to throttle arm pin and shift arm pin ⑫.

⚠ WARNING

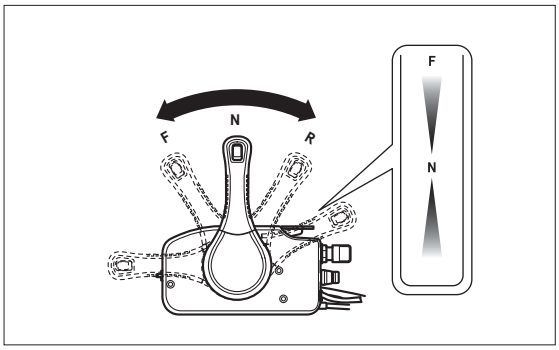
Screw-in remote control cable joint at least 10 mm (0.39 in) ⓗ.



12. Lock joint with nut ⑬, put in on the pin, and secure with washer and R-pin ⑭.

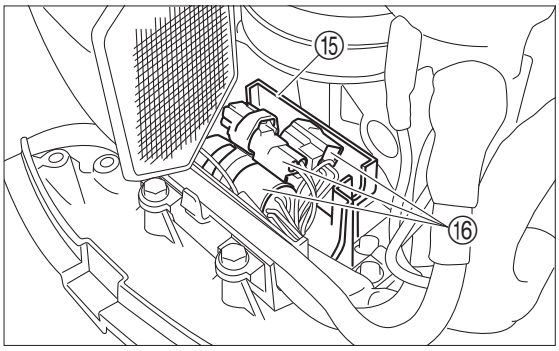


13. Check the shift lever operation to forward (F), neutral (N) and reverse (R) position.
Rotate prop shaft when shifting the control either into (F) Forward or to (R) Reverse.

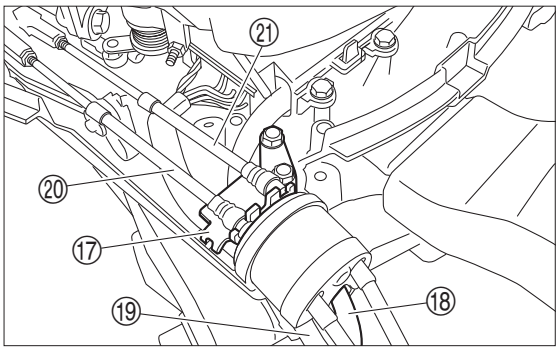


14. Open cable terminal holder cover ⑮, connect three connectors ⑯, and then close cover.

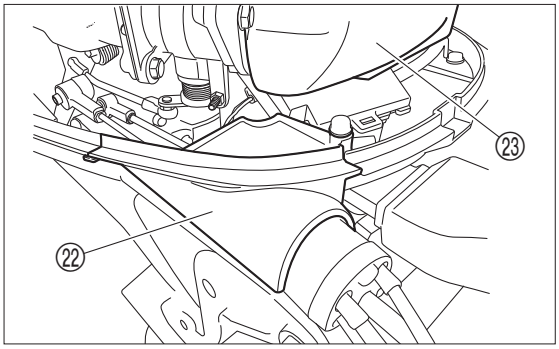
> **⚠ CAUTION**
>
> **Do not disconnect cord ass'y while engine operates.**



15. Install cable clip ⑰ to mount battery cable ⑱ and main harness ⑲.
Install grommet, and insert shift cable ⑳, throttle cable ㉑ to cable clip.



16. Install remote cont. cable stay cover ㉒, and then install air silencer ㉓.



6. Lower Unit

1) Installation of Propeller

⚠ WARNING

- **Before removing or installing propeller, be sure to disconnect battery cables from battery and remove stop switch lock plate.**
- **When removing or installing propeller, do not handle propeller with bare hands.**
- **Put a piece of wooden block between anti-ventilation plate and propeller to prevent rotation of propeller when removing or installing propeller.**

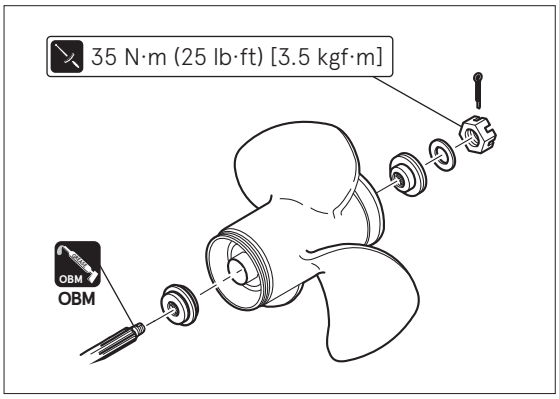
1. Set shift lever to neutral (N) position.
2. Remove both the battery cables from battery and the stop switch lock plate.
3. Apply grease to propeller shaft.
4. Put propeller parts on the propeller shaft in the order as shown.
5. Put a piece of wood in between gear case and propeller, and tighten nut to specified torque.

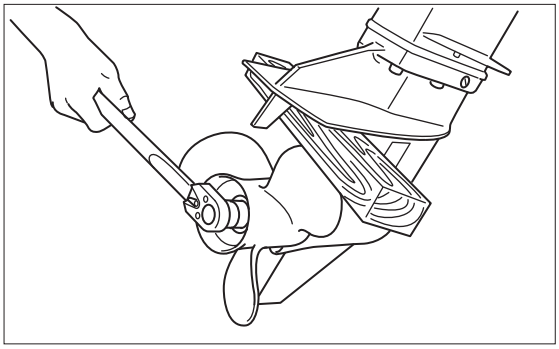
Propeller Nut :
35 N · m (25 lb · ft) [3.5 kgf · m]

6. Put split pin in the nut and bend.

⚠ CAUTION

Check nut for looseness at least every 20 hours of operation.



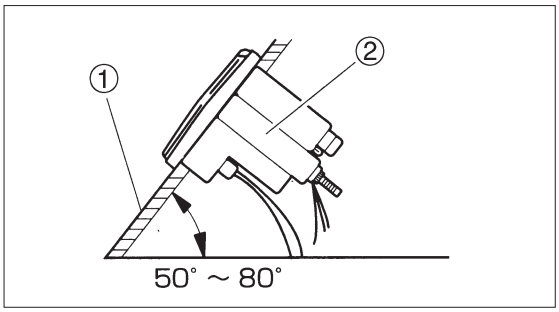


7. Installation of Meters and Battery

1) Installation of Meters

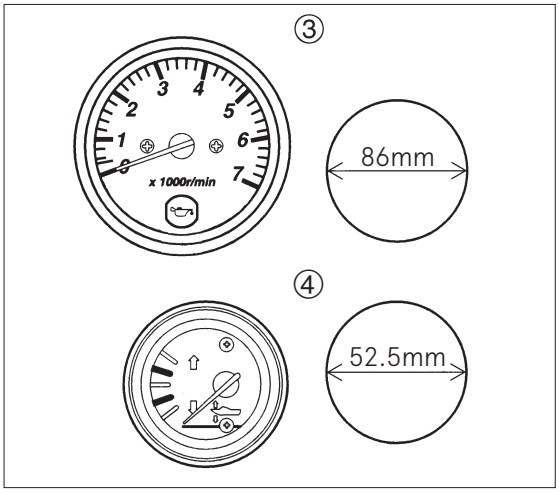
When installing meters, select a place on the dash board ① where operator can watch them easily and they are not exposed to direct water spray.

The meters can be installed on the dash board ① of 2 to 11mm thick. When the thickness is over 11 mm (0.43 in), cut fitting plate ② so that the meters can be installed.



・Angle of Installation

Install meters so that the angle is in between 50 to 80 degrees from horizontal plane.



③ Large Sized Meters : Tachometer ③ and Speedometer

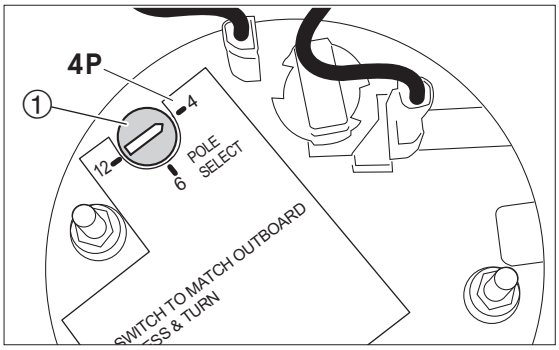
Installation Opening Diameter : 86mm (3-3/8 in)

④ Small Sized Meters : Trim Meter ④, Volt Meter, etc.

Installation Opening Diameter : 52.5mm (2-1/16 in)

・Tachometer

Set selector ① to "4P" on the back of the meter.



2) Installation of Battery

This outboard motor cannot be operated without using battery.

Minimum battery requirements:

512 Cold Cranking Amps(CCA), 70Ah/20HR

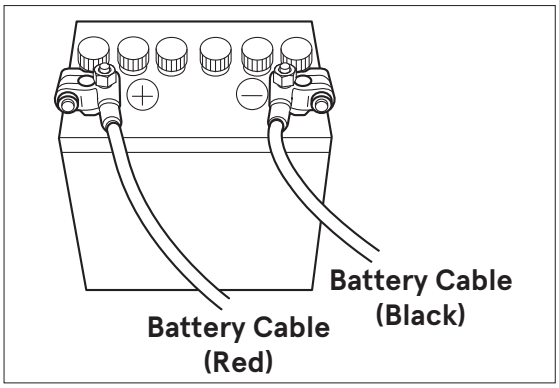
Larger capacity battery is required when it is using freezing condition.

Recommend connecting only the engine battery cables to the starting battery.

① Battery should be stored in battery storage box and secured to hull to prevent it from falling due to rolling or pitching or any shock in the place where it is protected from water spray.

② When connecting battery cables, connect positive cable (red) first and then negative cable (black). (Reverse the order when disconnecting.)

Positive cable is the one with red tube on the terminal end.

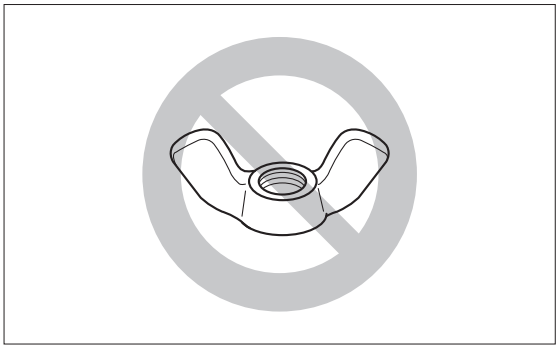


⚠ CAUTION

- **Before using battery, thoroughly read warning label.**
- **Do not disconnect battery cable during engine operation.**

⚠ CAUTION

Do not use a wing/butterfly nut for installing the battery cable.
A wing/butterfly nut tends to get loose easily, resulting in electrical failures.
Recommend to fasten with correct hex-nut and if washer is needed possibly locking washer or star washer to prevent accidental loosening of nuts.

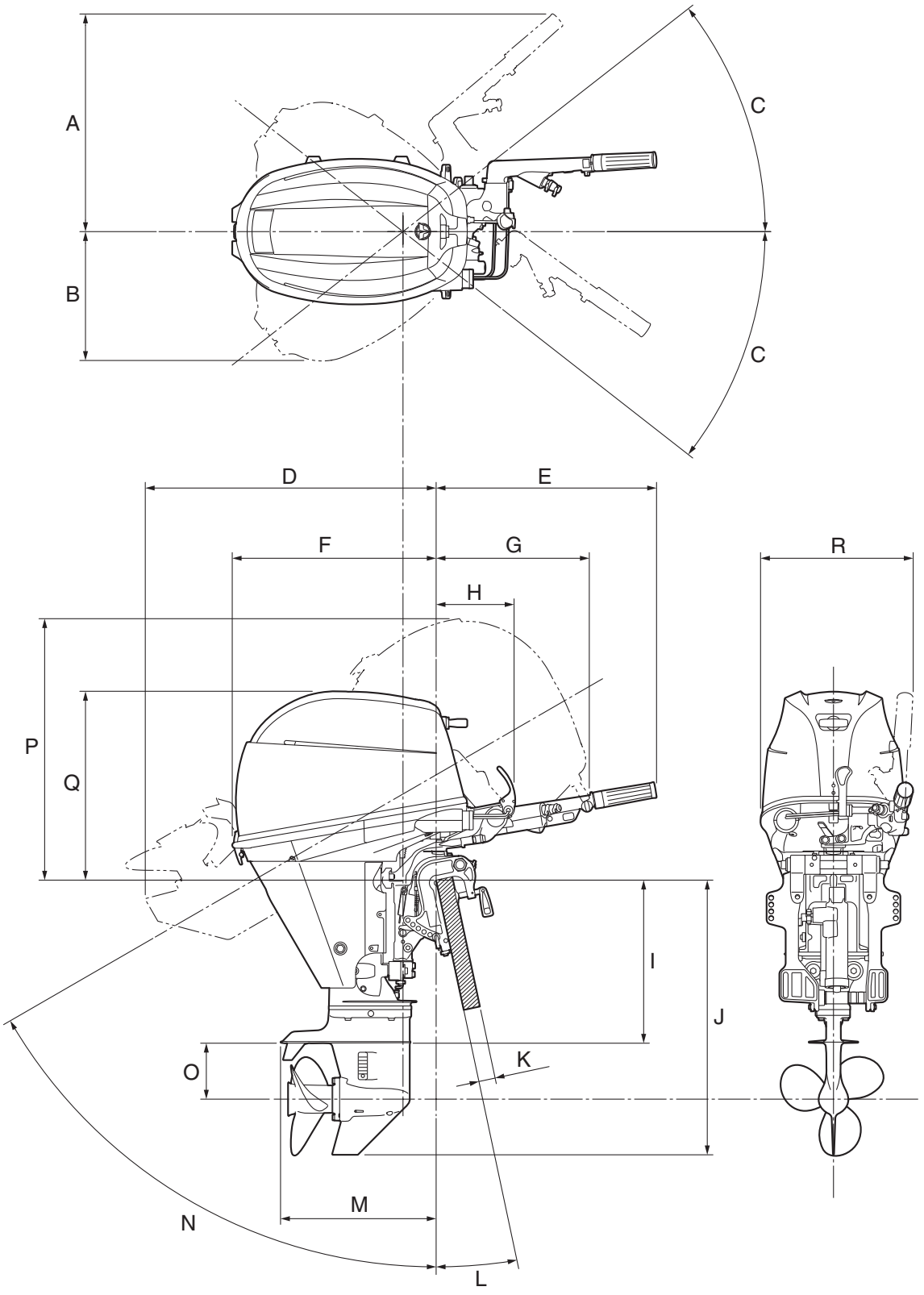


MFS25D/30D

1. Outline Dimensions

1) Engine Dimensions

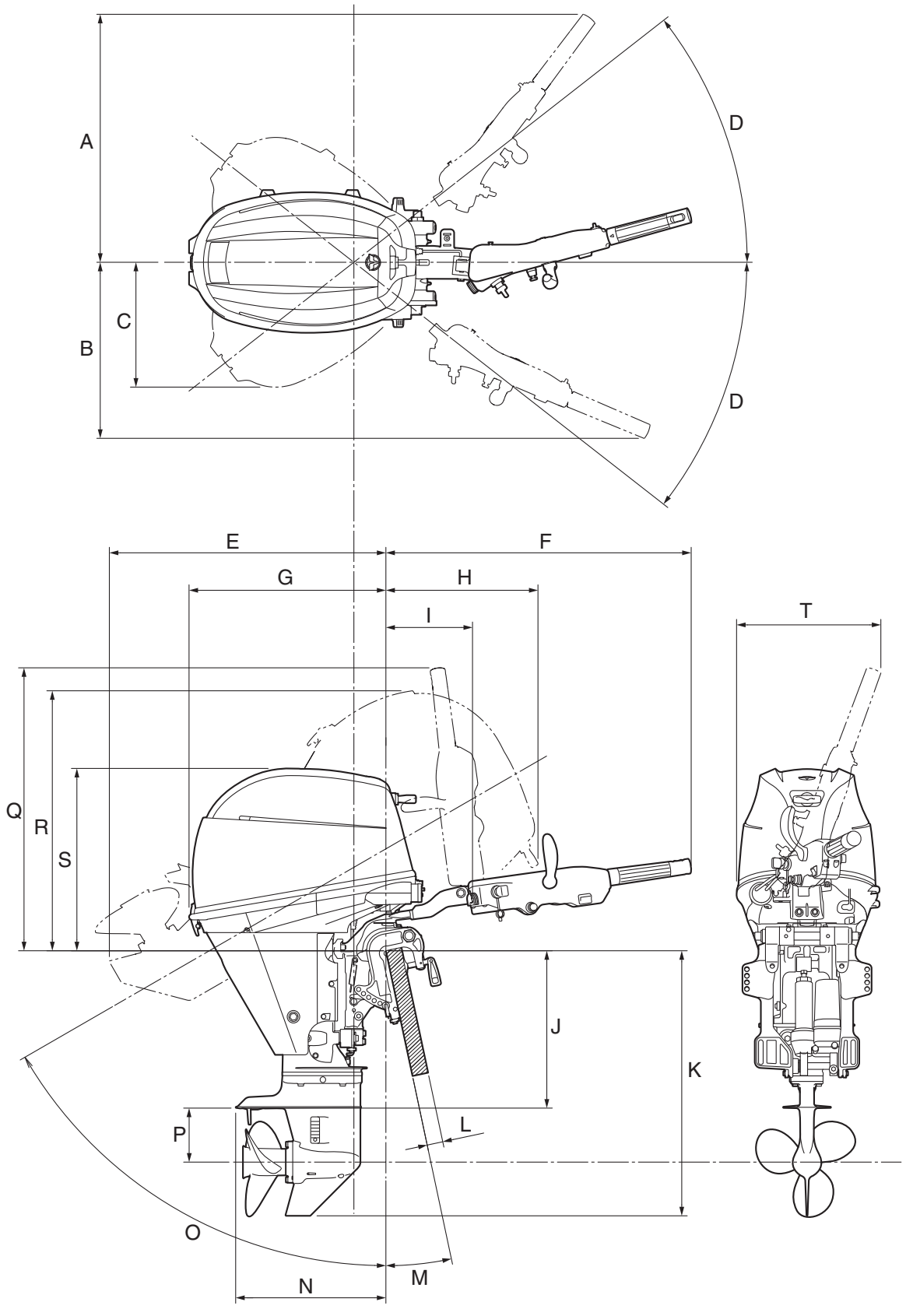
Basic Tiller Handle Model



Item	Type	Unit	MF/EF (Manual Tilt Model)		EFG (Gas Assist Model)		EFT (Power Tilt Model)	
			mm	in	mm	in	mm	in
A		mm/in	571	22.50	571	22.50	571	22.50
B		mm/in	338	13.30	338	13.30	338	13.30
C		deg.	38					
D	S	mm/in	763	30.05	768	30.25	777	30.60
	L	mm/in	873	34.35	873	34.35	889	35.00
	UL	mm/in	983	38.70	978	38.50	1001	39.40
E		mm/in	578	22.75	555	21.85	555	21.85
F		mm/in	535	21.05	558	21.95	558	21.95
G		mm/in	406	15.98	381	15.00	401	15.79
H		mm/in	204	8.05	182	7.15	182	7.15
I	S	mm/in	425	16.75	425	16.75	425	16.75
	L	mm/in	552	21.75	552	21.75	552	21.75
	UL	mm/in	679	26.75	679	26.75	679	26.75
J	S	mm/in	721	28.40	721	28.40	721	28.40
	L	mm/in	848	33.40	848	33.40	848	33.40
	UL	mm/in	975	38.40	975	38.40	975	38.40
K		mm/in	40-60	1.55-2.35	40-60	1.55-2.35	40-60	1.55-2.35
L		deg.	12					
M		mm/in	408	16.05	431	16.95	431	16.95
N		deg.	60		56		62	
O		mm/in	147	5.80	147	5.80	147	5.80
P		mm/in	686	27.00	703	27.65	706	27.80
Q		mm/in	495	19.50	495	19.50	495	19.50
R		mm/in	401	15.80	401	15.80	401	15.80
Trim Angle (Position)		deg. *1	-9 to 16 (6)		-4 to 8 (4)			

*1: Angle from the vertical position when the transom angle is at 12°

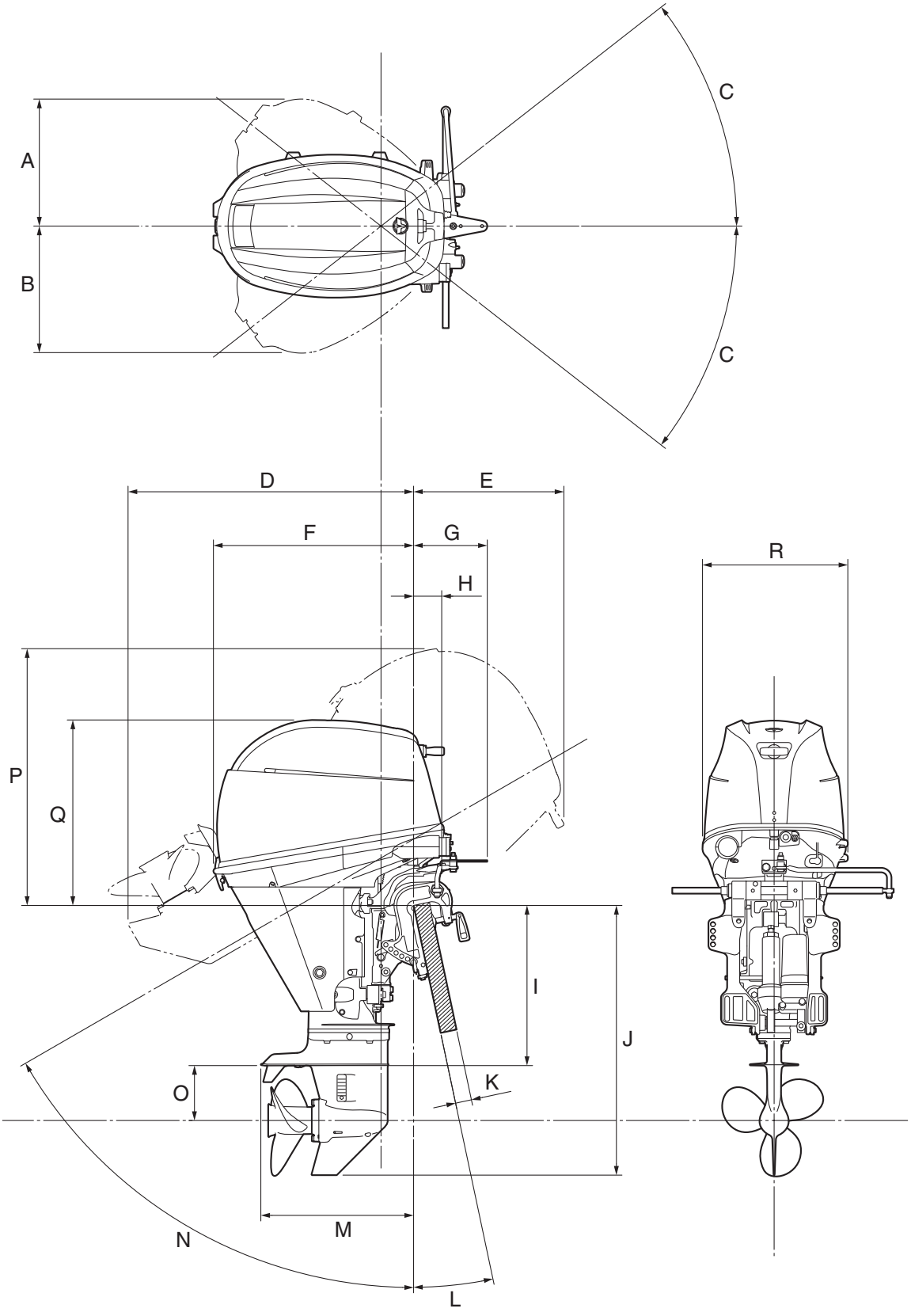
Multi-Function Tiller Handle Model



Item	Type	Unit	EH (Manual Tilt Model)		EHT (Power Tilt Model)	
			mm	in	mm	in
A		mm/in	674	26.55	674	26.55
B		mm/in	479	18.85	479	18.85
C		mm/in	338	13.30	338	13.30
D		deg.	38			
E	S	mm/in	763	30.05	777	30.60
	L	mm/in	873	34.35	889	35.00
	UL	mm/in	983	38.70	1001	39.40
F		mm/in	830	32.65	806	31.75
G		mm/in	535	21.05	559	22.00
H		mm/in	406	15.98	401	15.79
I		mm/in	235	9.25	212	8.35
J	S	mm/in	425	16.75	425	16.75
	L	mm/in	552	21.75	552	21.75
	UL	mm/in	679	26.75	679	26.75
K	S	mm/in	721	28.40	721	28.40
	L	mm/in	848	33.40	848	33.40
	UL	mm/in	975	38.40	975	38.40
L		mm/in	40-60	1.55-2.35	40-60	1.55-2.35
M		deg.	12			
N		mm/in	408	16.05	432	17.00
O		deg.	60		62	
P		mm/in	147	5.80	147	5.80
Q		mm/in	769	30.25	769	30.25
R		mm/in	707	27.85	705	27.75
S		mm/in	495	19.50	495	19.50
T		mm/in	392	15.45	392	15.45
Trim Angle (Position)		deg. *1	-9 to 16 (6)		-4 to 8 (4)	

