

X20 User Manual



Model: X20-L, X20-XL

2024.12 Version 1.1

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Acknowledgement

Thanks for choosing ePropulsion products, your trust and support in our company are sincerely appreciated. We are dedicated to providing high-performance electric outboards, electric outboards, sup/kayak motors, reliable lithium batteries and accessories.

Welcome to visit www.epropulsion.com and contact us if you have any concerns.

Using This Manual

Before use of the product, please read this user manual thoroughly to understand the correct and safe operations. By using this product, you hereby agree that you have fully read and understood all contents of this manual. ePropulsion accepts no liability for any damage or injury caused by operations that contradict this manual.

Due to ongoing optimization of our products, ePropulsion reserves the rights of constantly adjusting the contents described in the manual. ePropulsion also reserves the intellectual property rights and industrial property rights including copyrights, patents, logos and designs, etc.

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ePropulsion reserves the rights of final interpretation of this manual.

This manual is multilingual, in case of any discrepancy in the interpretation of different language versions, the English version shall prevail.

Safety Warning

ePropulsion attaches great importance to safety and advises anyone who comes into close contact with ePropulsion products, such as installation, operation, maintenance, or servicing, to exercise caution, use common sense, follow the instructions in this manual, and adhere to the safety information on the machine installation stickers to ensure the safety of individuals and property and reduce safety risks.

The following are the relevant information symbols found in the user manual or product label stickers:

Danger or Warning Signs: These signs indicate potential hazards or significant risks that, if not avoided, could result in death or serious personal injury. Extra caution and attention should be exercised regarding your safety or the safety of the product.

**Important warning:**

Tips or important informations help quickly grasp the use of the outboard motor and improve efficiency. Please read and follow the instructions following the safety warning signs.

**Caution:**

When installing, operating, maintaining or serving ePropulsion products, there are many safety risks in the process. You need to be alert, perform relevant operations reasonably, and pay attention to safety. When installing, operating, maintaining or serving ePropulsion products, there are many safety risks in the process. You need to be alert, perform relevant operations reasonably, and pay attention to safety.

**Entanglement hazard:**

Rotating parts can cause severe injury or death. Never wear jewelry, unbuttoned cuffs, ties or loose-fitting clothing and always tie long hair back when working near moving/rotating parts such as the flywheel or PTO shaft. Keep hands, feet and tools away from all moving parts.

**Electric shock hazard:**

The areas or equipment may be at risk of electric shock. The equipment uses 102.4V DC power. When operating electricity-related electrical connectors, switches, cables and other electricity-related items, power off operation to prevent electric shock.

**Burn hazard:**

Some of the machine surfaces become very hot during operation and shortly after shutdown. Keep hands and other body parts away from hot machine surfaces.

**Do not approach when the machine is running:**

The machine and equipment are in operation. Do not approach or touch the machine to avoid dangers.

**Do not pconnector or unconnector when the machine is running:**

Do not pconnector or unconnector electrical equipment when the machine is running to avoid the risk of electric shock.

**Warning:**

This product can expose you to chemicals including arsenic, which is known to the State of California to cause cancer. For more information, go to www.P65Warnings.ca.gov.

Product Serial Number

Below picture indicates the serial numbers of X20 Outboard Motor. Please note the position of the serial numbers and record them for access to warranty service and other after-sale services.

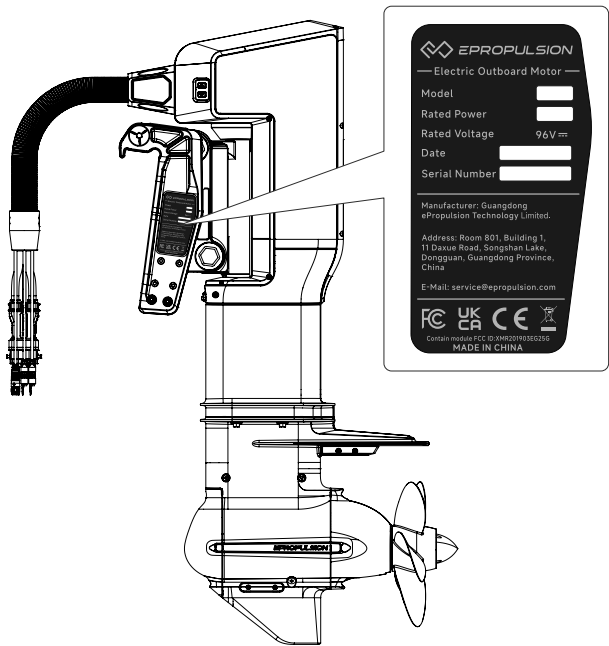


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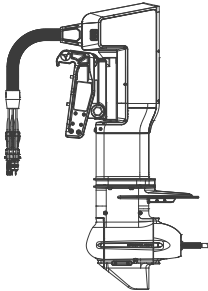
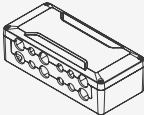

1 Product Introduction

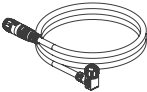


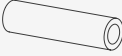

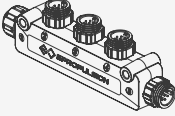
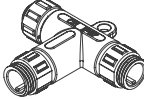
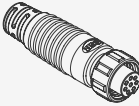
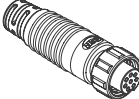

The X20 Electric Outboard Motor is an electric propulsion system with an input power of 20kW. It can be controlled using digital helm, smart throttle, and smart display 5". The X20 Electric Outboard Motor is environmentally friendly, clean, and efficient. It is available in two models: X20-L and X20-XL.

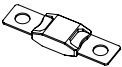
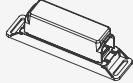

1.1 In the Package

Unpack the package and check if there is any damage caused during transport. Check all the items inside the package against the below list. If there is any transport damage or lack of any listed item, please contact your dealer immediately.

1.1.1 X20 Packaging List

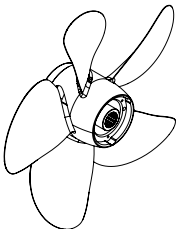
Items	Qty.	Figure	Function
X20 Electric Outboard Motor w/o propeller	1		Provide the main propulsion of the boat
Bus box	1		Transfers electrical energy from the power system's main circuit to different components or modules within the circuit
96V Power Cable 5m	1		Transfer DC power from the battery to the power input of the motor to provide the power needed for normal operation of the motor

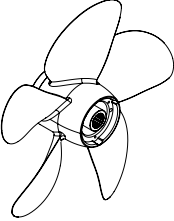
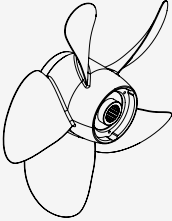
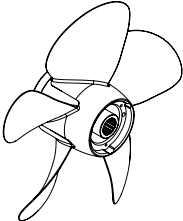
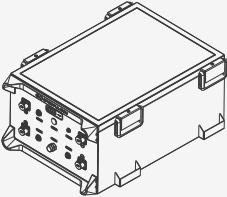
Items	Qty.	Figure	Function
eSSA Communication Cable 1m	1		Connect the motor and other devices such as the smart throttle, smart display and battery
eSSA Communication Extension Cable 10m	1		Extend the communication distance of the CAN communication cable
Heat Shrink Tubing (Red Φ19.1mm)	1		Protect the main power cable after stripping it
Heat Shrink Tubing (Black Φ19.1mm)	1		Protect the main power cable after stripping it
Cable Lug (SC50-8-L)	6		Retrofit terminal for rear end of main power cable
eSSA Communication 5-way T Connector	1		Connect the motor and each device to the CAN communication network (controller LAN)
eSSA Communication 3-way T Connector	2		Connect the motor and each device to the CAN communication network (controller LAN)
eSSA Communication Terminator 120Ω	1		Improve the quality of communication
eSSA Communication Terminator 360Ω	1		Improve the quality of communication
12V Fuse Connecting Cable	1		/

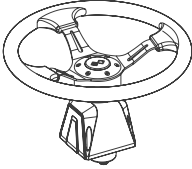
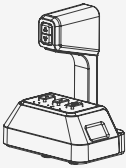

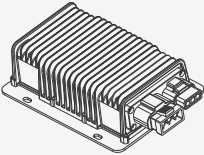
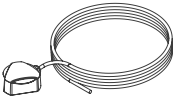
Items	Qty.	Figure	Function
12V Fuse	1		/
12V Fuse Base	1		/
X-Series Outboard Motor Installation Accessory Pack	1	Hexagon Bolt (M12x1.25x110)*4 Hexagon Nut (M12x1.25)*8 Plain Washer-Extra Large Series (M12x44x4)*4 Plain Washer (M12x24x2.5)*8 Eye Bolt (M8) *2 Plain Washer (M8x16x1.6)*2	Motor installation accessory
User manual Warranty card	1		Give information about the features, functions, performance, purpose and maintenance of the product

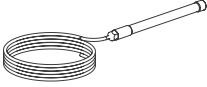
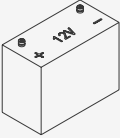
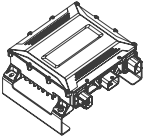
1.1.2 Optional Accessory List

Other accessories not included in the package are also required to operate the outboard motor such as propellers, digital helm, smart throttle, smart display 5", G102 battery, battery charger, and communication cables. Users can buy official accessories provided by ePropulsion Technology authorized dealers.

Items	Figure	Function
X20/X40 propeller 15" x 10 3/4" RH (Aluminium Alloy)		Suitable for heavy-load scenarios

Items	Figure	Function
X20/X40 Propeller 15" x 10 3/4" LH (Aluminium Alloy)		Suitable for heavy-load scenarios. Recommended for use in twin-motor or multi-motor
X20/X40 Propeller 13 3/8" x 16 3/4" RH (Aluminium Alloy)		Suitable for light-load scenarios
X20/X40 Propeller 13 3/8" x 16 3/4" LH (Aluminium Alloy)		Suitable for light-load scenarios Recommended for use in twin-motor or multi-motor
G102 Battery and Cables		Provides reliable electrical power for the system

Items	Figure	Function
Digital Helm		Outboard motor steering control
Smart Throttle		Start, stop the motor and control the power output
Smart Display 5"		Display system information such as power, speed, battery level and set system functions
DC-DC		DC to charge the 12V battery
GPS module		Use when outboard motor GPS signal is weak. Obtaining a ship's Global Positioning System (GPS) signal can provide the ship's position and speed information, helping ship managers with ship management and adjusting course plans

Items	Figure	Function
4G antenna		Use when outboard motor 4G signal is weak. The 4G antenna is a kind of communication equipment. The machine realizes remote network connection through the 4G antenna to realize remote control and monitoring. At the same time, it can support high-speed data transmission, which is convenient for the crew to carry out online data sharing and backup operations
12V battery		Provide power to the system 12V equipments
G battery charger		Charge the G102 battery



The 12V battery (not supplied with motor) needs a minimum current output of 120A, a capacity of 120Ah.



The maximum output power of the DC-DC Converter is 500W. When selecting the system's 12V equipment, ensure this charging capacity meets the battery's requirements.



When selecting and purchasing propellers, it is recommended to consult ePropulsion authorized dealers and consider the following references:

- If the expected speed is 25km/h or less, it is recommended to choose the X20/X40 Propeller 15" x 10 3/4" RH or X20/X40 Propeller 15" x 10 3/4" LH.
- If the expected speed is higher than 25km/h, it is recommended to choose the X20/X40 Propeller 13 3/8" x 16 3/4" RH or X20/X40 Propeller 13 3/8" x 16 3/4" LH.



In the case of twin-motor or multi-motor setups, it is recommended to use a combination of RH and LH propellers to achieve better-balance between the motors and easier steering.

1.1.3 Installation Tools List

Before installing the outboard motor, users or machine installation operators need to prepare the necessary tools for outboard motor installation, propeller installation, wiring arrangement, fixation, and connection.

Tool	Specification	Qty.	Purpose
M5 Hex Wrench	4mm, suitable for M5 hexagon socket cap screws	1	To disassemble the machine's top cover, facilitating the installation of eye bolts and machine hoisting
M4 Hex Wrench	3mm, suitable for M4 hexagon socket cap screws	1	To install the propeller deflector
M12 Socket Wrench	18mm, suitable for M12 hexagon bolts	2	To install the boat's bolt
M6 Socket Wrench	10mm, suitable for M6 hexagon bolts	1	For the 12V power line connectio
M8 Socket Wrench	13mm, suitable for M8 hexagon bolts	1	To connect and fix the bus box to the BDU busbar assembly
M20 Socket Wrench	30mm, suitable for M20 nuts	1	To install the propeller
M12 Torque Wrench	Torque range: 0~100Nm	1	To control the torque during the installation of the machine and boat mounting bolts
Cross-head Screwdriver	/	1	For DCDC and other installations
Crane	Lifting capacity $\geq 500\text{kg}$	1	To lift and install the machine
Lifting Rope	Bearing capacity $\geq 500\text{kg}$	1	To lift and install the machine
Wire Cutter	EC-50M	1	For cutting the battery terminal power cables
Wire Stripper	SW-1018	1	For stripping the battery terminal power cables
Crimping Plier	/	1	For crimping the battery terminal power cables
Heat Gun	/	1	For shrinking heat shrink tubes

Tool	Specification	Qty.	Purpose
Electric Drill / Hole-Making Equipment	Hole requirement: $\varnothing 13\text{mm}$	1	Drill holes in the boat for machine installation
Hole-making Tools	Hole requirement: $\varnothing 13\text{mm}$	1	Drill holes in the boat for machine installation
Hole-making Tool	Meet the hole size: 100mm	1	Boat hole routing
Sealant	Structural adhesive	1	Apply to the bolt position after machine installation

1.2 Parts and Diagram

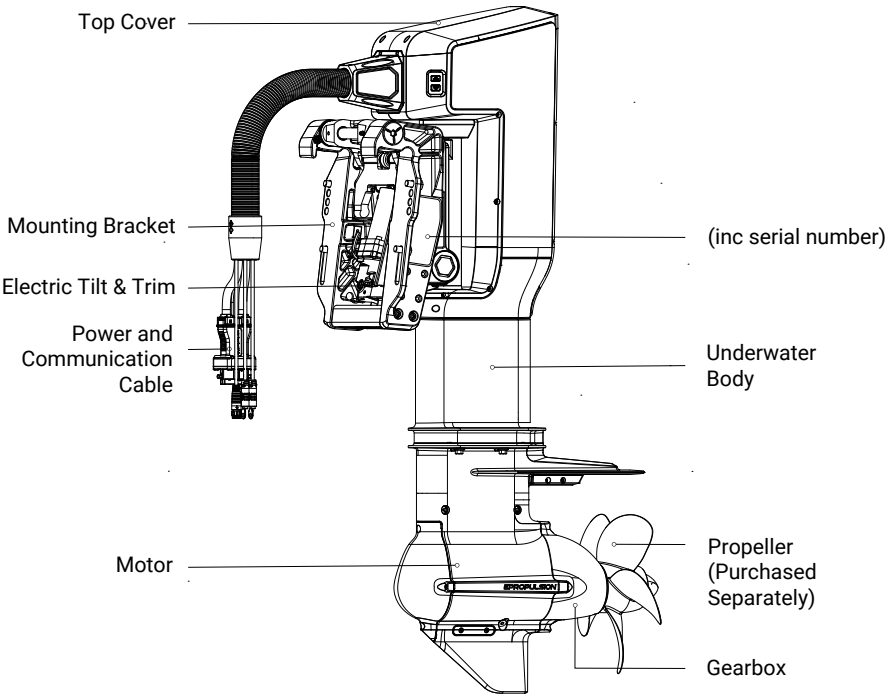


Figure 1-1

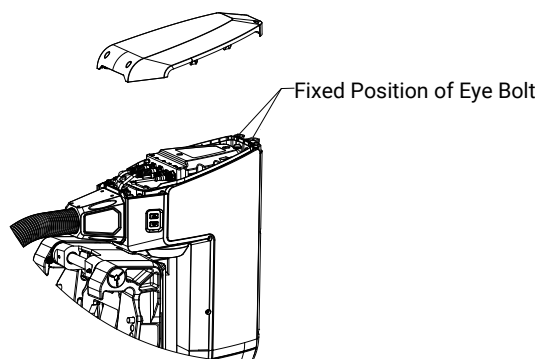


Figure 1-2

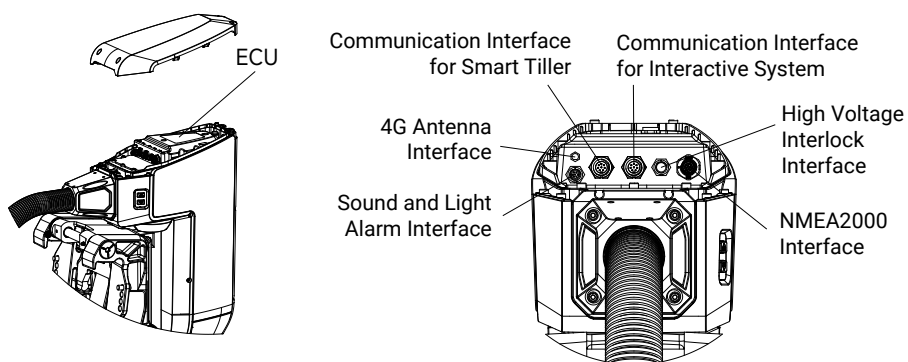


Figure 1-3

1.3 Specification

Model	X20-L / X20-XL
Rated input power	20 kW
Recommended battery	ePropulsion Lithium Iron Phosphate Battery
Rated input voltage	96 Vdc
Input voltage range (high voltage)	86 - 115 Vdc
Input voltage range (low voltage)	10.5 - 16 Vdc
Weight	L: 79 kg XL: 81 kg
Shaft length (from bracket clamp to anti-cavitation plate, see Figure 1.4)	L: 508 mm XL: 635 mm
Dimensions (Length * Width * Height)	L: 674 mm x 360 mm x 1229 mm XL: 674 mm x 360 mm x 1356 mm
Rated rotational speed	1500 rpm
Rated power rotational speed range	1200 - 1800 rpm
Operating Temperature	-5 - 55 °C
Storage Temperature	-25 - 70 °C
Control System	Smart Throttle; Digital Helm; Smart Display 5"
ePropulsion Connectivity Service	Supported
Assisted Driving	Supported ADAS L1
Suitable propeller (purchase separately)	X20/X40 propeller 15" x 10 3/4" RH X20/X40 propeller 15" x 10 3/4" LH X20/X40 propeller 13 3/8" x 16 3/4" RH X20/X40 propeller 13 3/8" x 16 3/4" LH
Trim adjustment device	Standard electric tilt & trim
Tilt Angle	-4° - 61°
Steering Device	Equipped with Electric Steering System
Steering Angle	±45°



When the high-voltage input voltage is below 96Vdc, there will be an undervoltage alarm.

1.4 Model and Shaft Length Selection

For X-series outboard motors, the shaft length refers to the distance from the bracket clamp to the lower surface of the anticavitation plate.

The mounting height can have a significant effect on performance. If it's too high, this may cause cavitation, leading to loss of speed, inefficiency, and propeller damage. But if it's too low this will increase drag, which will also slow the boat down.

Optimal mounting height is dependent on several factors including the boat's underwater profile. Ideally it should be tested at different heights. But the following is a good guide for most conventional boats, in consultation with your dealer.

Transom Height	Recommended Model
< 470mm	X20 - L
470mm~595mm	X20 - XL

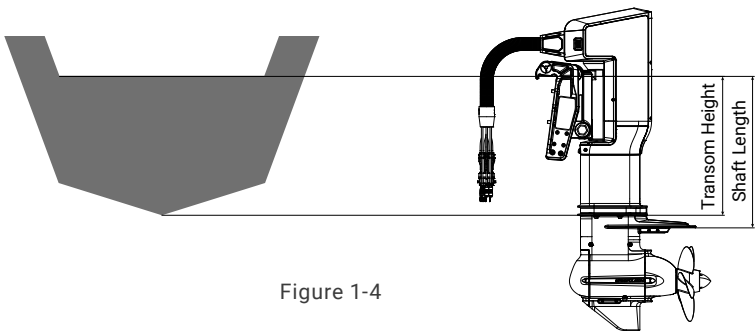


Figure 1-4

1.5 Important Notes

1.5.1 Motor Selection

Please follow the instructions of the boat manufacturer and ePropulsion authorised dealer in choosing a suitable outboard motor. Do not exceed the maximum power permitted, and do not overload the motor.

1.5.2 Motor Installation

This manual gives installation advice that must be followed as a condition of use, in addition to which:

1. We strongly advise professional installation of the whole motor system.

2. Specifically, you must not attempt installation if you don't have the necessary electrical, mechanical, boatbuilding and regulatory knowledge and experience.
3. Regulations vary but for example many authorities will class the X40 (which operates at 96V) as a "high voltage" installation, requiring the electrical work to be undertaken or at least thoroughly checked by a person with relevant qualifications. Other regulations that vary between countries and authorities may cover further aspects of the installation such as safety standards, risk assessment and documentation.
4. It is the responsibility of the installer to ensure that the installation complies with all regulations and standards that apply to the intended area of operation.
5. If you are in any doubt about the installation work please consult your dealer.

1.5.3 Users

1. This product must only be operated by adults who have fully read and understood this manual. ePropulsion accepts no liability for any damage or malfunction caused by operations that contradict the content of this manual.
2. You should only use this motor system if you are also familiar with all other aspects of operating your boat. If the boat is new to you, you should learn how the boat behaves in different conditions, including tide, wind and waves. Take professional advice and/or instruction as necessary.
3. If you are in any doubt about the operation of the motor or boat please consult your dealer before use.

1.5.4 General Boating Advice

Before operation:

1. Familiarize yourself with all the functions and operations of the motor and the boat it's fitted to. Make sure at least one other person on board is sufficiently familiar with the boat and its systems that they could take over from you in the event of emergency
2. Check the weather conditions and refer to weather forecasts before boating. Avoid boating in hazardous weather conditions.
3. Check there is sufficient and operational safety equipment, including but not limited to: life jackets, buoyancy aids or other personal flotation devices, fire extinguishers, bells and whistles, communication equipment, and paddles, etc.
4. Check that the boat and equipment comply with local boating safety regulations.
5. If the electric outboard motor is the only power source for your boat, make sure the batteries on board have sufficient charge for your round trip. As a minimum you need to calculate distance and battery consumption over that distance, making allowance for the effects of wind, tide and other variables that may affect range.

1.5.5 Specific to this Installation

1. If the outboard motor hits an object in the water, stop operation immediately. Return to the nearest port and seek assistance from your dealer.
2. Only operate the outboard motor when the propeller is submerged in the water; operating it in air is strictly prohibited.
3. If the boat is powered by other means, such as sails, do not leave the outboard motor in the water if boat speed may exceed 30 km/h.
4. The GPS and 4G antennae are inside the motor cowling. Avoid covering this area to avoid signal attenuation (loss).
5. The distance and speed values shown are measured by the Global Positioning System (GPS) and may be subject to errors in the event of weak GPS signal or changes in external forces such as atmospheric conditions, ocean currents, wind, etc.
6. If the outboard malfunctions, the smart display will display an error message and the system may stop or enter a limp home (reduced power) mode. The most likely reason for malfunctions include: collision, obstruction (eg seaweed or rope around the propeller or steering), motor or motor driver temperature too high, and low battery voltage. Refer to the Troubleshooting section of this manual for detailed information and corresponding solutions.

1.6 Declaration of Conformity

Object of the Declaration:

Product: Electric Outboard Motor

Model: X20, X20-L, X20-XL



We Guangdong ePropulsion Technology Limited, hereby, declares that this equipment is in compliance with the applicable Directives and European Norms, and amendments.

The object of the declaration is in conformity with the following directives:

Machinery Directive	2006/42/EC
Electromagnetic Compatibility (EMC) Directive	2014/30/EU

Applied Standards:

EN 61000-6-3:2007/A1:2011/AC:2012

EN IEC 61000-6-2:2019

EN IEC 61000-6-4:2019

IEC 60204-1:2016

EN ISO 12100:2010

Manufacturer

Name: Guangdong ePropulsion Technology Limited

Address: Room 801, Building 1, 11 Daxue Road, Songshan Lake, Dongguan, Guangdong Province, China

Signature:



Date: 2nd of June, 2023

Shizheng Tao, Chief Executive Officer & Cofounder of

Guangdong ePropulsion Technology Limited

1.7 Statement

Operation is subject to the following three conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.
- (3) This device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction

Note:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

1.8 Correct Disposal of this product



This marking indicates that this product should not be disposed with other household wastes throughout the EU. To prevent possible harm to the environment or human health from uncontrolled waste disposal, recycle it responsibly to promote the sustainable reuse of material resources. To return your used device, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.

2 Unboxing

2.1 Safety Notice

- 💡 Use appropriate safety equipment, including gloves, safety shoes, and other protective tools.
- 💡 Familiarize yourself with all safety measures before proceeding with the operation.
- 💡 Due to the product's substantial weight, at least two people are required for handling.

2.2 Tools and Equipment Required for Unpacking

- 💡 Unpacking tools: such as a rubber hammer, phillips screwdriver, etc.
- 💡 Handling equipment: forklift.

2.3 Check the Package

- 💡 Check for any obvious damage or transportation damage to the package and record.
- 💡 Confirm that the labels on the package match the purchased product.

2.4 Unpacking

Step 1

Use a forklift according to the forklift symbol on the external packaging to move the product. Before opening the packaging, ensure that the machine is stably positioned and will not tilt.

Step 2

Remove the fasteners on the wooden box cover and detach the cover. Take out the internal accessory box and user manual.

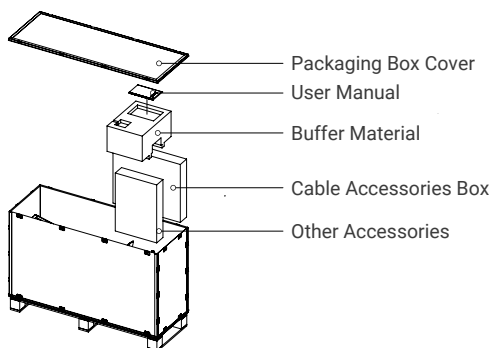


Figure 2.1

Step 3

Pry open the fasteners between the wooden box and the base, then lift the entire wooden box off the base.

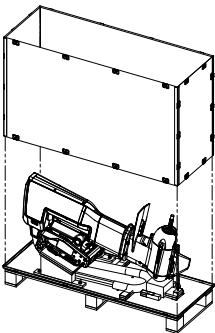


Figure 2.2

Step 4

Remove the motor top cover, screw in the lifting eye bolt, secure the straps to the lifting eye, lift the machine with the crane, and tighten.

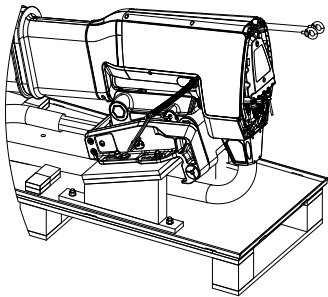
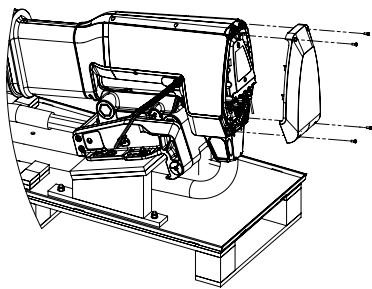


Figure 2.3

Step 5

Remove the bolts and components that secure the outboard motor bracket clamp and the skleg to the base. Cut the zip ties securing it to the base, and hoist the machine for transfer to the stern for installation.

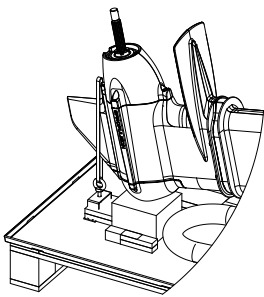
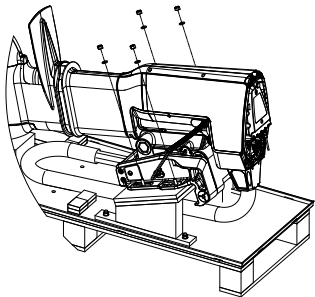





Figure 2.4

-  Please check the product for any damages or missing parts. If there are any issues, please contact customer support.
-  During the unpacking process, be careful to avoid damaging the product. Check all accessories and ensure they are complete.

2.5 Disposal of packaging materials

1. Recycle packaging materials, such as wood, paper, etc., by sorting them accordingly.
2. Follow local environmental regulations for the proper disposal of waste materials.
3. Please make sure to read the user manual provided with the product.

-  Dispose of packaging materials in accordance with local regulations to protect the environment.

3 X-Series Outboard Motor Installation

The quality of the installation plays a crucial role in the overall reliability of the entire system. Key aspects such as securing the machine to the boat, propeller installation, and wiring connections must be carefully considered and adhered to in order to ensure stable and reliable system operation. Please follow the installation requirements below to ensure the equipment functions optimally.