*1: Angle from the vertical position when the transom angle is at 12°

Remote Control Model



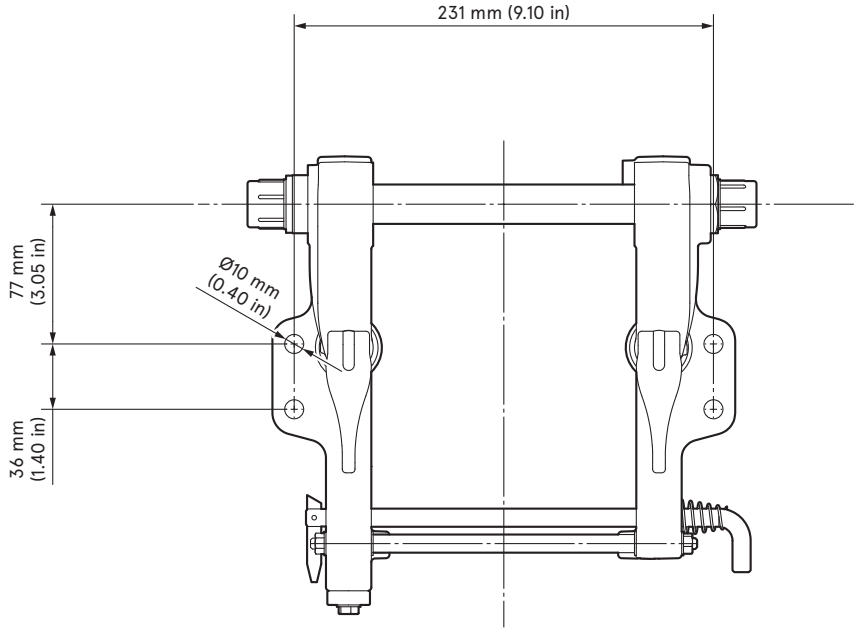
Item	Type	Unit	EP (Manual Tilt Model)		EPT (Power Tilt Model)	
			mm	in	mm	in
A		mm/in	338	13.30	338	13.30
B		mm/in	338	13.30	338	13.30
C		deg.	38			
D	S	mm/in	763	30.05	777	30.60
	L	mm/in	873	34.35	889	35.00
	UL	mm/in	983	38.70	1001	39.40
E		mm/in	406	15.98	401	15.79
F		mm/in	535	21.05	559	22.00
G		mm/in	197	7.75	173	6.80
H		mm/in	75	2.95	51	2.00
I	S	mm/in	425	16.75	425	16.75
	L	mm/in	552	21.75	552	21.75
	UL	mm/in	679	26.75	679	26.75
J	S	mm/in	721	28.40	721	28.40
	L	mm/in	848	33.40	848	33.40
	UL	mm/in	975	38.40	975	38.40
K		mm/in	40-60	1.55-2.35	40-60	1.55-2.35
L		deg.	12			
M		mm/in	408	16.05	432	17.00
N		deg.	60		62	
O		mm/in	147	5.80	147	5.80
P		mm/in	686	27.00	705	27.75
Q		mm/in	495	19.50	495	19.50
R		mm/in	389	15.30	389	15.30
Trim Angle (Position)		deg. *1	-9 to 16 (6)		-4 to 8 (4)	

*1: Angle from the vertical position when the transom angle is at 12°

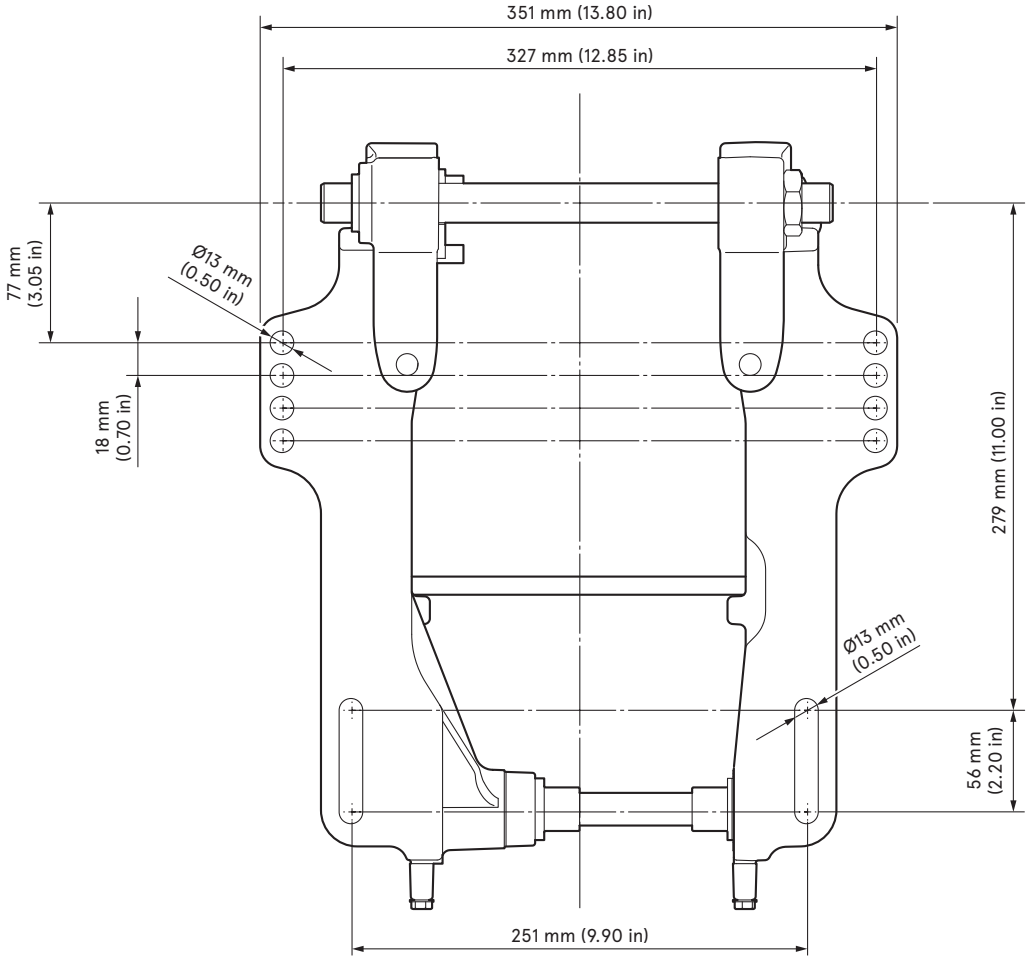
2) Transom Bolts

IMPORTANT: This is not a drill template. Found it on page 111.

Manual Tilt Model



Gas Assist/Power Tilt Model



2. Service Information

The installer shall ensure the work environment is safe by paying adequate attention to factors including fire prevention and ventilation so as not to cause injuries or damage the product.

3. Service Data

1) Boat Mounting Restriction

Be careful not to overload the boat or mount an engine with an output that is too large for the boat. A plate indicating the maximum permissible output and seating capacity set by the manufacturer according to specific standards is displayed on the boat. If you have any doubts or questions, consult your dealer or the boat manufacturer.

⚠ WARNING

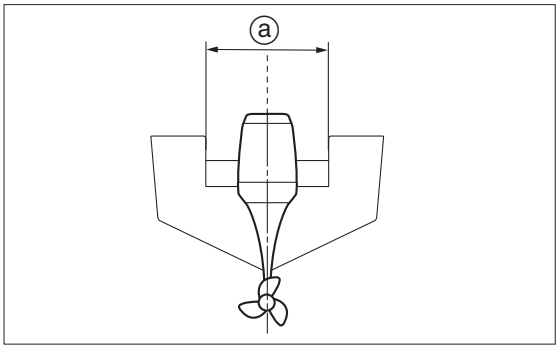
Never mount an outboard motor exceeding the maximum output set by the boat manufacturer as the following problems may occur.
· The boat may become uncontrollable.
· The design buoyancy characteristics of the boat may change by mounting an excessive weight on the transom.
· In particular, cracks or damage may occur in the boat around the transom area.
An overpowered boat may cause serious injuries, death, or damage to the boat.

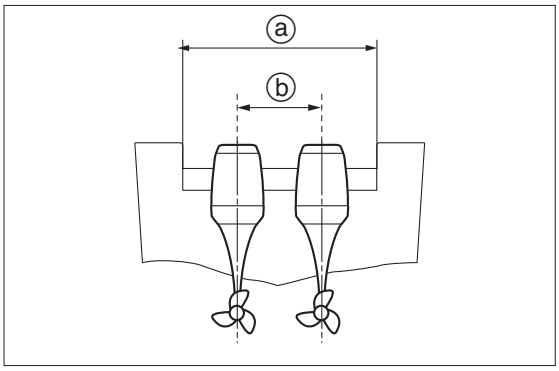
2) Mounting Dimensions

Transom Opening Smallest Dimension: ⓐ
1-engine mounted 696 mm (27.40 in)
2-engine mounted 1256 mm (49.45 in)

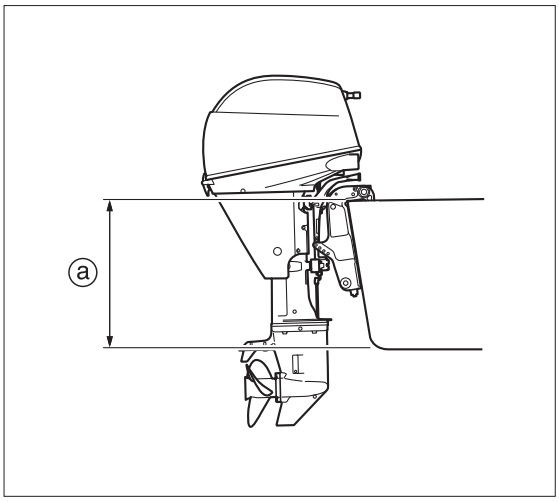
Minimum engine centerline distance when 2 engines are mounted: ⓑ
560 mm (22.05 in)

When the mounting height of the outboard motor is too high, the engine may overheat or the components of the gear case may be damaged.



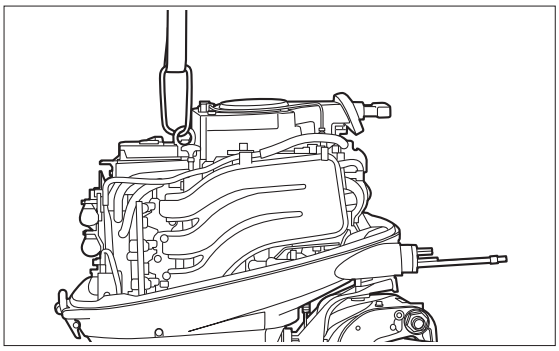


ⓐ: The transom height is the height from the bottom of the boat hull to the top of transom board.



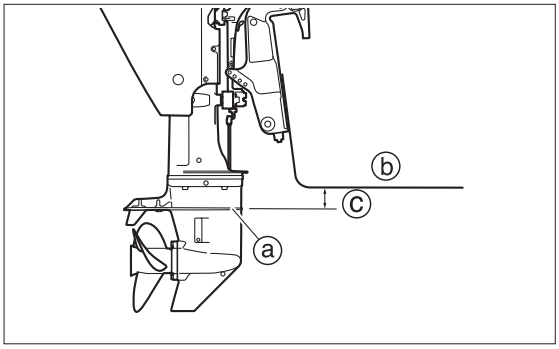
3) Lifting Up the Outboard Motor

Use an engine hanger.



4) Installation of the Outboard Motor

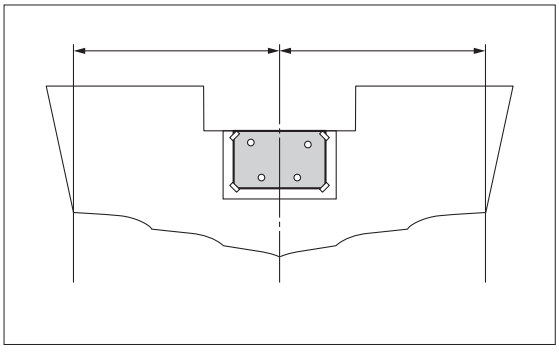
1. Install the outboard motor so that the interval ⓒ between the anti-ventilation plate ⓐ and the hull bottom ⓑ is 0 to 25 mm (0 to 1 in).



If the mounting height of the outboard motor is too high, the following may occur.

1) Air may be sucked in through the cooling water inlet port, and overheating may occur easily.
2) Steering performance deteriorates.
3) When planing, or when the load is heavy, the propeller tends to idle easily.

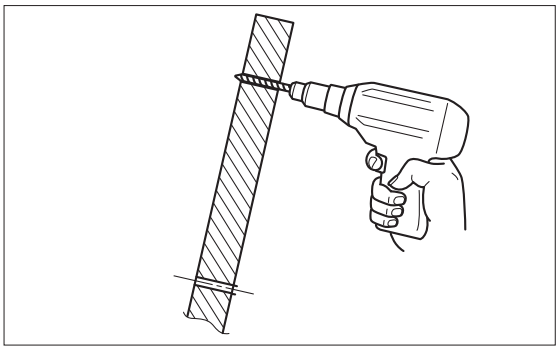
2. Attach an outboard motor mounting template to the boat transom (the template is shown on page 111).



Adjust the centerline of the template accurately to the center of the boat transom.

3. Power Tilt/Gas-Assist Type
   Mark the mount holes and drill 4 holes with a diameter of 12.5 mm (0.49 in).

   Manual Tilt Type
   Decide the mounting location and firmly tighten the clamp screw handle. Mark the mount holes and drill 2 holes with a diameter of 9.0 mm (0.35 in).

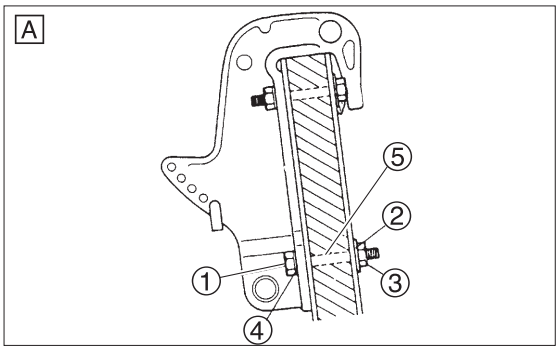


> To align correctly with the positions of the holes in the outboard motor's transom bracket, make holes that are perpendicular to the transom.

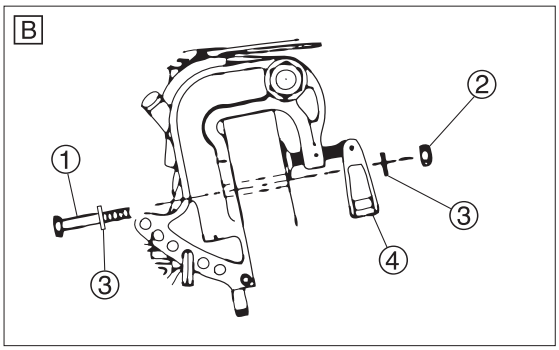
4. Refer to "Installation Dimensions" and install the outboard motor at the recommended height.

5. Secure the outboard motor with the enclosed mounting bolts and nuts as shown in the diagram.

   [A] Power Tilt/Gas-Assist Type
   ①: Bolt 12 x 105 mm (0.47 x 4.13 in), (4pcs)
   ②: Flat washer large (4pcs)
   ③: Nylon nut (4pcs)
   ④: Flat washer small (4pcs)
   ⑤: Marine sealing agent: Apply, avoiding the threaded section of the bolt.



   [B] Manual Tilt Type
   ①: Bolt 8 x 85 mm (0.31 x 3.35 in), (2pcs)
   ②: Nylon nut (2pcs)
   ③: Flat washer (4pcs)
   ④: Clamp screw



4. Fuel System

It is recommended to install additional fuel/water separator on the boat to effectively remove water and foreign substances contained in the fuel. If the improper size fuel/water separator is added to the fuel system this may prevent smooth flow of fuel which could lead to the engine stalling or resulting in damage to the engine due to fuel starvation. Use of a valve fitting can also cause similar troubles.

Filter requirements:
Flow Rate: 200 L/H (53 GPH) or more
Filter Rating: 10 Micron

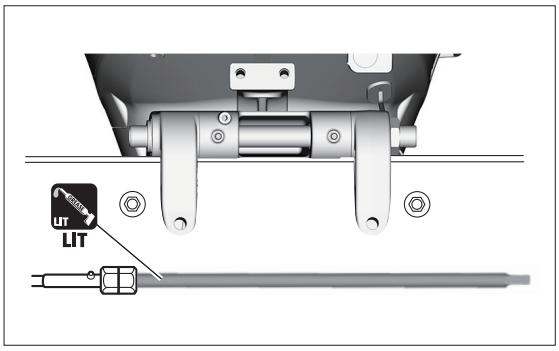
Recommended fuel filter water separator
Water/Fuel Separator Filter Kit :
P/N. 3KY-02230-0
Replacement 10 micron filter :
P/N. 3KY-02259-0

5. Connections to the Outboard Motor

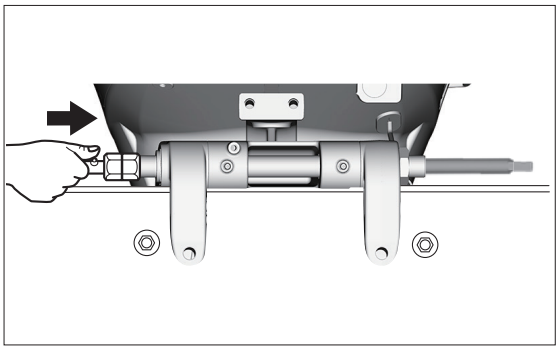
1) Steering Cable

Cable installed on the starboard side

1. Apply a thin coat of grease over the entire cable end.



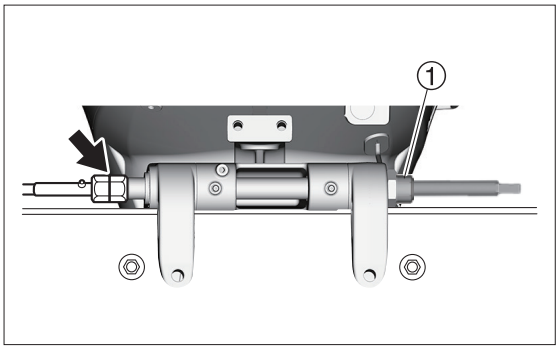
2. Insert the steering cable into the tilt tube.



3. Tighten the nut to the specified torque.

Nut:
48 N·m (35 lb·ft) [4.8 kgf·m]

Do not overtighten the drag link seal ring ① or it may deform and the telescopic shaft of steering cable will not be sealed properly.



2) Drag Link

1. Install the drag link as shown in the diagram.

- Be sure to use a special bolt ①, nylon nuts ②, washers ③, and a spacer ④ to install the drag link connecting the engine and the steering cable. Do not replace these bolts and nuts with ordinary bolts and nuts (non-locking type) as the drag link may get loose or detached due to vibration etc.
- Do not reuse nylon nut ②. Be sure to replace them with new ones.

⚠ WARNING

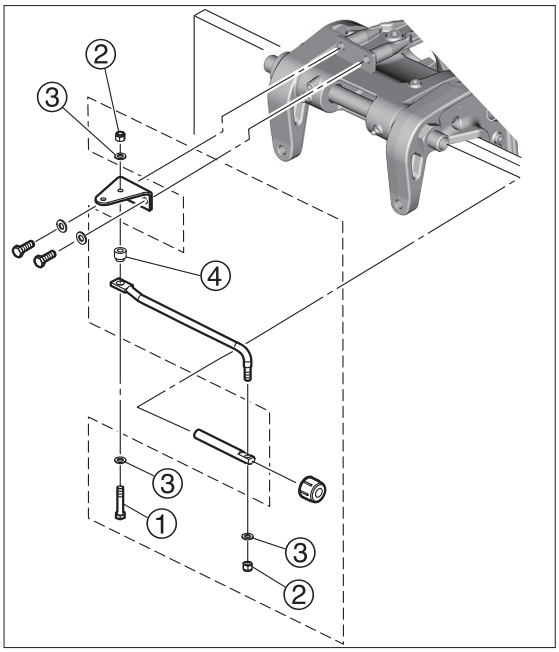
If the drag link becomes detached, it may result in the boat making a sharp turn. As a result, the passengers may be ejected out of the boat, resulting in serious injuries or even death.

Bolt ①:
27 N·m (20 lb·ft) [2.7 kgf·m]

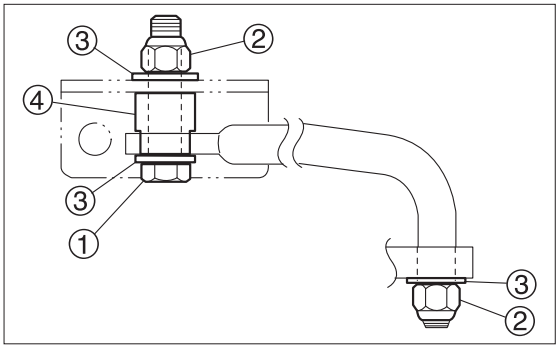
Nylon nut ②:
Tighten until contact is made, then loosen 1/4 of a turn.

Washer ③

Spacer ④



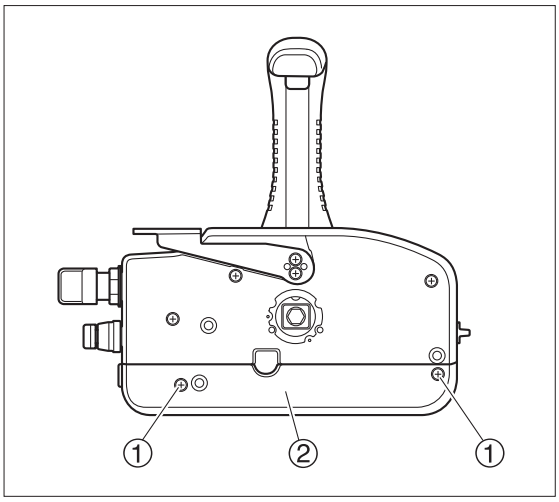
② Nylon nut **Do not reuse**



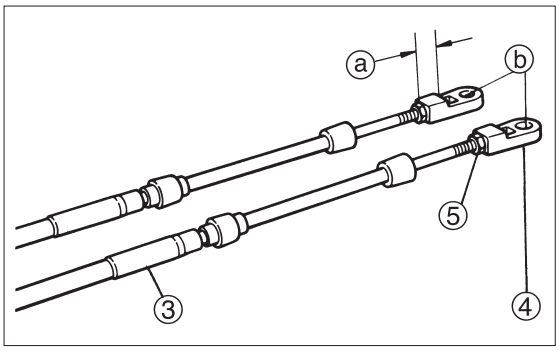
② Nylon nut **Do not reuse**

3) Installation of the Remote Control Cable (Remote Controller Side)

1. Loosen the screws ① on the rear panel and remove the rear panel ②.



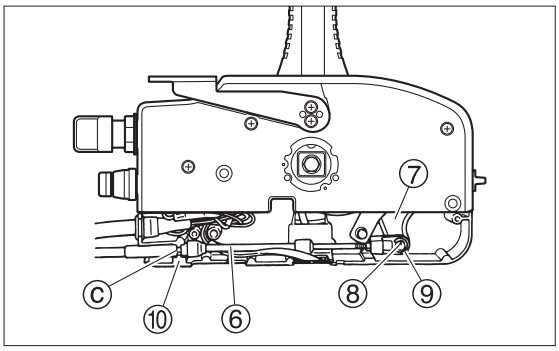
2. Screw about 11 mm (0.43 in) of the enclosed terminal eye ④ into the threaded section at the end of the remote control cable ③ and secure it with a nut ⑤. Then, apply grease on the mounting hole ⓑ of the terminal eye end.



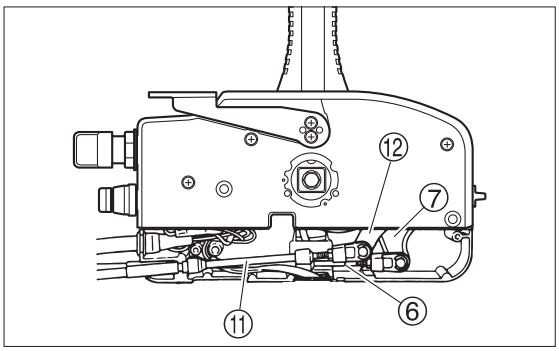
ⓐ Approx. 11 mm (0.43 in)

3. Insert the outer groove Ⓒ of the remote control cable for the shift ⑥ into the clamp groove of the housing. Next, insert the terminal eye into the pin ⑧ at the end of the shift arm ⑦ and secure it with the E-ring ⑨.

4. Insert the enclosed grommet ⑩ into the clamp groove.



5. Follow the same procedure as the remote control cable for the shift to install the remote control cable for the throttle ⑪ in the throttle arm ⑫.



⑥ Remote control cable for the shift
⑦ Shift arm

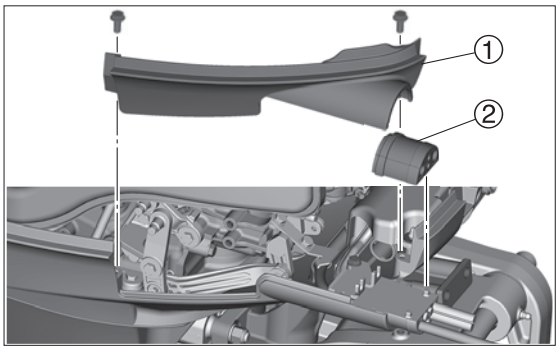
6. Fix the rear panel securely with 2 screws.