3.1 Before the Installation

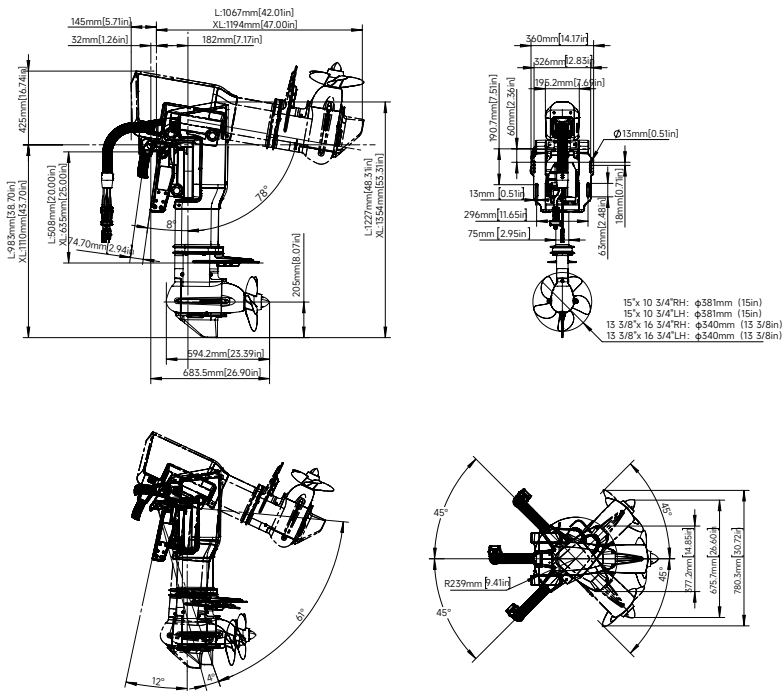
1. Preparation:

- (1) Motor main part: Check the X-Series outboard motor for any abnormal damage. Organize and secure power cables and communication cables in suitable positions for easy handling.
- (2) Tools: Prepare the tools and equipment required for installation as listed in section 1.1.3.
- (3) Accessories: Ensure all the accessories from the product package are ready.

2. Installation Preparation:



Check the dimensions of the boat's installation space to ensure that the machine will not interfere with the boat during its various motion states. Confirm that the installation position is accurate, easily adjustable, and meets the installation requirements.



- (1) The installation bolts for X-Series outboard motors are M12, and the recommended hole size is $\phi 12.5 \sim 13\text{mm}$. The motor main part must be securely fastened to the boat to withstand significant thrust.
- (2) Pre-installation preparations:
 - ① Confirm the motor model: Check if the motor's specifications (size, weight, voltage, and power) match the boat.
 - ② Design layout: Read the user manual and consider the entire system's layout and design. Ensure that the machine and related system components are properly installed on the boat for safe and effective operation.
 - ③ Simulate the installation process: Follow the instructions in the user manual and simulate the relevant procedures to ensure a low-risk installation process.
 - ④ Organize the boat interior: Based on the simulation process, clear irrelevant items, keep the interior dry and tidy, and ensure a smooth installation and debugging process without any abnormalities.

3.2 Outboard Motor Installation

Step 1: Drilling Boat Hull

Refer to the figure below and the Quick Start to drill holes in the appropriate position for outboard motor installation on the boat hull.

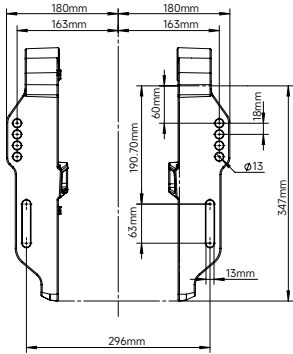


Figure 3.1

Refer to the figure below for the hull cable hole size requirements. Drill suitable holes on the hull for cable routing (hole size $\phi 90 \sim \phi 100\text{mm}$, or adjust based on actual connector shapes) and secure the cable with protective measures.

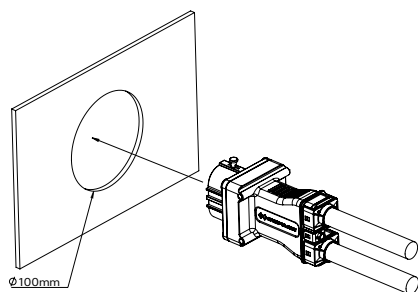


Figure 3.2

Step 2: Removing the Machine Cover

Before lifting, tidy up the cables and secure them to the motor. Remove the four M5 screws from the outboard motor cover.

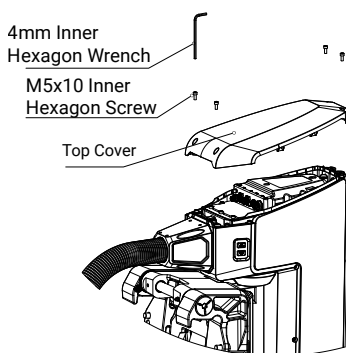


Figure 3.3

Step 3: Lifting Machine

Screw in the lifting ring and washers. Use a lifting rope to secure the machine and attach it to the hoist. Slowly adjust the hoist during a trial lift. If the machine remains stable without tilting or swinging, you may proceed with the proper lift.

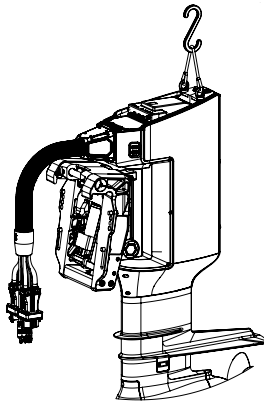


Figure 3.4



Lifting objects hazard: pay attention to safety when hoisting equipment or objects nearby to avoid being hurt or crushed by falling objects.

Step 4: Installing the Outboard Motor

Slowly move the outboard motor to the rear installation position using the hoist. Position the hooks of the machine's bracket clamp on the stern plate. Install the bolts, washers, nuts, and double nuts as shown in the figure below, and tighten them securely to prevent loosening.

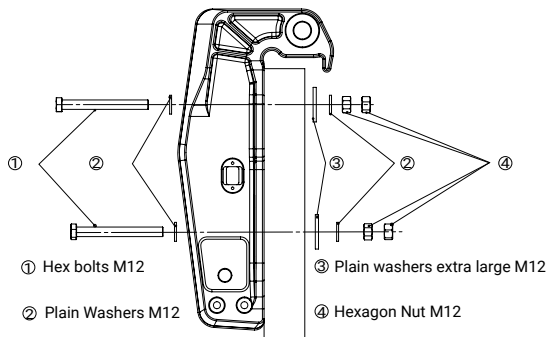


Figure 3.5



After the bolt installation, apply sealing adhesive to the bolt, bracket clamp, and hull hole positions to prevent corrosion and water infiltration.

Step 5: Installing the Motor Cover

Remove the lifting accessory, install the cover, and fasten it with four M5 screws. Tighten the screws by the standard torque: 1.5 N·m (0.153kgf.m, 1.1 lbf·ft).



The top of the outboard contains an internal 4G antenna and GPS module. To avoid signal loss, do not cover this area.

3.3 Propeller Installation

Refer to the following steps to install or replace the propeller:

1. Turn off the system or turn off the 12V power supply.
2. Remove the M4 screws fixing the propeller tail fairing.
3. Straighten and remove the cotter pin.
4. Remove the nuts and washers securing the propeller.
5. Pull the propeller straight out along the axis. If the propeller is stuck and cannot be removed from the shaft, please contact customer support for assistance.
6. Apply a layer of 2-4-C lubricant containing polytetrafluoroethylene (PTFE) to the propeller shaft to prevent the propeller from sticking to the shaft.
7. Assemble the thrust washer and propeller onto the output shaft. Then, install the washer and hex slotted nut onto the propeller shaft.
8. Use tools to tighten the nut and align the slot in the nut with the hole in the output shaft. Insert the cotter pin and bend it at the opening.
9. Secure the tail cone to the propeller hub using four M4 screws.

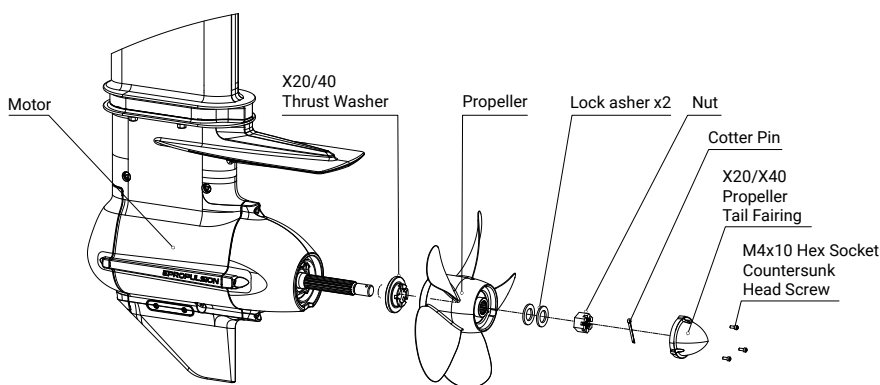






Figure 3.6

-  It is mandatory to shut down and disconnect the power supply of the outboard motor before removing and installing the propeller.
-  Caution: There are various safety risks during the installation process, so it is essential to be vigilant and perform operations with caution to ensure safety.
-  During trial runs, please stay away from the propeller to avoid any risk of being cut or injured.
-  After installing the propeller nut, insert the cotter pin and bend it to secure it in place. This precaution is essential to prevent the propeller nut from loosening and coming off during machine operation, which could result in the propeller detaching and falling into the water.

4 Connections

4.1 X20 Various Scenario System Connection

4.1.1 Single System Connection



The accessories marked * are not included in the package. Users need to adjust according to local regulatory requirements, such as fuses, circuit breakers and cables.



One 12V Fuse is included in the package, which should be installed between the 12V power cable of the inboard motor and the positive of the 12V battery. If local regulations require the installation of fuses for both positive and negative, customers need to purchase and install fuses based on local regulations.



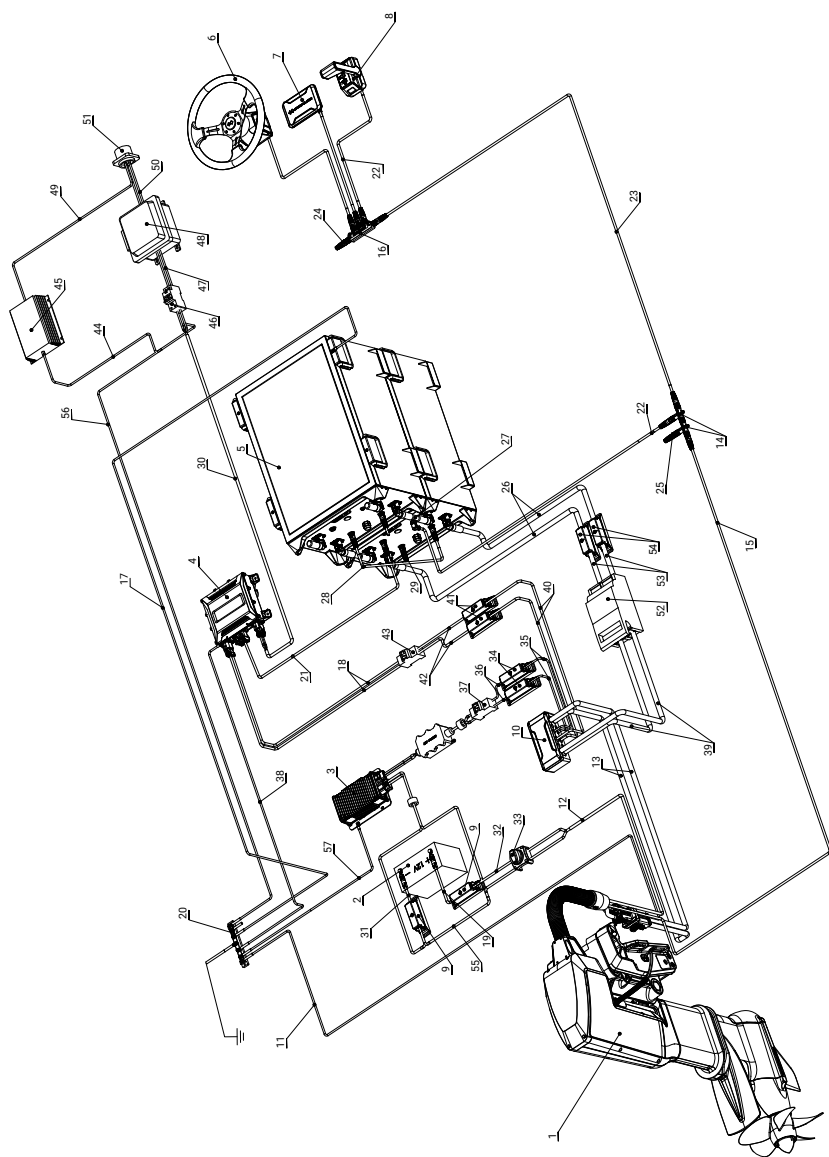
When the communication cable length is insufficient and a communication extension cable is necessary, please contact the ePropulsion authorized dealers. When the length of the communication cable from the inboard to the interaction system or battery exceeds 30m, the communication terminators need to be replaced from one 360Ω and one 120Ω to two 120Ω. Please contact the ePropulsion authorized dealers for purchase the 120Ω communication terminator.



Whether the negative pole of the 12V battery is grounded needs to be adjusted according to local regulations.