4) Installation of the Remote Control Cable (Engine Side)

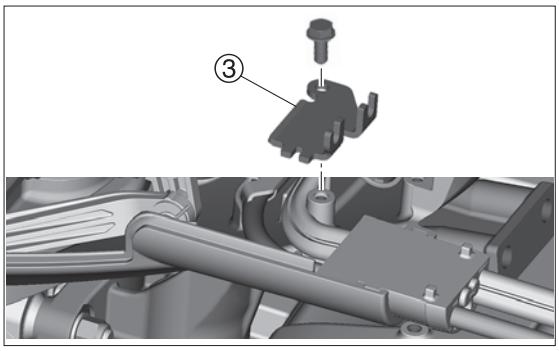
Remote Control Model

1. Release the latch attaching the bottom cowl and remove the top cowl.

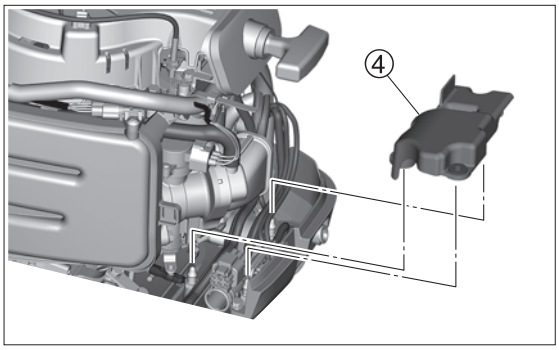
2. Remove the remote control stay cover ① and the grommet (upper) ②.



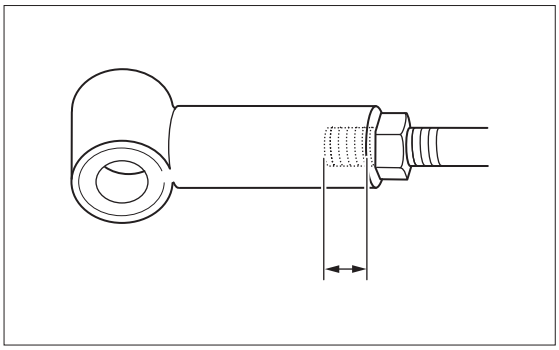
3. Remove the cable clip ③.



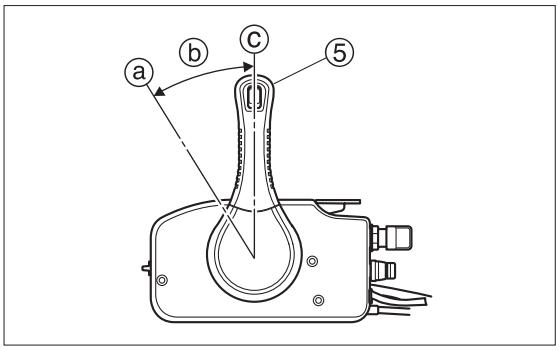
4. Remove the cover ④.



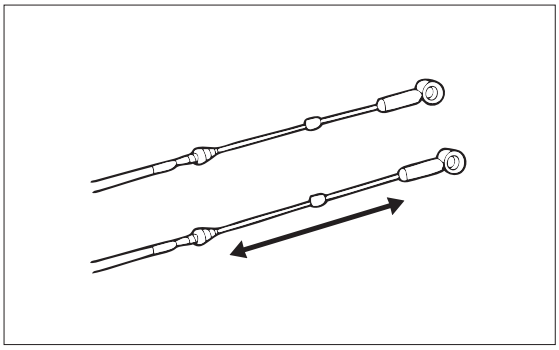
5. Screw about 12 mm (0.47 in) of the cable joint into the end of the remote control cable.



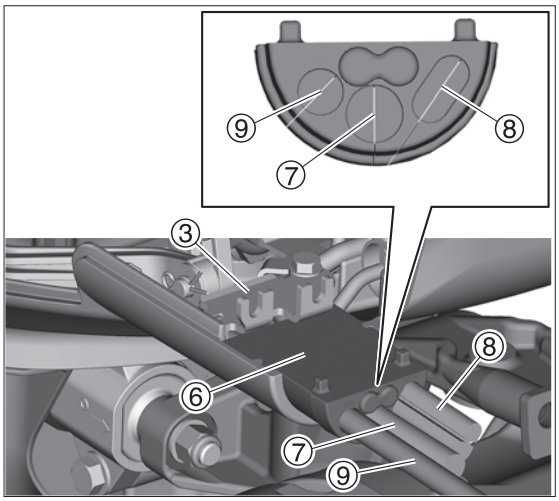
6. Of the two remote control cables, the shift cable is the one with the end that moves first when the control lever ⑤ on the remote control box is lowered to the forward (F) side ⓐ until it stops once (approx. 32 °).



ⓑ Approx. 32°
ⓒ Neutral position

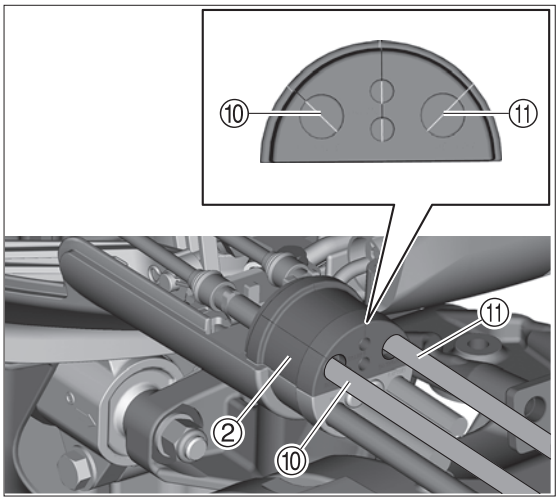


7. Pass the main harness ⑦ through the grommet (lower) ⑥ and attach the cable clip ③.

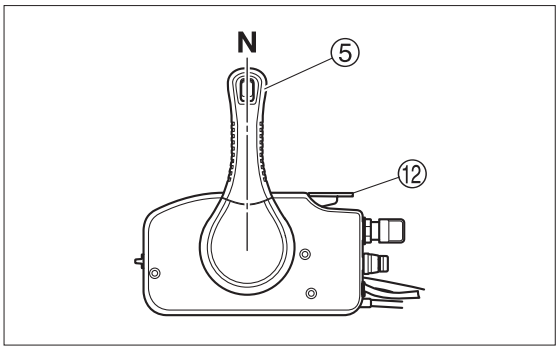


⑦ Main harness
⑧ Battery cable
⑨ Fuel hose

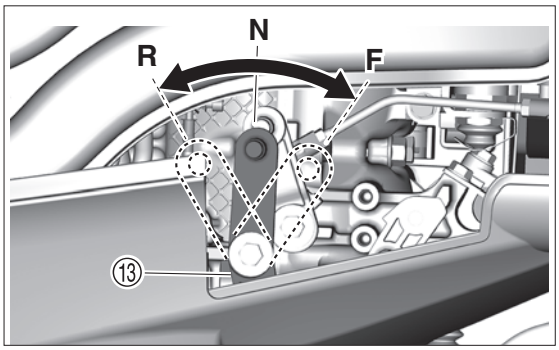
8. Pass the shift cable ⑩ and the throttle cable ⑪ through the grommet (upper) ② and place the unit temporarily onto the grommet (lower).



9. With the control lever ⑤ on the remote control box at the neutral position, check that the free acceleration lever ⑫ is at the fully closed position.



10. Operate the shift arm ⑬ to the forward (F), neutral (N), and reverse (R) positions to confirm the positions, then set it to the neutral (N) position.

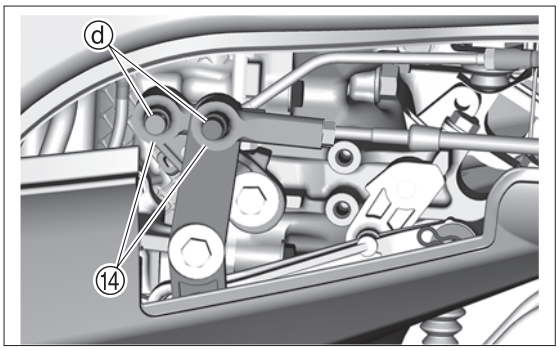


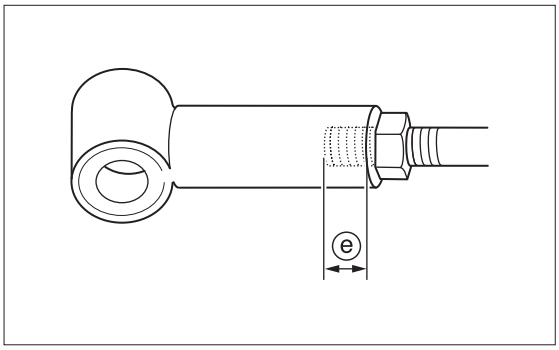
11. Adjust the screw-in amount of the cable joint ⑭ so that its holes are aligned with the pins ⓑ of the throttle arm and the shift arm.

⚠ WARNING

The cable joint should be screwed in at least 10 mm.

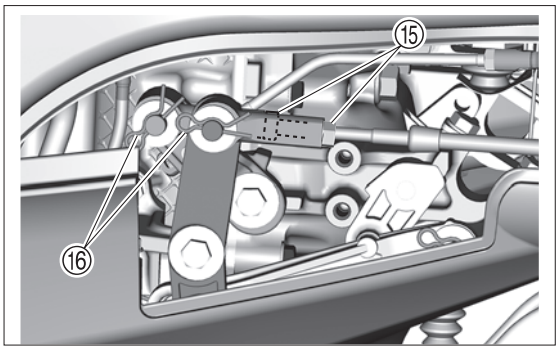
- The cable joint is shipped in the outboard motor packing box.
- When adjusting the cable joint, secure it with the cable fully pushed in.



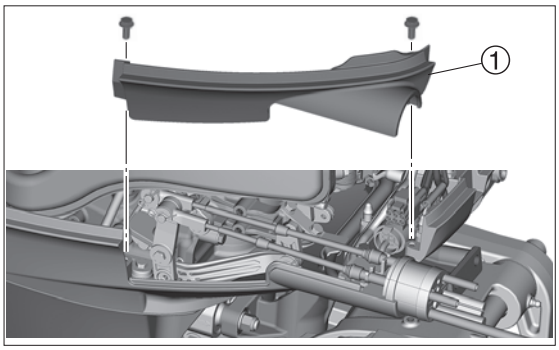


ⓔ Cable joint screw-in amount

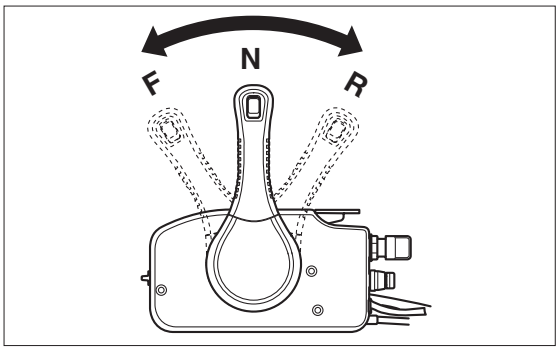
12. Tighten nuts ⑮, then install the cable joint on the pins and secure them with the washers and snap pins ⑯.



13. Install the remote control stay cover ①.

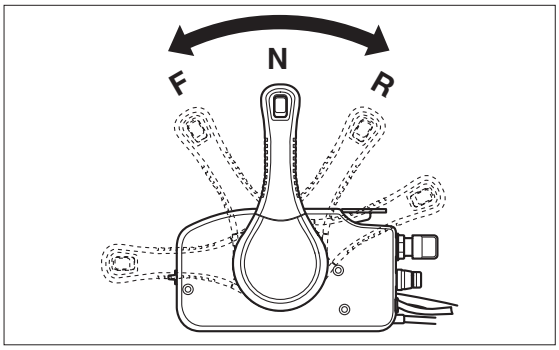


14. Operate the control lever and check that it moves to the forward (F), neutral (N), and reverse (R) positions.



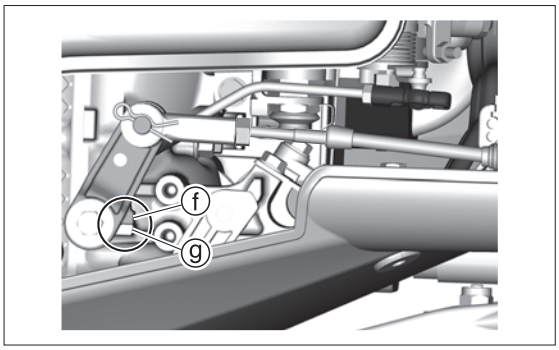
15. Check that the outboard motor shifts in when the control lever is lowered to the forward (F) side until it stops once (approx. 32°) and that the stopper ⓕ on the throttle armcomes into contact with the protrusion ⓖ on the crank case when the lever is lowered further.

If the control lever is in the fully open position but the stopper on the throttle arm is not in contact with the protrusion on the crank case, adjust the screw-in amount of the cable joint.

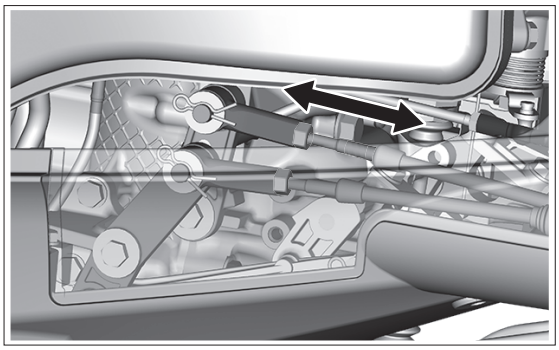


16. Check that the throttle body on the outboard motor side is fully closed when the control lever is returned to the neutral (N) position.

If the throttle body is not fully closed when the control lever is in the neutral (N) position, adjust the screw-in amount of the cable joint.

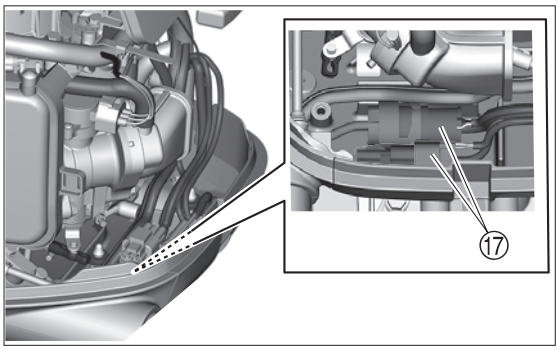


17. Check that the throttle operates smoothly and repeat steps 9 to 16 as necessary.

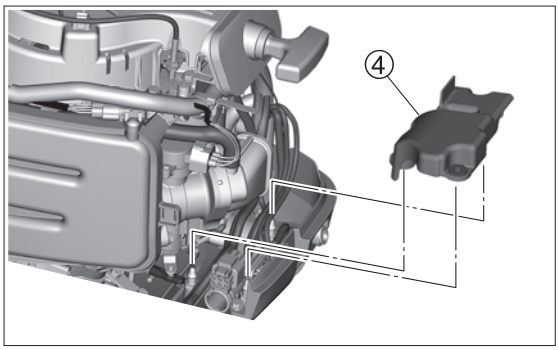


18. Reconnect the main harness connectors ⑰.

> **⚠ CAUTION**
>
> **Do not disconnect a main harness while the engine is in operation.**



19. Install the cover ④.



6. Lower Unit

1) Installation of the Propeller

⚠ WARNING

- **Before removing or installing the propeller, be sure to disconnect the battery cables from the battery and remove the stop switch lock plate.**
- **When removing or installing the propeller, do not handle the propeller with your bare hands.**
- **Insert a piece of wood or a similar object between the anti-ventilation plate and the propeller when removing or installing the propeller.**

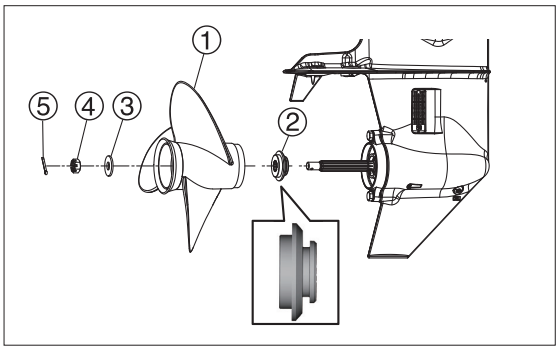
1. Set the shift lever to the neutral (N) position.
2. Apply water-resistant grease on the propeller shaft.
3. Install the propeller on the propeller shaft as shown in the diagram.
4. Insert a piece of wood between the anti-ventilation plate and the propeller and tighten the nut to the specified torque.

Propeller nut:
25 N·m (18 lb·ft) [2.5 kgf·m]

5. Insert a split pin into the nut and bend it.

⚠ CAUTION

If the propeller shaft pin hole and the propeller nut pin groove are not aligned, tighten the nut further until the hole and the groove are aligned.



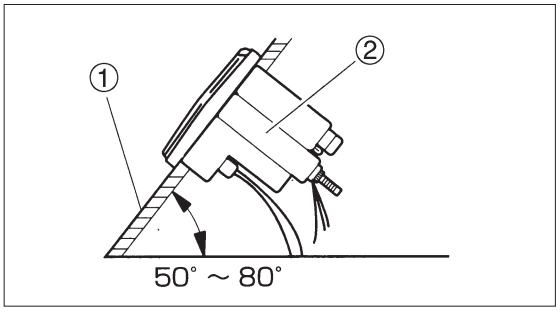
① Propeller
② Thrust holder
③ Washer
④ Nut
⑤ Split pin

7. Installation of Meters and Battery

1) Installation of Meters

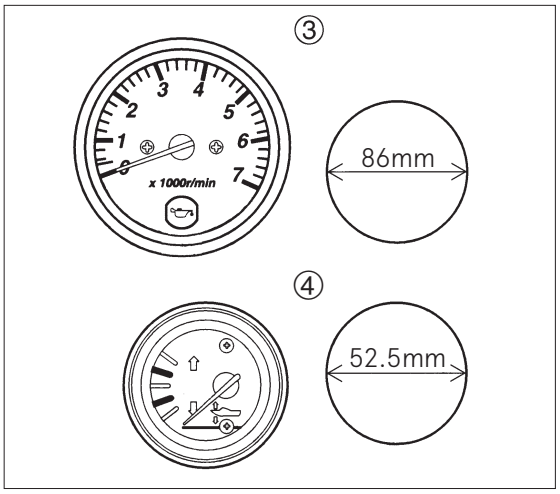
When installing meters, select a place on the dash board ① where operator can watch them easily and they are not exposed to water spray.

The meters direct water spray can be installed on the dash board ① of 2 to 11mm thick. When the thickness is over 11 mm (0.43 in), cut fitting plate ② so that the meters can be installed.



· Angle of Installation

Install meters so that the angle is in between 50 to 80 degrees from horizontal plane.

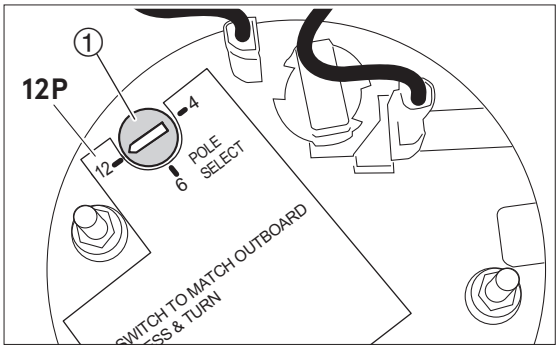


③ Large Sized Meters : Tachometer ③ and Speedometer
Installation Opening Diameter : 86mm (3-3/8 in)

④ Small Sized Meters : Trim Meter ④, Volt Meter, etc.
Installation Opening Diameter : 52.5mm (2-1/16 in)

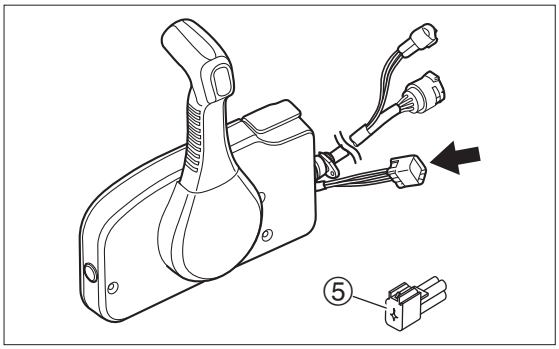
· Tachometer

Set selector ① to "12P" on the back of the meter.

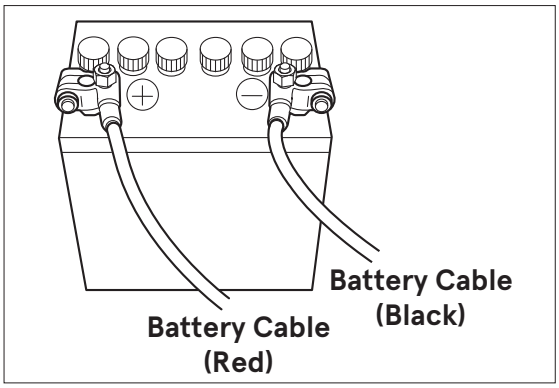


⚠ CAUTION

If you do not use the meter on the remote control model, install Cable terminal plug ⑤ (3VS-76037-0) prevent from a short circuit.



2) Installation of Battery



Minimum battery requirements:

512 Cold Cranking Amps(CCA), 70Ah/20HR

Larger capacity battery is required when it is using freezing condition.

Recommend connecting only the engine battery cables to the starting battery.

① Battery should be stored in battery storage box and secured to hull to prevent it from falling due to rolling or pitching or any shock in the place where it is protected from water spray.

② When connecting battery cables, connect positive cable (red) first and then negative cable (black). (Reverse the order when disconnecting.)

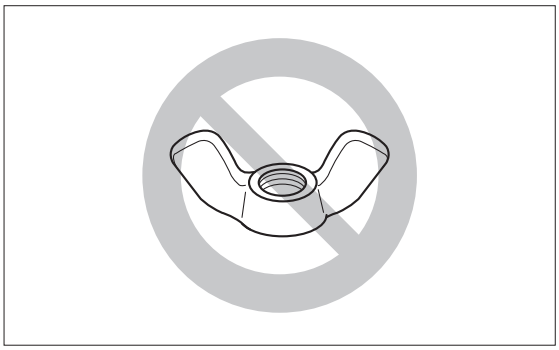
Positive cable is the one with red tube on the terminal end.

⚠ CAUTION

- **Before using battery, thoroughly read warning label.**
- **Do not disconnect battery cable during engine operation.**

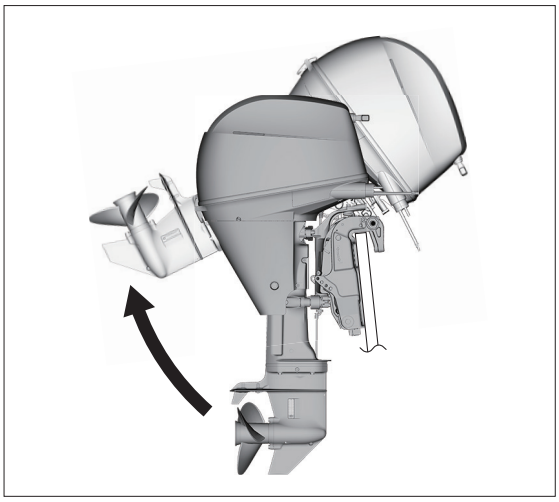
⚠ CAUTION

Do not use a wing/butterfly nut for installing the battery cable.
A wing/butterfly nut tends to get loose easily, resulting in electrical failures.
Recommend to fasten with correct hex-nut and if washer is needed possibly locking washer or star washer to prevent accidental loosening of nuts.



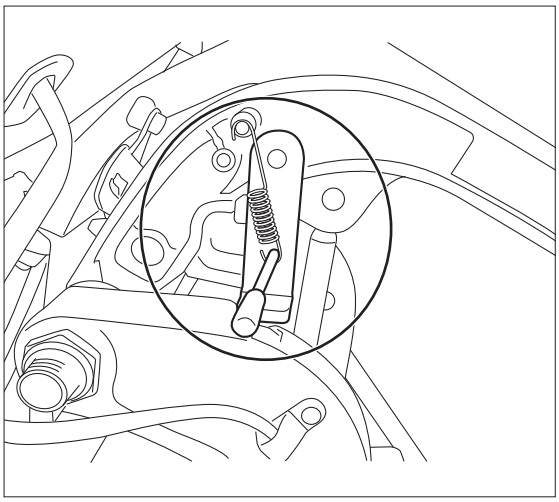
8. Installation of the Trim Sensor

1. Tilt the engine up fully and secure it with the tilt stopper.

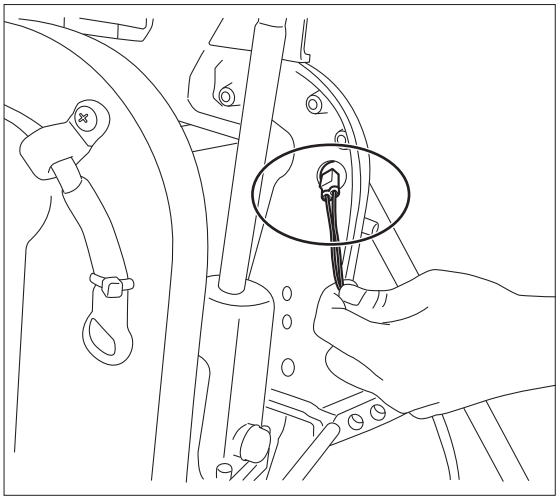


⚠ WARNING

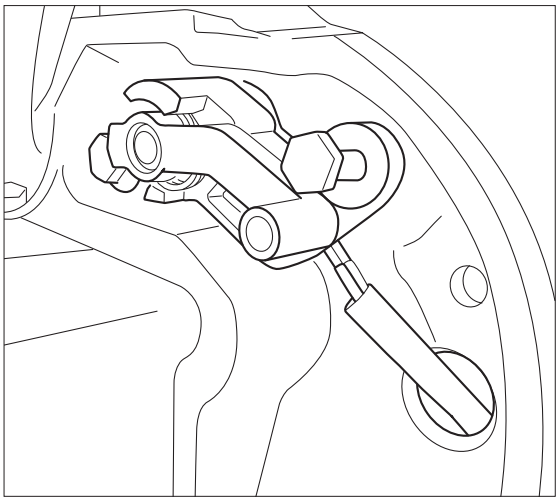
- **Do not insert your hand or finger between the outboard motor and the clamp bracket while working.**
- **When attaching or detaching the PT unit without removing the power unit, suspend and support the outboard motor with a hoist etc. If not, it may be dangerous as the outboard motor may fall down.**

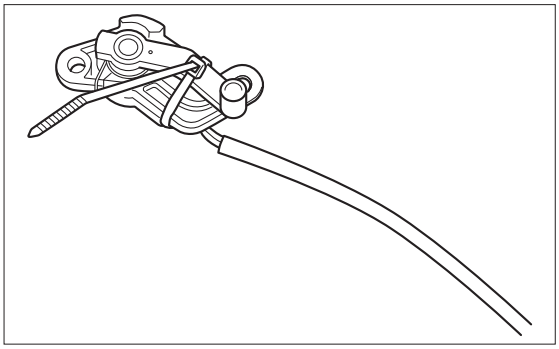


2. Pass the trim sensor wiring through the hole in the clamp bracket and attach the trim sensor to the clamp bracket using 2 bolts.