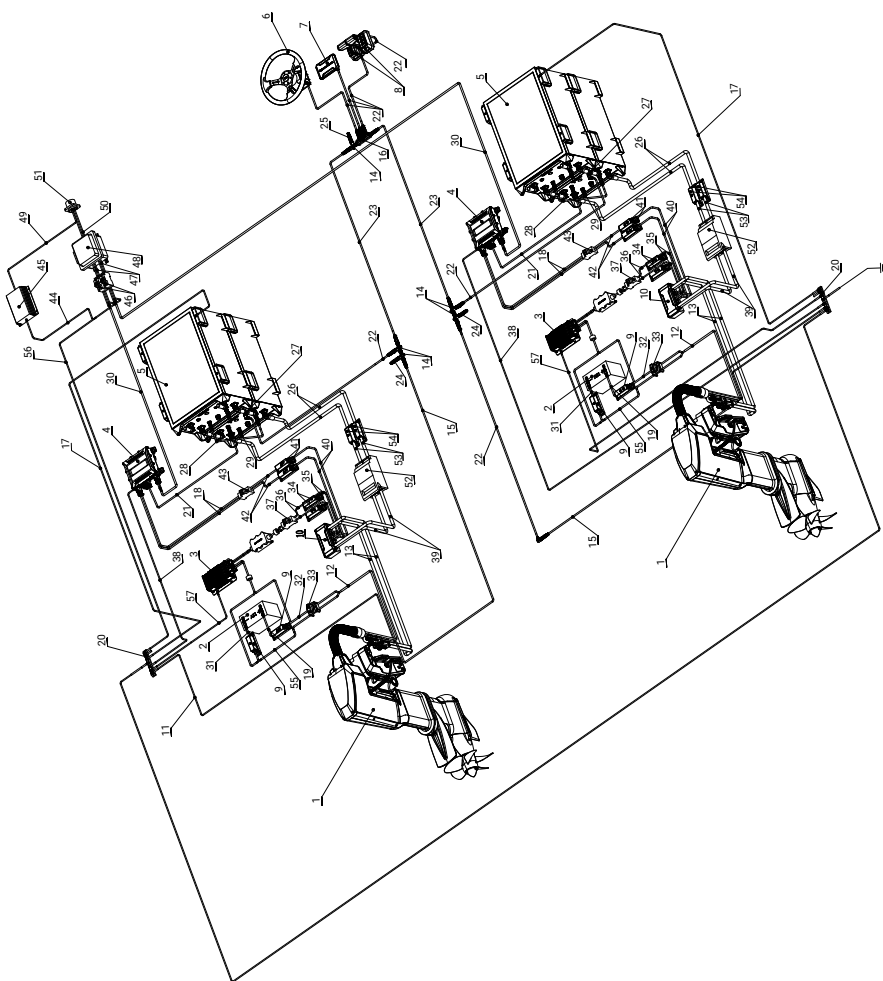
The X20 system can support up to four motors and two consoles. For setups not shown here, please contact your ePropulsion dealer for assistance.



1. X20 Electric Outboard Motor	21. Charger Communication Cable	39. Bus Box and Battery Output Fuse
2. 12V battery	22. eSSA Communication Cable 1m	Connecting Cable
3. DCDC 96V-12V	23. eSSA Communication Extension Cable 10m	40. G Battery Charger Output Fuse and Bus
4. G Battery Charger 16A	24. eSSA Communication Terminator 120Ω	Box Connecting Cable
5. G102-100 Battery	25. eSSA Communication Terminator 360Ω	41. G Battery Charger Output Fuse (45A)*
6. Digital Helm	26. Battery to fuse power cable	42. G Battery Charger Output Fuse and
7. Smart Display 5"	27. G Battery Bridging Cable	Circuit Breaker Connecting Cable
8. Smart Throttle	(Positive & Negative)	43. G Battery Charger Output Circuit Breaker (40A)*
9. 12V Fuse(150A)	28. Battery Communication Cable	44. Current Isolator Grounding Line
10. Bus Box	29. Battery Communication Terminator	45. Current Isolator
11. Outboard Grounding Line 5m	30. Charger input power cable	46. G Battery Charger Input Leakage Protector
(Come with Motor)	31. 12V Fuse Connecting Cable	47. G Battery Charger Input Fuse and Leakage
12. Outboard 12V Power Cable 5m	(Positive)	Protector Connecting Cable
(Come with Motor)	32. 12V Fuse to Switch Cable	48. G Battery Charger Input Fuse (24A)*
13. Motor to bus bar power cable	(Positive)	49. Charging Port Grounding Line
14. eSSA Communication 3-way T Connector	33. 12V Battery Two-Way Switch	50. G Battery Charger and Fuse Connecting Cable
15. Outboard Communication Cable 10m	34. DCDC Input Fuse(50A)	51. G Battery Charger Input Port
(Come with Motor)	35. Bus Box to DCDC Input Fuse	52. 4 Way Fuse Switch Circuit Breaker (250A)*
16. eSSA Communication 5-way T Connector	Connecting Cable	53. Bus Fuse and Circuit Breaker Connecting Cable
17. G102-100 Battery Grounding Line	36. DCDC Input Fuse to Circuit Breaker	54. Bus Fuse (DC 400A)
18. Charger output power cable	Connecting Cable	55. 12V Fuse to Switch Cable (Negative)
19. 12V Fuse Connecting Cable (Positive)	37. DCDC Input Circuit Breaker (40A)*	56. G Battery Charger Input Grounding Line
20. Grounding Bus Bar	38. G Battery Charger Grounding Line	57. DCDC Grounding Line

4.1.2 Twin System Connection

-  The accessories marked * are not included in the package. Users need to adjust according to local regulatory requirements, such as fuses, circuit breakers and cables.
-  One 12V Fuse is included in the package, which should be installed between the 12V power cable of the inboard motor and the positive of the 12V battery. If local regulations require the installation of fuses for both positive and negative, customers need to purchase and install fuses based on local regulations.
-  When the communication cable length is insufficient and a communication extension cable is necessary, please contact the ePropulsion authorized dealers. When the length of the communication cable from the inboard to the interaction system or battery exceeds 30m, the communication terminators need to be replaced from one 360Ω and one 120Ω to two 120Ω. Please contact the ePropulsion authorized dealers for purchase the 120Ω communication terminator.
-  Whether the negative pole of the 12V battery is grounded needs to be adjusted according to local regulations.
-  The X20 system can support up to four motors and two consoles. For setups not shown here, please contact your ePropulsion dealer for assistance.



1. X20 Electric Outboard Motor	21. Charger Communication Cable	39. Bus Box and Battery Output Fuse
2. 12V battery	22. eSSA Communication Cable 1m	Connecting Cable
3. DCDC 96V-12V	23. eSSA Communication Extension Cable 10m	40. G Battery Charger Output Fuse and Bus
4. G Battery Charger 16A	24. eSSA Communication Terminator 120Ω	Box Connecting Cable
5. G102-100 Battery	25. eSSA Communication Terminator 360Ω	41. G Battery Charger Output Fuse (45A)*
6. Digital Helm	26. Battery to fuse power cable	42. G Battery Charger Output Fuse and
7. Smart Display 5"	27. G Battery Bridging Cable	Circuit Breaker Connecting Cable
8. Smart Throttle	(Positive & Negative)	43. G Battery Charger Output Circuit Breaker (40A)*
9. 12V Fuse (150A)	28. Battery Communication Cable	44. Current Isolator Grounding Line
10. Bus Box	29. Battery Communication Terminator	45. Current Isolator
11. Outboard Grounding Line 5m	30. Charger input power cable	46. G Battery Charger Input Leakage Protector
(Come with Motor)	31. 12V Fuse Connecting Cable	47. G Battery Charger Input Fuse and Leakage
12. Outboard 12V Power Cable 5m	(Positive)	Protector Connecting Cable
(Come with Motor)	32. 12V Fuse to Switch Cable	48. G Battery Charger Input Fuse (24A)*
13. Motor to bus bar power cable	(Positive)	49. Charging Port Grounding Line
14. eSSA Communication 3-way T Connector	33. 12V Battery Two-Way Switch	50. G Battery Charger and Fuse Connecting Cable
15. Outboard Communication Cable 10m	34. DCDC Input Fuse(50A)	51. G Battery Charger Input Port
(Come with Motor)	35. Bus Box to DCDC Input Fuse	52. 4 Way Fuse Switch Circuit Breaker (250A)*
16. eSSA Communication 5-way T Connector	Connecting Cable	53. Bus Fuse and Circuit Breaker Connecting Cable
17. G102-100 Battery Grounding Line	36. DCDC Input Fuse to Circuit Breaker	54. Bus Fuse (DC 400A)
18. Charger output power cable	Connecting Cable	55. 12V Fuse to Switch Cable (Negative)
19. 12V Fuse Connecting Cable (Positive)	37. DCDC Input Circuit Breaker (40A)*	56. G Battery Charger Input Grounding Line
20. Grounding Bus Bar	38. G Battery Charger Grounding Line	57. DCDC Grounding Line

4.1.3 Twin Motor and Twin Console System Connection



The accessories marked * are not included in the package. Users need to adjust according to local regulatory requirements, such as fuses, circuit breakers and cables.



One 12V Fuse is included in the package, which should be installed between the 12V power cable of the inboard motor and the positive of the 12V battery. If local regulations require the installation of fuses for both positive and negative, customers need to purchase and install fuses based on local regulations.



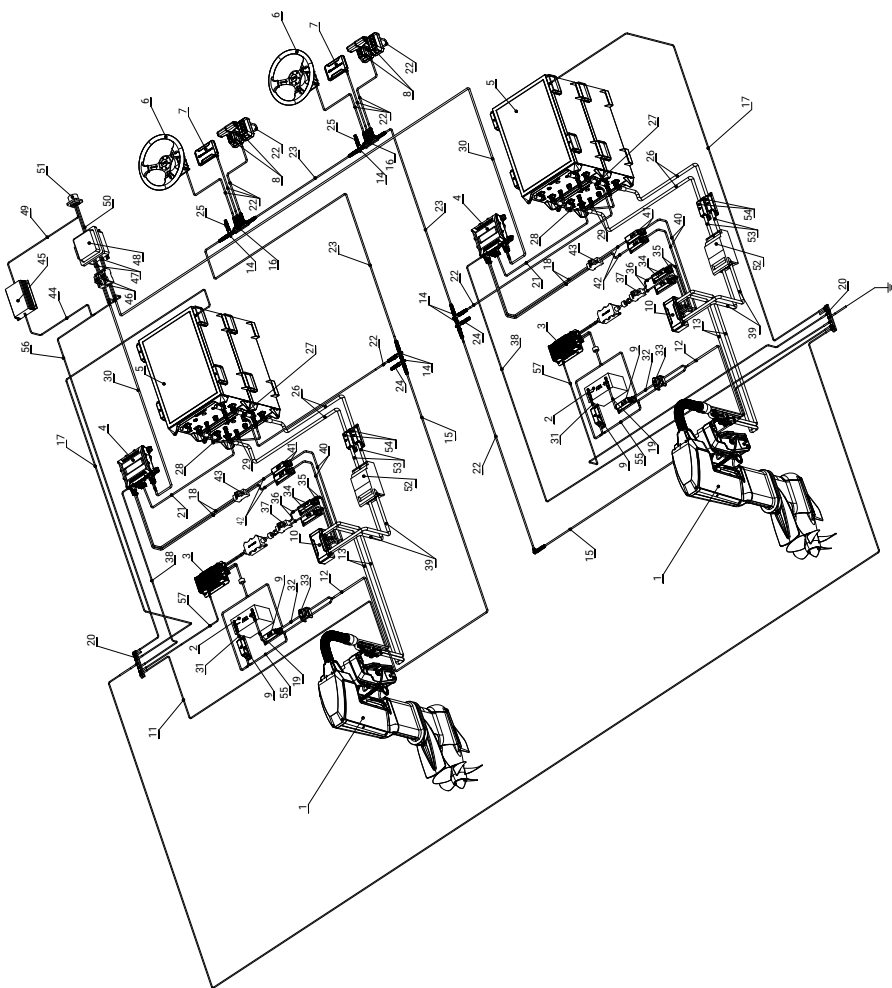
When the communication cable length is insufficient and a communication extension cable is necessary, please contact the ePropulsion authorized dealers. When the length of the communication cable from the inboard to the interaction system or battery exceeds 30m, the communication terminators need to be replaced from one 360Ω and one 120Ω to two 120Ω. Please contact the ePropulsion authorized dealers for purchase the 120Ω communication terminator.



Whether the negative pole of the 12V battery is grounded needs to be adjusted according to local regulations.



The X20 system can support up to four motors and two consoles. For setups not shown here, please contact your ePropulsion dealer for assistance.



1. X20 Electric Outboard Motor	21. Charger Communication Cable	39. Bus Box and Battery Output Fuse
2. 12V battery	22. eSSA Communication Cable 1m	Connecting Cable
3. DCDC 96V-12V	23. eSSA Communication Extension Cable 10m	40. G Battery Charger Output Fuse and Bus
4. G Battery Charger 16A	24. eSSA Communication Terminator 120Ω	Box Connecting Cable
5. G102-100 Battery	25. eSSA Communication Terminator 360Ω	41. G Battery Charger Output Fuse (45A)*
6. Digital Helm	26. Battery to fuse power cable	42. G Battery Charger Output Fuse and
7. Smart Display 5"	27. G Battery Bridging Cable	Circuit Breaker Connecting Cable
8. Smart Throttle	(Positive & Negative)	43. G Battery Charger Output Circuit Breaker (40A)*
9. 12V Fuse (150A)	28. Battery Communication Cable	44. Current Isolator Grounding Line
10. Bus Box	29. Battery Communication Terminator	45. Current Isolator
11. Outboard Grounding Line 5m	30. Charger input power cable	46. G Battery Charger Input Leakage Protector
(Come with Motor)	31. 12V Fuse Connecting Cable	47. G Battery Charger Input Fuse and Leakage
12. Outboard 12V Power Cable 5m	(Positive)	Protector Connecting Cable
(Come with Motor)	32. 12V Fuse to Switch Cable	48. G Battery Charger Input Fuse (24A)*
13. Motor to bus bar power cable	(Positive)	49. Charging Port Grounding Line
14. eSSA Communication 3-way T Connector	33. 12V Battery Two-Way Switch	50. G Battery Charger and Fuse Connecting Cable
15. Outboard Communication Cable 10m	34. DCDC Input Fuse(50A)	51. G Battery Charger Input Port
(Come with Motor)	35. Bus Box to DCDC Input Fuse	52. 4 Way Fuse Switch Circuit Breaker (250A)*
16. eSSA Communication 5-way T Connector	Connecting Cable	53. Bus Fuse and Circuit Breaker Connecting Cable
17. G102-100 Battery Grounding Line	36. DCDC Input Fuse to Circuit Breaker	54. Bus Fuse (DC 400A)
18. Charger output power cable	Connecting Cable	55. 12V Fuse to Switch Cable (Negative)
19. 12V Fuse Connecting Cable (Positive)	37. DCDC Input Circuit Breaker (40A)*	56. G Battery Charger Input Grounding Line
20. Grounding Bus Bar	38. G Battery Charger Grounding Line	57. DCDC Grounding Line

4.2 High Voltage Cables Connection

4.2.1 Make a cable (crimped cable connector)

When you receive the cable, "Motor to bus box power cable" and "Battery to bus box power cable" are integrated. You need to cut one of the integrated cables from an appropriate position according to the placement and distance of the battery, bus box and outboard motor on board. And crimp the cable connector (a total of 4 cable connectors needs to be crimped) at the cutting place to make "Motor to bus box power cable" and "Battery to bus box power cable".