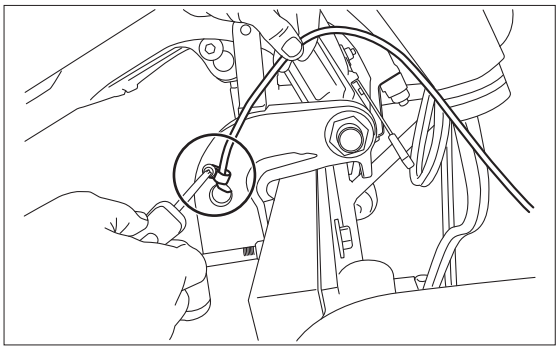


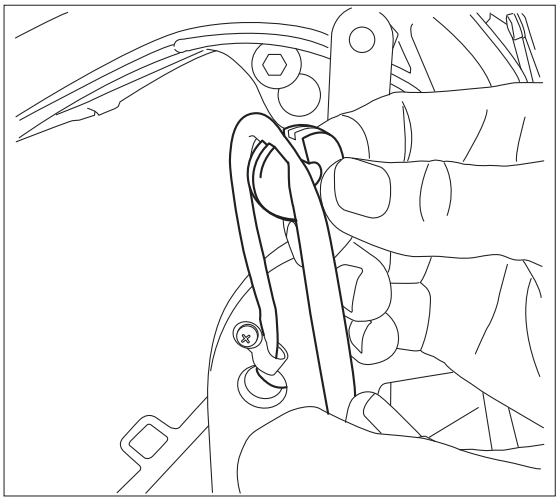
The trim sensor is easier to install if it is held in place with a tie wrap.



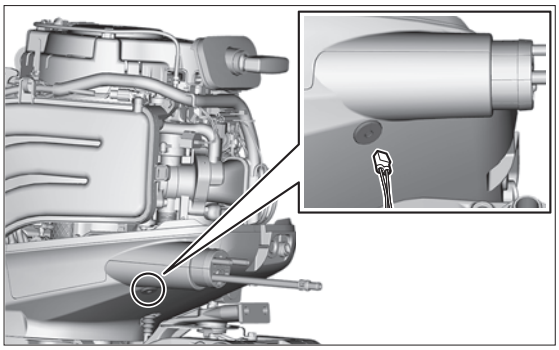


3. Install the clamp and the grommet.

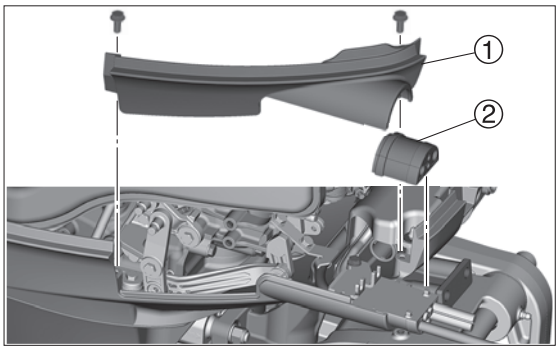




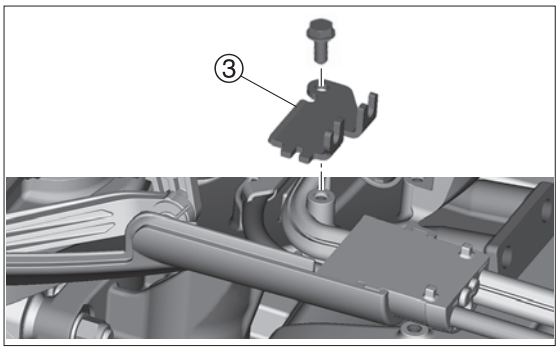
4. Draw the trim sensor harness into the engine through the hole in the bottom cowl.



5. Remove the remote control stay cover ① and the grommet (upper) ②.



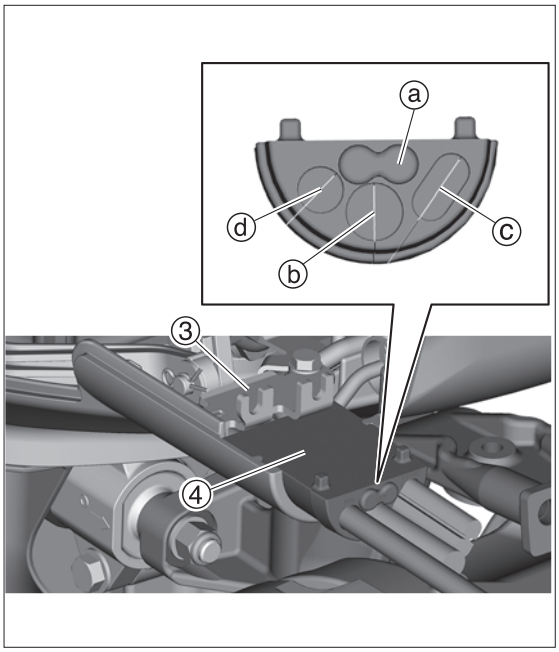
6. Remove the cable clip ③.



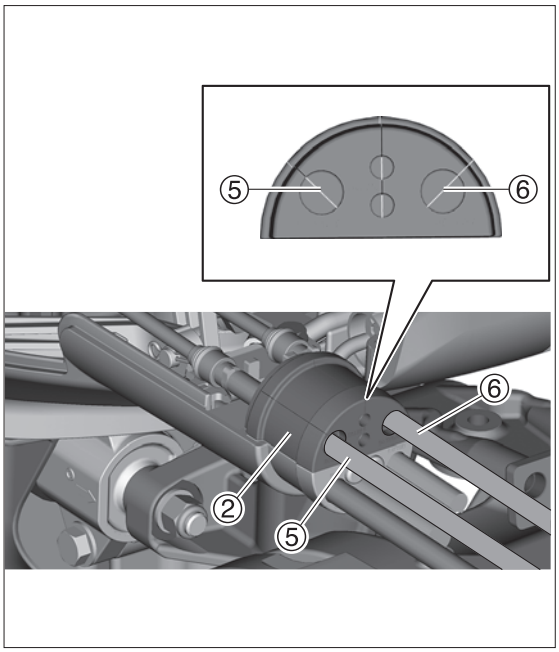
7. Pass the trim sensor wiring through the hole ⓐ of the grommet (lower) ④.

   ⓑ Main harness
   ⓒ Battery cable
   ⓓ Fuel hose

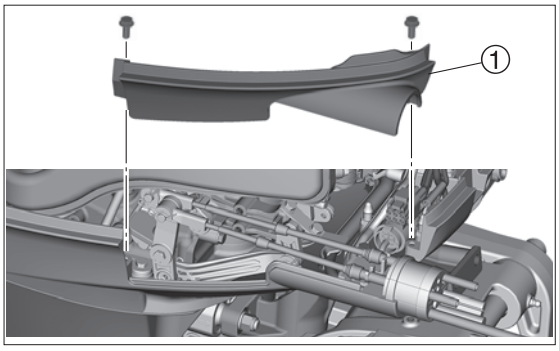
8. Install the cable clip ③.



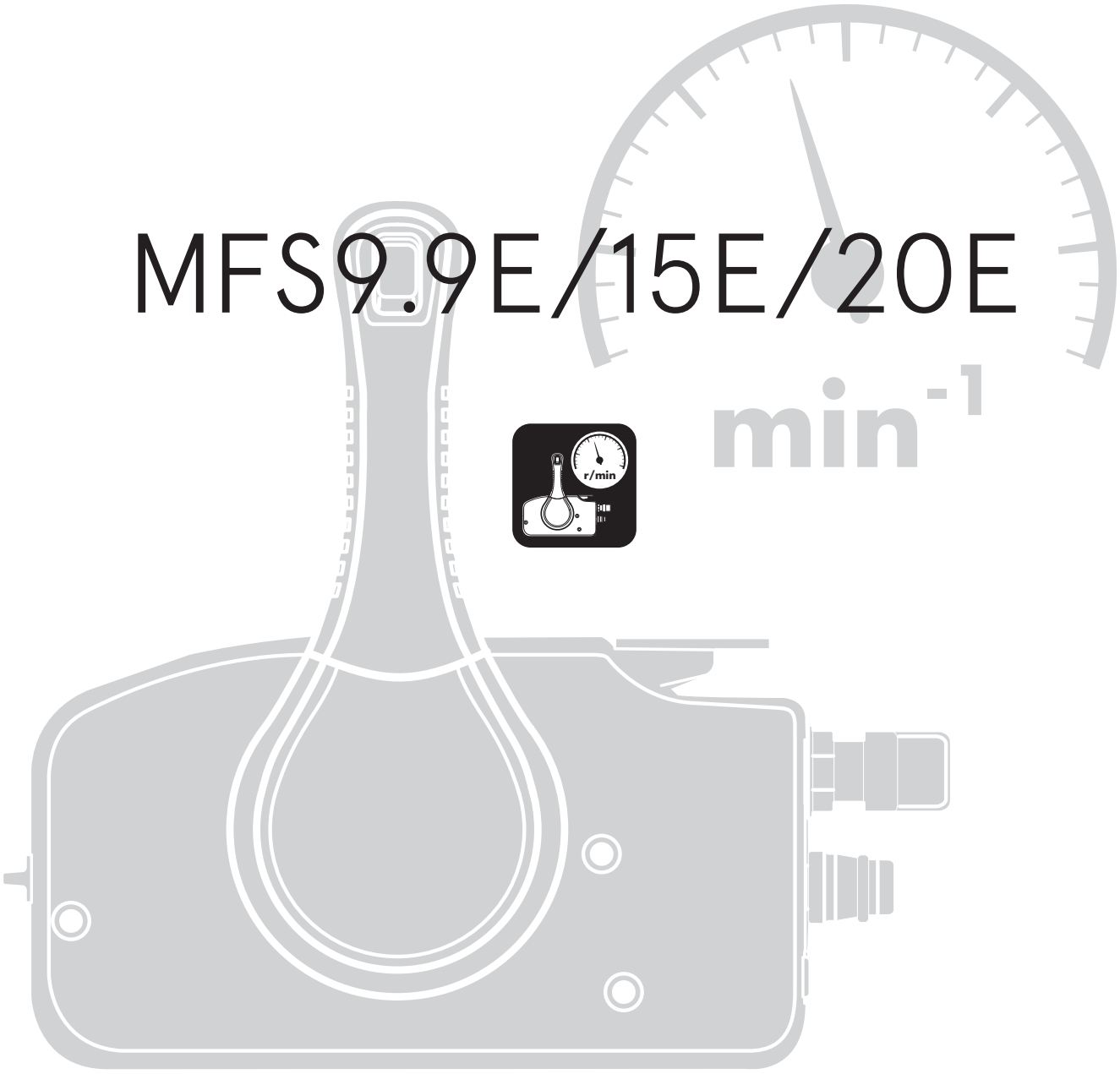
9. Pass the shift cable ⑤ and the throttle cable ⑥ through the grommet (upper) ② and place the unit onto the grommet (lower).



10. Install the remote control stay cover ①.

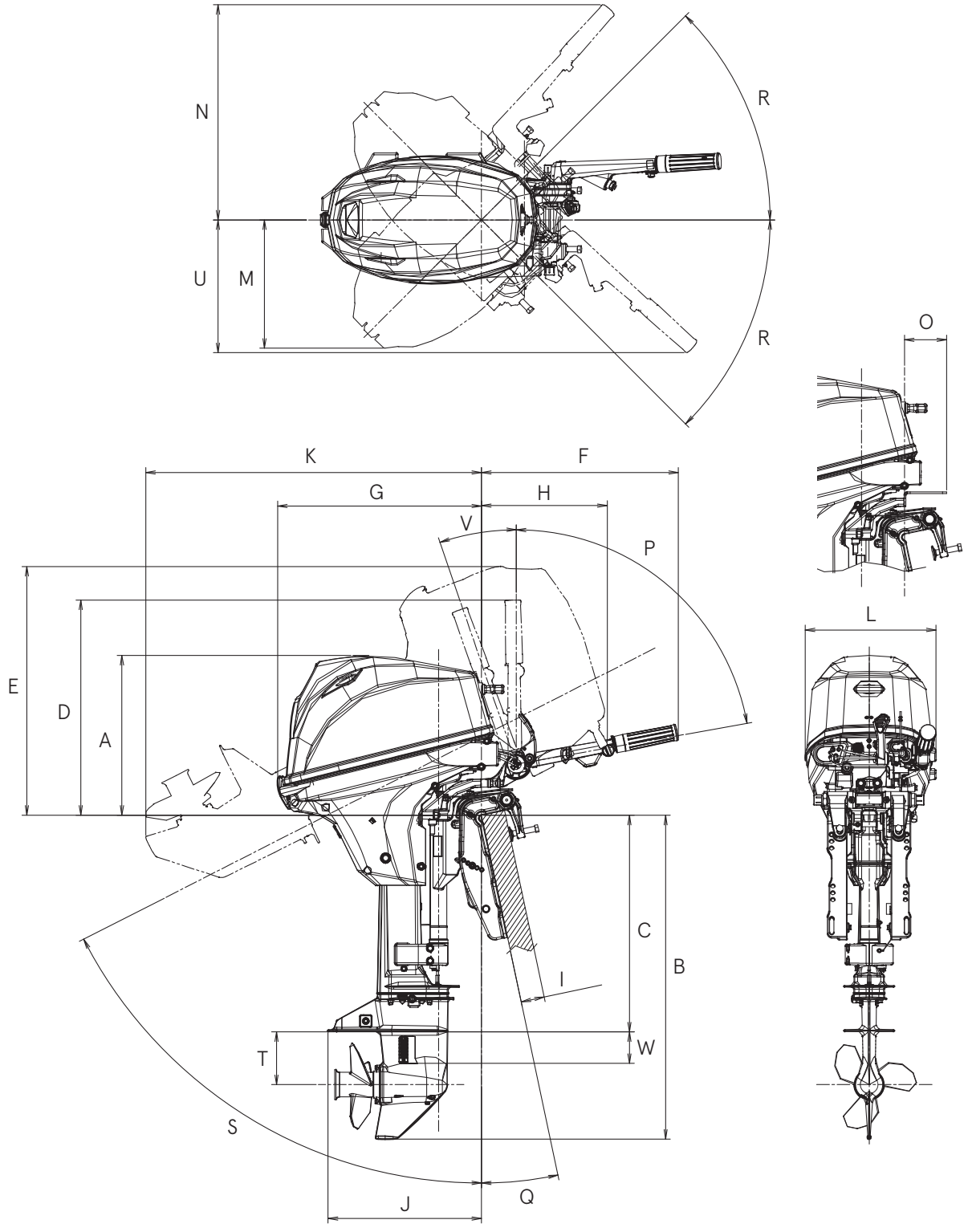


MFS9.9E/15E/20E



1. Outline Dimensions

1) Engine Dimensions



Manual Tilt Model

Item	Type	Unit	MFS9.9/15/20E	
			mm	in
A		mm/in	417	16.42
B	S	mm/in	689	27.13
	L	mm/in	838	32.99
	UL	mm/in	965	37.99
C	S	mm/in	413	16.26
	L	mm/in	562	22.13
	UL	mm/in	689	27.13
D		mm/in	558	21.97
E		mm/in	620	24.41
F		mm/in	540	21.26
G		mm/in	498	19.61
H		mm/in	343	13.50
I		mm/in	40 to 60	1.57 to 2.36
J		mm/in	370	14.57
K	S	mm/in	722	28.43
	L	mm/in	859	33.82
	UL	mm/in	975	38.39
L		mm/in	343	13.50
M		mm/in	333	13.11
N		mm/in	560	22.05
O		mm/in	137	5.39
P		deg.	80	
Q		deg.	12	
R		deg.	45	
S		deg.	64	
T		mm/in	137	5.39
U		mm/in	345	13.58
V		deg.	19	
W		mm/in	82	3.23
Trim Angle (Position)		deg. *1	-8 to +12 (6)	

* 1: Trim angle to horizontal when transom 12 °.

Power Tilt Model

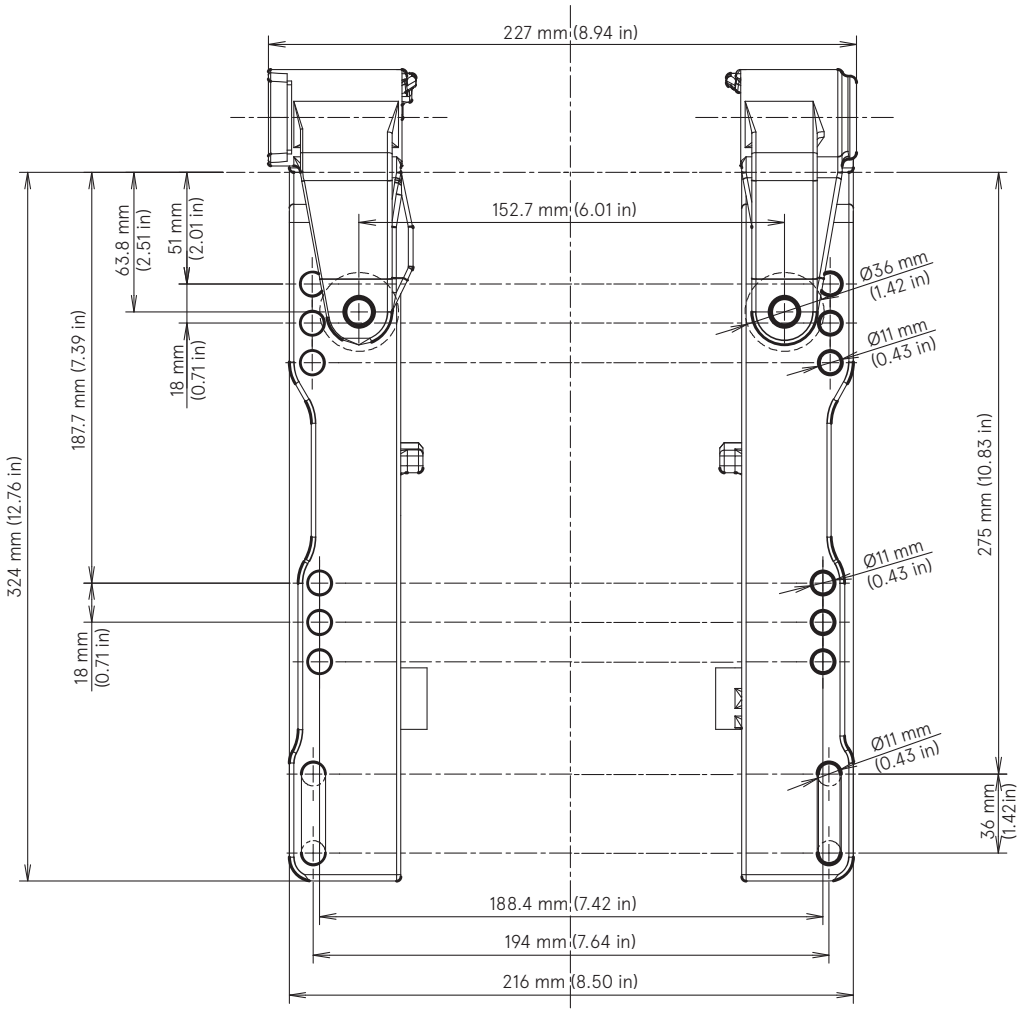
Item	Type	Unit	MFS9.9/15/20E	
			mm	in
A		mm/in	417	16.42
B	S	mm/in	689	27.13
	L	mm/in	838	32.99
	UL	mm/in	965	37.99
C	S	mm/in	413	16.26
	L	mm/in	562	22.13
	UL	mm/in	689	27.13
D		mm/in	558	21.97
E		mm/in	645	25.39
F		mm/in	512	20.16
G		mm/in	526	20.71
H		mm/in	326	12.83
I		mm/in	30 to 63	1.18 to 2.48
J		mm/in	370	15.67
K	S	mm/in	735	28.94
	L	mm/in	872	34.33
	UL	mm/in	988	38.90
L		mm/in	339	13.35
M		mm/in	333	13.11
N		mm/in	560	22.05
O		mm/in	137	4.29
P		deg.	80	
Q		deg.	12	
R		deg.	45	
S		deg.	63	
T		mm/in	137	5.39
U		mm/in	345	13.58
V		deg.	19	
W		mm/in	82	3.23
Trim Angle (Position)		deg. *1	-8 to +12 (5)	

* 1: Trim angle to horizontal when transom 12 °.

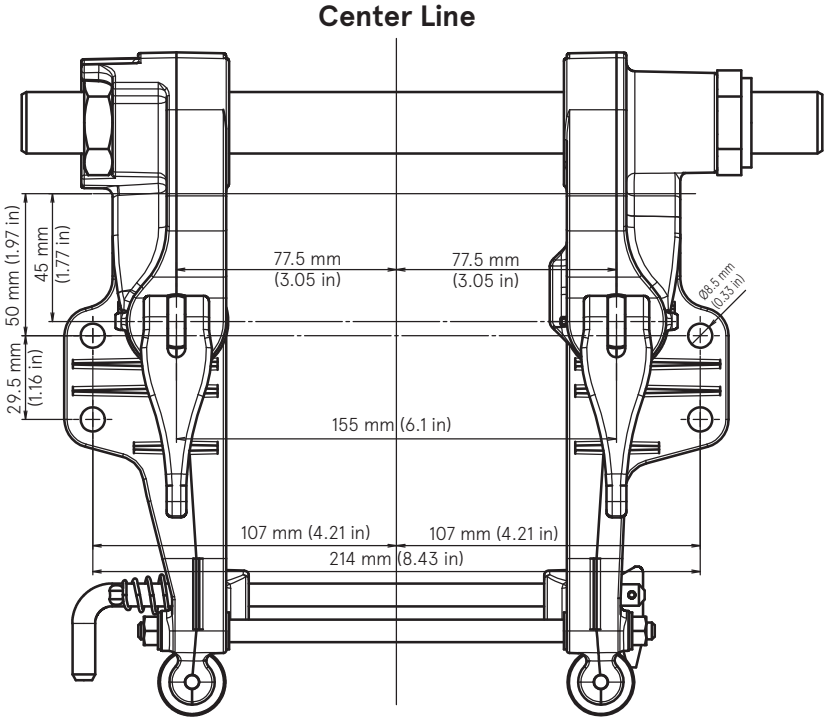
2) Transom Bolts

IMPORTANT: This is not a drill template. Found it on page 112.

Power Tilt Model



Manual Tilt Model



2. Service Information

The persons who perform the rigging should take sufficient care for prevention of damage to himself or herself and the product, prevention of fire, and ventilation of the shop.

The persons who operate the boat equipped with this product for test run should read the operating instructions of the outboard, and be familiar with the operating procedure.

3. Service Data

1) Load Limit of Boat

Do not over-power the boat and take care not to over-load the engine. Boat manufacturers specify the maximum allowable engine power and complement of their boat in accordance with certain standards and show the data on the plate attached to the boat. For unknown matters, if any, inquire to the manufacturer of the boat.

⚠ WARNING

Never use boat equipped with an outboard motor(s) that outputs power exceeding the maximum allowable limit specified by the manufacturer of the boat, or the following problems can occur.

- **The boat can go out of control.**
- **The buoyancy property of the boat varies from the designed value if the boat is overloaded especially at the transom.**
- **The boat may crack or be damaged around the transom.**

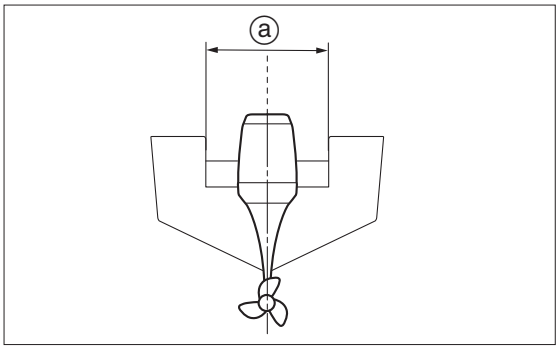
Over-powering boats can cause serious injury, fatal accident and/or serious damage to the hull.

2) Installation Dimensions

Minimum allowable size of transom opening : ⓐ

Single engine installation (Remote control models)

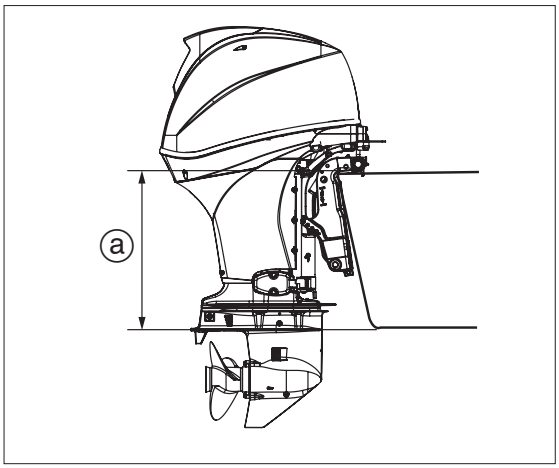
865 mm (34.06 in)



Installation of an outboard motor at too high of a position can cause the matters described below.

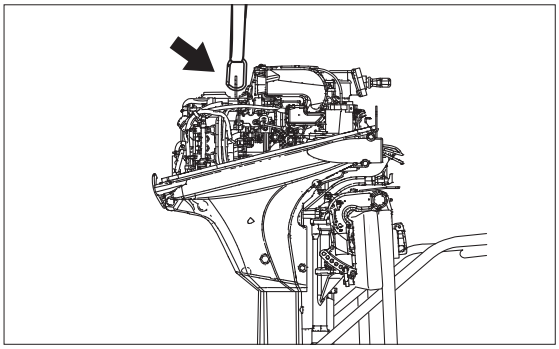
1) Sucking in air from the cooling water inlet causing an overheat
2) Possible loss of steering control.
3) Propeller can easily run above water surface (over-revs) during planing or when the boat is turning causing a loss of control.

ⓐ : Outboard installation height is the distance from the boat's bottom to upper edge of outboard motor transom bracket.



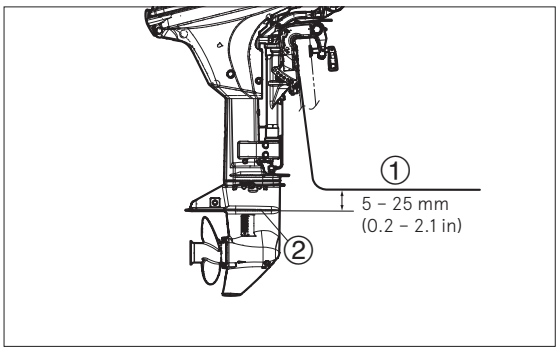
3) Hanging Outboard Motor

Use hanger installed on the engine.



4) Installation of Outboard Motor

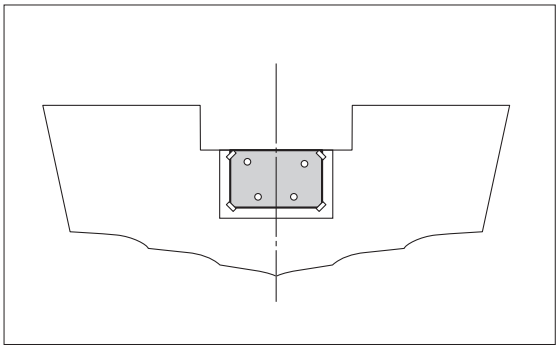
1. Besure that the antiventilation plate of the outboard motor is 5 – 20 mm (0.2 – 1 in) below the bottom of hull..



① : Bottom of hull
② : Anti ventilation plate

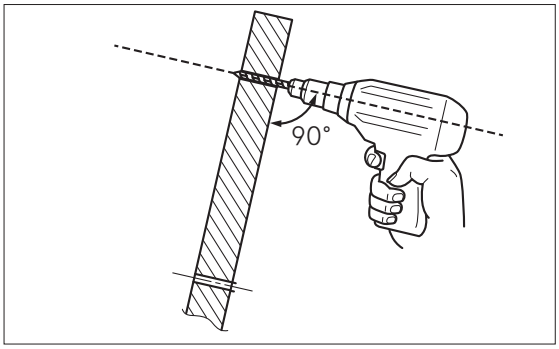
Power Tilt Model

2. Put the outboard motor installation template on the transom (the template is shown on page 112).



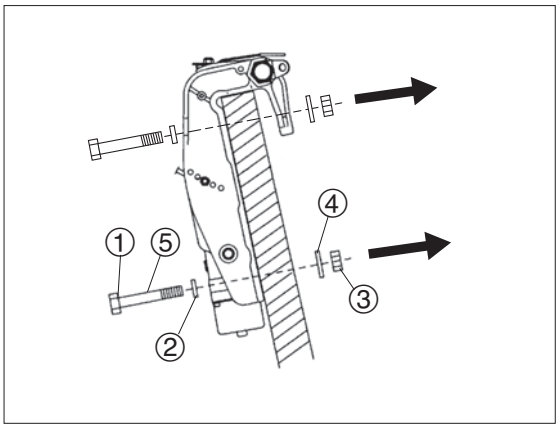
· Before drilling any holes, check that the template matches the holes arrangement of the outboard.
· Align center line of template with center line of transom accurately.

3. Mark up the transom with four 8.3 mm (21/64 in) mounting holes and drill.

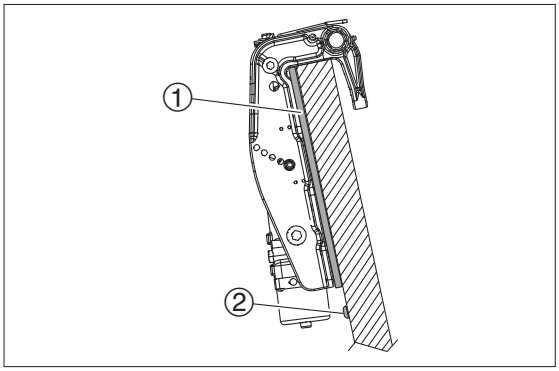


Drill at right angle to transom surface to align the transom holes with outboard motor's transom bracket holes accurately.

4. Secure the outboard motor by using fasteners contained in the package of the product.
   ① : 8 mm diameter, Bolts (4 pcs.)
   ② : Flat Washers (4 pcs.)
   ③ : Nuts (4 pcs.)
   ④ : Flat Washers (4 pcs.)
   ⑤ : Marine Sealant : Apply to the bolts' surface excluding their threaded area.

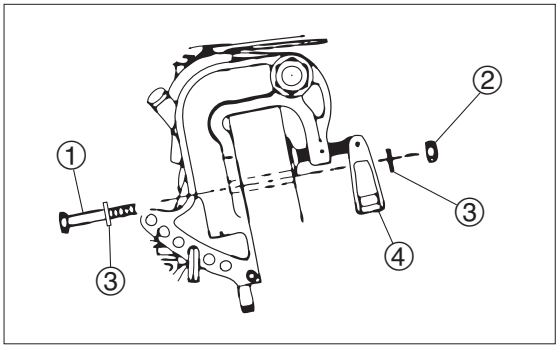


The boat transom surface where the outboard is being installed must be flat. If there is any rivet or screw that may interfere with the motor being mounted flat to the transom you will need to add a spacer of appropriate thickness between the engine clamp brackets and the transom to avoid contact.
① : Spacer
② : Rivet



Manual Tilt Model

Set the outboard motor at centerline of the boat.
Tighten the clamp screws securely by hand.
Use a long drill bit to drill the two lower 8.3mm (21/64 in.) holes through the clamp brackets.
Apply marine sealant to the bolts surface excluding their threaded area.
Secure the outboard motor by the mounting hardware supplied with the engine as described in below.



① 8mm diameter, Bolt (2 pcs)
② Nut (2 pcs)
③ Flat Washer (4 pcs)]
④ Clamp Screw

4. Fuel System

It is recommended to install additional fuel/water separator on the boat to effectively remove water and foreign substances contained in the fuel. If the improper size fuel/water separator is added to the fuel system this may prevent smooth flow of fuel which could lead to the engine stalling or resulting in damage to the engine due to fuel starvation. Use of a valve fitting can also cause similar troubles.

Filter requirements:
Flow Rate: 200 L/H (53 GPH) or more
Filter Rating: 10 Micron

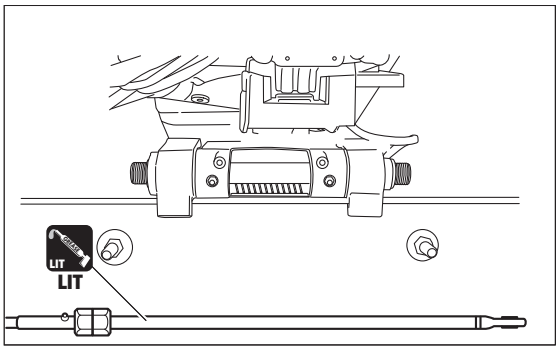
Recommended fuel filter water separator
Water/Fuel Separator Filter Kit :
P/N. 3KY-02230-0
Replacement 10 micron filter :
P/N. 3KY-02259-0

5. Connections to Outboard Motor

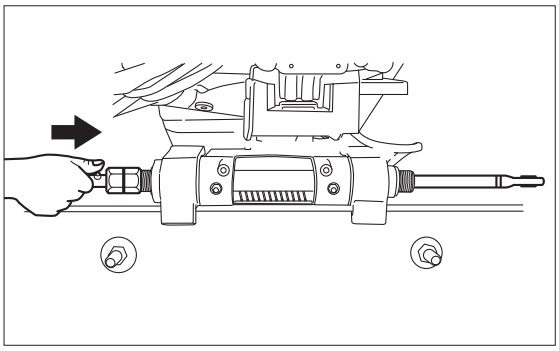
1) Steering Cable

Cable arranged on the starboard side

1. Apply thin coat of grease to entire area of cable end.



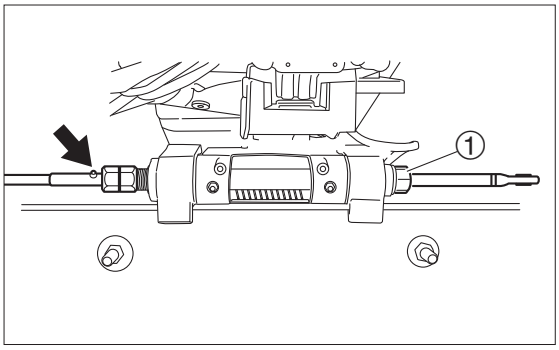
2. Insert the steering cable into tilt tube.



3. Tighten nut to specified torque.

Nut :
48 N · m (35 lb · ft) [4.8 kgf · m]

Do not overtighten the drag link seal ring ① or it may deform and the telescopic shaft of steering cable will not be sealed properly.



2) Drag Link

1. Attach drag link as shown.

When installing the drag link that connects engine and steering cable, be sure to use special bolt ①, nylon lock nuts ② washer ③ and collar ④. Do not use regular bolts and non-lock type nuts in place of these bolts and lock nuts, or the nuts may be loosened due to mechanical vibration resulting in disconnection of the link rod.

⚠ WARNING

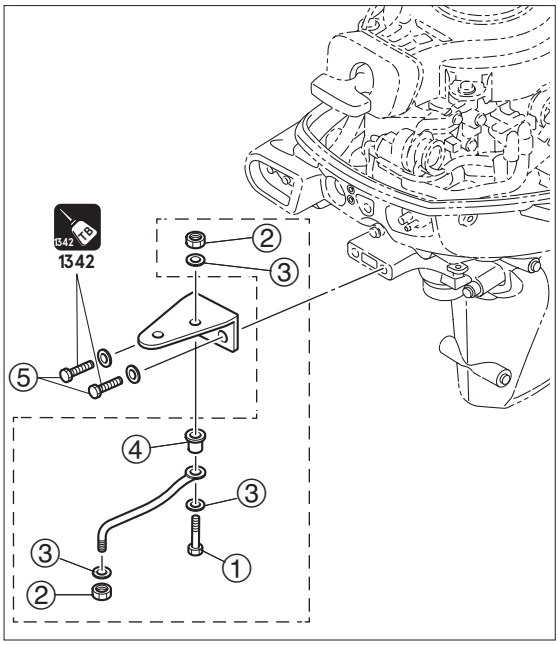
Disconnection of the drag link will cause the boat to turn accidentally. The sudden turn of the boat may cause the passenger to be thrown overboard, leading to serious injury or fatal accident.

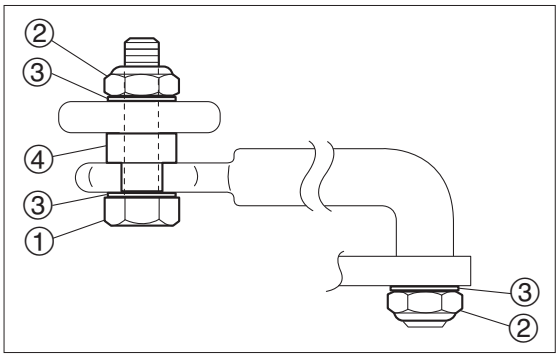
Bolt ⑤ :
27 N · m (20 lb · ft) [2.7 kgf · m]

Nylon Nuts ② :
Fully tighten, and then loosen 1/4 of a turn.

Washer ③

Collar ④

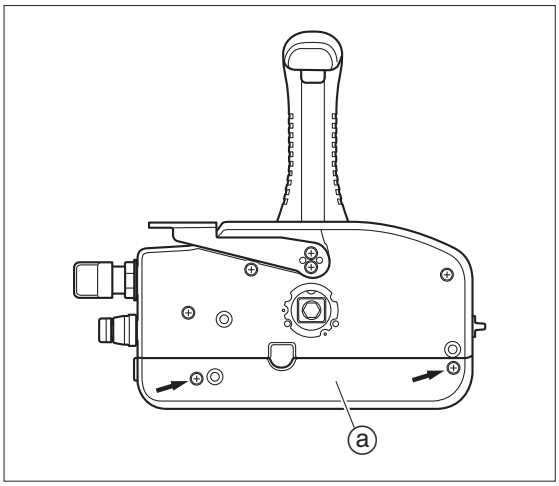




3) Installation of Remote Control Cable (Remote Control Head Side)

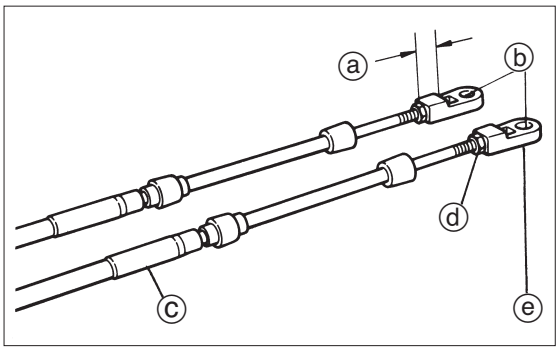
1. Unscrew two screws from the rear panel, then detach the rear panel.

   ⓐ Rear Panel



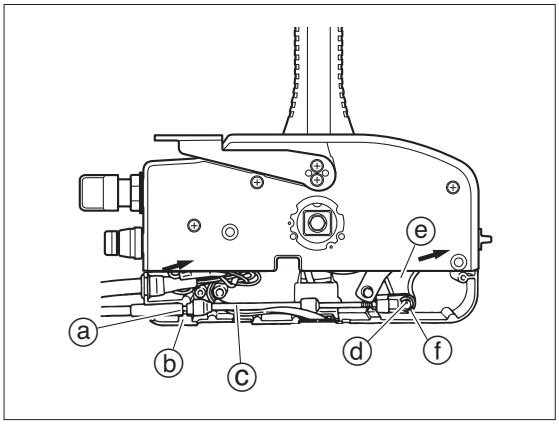
2. Thread the tip of the remote control cable into the cable joint up to approx. 11 mm, then lock them with a lock nut. Here, apply grease to the hole of the cable joint.

   ⓐ Approx.11mm (0.43inch)
   ⓑ Apply Grease
   ⓒ Remote ControL Cable
   ⓓ Lock Nut
   ⓔ Cable Joint



3. Engage the outer groove of the shifting remote-control cable with the clamp groove of the housing.
   Then, insert the end pin of the shift arm into the cable joint, and lock them with E-ring.

   ⓐ Outer Groove
   ⓑ Grommet
   ⓒ Remote Control Cable for Shift
   ⓓ Shift Arm Pin
   ⓔ Shift Arm
   ⓕ E-Ring

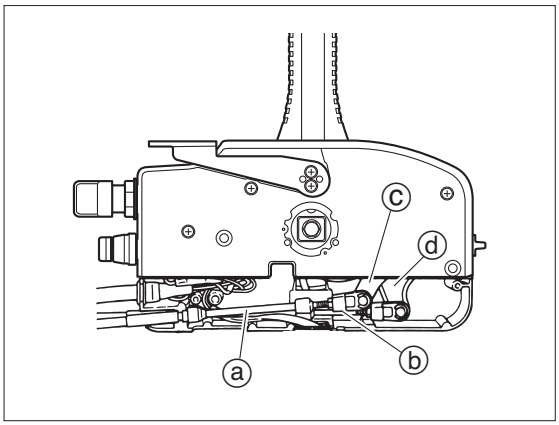


4. Insert an associated grommet into the clamp groove.

5. Similar to the remote-control cable for shifting. attach the remote-control cable for throttling to the throttle arm.

   ⓐ Remote Control Cable for Throttle
   ⓑ Remote Control Cable for Shift
   ⓒ Throttle Arm
   ⓓ Shift Arm

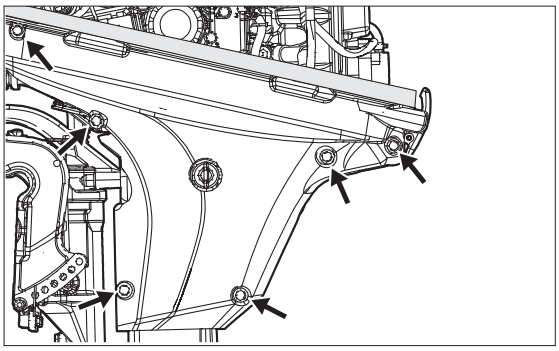
6. Fix the rear panel securely with two screws.



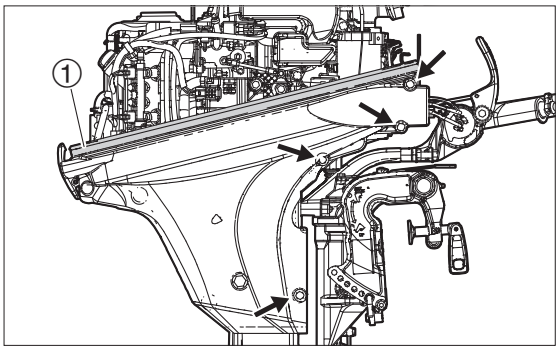
(Engine Side)
Remote Control Model

1. Loosen drive shaft housing cover bolts (Port side).

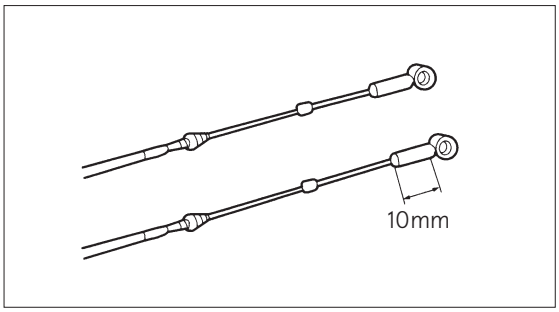
   · Loosen the port side bolts completely, then fully loosen the starboard side bolts.
   · The bolts have a falling prevention structure and cannot be removed from drive shaft housing cover.

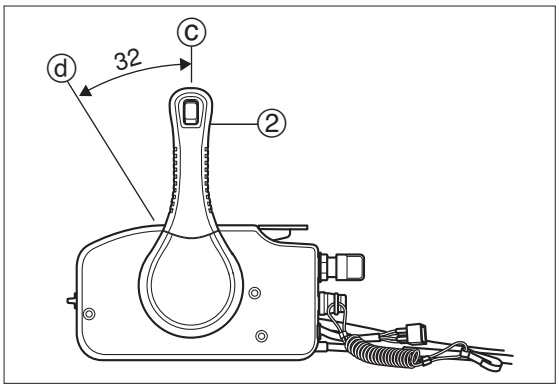


2. Remove cowl seal ① then loosen drive shaft housing cover bolts (Starboard side) and remove driveshaft housing cover.

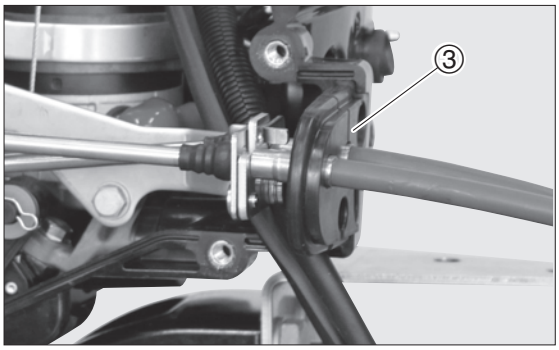


3. Screw cable joint on the end of remote control cable by approximately 0.39 in (10mm), equivalent to 9 threads.
Shift cable is the one of which tip is moved earlier than throttle cable when remote control lever ② is set to forward (F) side ⓓ until it stops once (approx. 32 degrees).

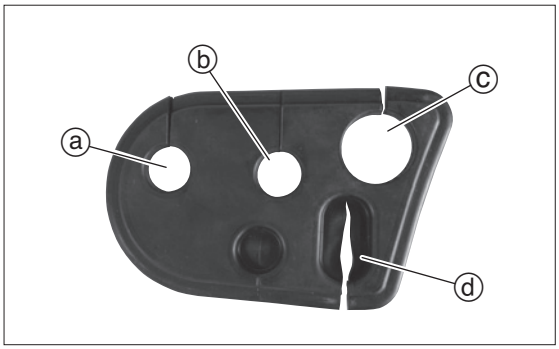




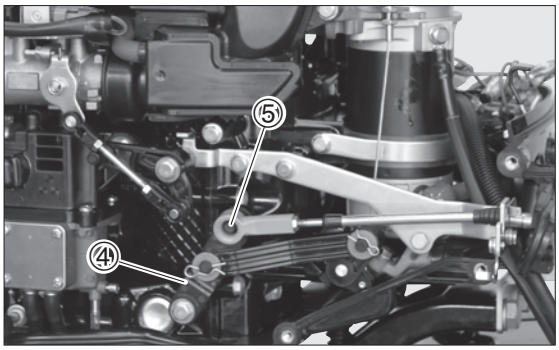
4. After inserting remote control cable through grommet ③ at front part of front panel, attach grooved part of remote control cable to bracket.



ⓐ Throttle cable
ⓑ Shift cable
ⓒ Cord ass'y
ⓓ Battery cables



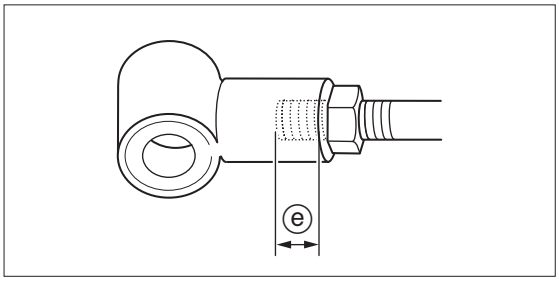
5. Set shift arm ④ forward (F), adjust screw-in length of cable joint so that hole of cable joint is brought to shift arm pin ⑤, and install remote control cable.



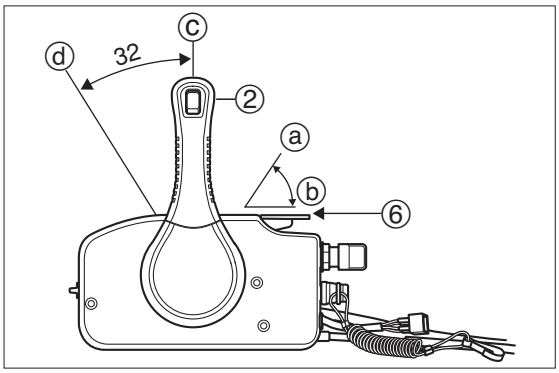
⚠ WARNING

Screw-in remote control cable joint at least 10 mm (0.39 in) ⓔ.

After adjusting remote control cable joint, fix it with remote control cable fully pushed in.



6. Set remote control lever ② to neutral (N) ⓒ, and check that neutral throttling lever ⑥ is at full close position ⓑ.

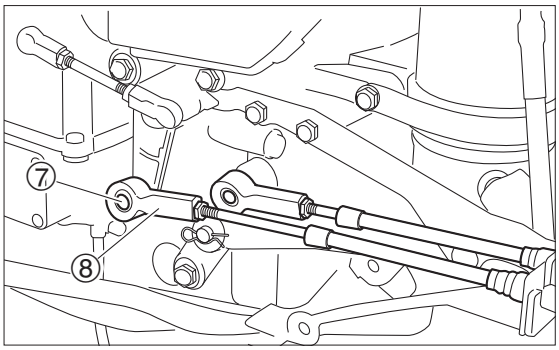


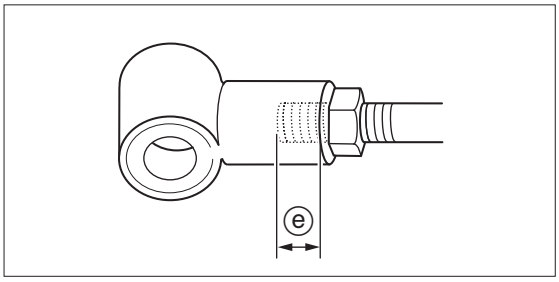
7. Adjust screw-in length of cable joint ⑧ so that hole of cable joint is brought to throttle arm pin ⑦.