Tools needed to make the cable:

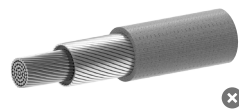
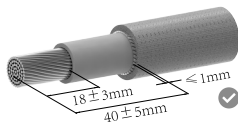
No.	Tools	Recommended model
1	Wire cutter	EC-50M
2	Wire stripper	SW-1018
3	Crimping plier	/

CCrimping cable connectors:

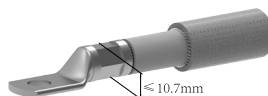
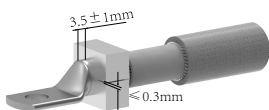
MAKING THE BATTERY TO BUS BOX AND BUS BOX TO MOTOR POWER CABLES

Cut one of the two 96V power cables into two pieces, paying attention to which end is which and the distance from each to bus box (battery and motor connectors are different). Then:

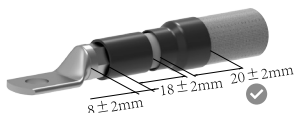
- Strip back the insulation/shielding as follows:
 - outer sheath and metal shielding layer by $40\pm5\text{mm}$. When cut, the metal shielding layer must not extend more than 1mm beyond the outer sheathing. (Contact between the metal shielding layer and terminals or inner cores will cause insulation failure.)
 - inner sheaths (on positive and negative cables) by $18\pm3\text{mm}$



- Slide the terminals over the inner cores and crimp at approx. 3.5mm from the terminal end. After crimping the height of the uncrimped sides should be 10.7mm or less (if more, crimp again).



3. Fit heat shrink tubing over the joints between the terminals and the inner cables, and (separately) over the shielding layer. Leaving the joints or the shielding exposed to air may result in insulation and system failure.



- ⚠** Please use the crimping tool corresponding to the specifications of the terminal to ensure a proper crimping process. Make sure the crimping is fully seated. Otherwise, poor crimping may lead to local heating and severe damage.
- ⚠** During the crimping process, pay special attention to prevent the shield layer from contacting the terminal and core wire, to avoid leakage or short circuits.

4.2.2 Connecting Cables to the bus box

4.2.2.1 Required accessories and tools

- ① Bus box
- ② Motor to bus box power cable
- ③ Battery to bus box power cable
- ④ Bus box to DC-DC power cable
- ⑤ G battery charger
- ⑥ M4 hex wrench, M6 hex wrench, M8 hex wrench

4.2.2.2 Installation

The cables that go into the bus box should be installed by reference to the symbols next to the terminals, as follows:

- a. BAT - connected to G102 battery bank
- b. 96V-1, 96V-2, 96V-3 - connect to the DC-DC module or other 102.4V electrical equipment
- c. CHG - connect to charger
- d. MOT - connect to the motor

(1) Remove the top cover of the bus box (4x M4 screws). Then remove the positive/negative baffle plate, to access the positive terminals.

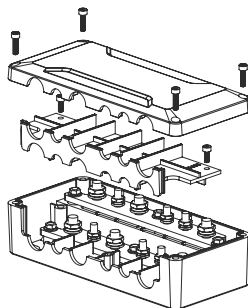


Figure 4.3

(2) Connect the positive cables for Motor, Battery, Charger & DC-DC Module

1. Undo the terminal nuts, and remove the spring and flat washers
2. Install the positive cables (red sleeves) to the terminals on the lower copper bar. BAT+ connects to G102 Battery; CHG+ connects to charger; 96V-1+, 96V-2+, 96V-3+ connect to DCDC or other 102.4V Device; MOT+ connects to X series motor; The figure after installation is shown below.

The terminal should go on first, followed by the flat washer, the spring washer and the nut.

Note the locking torque for the M6 nuts should be 5N.m, and M8 nuts 10N.m.

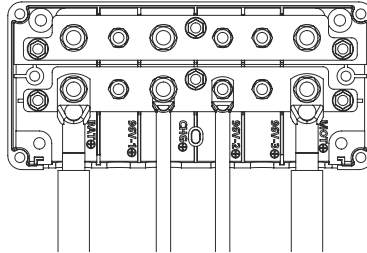


Figure 4.4

(3) Reinstall the baffle plate.

Once the positive cables are installed as above, put the baffle plate back in place with its holding screws.

(4) Connect the negative cables for Motor, Battery, Charger & DC-DC Module

1. Undo the terminal nuts, and remove the two washers.
2. Install the positive cables (red sleeves) to the terminals on the lower copper bar. BAT- connects to G102 Battery; CHG- connects to charger; 96V-1-, 96V-2-, 96V-3- connect to DCDC or other 102.4V Device; MOT- connects to X series motor; The figure after installation is shown below.

The terminal should go on first, followed by the flat washer, spring washer, nut.

The locking torque for the M6 nuts should be 5N.m, and M8 nuts 10N.m.

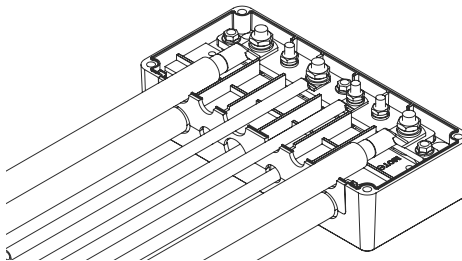


Figure 4.5



If parallel connecting the batteries, the positive and negative connectors of the battery output cable need to connect with the first battery and the last battery respectively. Otherwise, it might cause overcurrent alarms or parallel faults, which shortens the battery life.

(5) Bus Box installation

The bus box should be fitted to a flat surface, as far from sources of moisture and heat as is reasonably practical. Depending on the mounting surface, M6 screws or bolts can be used to fix it in place. M6 locking torque is 8N.m.



IMPORTANT. The positive and negative terminals must be connected correctly for both the battery and charger (input) and motor and DC DC module (outputs). Reverse polarity may cause severe damage and invalidate warranty.

(6) Put bus box cover back on (with screws)

When the bus box connections have been made it should look like this.

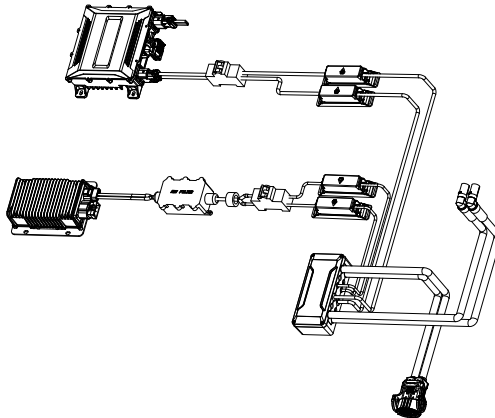


Figure 4.6



Before connecting the DCDC, please determine the positive and negative identification of the input and output terminals, and connect them one by one with the positive and negative copper bars of the bus box and the positive and negative of the battery to avoid damage to the DCDC, battery, outboard motor and system caused by incorrect positive and negative connection.



Please configure the fuses, circuit breakers in accordance with local regulations, and purchase separately.

4.2.3 Connecting the DC-DC Module and 12V Battery

4.2.3.1 Required Accessories and Tools

- ① Bus box part completed in step 4.2.2
- ② M6 hexagon wrench
- ③ 12V battery (purchased by the user)
- ④ Hex socket wrench suitable for 12V battery terminal screws and nuts

4.2.3.2 Installation Steps

Step 1: Connecting the Bus Bar with the DC-DC Module

See 4.2.2 if not already done.

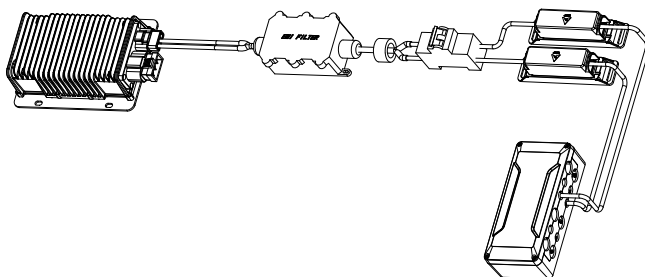


Figure 4.7

Step 3: Connecting the DC-DC Output and 12V Battery

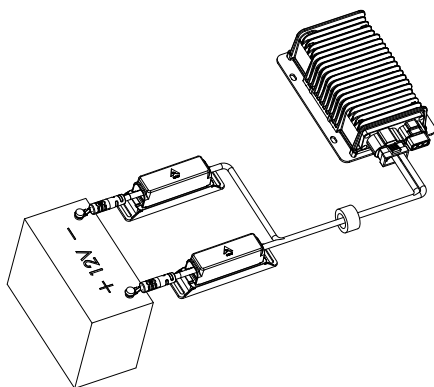


Figure 4.8



When connecting DC-DC and 12V battery, pay attention to avoid short circuits.



Before connecting the DCDC, please determine the positive and negative identification of the input and output terminals, and connect them one by one with the positive and negative copper bars of the bus box and the positive and negative of the battery to avoid

damage to the DCDC, battery, outboard motor and system caused by incorrect positive and negative connection.



Please configure the fuses, circuit breakers in accordance with local regulations, and purchase separately.

4.2.4 Connecting the G102-100 Battery Bank

4.2.4.1 Required Accessories and Tools

- ① G102-100 battery bank (at least 4 G102 batteries are needed, connected in parallel, to operate X40 motor).
- ② Bus box part completed in step 4.2.2.
- ③ 96V power cable.



Ensure that the main switch is turned off before connecting the batteries.



Users can also connect multiple batteries in parallel to increase battery capacity. Refer to the G102 battery user manual for battery usage and cautions.

4.2.4.2 Installation Steps

Insert the battery connector leads from the bus box into the corresponding color terminals on the G102-100 battery. After installation, refer Figure 4.9.

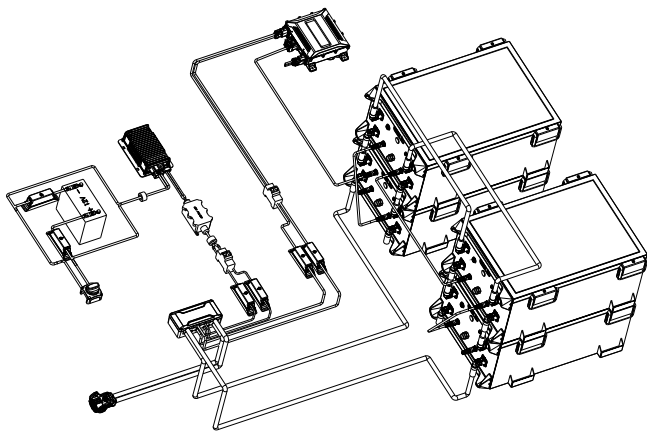


Figure 4.9



Please configure the fuses, circuit breakers in accordance with local regulations, and purchase separately.

4.2.5 Connecting the outboard motor's Main Power Cable

4.2.5.1 Required Accessories and Tools

- ① Outboard motor
- ② Bus box, DC-DC module, and 12V battery connected in step 4.2.3



If you need to extend the 12V cable, prepare the following:

- ① 12V extension cable (user should purchase a specified cable not exceeding 3m in length)
- ② Heat shrink tubing, electrical tape, etc

4.2.5.2 Installation Steps

Step 1: Connecting the High-Voltage Power Cable of the Motor

Connect the orange self-locking pconnector of the bus box part to the motor's orange pconnector. Follow these steps:

Open the locking mechanism of the orange self-locking pconnector, lift the black handle as shown in Figure 4.11.

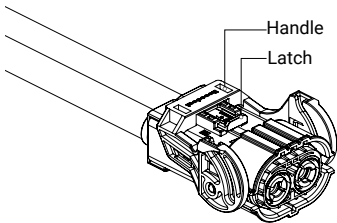


Figure 4.10 High-voltage interlock pconnector

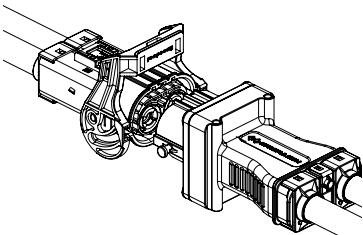


Figure 4.11 High-voltage interlock pconnector - Installation step 1

Insert the orange self-locking pconnector into the motor's orange junction box. Engage the latch into the slot on the black handle, as shown in Figures 4.13 and 4.14.

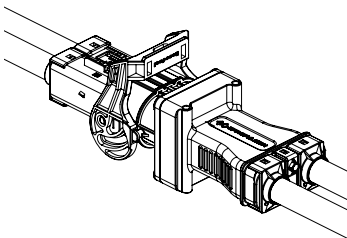


Figure 4.12 High-voltage interlock pconnector - Installation step 3

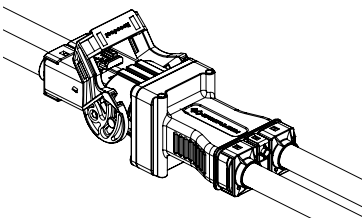


Figure 4.13 High-voltage interlock pconnector - Installation step 4

Press down the black handle to firmly secure the connector. Close the locking mechanism, as shown in Figure 4.15.

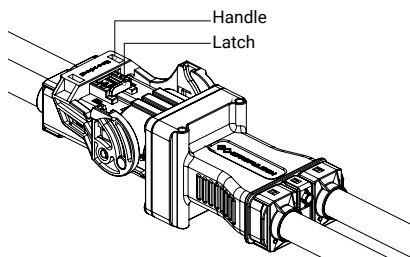






Figure 4.14 High-voltage interlock pconnector - Installation step 5


 You can use an M4x80mm screw to fix the high-voltage interlock pconnector to the boat (user-provided).


 X20 Outboard motor Dual-Group Bus Connection


The other "96V power cable 5m" included in the X20 package does not require cutting. Connect one end with the aviation pconnector to the corresponding color interface of the G102-100 battery and the other end with the orange self-locking pconnector of the motor's other group of orange pconnectors.


 If the "96V power cable 5m" provided with the machine is not long enough for your installation needs, please contact your dealer to purchase a longer high-voltage extension cable.

 After cutting and crimping the cables, check to ensure that the positive and negative poles are correctly matched to avoid damage to the outboard motor.

 Before connecting the high-voltage connector, it is necessary to check whether there are water droplets condensing inside the connector. If there are water droplets condensing inside the connector, it is necessary to dry the water droplets before connecting the connector.

 After the high-voltage connector is connected, the connector and cable should not be soaked in water.

 When the high-voltage connector is unconnected, it is necessary to use the protective cover that comes with the connector or tape to cover the unplugged connector, keep the metal conductive terminals inside the connector dry, and avoid water splashing into the connector, which may cause corrosion of the metal conductive terminals.

 Do not charge high voltage connectors when they are not connected, as charging unconnected connectors can cause rapid corrosion of the internal terminals of the connectors, and charging high voltage connectors when they are not connected poses a risk of electric shock.