⚠ WARNING

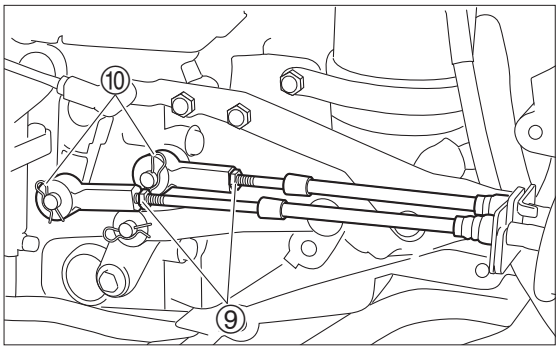
Screw-in remote control cable joint at least 10 mm (0.39 in) ⓔ.

After adjusting remote control cable joint, fix it with remote control cable fully pushed in.





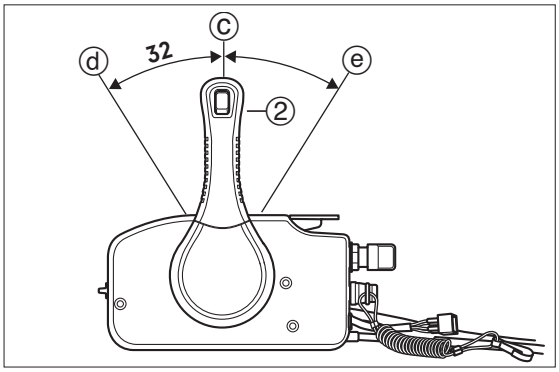
8. Lock joint with nut ⑨, put it on the pin, and secure with washer and snap pin ⑩.

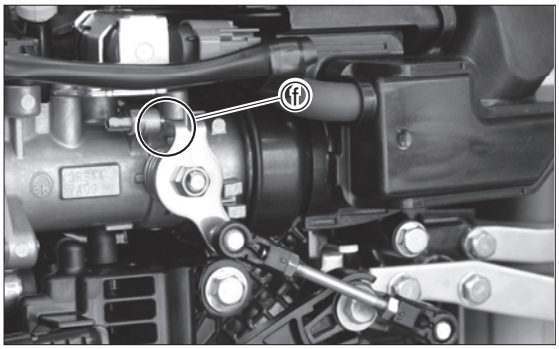


9. Check that shifting control lever ② forward (F) by approximately 32 degrees (ⓓ), where it is stopped once, makes the gear engage, and fully shifting the lever makes throttle valve fully open, and then check that shifting the lever reverse (R) by approximately 32 degrees (ⓔ), where it is stopped once, makes the gear engage, and fully shifting the lever makes throttle valve fully open.

Then, check that when control lever is returned to neutral position (N) ⓒ, throttle valve is fully closed ⓕ. Adjust position and reinstall cable joint of outboard motor side, if the valve does not contact with full close stopper in this case.

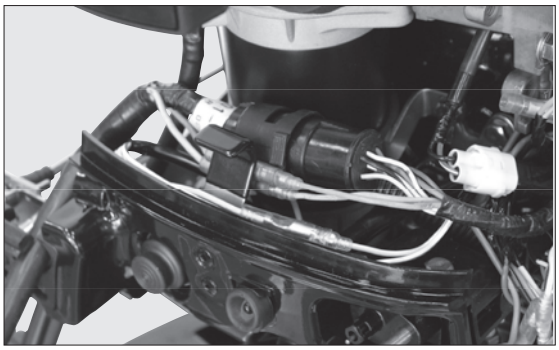
Rotate prop shaft when shifting the control either into (F) Forward or to (R) Reverse.



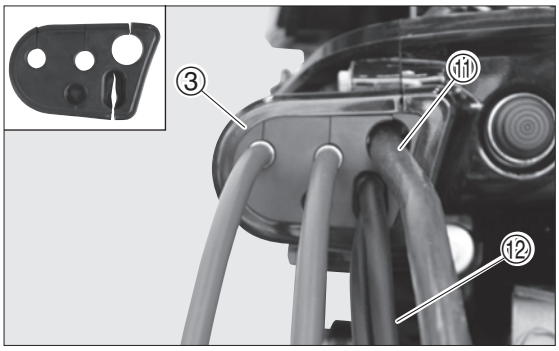


10. Connect cord ass'y connectors.

> **⚠ CAUTION**
>
> **Do not disconnect cord ass'y while engine operates.**

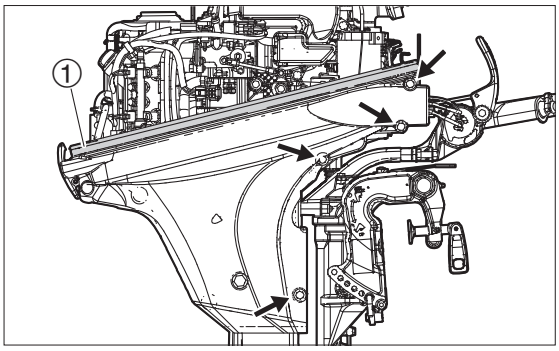


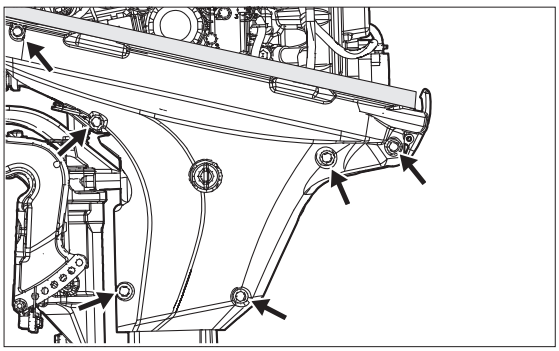
11. Pass cord ass'y ⑪ and battery cables ⑫ through grommet ③ located on the front pannel. Install remote control cable groove to bracket, and then fix it to front panel.
Pass cord ass'y through grommet, then install drive shaft housing cover.



12. Install the drive shaft housing cover (starboard side).
Tighten starboard side bolts.
Tighten port side bolts and install top cowl seal ① firmly.

Check the mating surface of housing covers with it completely.



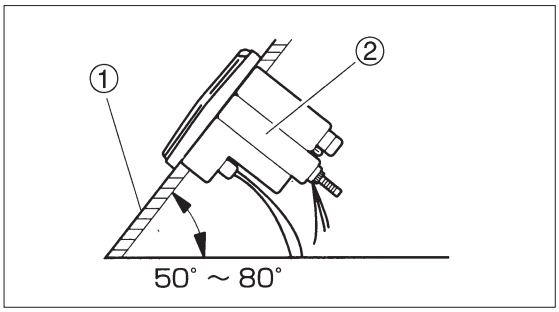


6. Installation of Meters and Battery

1) Installation of Meters

When installing meters, select a place on the dash board ① where operator can watch them easily and they are not exposed to direct water spray.

The meters can be installed on the dash board ① of 2 to 11mm thick. When the thickness is over 11 mm (0.47 in), cut fitting plate ② so that the meters can be installed.

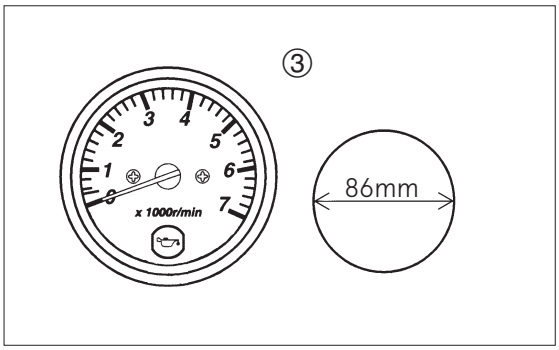


・Angle of Installation

Install meters so that the angle is in between 50 to 80 degrees from horizontal plane.

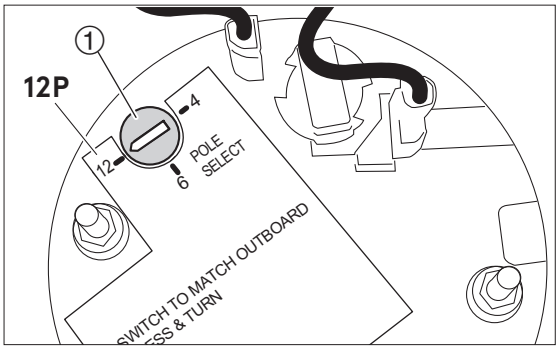
③ Large Sized Meters : Tachometer ③ and Speedometer

Installation Opening Diameter : 86mm (3-3/8 in)



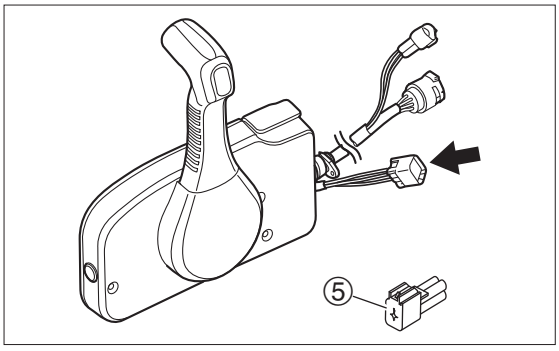
・Tachometer

Set selector ① to "12P" on the back of the meter.



⚠ CAUTION

If you do not use the meter on the remote control model, install Cable terminal plug ⑤ (3VS-76037-0) prevent from a short circuit.



2) Installation of Battery

Minimum battery requirements:

330 Cold Cranking Amps(CCA), 40Ah/20HR

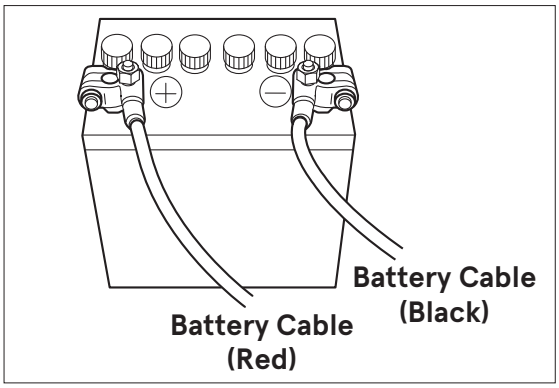
Larger capacity battery is required when it is using freezing condition.

Recommend connecting only the engine battery cables to the starting battery.

① Battery should be stored in battery storage box and secured to hull to prevent it from falling due to rolling or pitching or any shock in the place where it is protected from water spray.

② When connecting battery cables, connect positive cable (red) first and then negative cable (black). (Reverse the order when disconnecting.)

Positive cable is the one with red tube on the terminal end.

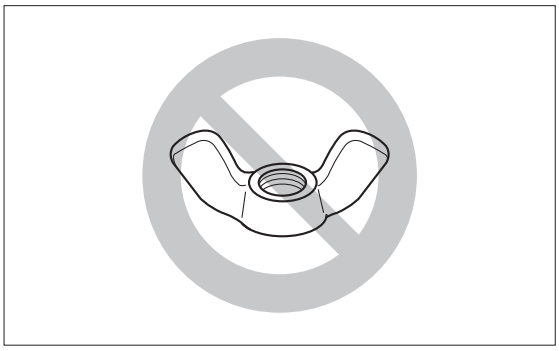


⚠ CAUTION

- **Before using battery, thoroughly read warning label.**
- **Do not disconnect battery cable during engine operation.**

⚠ CAUTION

Do not use a wing/butterfly nut for installing the battery cable.
A wing/butterfly nut tends to get loose easily, resulting in electrical failures.
Recommend to fasten with correct hex-nut and if washer is needed possibly locking washer or star washer to prevent accidental loosening of nuts.

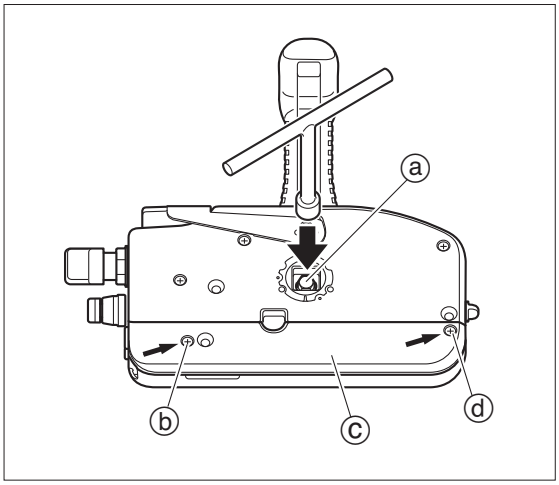


Change of Control Lever Position

RC-12A

(Models with PTT switch)

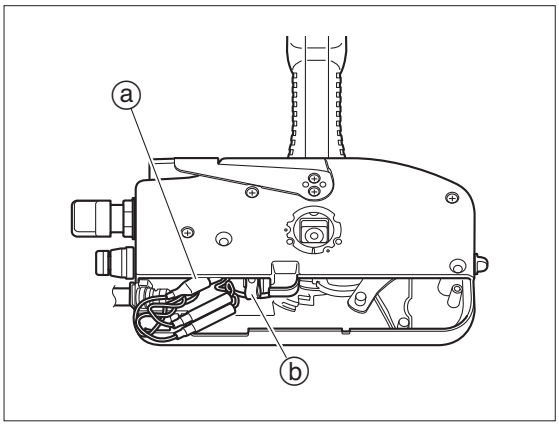
1. Remove the two mounting screws on the rear panel, and then remove the rear panel.
   Remove the control lever installation bolt (1 piece) and remove the control lever.



> If the control lever cannot be removed even with the bolt off, hitting the bolt head with the bolt partially inserted will make it easier to remove.

ⓐ Lever Installation Bolt, washer
ⓑ Screw
ⓒ Rear Panel
ⓓ Screw

2. Cut the band which binds the 3 cords to disconnect bullet connector. And remove the cords from the hole of the control box. -R-R P-Lg Sb-Sb



> · The cord can be removed even if the plastic part (the clamp) holding the PTT corsds is not removed. (Note that the plastic part (the clamp) is shaped to allow the cords to pass through, but it's just to hold the cords from above so as not to interfere with the shift/throttle mechanism.)
> · The remote control box hole is the minimum size required, so remove the bullet terminals one at a time.

⚠ CAUTION

- **Be careful not to damage the cords on the edges of the hole when removing it.**
- **Be careful not to damage the cords when the band is cut.**

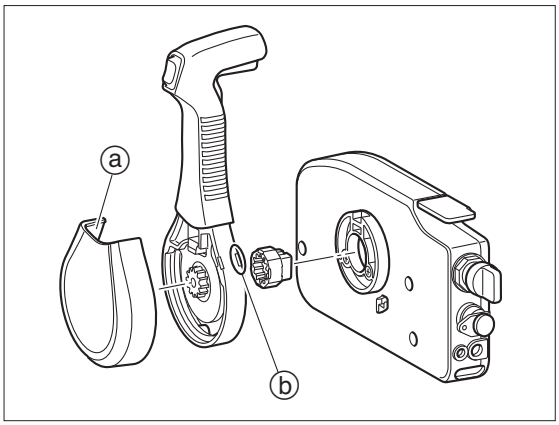
ⓐ PTT Switch Cord
ⓑ Cramp

3. Remove the cover from the control lever.

Remove the cover by unlocking the hook located in the upper part of the cover.

⚠ CAUTION

There are three hooks on the cover. Be careful not to break the hooks.

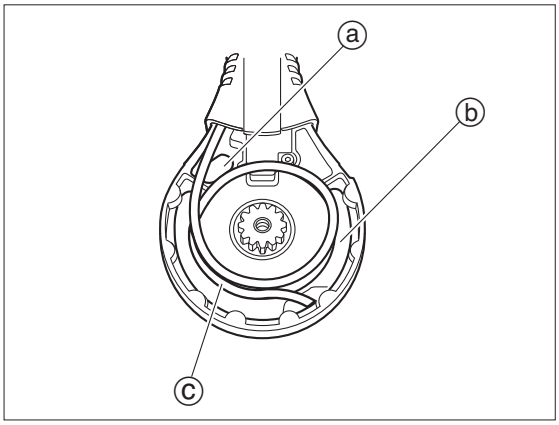


ⓐ Cover
ⓑ Hooked part

(a) Center console-mounted / left-handed operation

4. Reverse the lever and loop the PTT switch cord as illustrated.

Pull out the PTT switch cords from the U-shaped groove on the lever and the elliptical groove above it. Loop the PTT switch cords once around on the cover side, and pass the cords through the U-shaped groove.

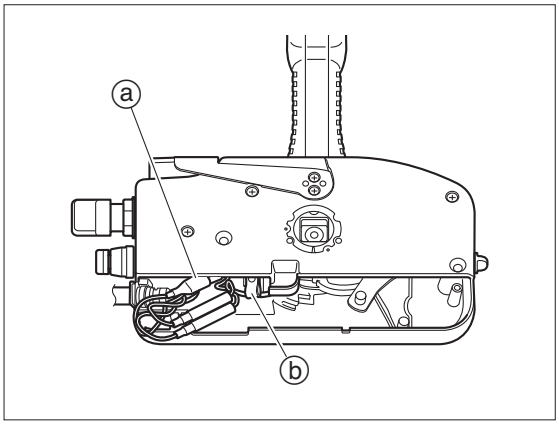


ⓐ Elliptical Groove
ⓑ U-Shaped Groove
ⓒ PTT Switch Cord

5. Insert the PTT switch cord through the hole in the control box and connect the connectors ("P" is to be connected with "Lg")
Route the cords with locating the white tape of the cord under the clamp.
Bind the 3 cords with the band.

⚠ CAUTION

Store the binded cords so as not to pinch with rear panel and not to touch with the remote control cable.



ⓐ PTT Switch Cord
ⓑ Cramp

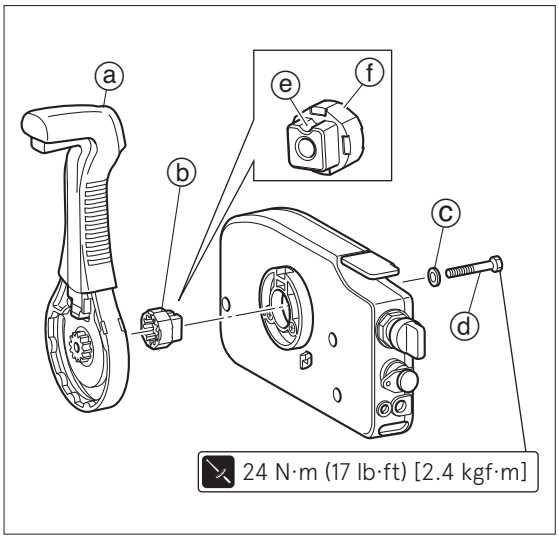
6. Use the bolt and washer to attach the lever.

7. Carefully attach the cover and then attach the rear panel.

Push the upper part of the cover slowly. Then, push the lower part to install the cover securely.

⚠ CAUTION

Please confirm that the locking hooks are securely installed.



ⓐ Control lever
ⓑ Joint
ⓒ Washer
ⓓ Bolt
ⓔ Hollow
ⓕ Joint

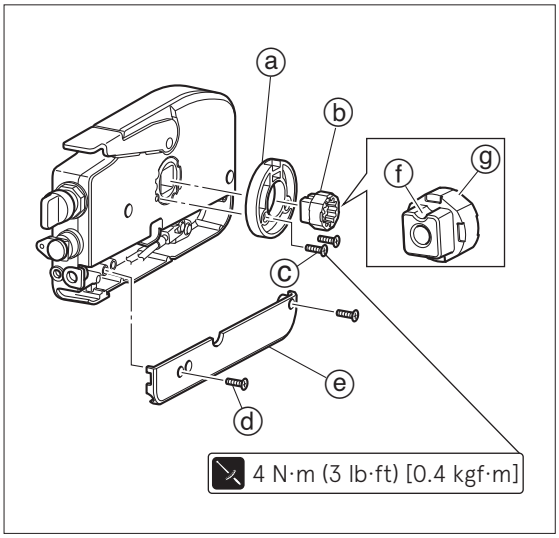
(b) Center console-mounted / right-handed operation

4. Loosen the two screws, remove the holder, and attach it to the opposite side of the remote control box.
Attach the joint attached to the lever or the remote control box to the opposite side.

⚠ CAUTION

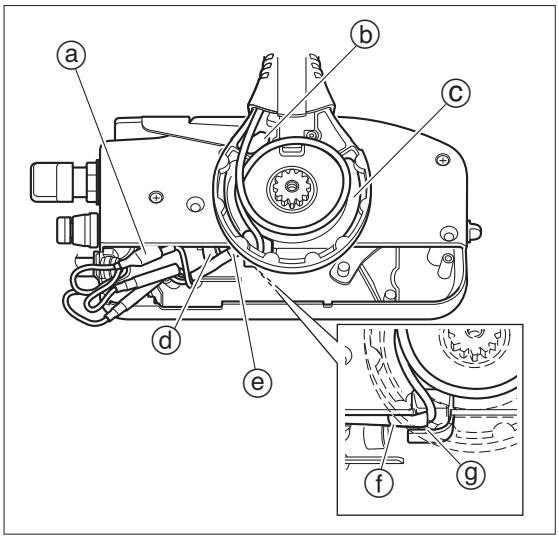
- **Thread lock is applied on the holder screw, so ensure you do not damage the screw head when attaching or removing it.**
- **Thread lock is applied on the female screw of the opposite side beforehand.**

· When removing the joint, inserting a flat-headed screwdriver in the groove will make it easier to remove.
· Attach it with the hollow facing the top.



ⓐ Holder
ⓑ Joint
ⓒ Screw
ⓓ Screw
ⓔ Rear Panel
ⓕ Hollow
ⓖ Joint

5. Reverse the lever. Route the PTT switch cord as figured below and reconnect the connector (P is to be connected with LG)
Bind the 3 cords with the band.



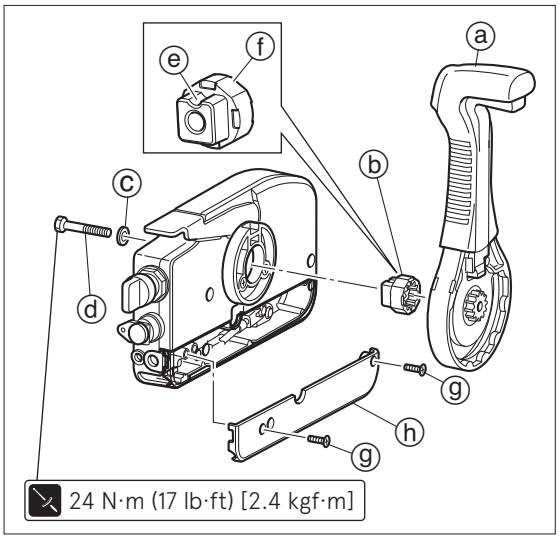
⚠ CAUTION

- **Do not route the cord under the clamp.**
- **Store the binded cords so as not to pinch with rear panel and not to touch with the remote control cable.**

- Pull out the PTT switch cords from the U-shaped groove on the lever and the elliptical groove above it. Loop the PTT switch cords once around on the cover side, and pass the cords through the U-shaped groove.
- Make sure that the white tape on the cord comes to the end of the groove.

ⓐ PTT Switch Cord
ⓑ Elliptical Groove
ⓒ U-Shaped Groove
ⓓ Clamp
ⓔ White Tape
ⓕ White Tape
ⓖ Groove

6. Use the bolt and washer to attach the lever.



ⓐ Control lever
ⓑ Joint
ⓒ Washer
ⓓ Bolt
ⓔ Hollow
ⓕ Joint
ⓖ Screw
ⓗ Rear Panel

7. Carefully attach the cover and then attach the rear panel.

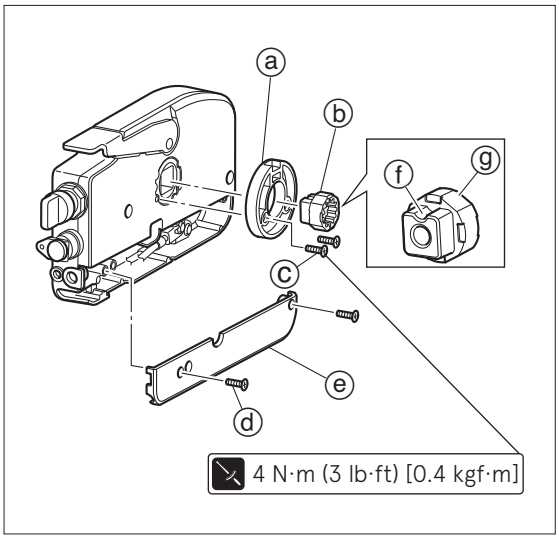
Push the upper part of the cover slowly. Then, push the lower part to install the cover securely.

⚠ CAUTION

Please confirm that the locking hooks are securely installed.

(c) Left hull-mounted / left-handed operation

4. Loosen the two screws, remove the holder, and attach it to the opposite side of the remote control box.
Attach the joint attached to the lever or the remote control box to the opposite side.



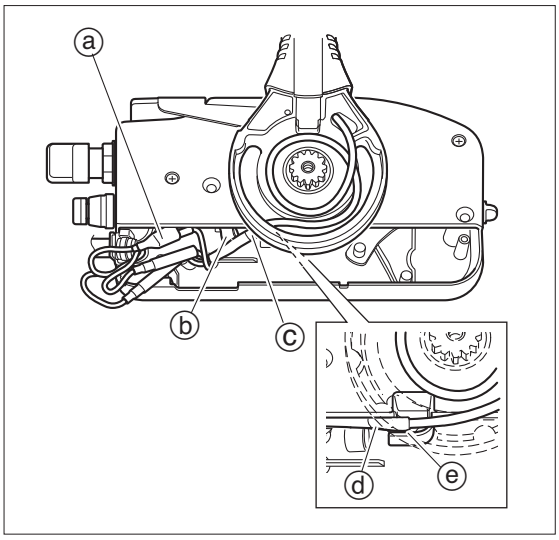
⚠ CAUTION

- **Thread lock is applied on the holder screw, so ensure you do not damage the screw head when attaching or removing it.**
- **Thread lock is applied on the female screw of the opposite side beforehand.**

· When removing the joint, inserting a flat-headed screwdriver in the groove will make it easier to remove.
· Attach it with the hollow facing the top.

ⓐ Holder
ⓑ Joint
ⓒ Screw
ⓓ Screw
ⓔ Rear Panel
ⓕ Hollow
ⓖ Joint

5. Route the PTT switch cord as figured below and reconnect the connector (P is to be connected with LG)
Bind the 3 cords with the band.



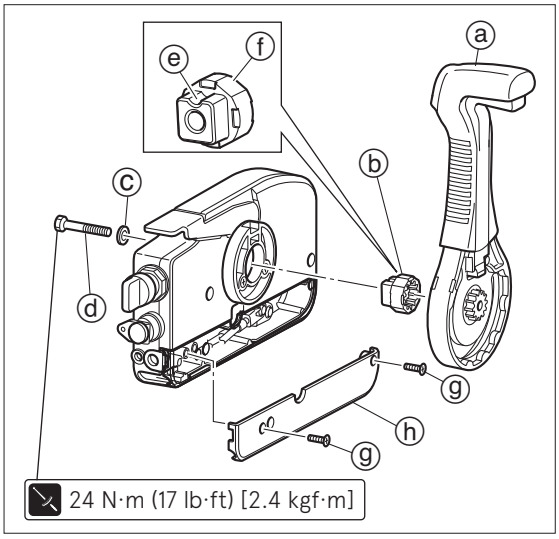
⚠ CAUTION

- **Do not route the cord under the clamp.**
- **Store the binded cords so as not to pinch with rear panel and not to touch with the remote control cable.**

Make sure that the white tape on the cord comes to the end of the groove.

ⓐ PTT Switch Cord
ⓑ Clamp
ⓒ White Tape
ⓓ White Tape
ⓔ Groove

6. Use the bolt and washer to attach the lever.



ⓐ Control lever
ⓑ Joint
ⓒ Washer
ⓓ Bolt
ⓔ Hollow
ⓕ Joint
ⓖ Screw
ⓗ Rear Panel

7. Carefully attach the cover and then attach the rear panel.

Push the upper part of the cover slowly. Then, push the lower part to install the cover securely.

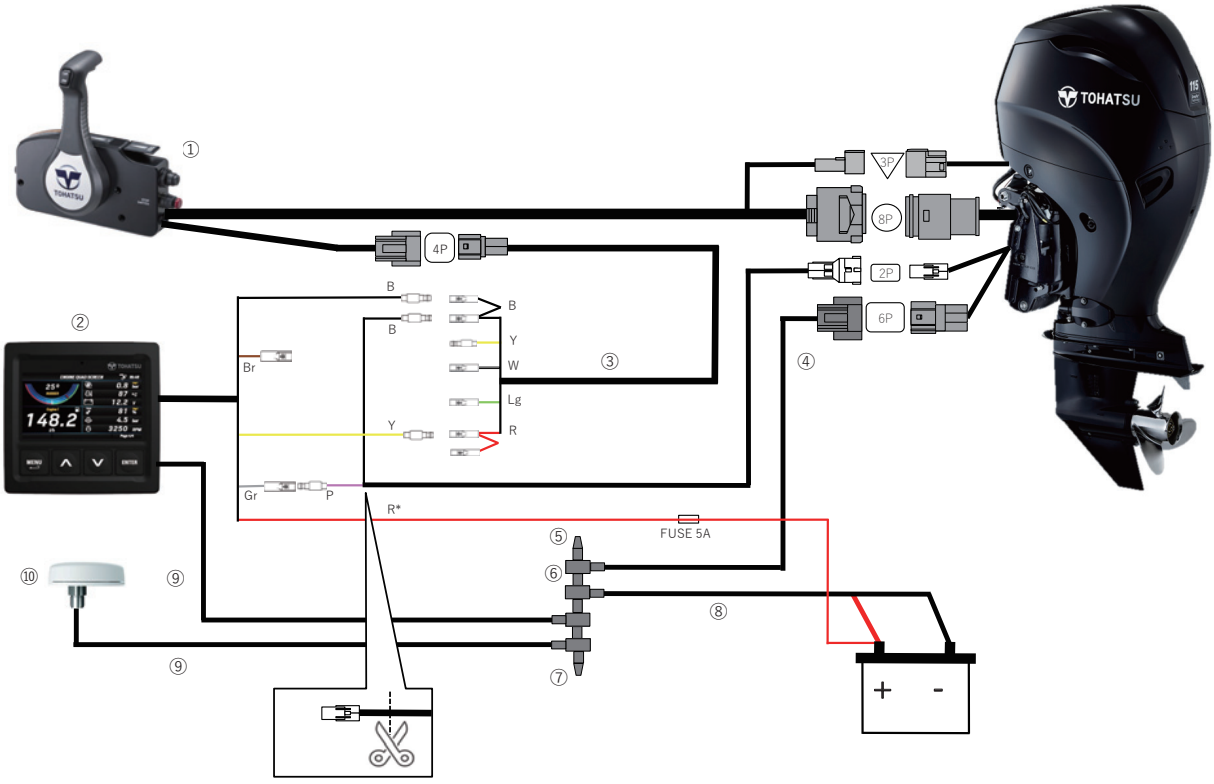
⚠ CAUTION

Please confirm that the locking hooks are securely installed.

Wiring Diagram

Harness Diagram for TOCS4.3"LCD DISPLAY with analog trim sensor (standard)

MFS 25 – 140A



Cut the original connector to separate pink and black leads.

Display Lead Wire Color Code

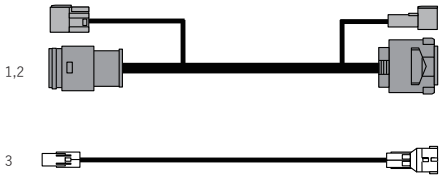
Code	Color	Function
B	Black	Ground
Br	Brown	Fuel gauge signal
Y	Yellow	+12V key ON
Gr	Gray	Trim signal
R*	Red	+12V always ON

Meter Lead Wire Color code

Code	Color	Tag	Function
B	Black	GND	Ground
Y	Yellow	TAC-	Ground
W	White	TAC+	Tachometer signal
Lg	Light Green	OIL	Warning Signal
R	Red	BAT+	+12V key ON

Parts

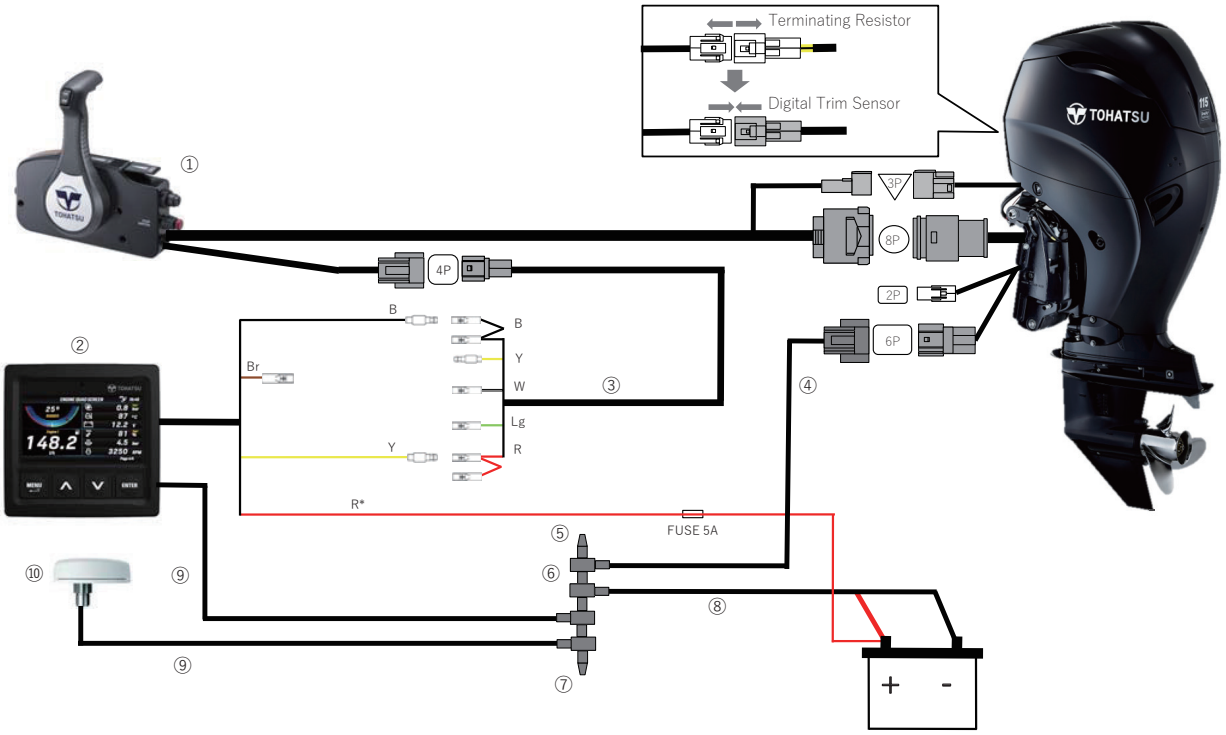
No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12F)
②	TOCS 4.3" LCD DYSPLAY
③	METER LEAD WIRE L=2000 (6.5')
④	ENGINE DROP CABLE
⑤	TERMINATOR (FEMALE)
⑥	TEE CONNECTOR
⑦	TERMINATOR (MALE)
⑧	BATTERY CABLE
⑨	BACKBONE CABLE
⑩	GPS MODULE



No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')
3	3Z4-72573-0	EXTENSION CORD (TRIM SENSOR) L=2000 (6.5')

Harness Diagram for TOCS4.3"LCD DISPLAY with digital trim sensor (option)

MFS 75 – 140A



Display Lead Wire Color Code

Code	Color	Function
B	Black	Ground
Br	Brown	Fuel gauge signal
Y	Yellow	+12V key ON
R*	Red	+12V allways ON

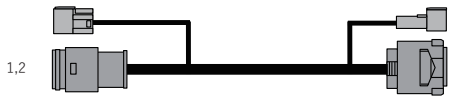
Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
Y	Yellow	TAC-	Ground
W	White	TAC+	Tachometer signal
Lg	Light Green	OIL	Warning Lamp
R	Red	BAT+	+12V key ON

Parts

No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12F)
②	TOCS 4.3" LCD DYSPLAY
③	METER LEAD WIRE L=2000 (6.5')
④	ENGINE DROP CABLE
⑤	TERMINATOR (FEMALE)
⑥	TEE CONNECTOR
⑦	TERMINATOR (MALE)
⑧	BATTERY CABLE
⑨	BACKBONE CABLE
⑩	GPS MODULE

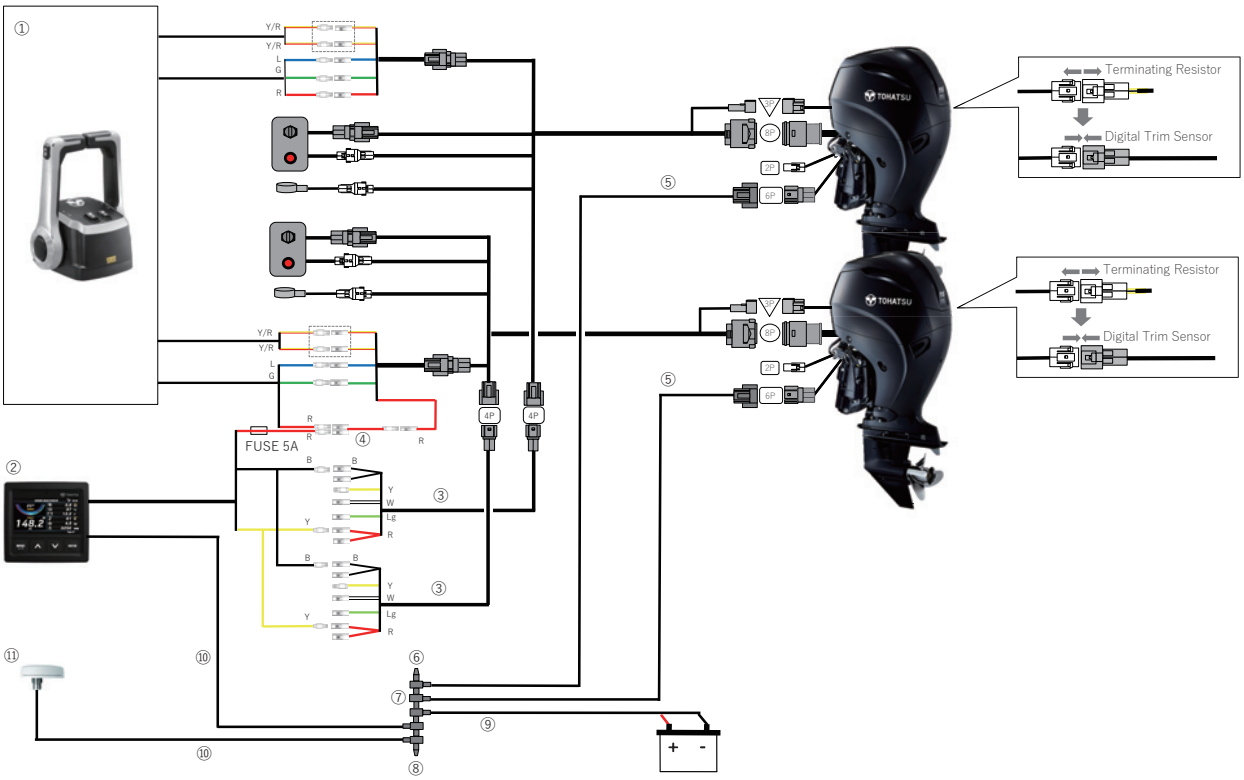
Optional Extension Harness



No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')

Harness Diagram for TOCS4.3"LCD DISPLAY with digital trim sensor (option)

MFS 75 –140A Twin Installation



Display Lead Wire Color Code

Code	Color	Function
B	Black	Ground
Y	Yellow	+12V key ON
R*	Red	+12V allways ON

Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
Y	Yellow	TAC-	Ground
W	White	TAC+	Tachometer signal
Lg	Light Green	OIL	Warning Signal
R	Red	BAT+	+12V key ON

Parts

No.	Description	Qty
①	REMOTE CON. HEAD ASSY. (TOP TWIN)	1
②	TOCS 4.3" LCD DYSPLAY	1
③	METER LEAD WIRE L=2000 (6.5')	1
④	ASSIST CORD (RED) L=200	1
⑤	ENGINE DROP CABLE L=6000	2
⑥	TERMINATOR (FEMALE)	1
⑦	TEE CONNECTOR	5
⑧	TERMINATOR (MALE)	1
⑨	BATTERY CABLE	1
⑩	BACKBONE CABLE L=5000	2
⑪	GPS MODULE	1

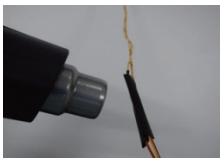
Optional Extension Harness

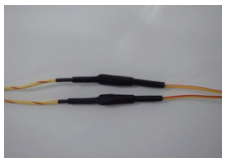
1,2

No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')

***Note**

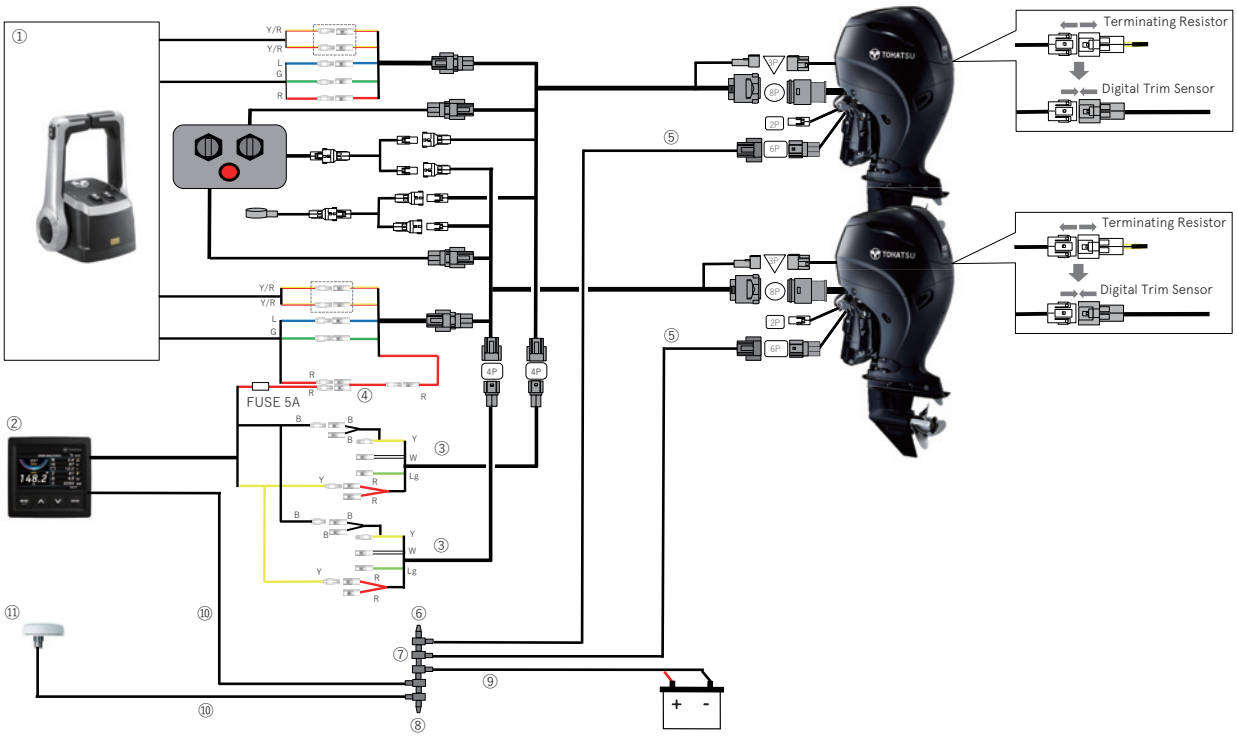
Neutral switch blade terminals must be covered by supplied heatshrink tubes to prevent connection lose and corrosion from water intrusion.





Harness Diagram for TOCS4.3"LCD DISPLAY with digital trim sensor (option)

MFS 75A/90A/115A/140A Twin Installation



Display Lead Wire Color Code

Code	Color	Function
B	Black	Ground
Y	Yellow	+12V key ON
R*	Red	+12V allways ON

Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
Y	Yellow	TAC-	Ground
W	White	TAC+	Tachometer signal
Lg	Light Green	OIL	Oil signal
R	Red	BAT+	+12V key ON

Parts

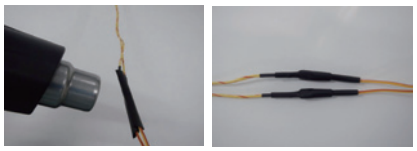
No.	Description	Qty
①	REMOTE CONTROL HEAD ASSY. (TOP TWIN)	1
②	TOCS 4.3" LCD DYSPLAY	1
③	METER LEAD WIRE L=2000 (6.5')	1
④	ASSIST CORD (RED) L=200	1
⑤	ENGINE DROP CABLE L=6000	2
⑥	TERMINATOR (FEMALE)	1
⑦	TEE CONNECTOR	5
⑧	TERMINATOR (MALE)	1
⑨	BATTERY CABLE	1
⑩	BACKBONE CABLE L=5000	2
⑪	GPS MODULE	1

Extension Harness (Optional)

No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')

***Note**

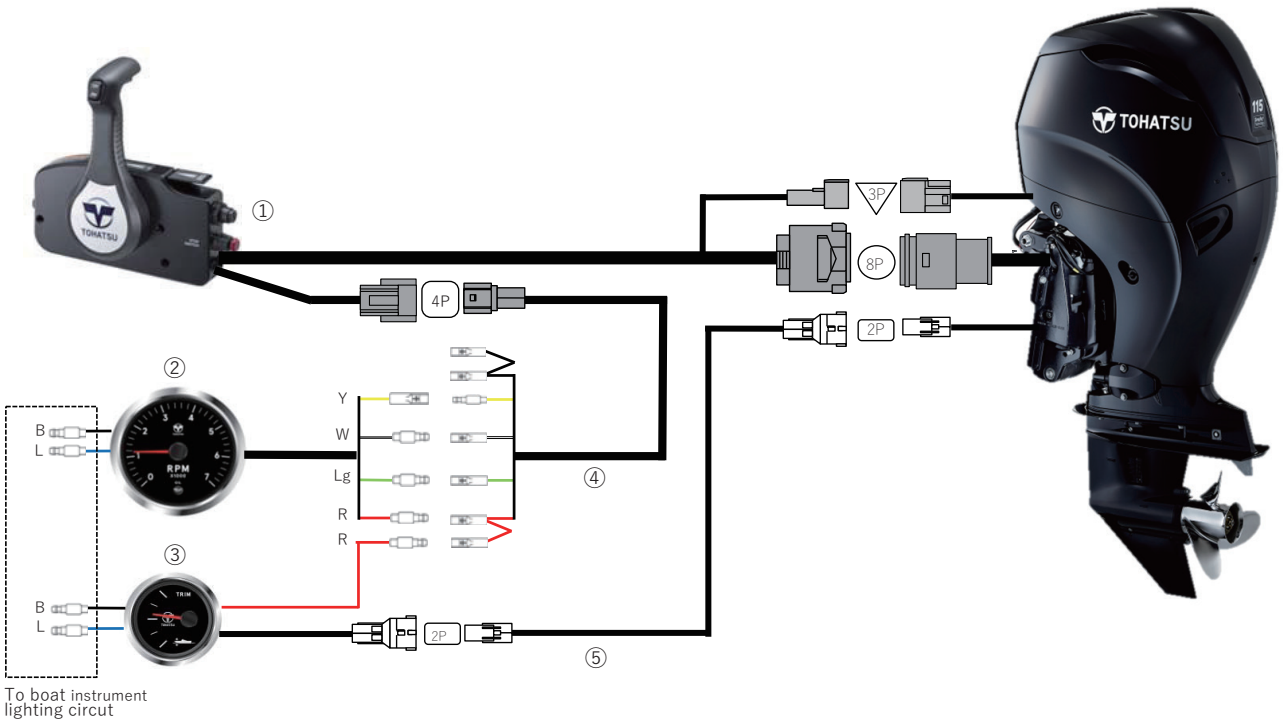
Neutral switch blade terminals must be covered by supplied heat shrink tubes to prevent connection and corrosion from water intrusion.