Step 2: Connecting the Low-Voltage Power Cable

Connect the red and black twin cables from the machine. Match the red cable with the positive pole and the black cable with the negative pole of the 12V battery. Connect them to the 12V battery terminal screws and tighten the nuts. (Note: The 12V battery should be placed near the outboard motor).



After completing the above installation steps, the cable can be fixed by expanding or winding it based on the distance between the battery compartment and the motor.



12V Cable Extension: The X-series outboard motor's 12V cable is approximately 5m long. If the length is not suitable for your installation requirements, please contact your dealer to purchase a dedicated extension cable, and have a professional handle the installation, ensuring that the total length of the low-voltage cable does not exceed 8m (extension cable specification requirements: copper conductor cross-sectional area should be larger than 35 square meters).



Proper insulation treatment should be carried out at the connection position of the extension cable to prevent battery short circuits and potential fire hazards.

4.3 Communication Device and Connection

4.3.1 Remote Control Scenario: Connecting Interactive Devices and Accessory Communication Cables



Taking the example of a single-machine single-set interactive system with a single group of X20 model batteries, the communication device connection for other scenarios should be based on the "System Device Connection Plan." Contact an Evirot dealer to purchase accessories and have professionals handle the installation and connection.

4.3.1.1 Required Accessories of Single System Connection

- ① Digital helm ×1
- ② Smart throttle ×1
- ③ Smart display 5" ×1
- ④ G102-100 battery ×4 (specific number of batteries matched according to the scenario and endurance requirements)
- ⑤ eSSA Communication 1m Extension Cable ×4
- ⑥ eSSA Communication 10m Extension Cable ×1
- ⑦ eSSA Communication 5-Way T-Connector ×1 & eSSA Communication 3-Way T-Connector ×2

4.3.1.2 Installation Steps

4.3.1.2.1 Connecting Interactive Devices and Accessories

As shown in Figure 12, follow the relationships on the diagram to connect the components and devices according to the numbered labels. The components are as follows:

1. eSSA communication cable 10m of the X-series outboard motor.
2. 5-way T-connector ×1
3. 3-way T-connector ×1
4. Communication terminator
5. eSSA communication cable 1m, eSSA communication extension cable 10m (one end with a 90° right-angle connector, connected to the MOTOR interface of the G102 battery, digital helm/digital helm pro, smart throttle, smart display 5")

💡 After connecting the interactive devices, make sure to tighten the threads of each connector to ensure stability and waterproofing.

⚠ After the communication connector is connected, the connector and cable cannot be soaked in water, and there should be no connectors with metal conductive pins exposed. If the connector with metal conductive pins is exposed, please check whether the communication cable connection is carried out according to the user manual, or add and tighten the waterproof cover of the communication connector.

⚠ Unconnected communication connectors need to tighten the waterproof cap of the connector to avoid splashing water and steam entering the connector.

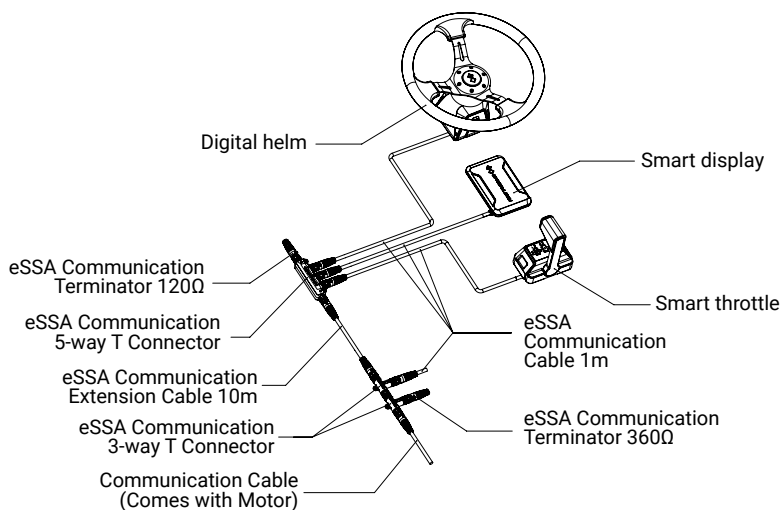


Figure 4.15

4.3.1.2.2 Smart throttle connection

Each smart throttle has a BUS port and DUAL port at the bottom.

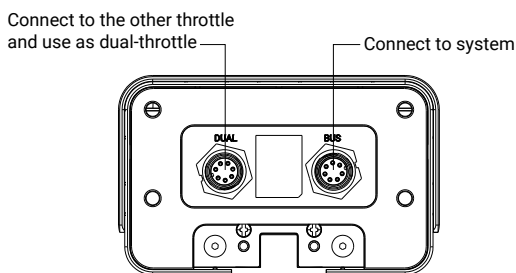


Figure 4.16

Specific connecting instructions for different scenarios are as follows:

- **Single Smart Throttle Mode**

The smart throttle's BUS port should be connected to the CAN bus.

- **Dual Smart Throttle Mode**

For the 1# smart throttle, the BUS port should be connected to the CAN bus, and the DUAL port should be linked to the DUAL port of the second smart throttle. The 2# smart throttle's BUS port must be left without connection.



All operations must be done without power. Do not connect or disconnect the cables while there is power.

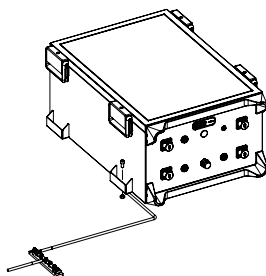
4.4 Grounding

In order to ensure safety and stability of system operation, the X series outboard motor (with a 5-meter-long 25-square grounding line), DCDC module, G102-100 battery, and 12V battery (purchased by the user) must be grounded during system installation.


Grounding preparation and operation:

Hull grounding bolt, or grounded copper bar/bus bar and connected to the hull grounding point. Users or operators can prepare grounding line, connection terminals, bolts and other materials by combining the DCDC module, G102-100 battery, 12V battery layout position, and grounding bolt or grounding copper bar/bus position. Refer to the following instructions for grounding.

1. The outboard motor comes with a 5m long grounding wire harness. Please prepare your own grounding bolts or grounding busbars to connect to the hull grounding.
2. Refer to the figure below, prepare the grounding wire yourself, connect one end to the mounting foot of the G102-100 battery through the M8 fastener (prepare yourself), and connect the other end to the grounding bus or hull grounding point.




4.5 Purchasing Accessories and Connections

 The X-series outboard motor already has integrated 4G and GPS modules. Do not cover the machine's head. If the installation environment affects the strength of the 4G and GPS signals, an external 4G and GPS module can be used.

4.5.1 Installation of the 4G Antenna

Step 1:

Use an M5 hexagon wrench (4mm) to remove the four M5 hexagon cylindrical head screws on the machine cover and take off the cover.

 If the 4G external module is installed during hoisting and the cover has already been removed for wiring, this step can be skipped.

Step 2:

Connect the SMA connector at the end of the 4G antenna to the internal interface of the machine head. Confirm that it is tightly fastened. The outboard motor's body is designed with wire slots. Route the 4G antenna device through the wire slot, and then install the cover.

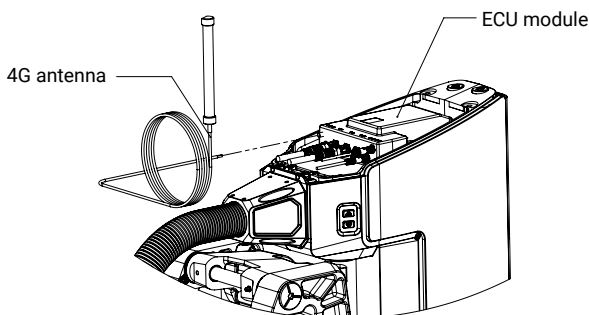


Figure 4.17 Connection between the 4G antenna and the outboard motor

Step 3:

Install the machine cover.

Step 4:

Fix the 4G antenna on the boat (outdoors). There are two fixing options, as shown in the following images.

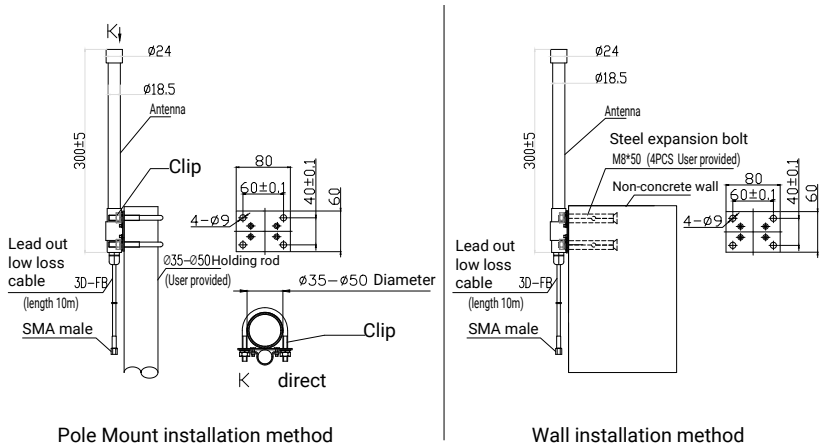


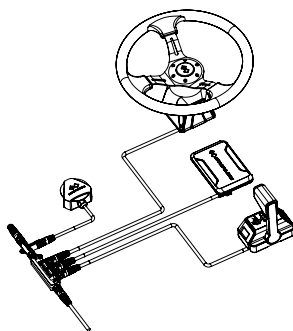
Figure 4.18

- Pole Mounting: The customer provides a pole with an outer diameter of $\Phi 35\sim\Phi 50\text{mm}$. Then, use a supporting bracket to secure the 4G antenna tightly to the pole.
- Fixing to an existing structure: choose an area that's likely to have a clear signal, such as the top of a cabin or communication arch. Drill holes as appropriate and fix the aerial in place using 4x 8mm bolts (not supplied).

4.5.2 Installation of the External GPS Module

Step 1:

Connect the CAN communication port of the external GPS module to the 3-way T-connector, instead of one of the communication terminators. See diagram 4.16, and select the communication terminators according to section 4.5.



Step 2:

Select a location for the GPS module that's outdoors, open to the sky, flat, and out of the way (won't get trodden on etc). There are two fixing options.

• 3M Adhesive Attachment

Use the provided sealing cover of the accessory to secure the adhesive attachment on the specified area at the bottom of the external GPS module. Then, paste it in an open outdoor area. Before pasting, ensure the cleanliness of the pasting area to prevent poor adhesion due to impurities.

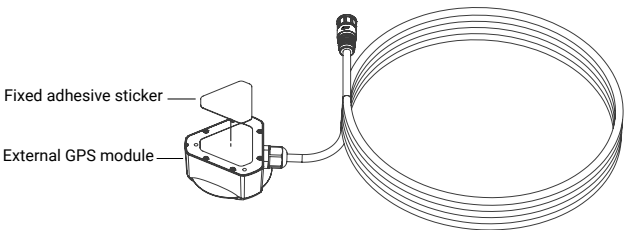


Figure 4.19 GPS external module fixation method 1

• Self-Tapping Screw Fixation

Opening the decorative cover of the external GPS module, use the three M3 self-tapping screws provided with the accessories to secure the external GPS module in an open outdoor area. After confirming that all three self-tapping screws are tightened, finally, snap the decorative cover onto the GPS casing, aligning the snap direction with the logo direction.

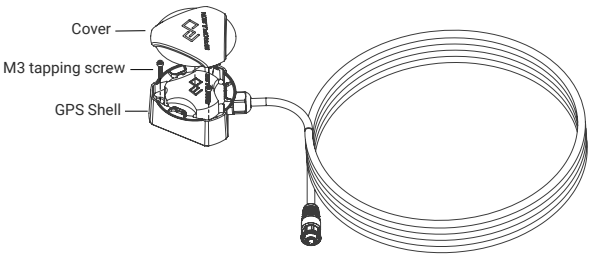
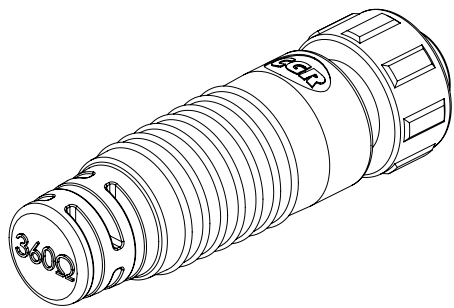


Figure 4.20 GPS External Module Mounting Method 2

4.6 Communication Terminator Connection

During the use of the outboard motor, for more stable communication between various components, it is necessary to connect different combinations of communication terminators to the T connector according to the following scenarios. The resistance value of each communication terminator is marked on its tail, as shown in the figure:



Quality of motors	Using an external GPS module			Not using external GPS modules		
	Communi- cation Terminator 1	Communi- cation Terminator 2	Communi- cation Terminator 3	Communi- cation Terminator 1	Communi- cation Terminator 2	Communi- cation Terminator 3
1	120Ω	/	/	120Ω	360Ω	/
2	120Ω	120Ω	/	120Ω	120Ω	360Ω
3	120Ω	360Ω	360Ω	120Ω	120Ω	/
4	120Ω	360Ω	/	120Ω	360Ω	360Ω

5 Operation



5.1 Smart Throttle Button Functions (single & double throttles)



- Single-throttle operation

Button	Function
Power	Press and hold down this button for 1 second to power the system on or off. Switch console (when two throttles are fitted): When the system is turned on, press the Power button twice on the inactive console to activate it.
Dock	Dock mode: Press the button once to enter Dock mode, where the default maximum power limit is set to 70% to ensure smoother handling during mooring. The maximum power limit can be adjusted via the display interface, with the F gear adjustable from 30% to 70% and the N gear from 50% to 70%. To exit Dock mode, press the button once while the gear is in the N position. Turbo mode: Only when the throttle is at the maximum of the forward, long press Dock button for 2s to enter Turbo mode, and long press Dock for 2s or adjust the power to exit.



The factory default for the throttle handle is Starboard mode, ie the handle is to the right of the main unit when facing forwards on the boat. To change to Port mode please refer to section 5.6.2.1.

Button	Function
	Tilt/Trim Up: press and hold this button to raise the motor or angle it outwards from the hull, stops when button is released.
	Tilt/Trim Down: press and hold this button to lower the motor or angle it in towards the hull, stops when button is released.

- Dual-throttle operation

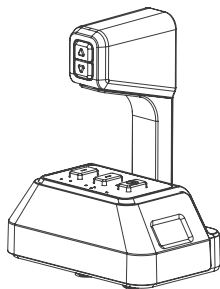
Button	Function
Power	Press and hold down this button for 1 second to power the system on or off. Switch console: When the system is turned on, press the Power button twice on the inactive console to activate it.
Hold	Direction holding function or anchor mode: Press twice to enter Hold mode, and when in Hold mode press once to exit.This function is under development.
Dock	Press once, to enter or exit Dock mode. In Dock Mode maximum power is limited to 50%, for smoother handling when mooring etc. This button only works when throttle lever is in neutral.
1Lever	Press once to enter left lever control mode. Press twice to enter right lever control mode. Press three times to exit mode. In 1Lever control mode the chosen throttle adjusts power input to both throttles simultaneously. This mode can only be entered with both throttles in neutral position.
Turbo	Only when the throttle is at the maximum of the forward, press twice to enter Turbo mode, and once to exit.
FN	Function button: Press once to enter or activate the function, and press again to exit the function. For function configuration, please use the Smart Display to select (see section 5.6.2.2).

Dock and Turbo modes cannot be accessed at the same time.

Button	Function
	Tilt/Trim Up: press and hold this button to raise the motor or angle it outwards from the hull, stops when button is released.
	Tilt/Trim Down: press and hold this button to lower the motor or angle it in towards the hull, stops when button is released.



Note: The kill switch is placed correctly.



- Please place a kill switch on either side of the Smart Throttle to start the motor.
- Please remove the kill switch after the machine is turned off.
- Stop the outboard motor in emergency by detaching the kill switch.
- To run the motor again, first attach the kill switch, then start the motor.

5.2 Start the Machine

5.2.1 Boot Operation



Long press the Power button for 1s to start the system. When the smart throttle panel lights up, the system is started.



After powering on the system, wait until the Power button light is steady green and the smart display "READY" lights up before driving.

5.2.2 System problem feedback method after startup

If the smart throttle chirps after the system is started and the display displays an error meSSAge, refer to 5.7 Troubleshooting to solve the problem.

5.3 Perform initial configuration

Step 1: Read the device

After all accessories are assembled, power on, turn on the smart throttle, the Smart display will automatically read the SN of the device when it is turned on.



Manually check whether the SN of all parts on board is displayed on the display. If it is correct, click Confirm; If SN of any part is not displayed, check the connection of parts on the ship is normal and click Check again. The system will read it again.



When there is only one console and one motor, the system will automatically complete the system initialization settings and proceed directly to the home page.



Step 2: Configure the location of the equipment

When there is only one console and one motor, the system will automatically complete the system initialization settings and directly enter the home page.

When there are more than one console and more than one propulsion, the user needs to configure the console accessories and the position of the propulsion. The following illustrates the configuration process with two sets of consoles and two motors.

1. Configuration display

When there are two consoles, the display will display two consoles. By default, the console where the current display is located is Console A.

2. Configure Digital Helm

Manually turn the steering wheel more than half a turn to configure the digital helm.



3. Configure smart throttle

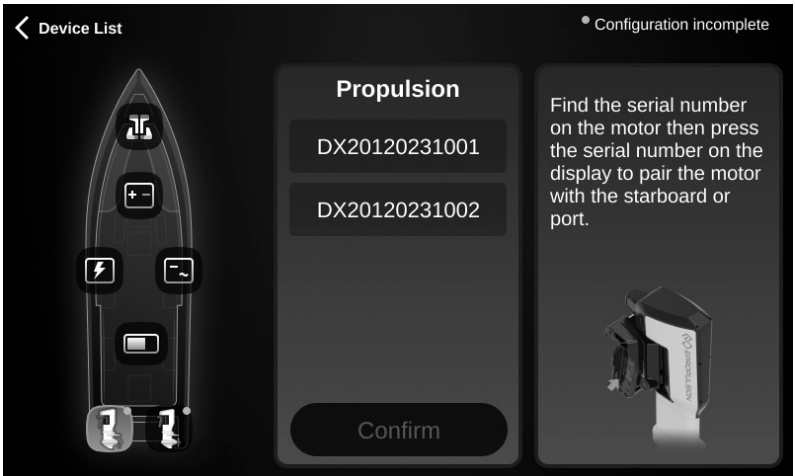
When it is a single-throttle, manually click any button of the throttle to match successfully.
When it is a dual-throttle, click any button of the left and right throttles respectively to match successfully.



4. After console A is configured, the remaining parts will be automatically matched to console B.

5. Configure motors

Click the SN of the motor to configure the port and port sides of the motor.



5.4 Home Page



No.	Function	Description
1	Setting page	Click to go to the setting page.
2	Home page	Click to go to the home page.
3	Propulsion page	Click to go to the propulsion page.
4	Warning	When the system fails, it will prompt a fault icon.
5	System status	READY indicates that the system is ready to start.
6	4G network signal strength	/
7	Travelled time/ distance	You can switch between trip distance and time in settings.
8	Battery indicator bar	The indicator changes with battery level.
9	Battery level	Battery level
10	Remaining distance or time	The remaining distance/time supported by the current battery level. You can switch between distance and time in the settings.
11	Compass	/
12	Power indicator	The indicator will change as the power output changes.
13	Current power/ Current RPM	You can switch between current power or current RPM in the settings.
14	Gear	F: Forward gear N: Neutral R: Backward gear
15	Speed	Current speed, which can be switched between KNOTS, KM/H, and MPH in the settings.
16	Trim	Press Trim to enter the Trim control page, adjust the tilting angle of the motor.
17	Function	Press to enter the function page to enter the Dock mode or adjust the lightness

5.5 Trim

5.5.1 Single Motor Trim

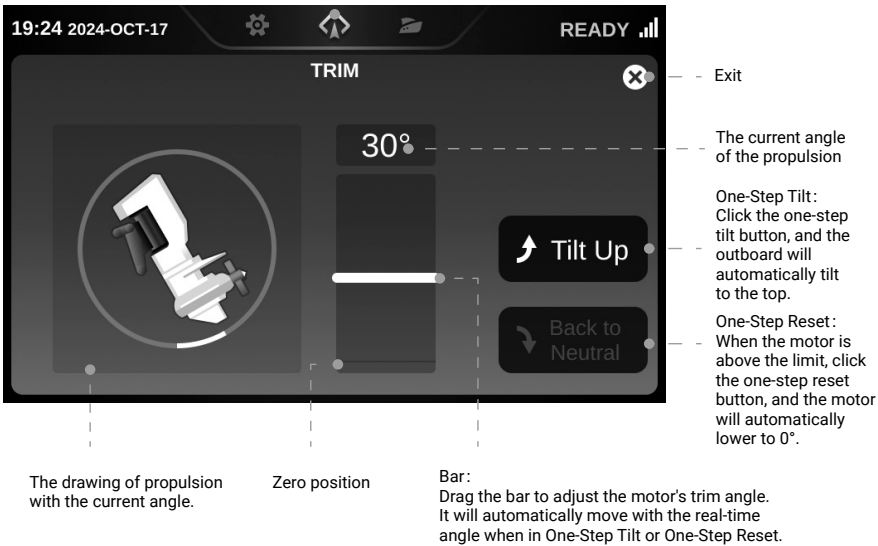
5.5.1.1 Single Motor Trim Pop-up



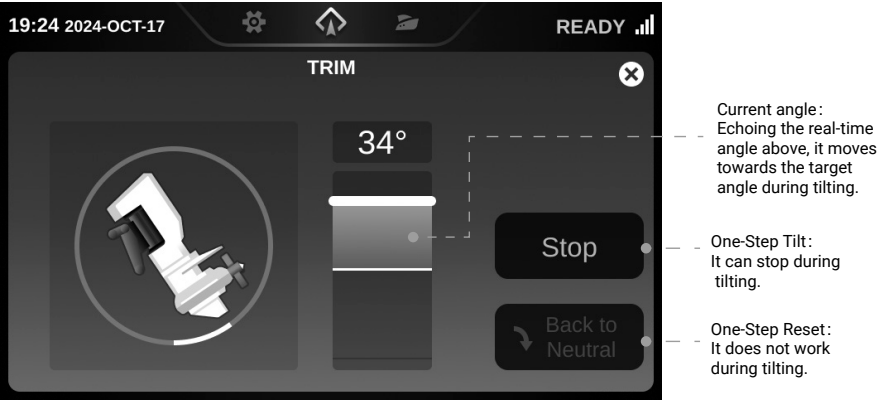
Figure 5.1 Click the trim entrance to pop up the control pop-up window

Normal Single Motor Trim

When in the pop-up window, the Home page button is not work.

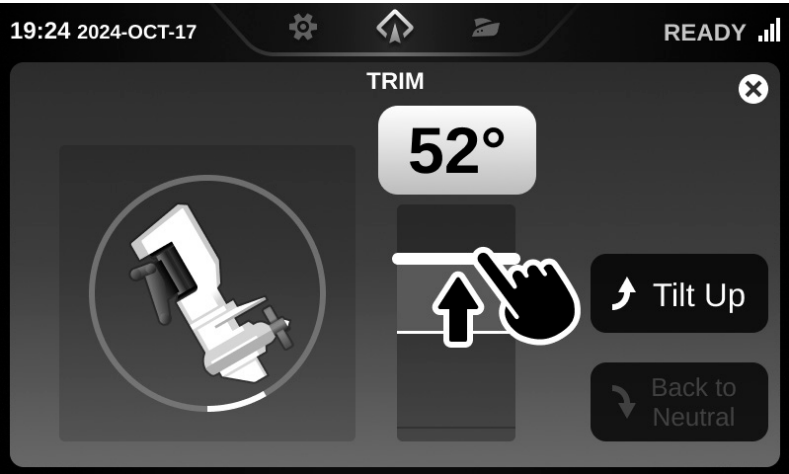


Single Motor Trim Manually Tilting



5.5.1.2 Manually Set the Trim Angle

Manually click or drag the bar to adjust the motor's trim angle. Long press and slide, the target angle will follow and be zoomed in.



Slide the bar to the target angle and release. The real-time angle line moves towards the target angle until the target angle value is reached.

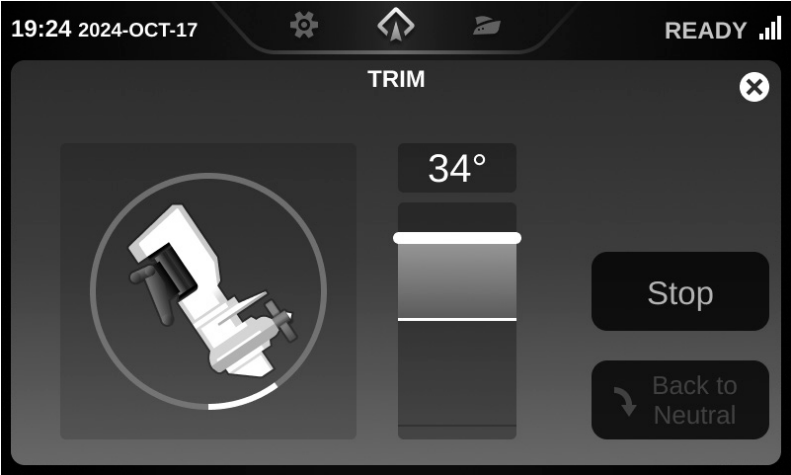
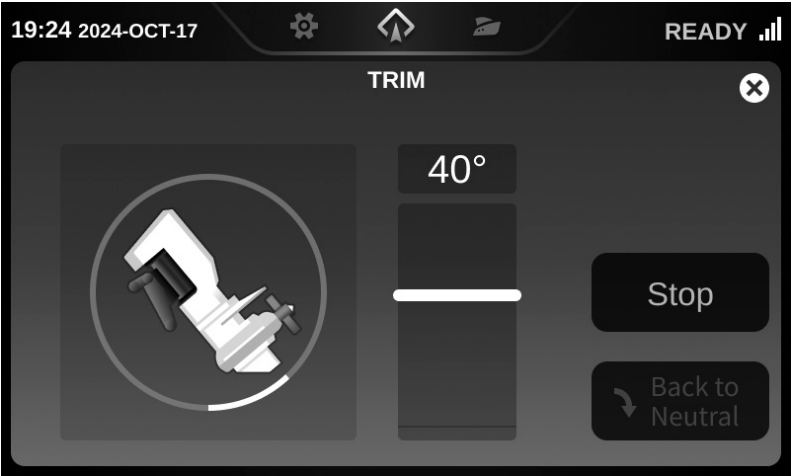


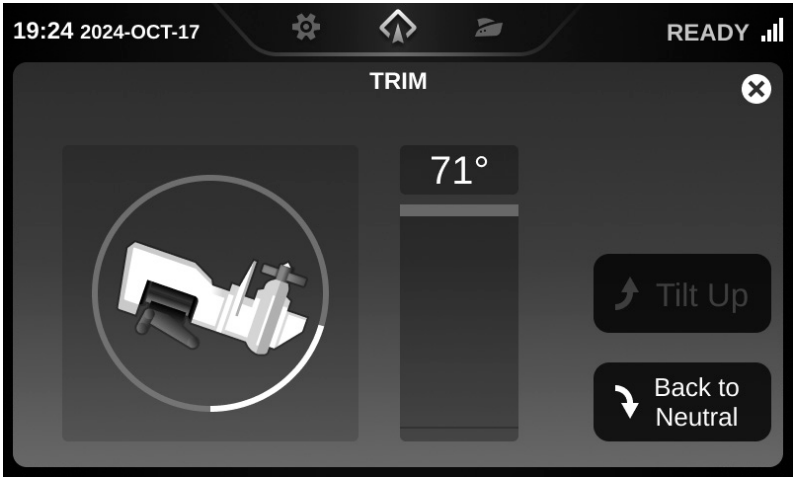
Figure 5.2 Figure while the target angle is 52° and the real-time angle is 34°

5.5.1.3 One-Step Tilt

Click the one-step tilt button, and the outboard will automatically tilt to the top. It can be stopped anytime during tilting. The bar will automatically move with the real-time angle during tilting.