Wiring Diagram

Harness Diagram for Side Mount Remote Control

MFS 40 -140A



Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
L	Blue		+12V Back light
Lg	Light Green	OIL	Warning Signal
R	Red	BAT+	+12V key ON
W	White	TAC+	Tachometer signal
Y	Yellow	TAC-	Ground

Parts

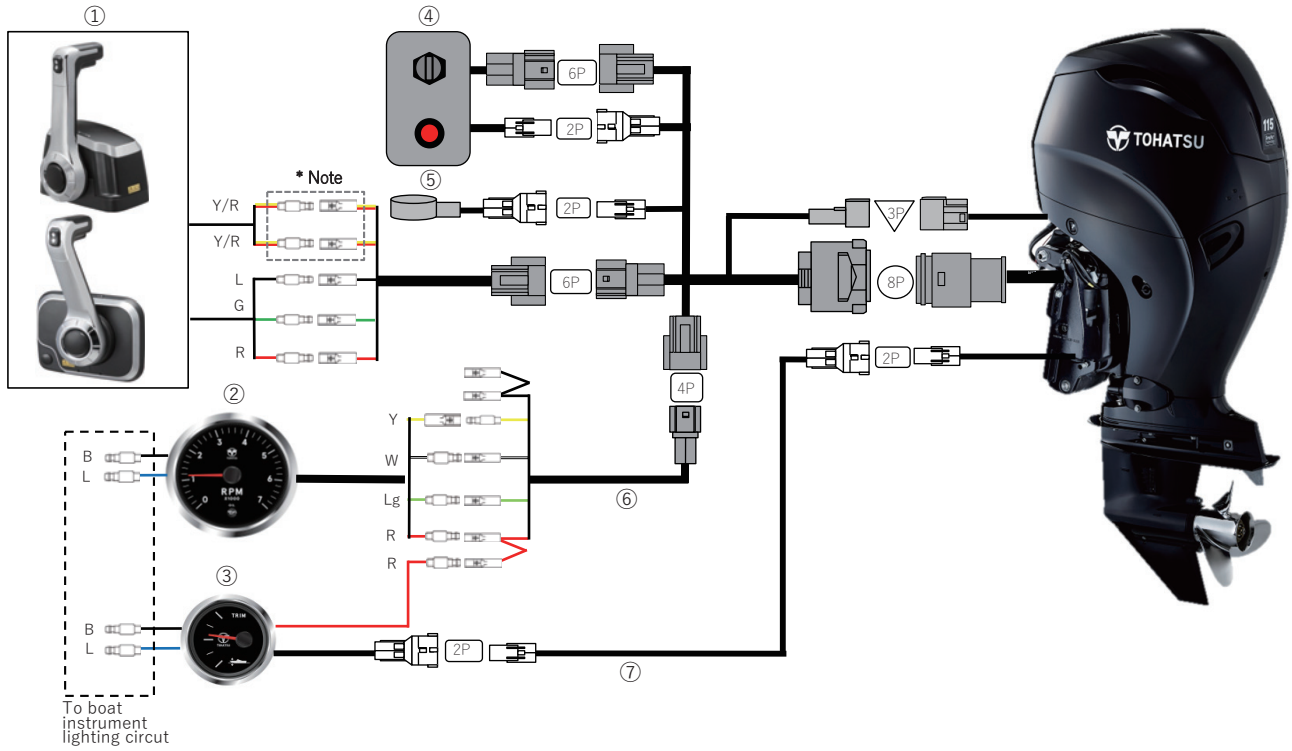
No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12F)
②	TACHOMETER
③	TRIM METER
④	METER LEAD WIRE　L=2000 (6.5')
⑤	EXTENSION CORD（TRIM SENSOR）　L=6000 (19.5')

Optional Extension Harness

No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')
3	3Z4-72573-0	EXTENSION CORD (TRIM SENSOR) L=2000 (6.5')

Harness Diagram for Top/Flush Mount Remote Control

MFS 40 -140A



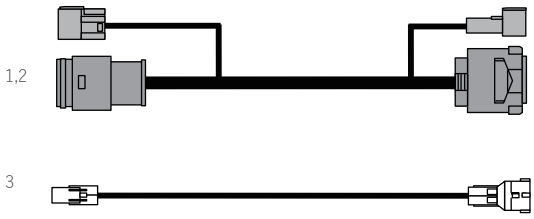
Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
L	Blue		+12V Back light
Lg	Light Green	OIL	Oil signal
R	Red	BAT+	+12V key ON
W	White	TAC+	Tachometer signal
Y	Yellow	TAC-	Ground

Remote Control Head Wire Color Code

Code	Color	Tag	Function
Y/R	Yellow/Red	NEUTRAL SWITCH	Neutral switch
R	Red		+12V always ON
L	Blue		Trim&Tilt Up
G	Green		Trim&Tilt Down

Optional Extension Harness



No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')
3	3Z4-72573-0	EXTENSION CORD (TRIM SENSOR) L=2000 (6.5')

Parts

No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12F)
②	TACHOMETER
③	TRIM METER
④	MAIN SWITCH PANEL
⑤	BUZZER
⑥	METER LEAD WIRE L=2000 (6.5')
⑦	EXTENSION CORD (TRIM SENSOR) L=6000 (19.5')

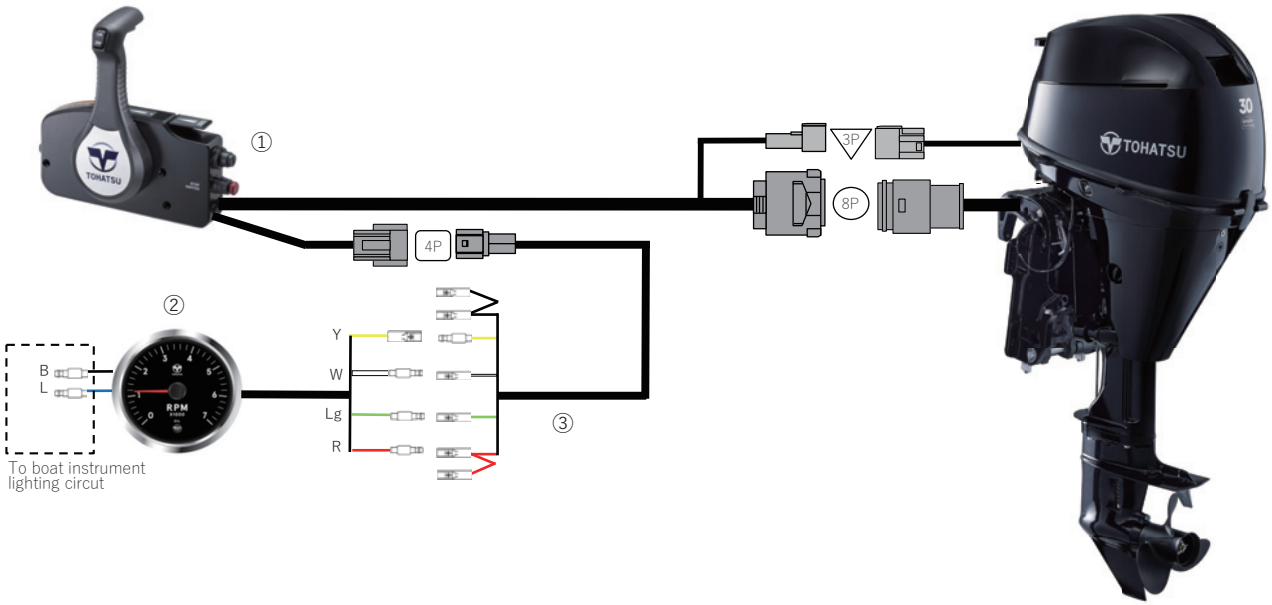
***Note**

Neutral switch blade terminals must be covered by supplied heat shrink tubes to prevent electrical short connection and corrosion from water intrusion. Please make sure the tubing is shrunk to wrap tightly after heating by hot air gun.

Wiring Diagram

Harness Diagram for Side Mount Remote Control

MFS 25/30D



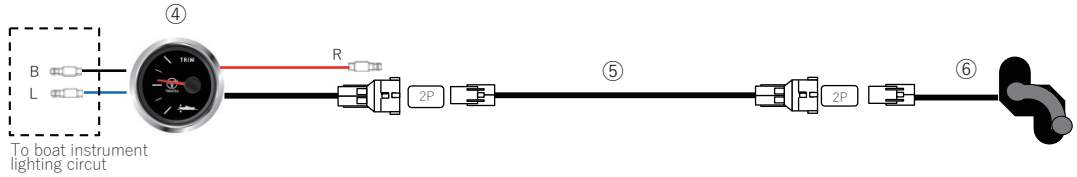
Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
L	Blue		+12 Back Light
Lg	Light Green	OIL	Warning lamp
R	Red	BAT+	+12V Key On
W	White	TAC+	Tachometer Signal
Y	Yellow	TAC-	Ground

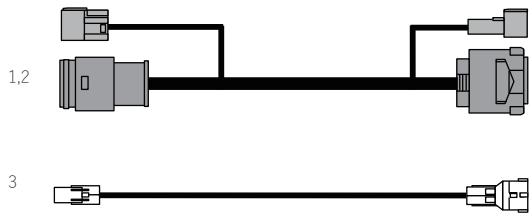
Parts

No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12F)
②	TACHOMETER
③	METER LEAD WIRE　L=2000 (6.5')
④	TRIM METER
⑤	EXTENSION CORD（TRIM SENSOR）　L=6000 (19.5')
⑥	TRIM SENSOR KIT

Trim Meter Kit (Option)



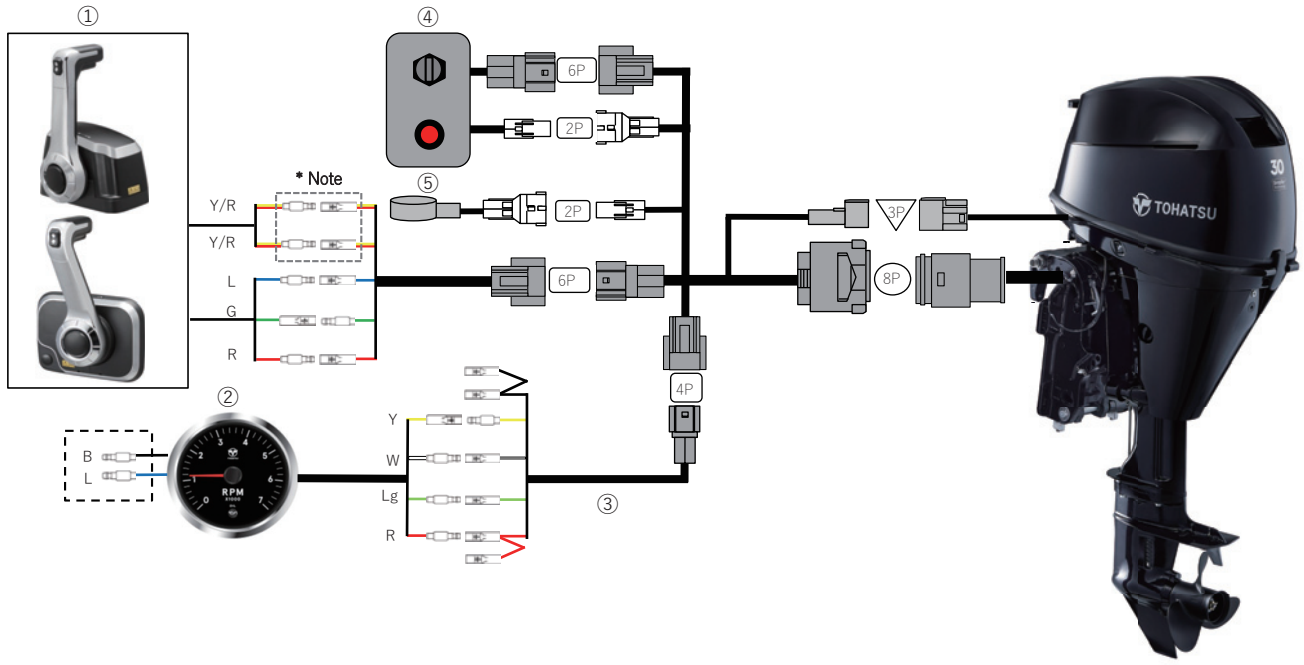
Optional Extension Harness



No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')
3	3Z4-72573-0	EXTENSION CORD (TRIM SENSOR) L=2000 (6.5')

Harness Diagram for Top/Flush Mount Remote Control

MFS 25/30D



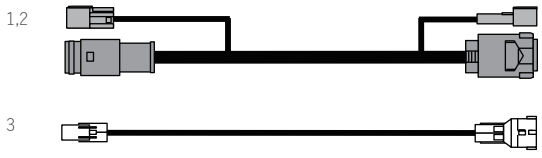
Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
L	Blue		+12V Back Light
Lg	Light Green	OIL	Warning Lamp
R	Red	BAT+	+12V Key On
W	White	TAC+	Tachometer Signal
Y	Yellow	TAC-	Ground

Remote Control Head Wire Color Code

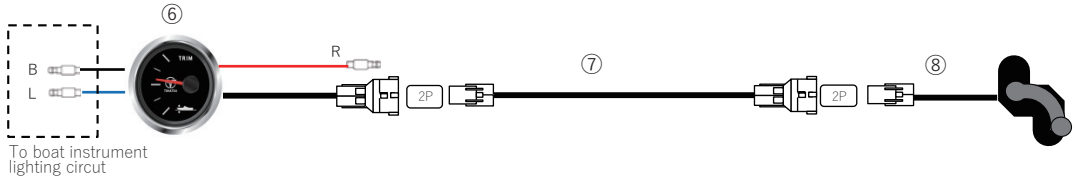
Code	Color	Tag	Function
Y/R	Yellow/Red	NEUTRAL SWITCH	Neutral Switch
R	Red		Positive +12V
L	Blue		Tilt Up
G	Green		Tilt Down

Optional Extension Harness



No.	Part Number	Description
1	3KY-76114-0	EXTENSION CORD L=4000 (13')
2	3T5-76114-0	EXTENSION CORD L=2000 (6.5')
3	3Z4-72573-0	EXTENSION CORD (TRIM SENSOR) L=2000 (6.5')

Trim Meter Kit (Option)

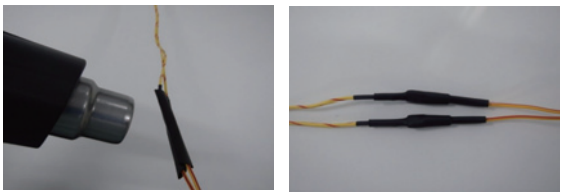


Parts

No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12F)
②	TACHOMETER
③	METER LEAD WIRE L=2000 (6.5')
④	MAIN SWITCH PANEL
⑤	BUZZER
⑥	TRIM METER
⑦	EXTENSION CORD (TRIM SENSOR) L=6000 (19.5')
⑧	TRIM SENSOR KIT

*Note

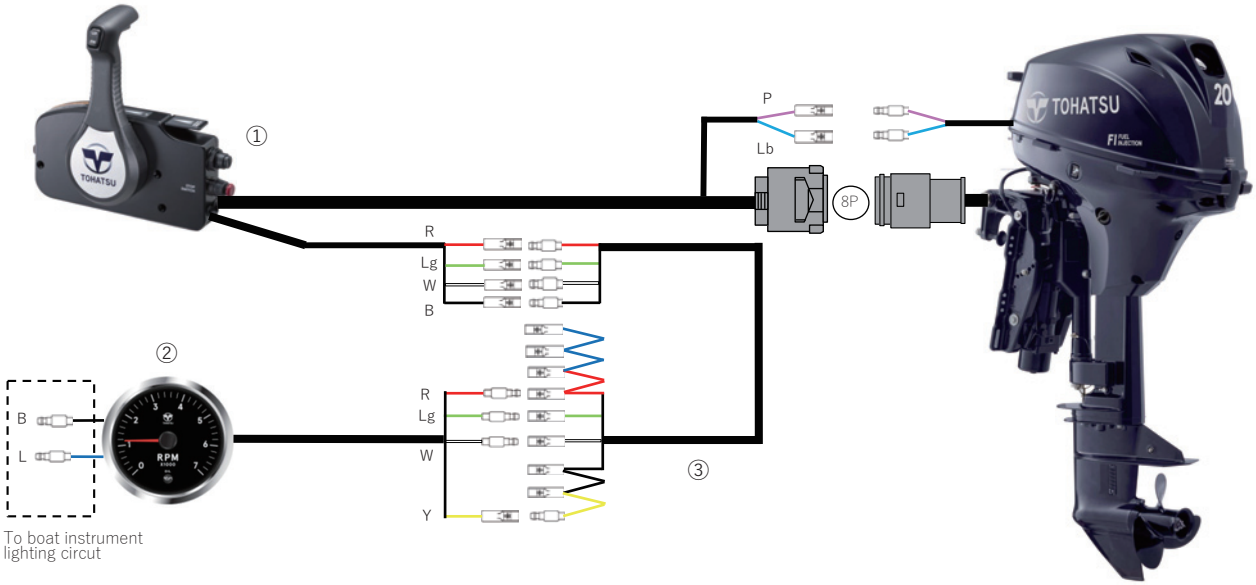
Neutral switch blade terminals must be covered by supplied heat shrink tubes to prevent connection lose and corrosion from water intrusion.



Wiring Diagram

Harness Diagram for Side Mount Remote Control

MFS 9.9/15/20E



Meter Lead Wire Color Code

Code	Color	Tag	Function
B	Black	GND	Ground
L	Blue		12V Back light
Lg	Light Green	OIL	Warning lamp
R	Red	BAT+	12V Key On
W	White	TAC+	Tachometer Signal
Y	Yellow	TAC-	Ground

Parts

No.	Description
①	REMOTE CONTROL HEAD ASSY. (RC12A)
②	TACHOMETER
③	METER LEAD WIRE L=2000 (6.5')

Optional Extension Harness

No.	Part Number	Description
1	3A3-76114-0	EXTENSION CORD L=2000 (6.5')

Upper edge of transom

51 mm (2 in)

Ø12.7 mm hole (1/2 in)

⚠ WARNING

Do not drill upper mounding holes on the area of the transom below 25.4 mm (1 in) or lower from the top edge of the transom.

163.5 mm (6-7/16 in)

163.5 mm (6-7/16 in)

51 mm (2 in)

Vertical center line of boat transom

203 mm (7.992 in)

Outboard Motor Installation Template

Applicable model: MFS25/30D PT model only
MFS40/50/60A, MFS75/90/115/140A

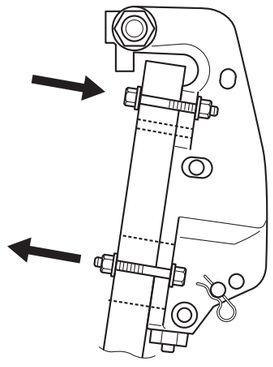
IMPORTANT

Before drilling any holes, check that this template matches the hole arrangement of the outboard motor. Please make sure the size by using a ruler when it printed out.

⚠ WARNING

When securing an outboard motor on the transom, upper installation bolts with washer should be run from inside of the hull to outside, and lower installation bolts should be run from outside of the hull to inside, and the bolts are to be tightened using a washer and nut. After installing an outboard motor, check the installation for water-tightness and that the outboard is fixed on the transom securely.

Installation of an outboard motor improperly bolted on the transom can cause damages to the hull, submersion of the machine, and/or injury to the crew(s) and passenger(s).

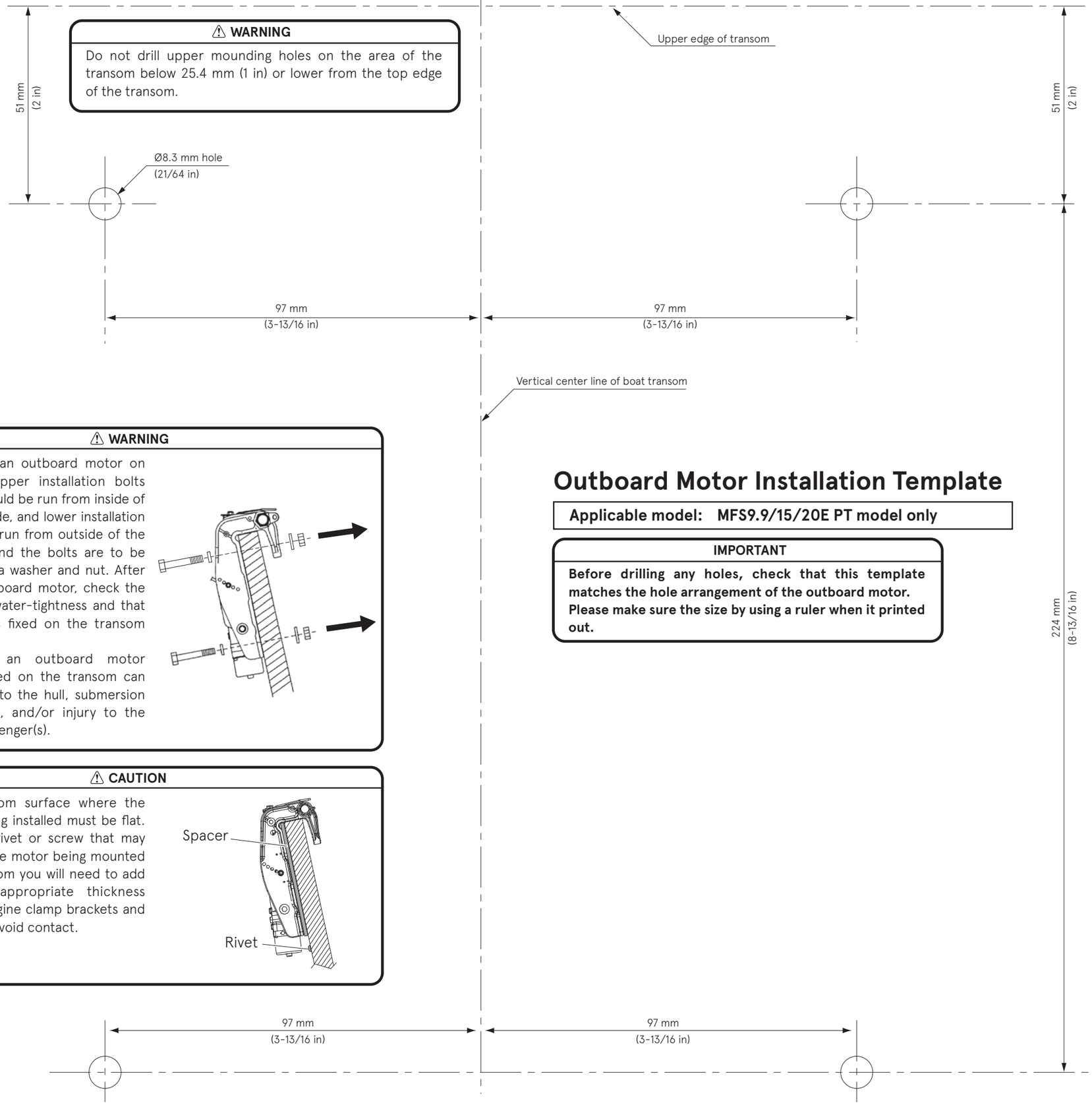


125.5 mm (4-15/16 in)

125.5 mm (4-15/16 in)

⚠ WARNING

Do not drill upper mounding holes on the area of the transom below 25.4 mm (1 in) or lower from the top edge of the transom.



Outboard Motor Installation Template

Applicable model: MFS9.9/15/20E PT model only

IMPORTANT

Before drilling any holes, check that this template matches the hole arrangement of the outboard motor. Please make sure the size by using a ruler when it printed out.

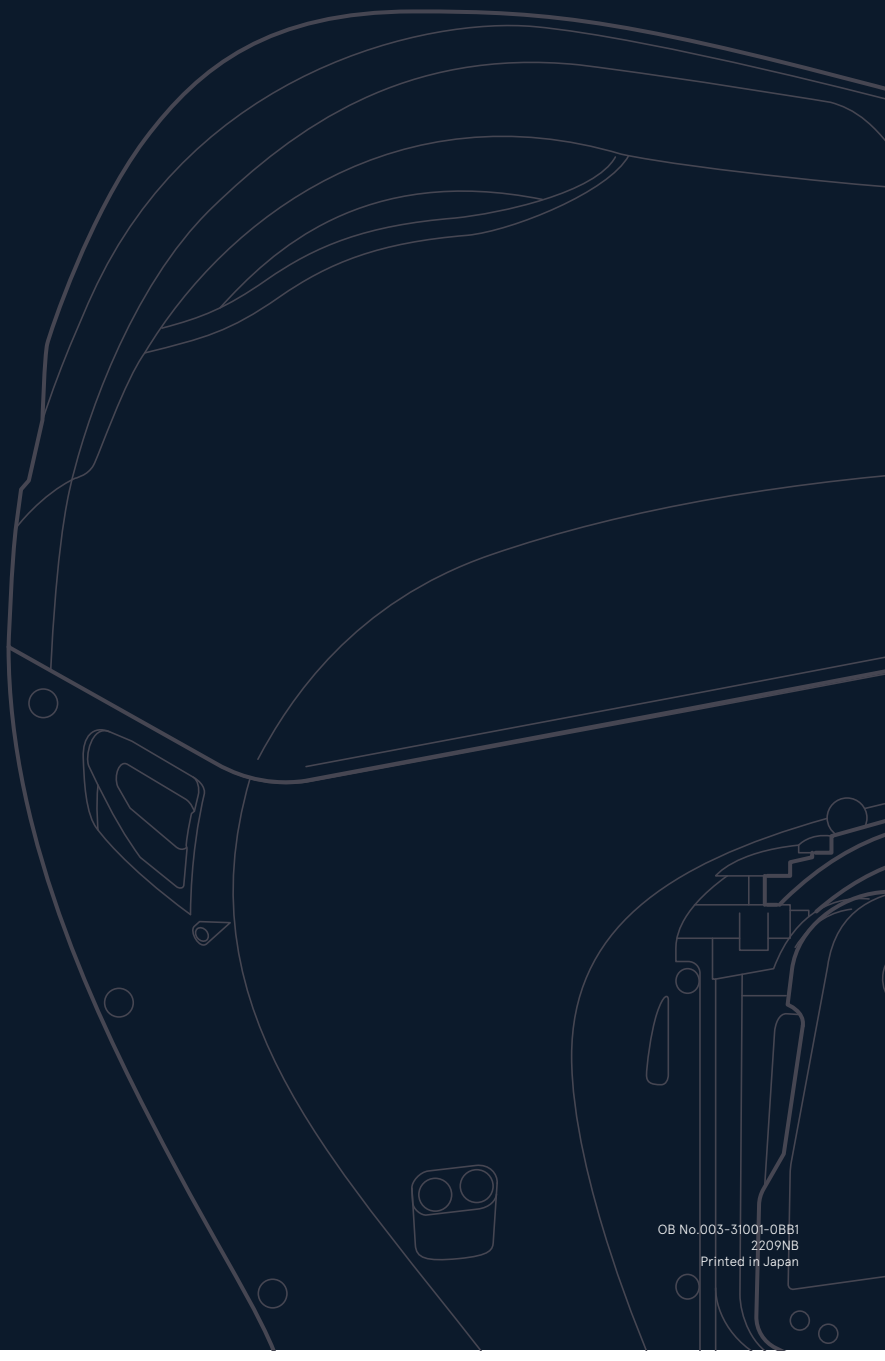
⚠ WARNING

When securing an outboard motor on the transom, upper installation bolts with washer should be run from inside of the hull to outside, and lower installation bolts should be run from outside of the hull to inside, and the bolts are to be tightened using a washer and nut. After installing an outboard motor, check the installation for water-tightness and that the outboard is fixed on the transom securely.
Installation of an outboard motor improperly bolted on the transom can cause damages to the hull, submersion of the machine, and/or injury to the crew(s) and passenger(s).

⚠ CAUTION

The boat transom surface where the outboard is being installed must be flat. If there is any rivet or screw that may interfere with the motor being mounted flat to the transom you will need to add a spacer of appropriate thickness between the engine clamp brackets and the transom to avoid contact.

RIGGING MANUAL



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