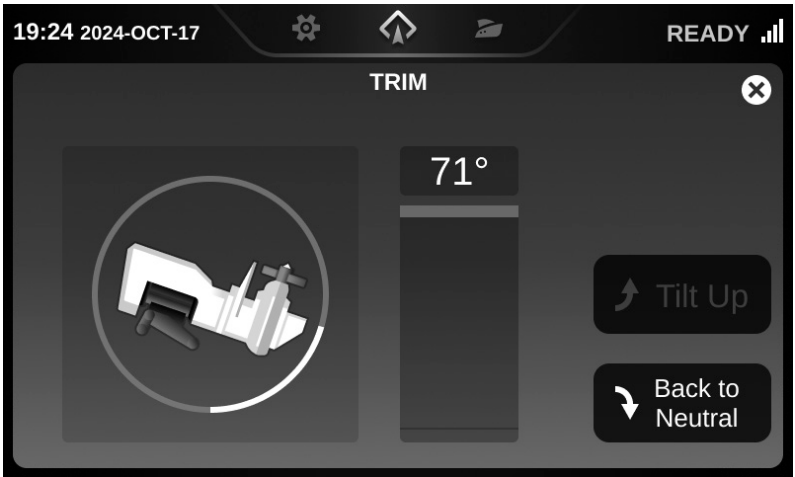


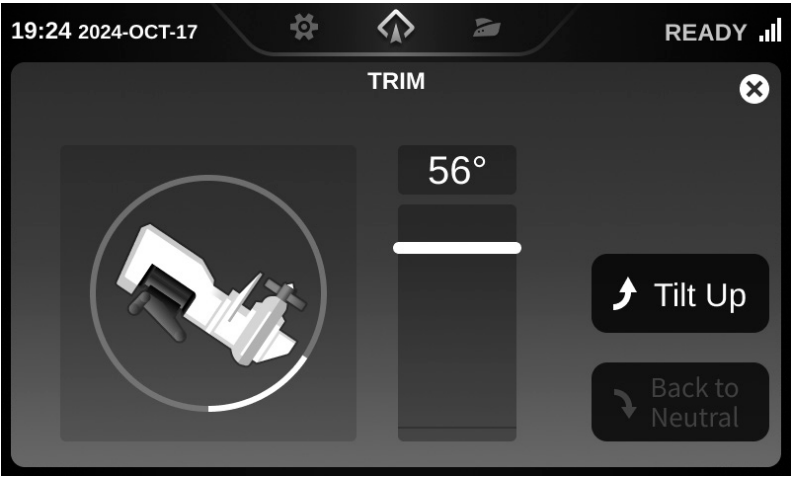
When the tilt angle reaches the upper limit for the motor, the one-step tilt button becomes unavailable. If the upper limit exceeds 56°, the tilt angle is locked, and the tilt and trim is shown as non-operable.



5.5.1.4 One-Step Reset

When the motor is above the limit, click the one-step reset button, and the motor will automatically lower to 0°.





5.5.2 Multiple Motors Trim

5.5.2.1 SYNC

Click the SYNC button to turn on or off the SYNC function. When multiple motors are under SYNC mode, slide any of the bars and all the outboard motors will tilt to the same target angle.

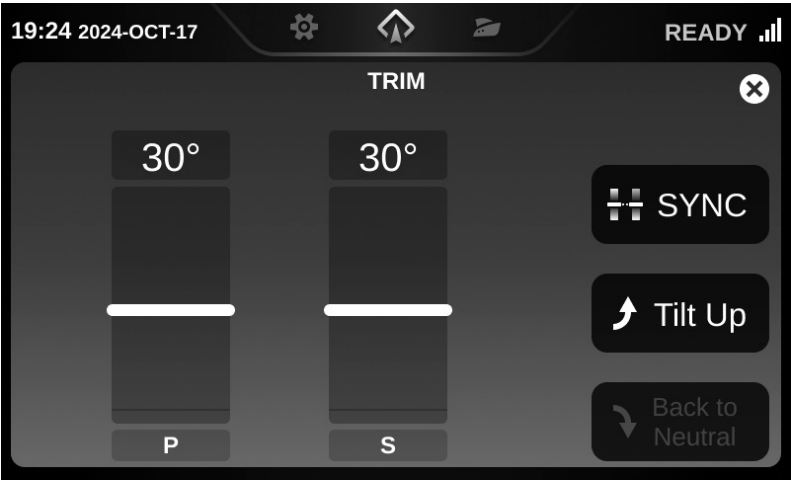


Figure 5.3 Not in SYNC mode

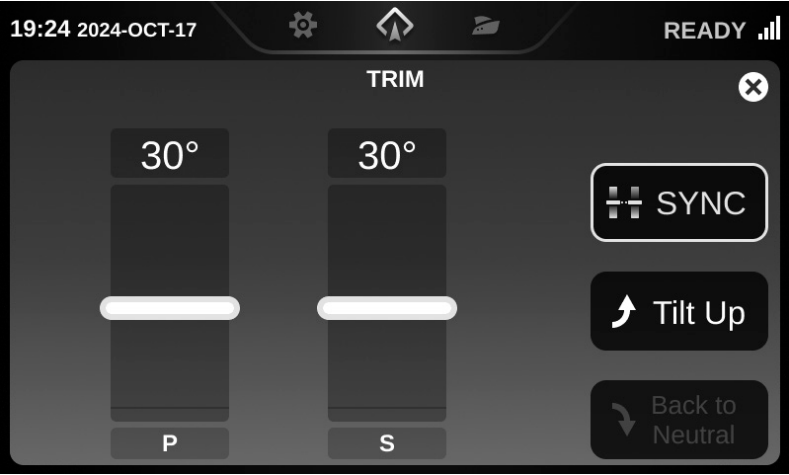


Figure 5.4 SYNC mode

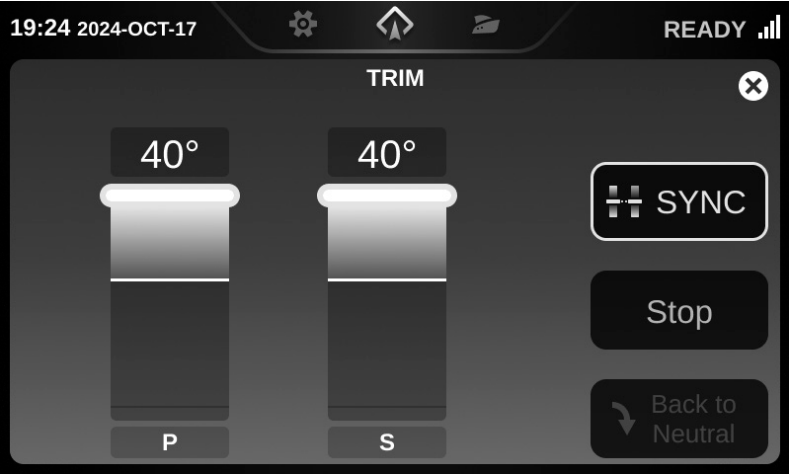


Figure 5.5 SYNC Trim

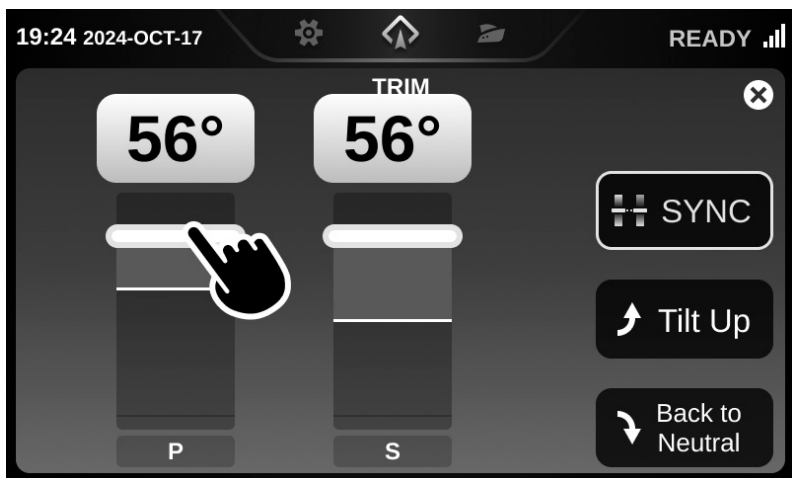


Figure 5.6 Different real-time angle to the same target angle

5.5.2.2 Multi-motor One-Step Tilt or Reset

The One-Step Tilt or Reset button will work for all propulsions no matter if they are in SYNC mode or not. If one propulsion needs to tilt or trim, please confirm they are not in SYNC mode, then slide the bar of this propulsion.

Please refer to 5.5.1 for single motor trim.



Before and during the operation, please pay attention to the surrounding environment of the ship and motor at all times to avoid collision damage to the motor, ship or nearby personnel and objects.

5.6 Propulsion Page

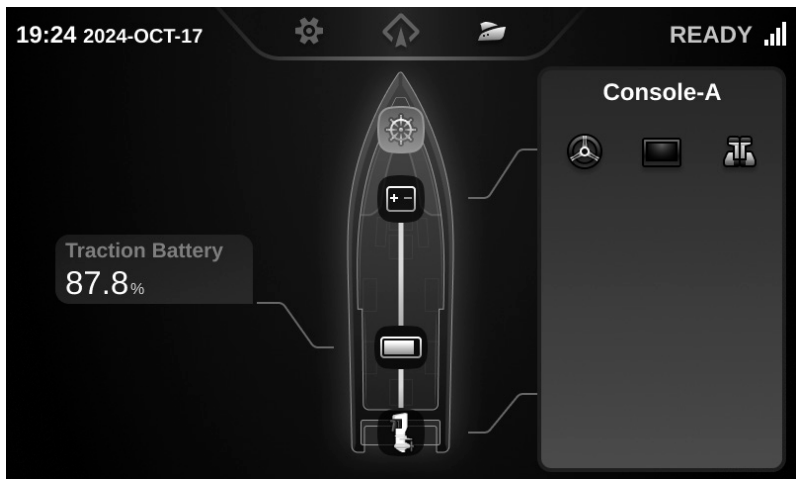
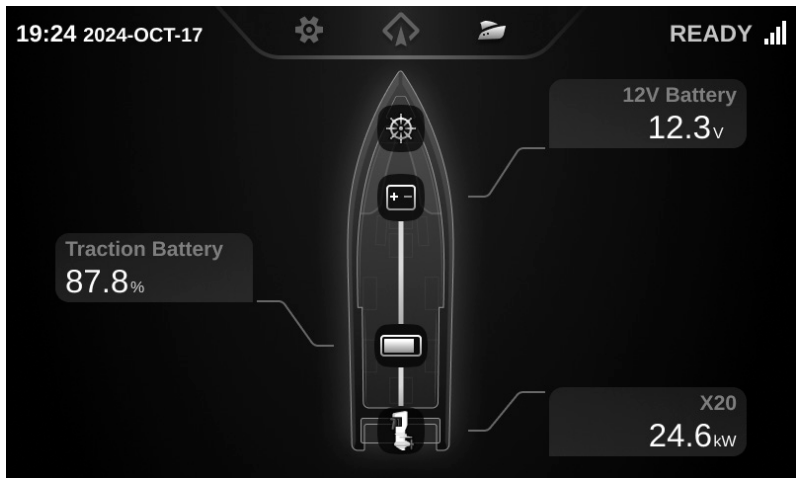


The propulsion system page is accessed by clicking the boat icon, just to the right of top centre on the screen.

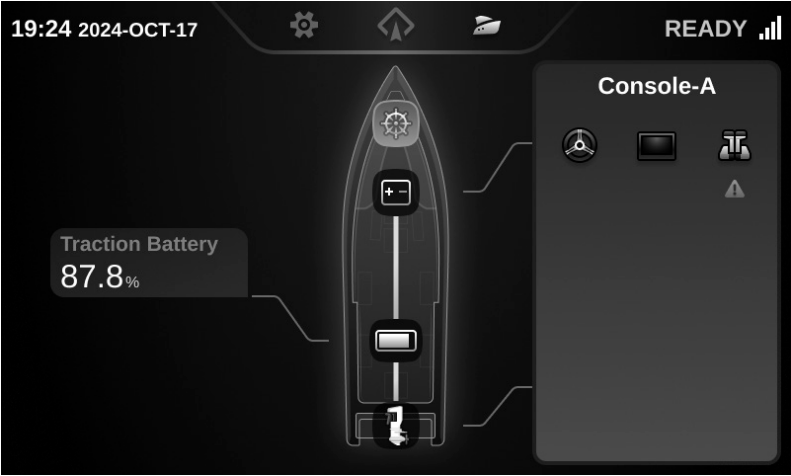
5.6.1 Control Console



Click on the console icon to view the accessories for each console.



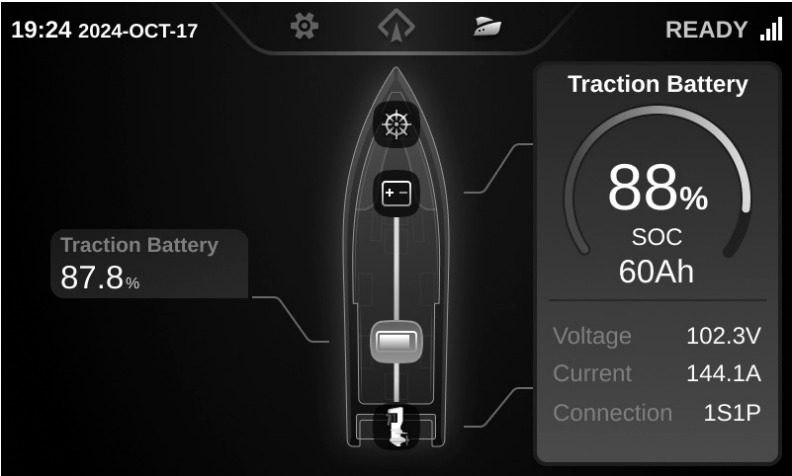
If an accessory fails, its icon will turn orange or red. Click the fault icon to view the problem in more detail.



5.6.2 Traction Battery



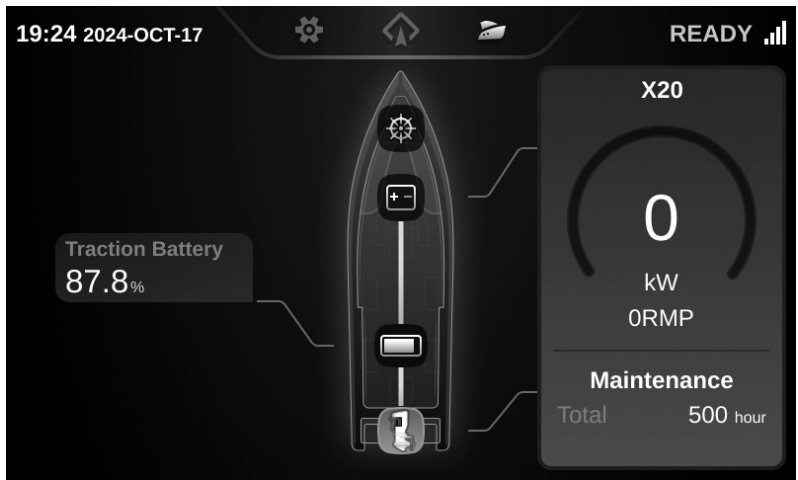
Click on the Traction Battery icon to view the remaining power, voltage, and current.



5.6.3 Motor(s)

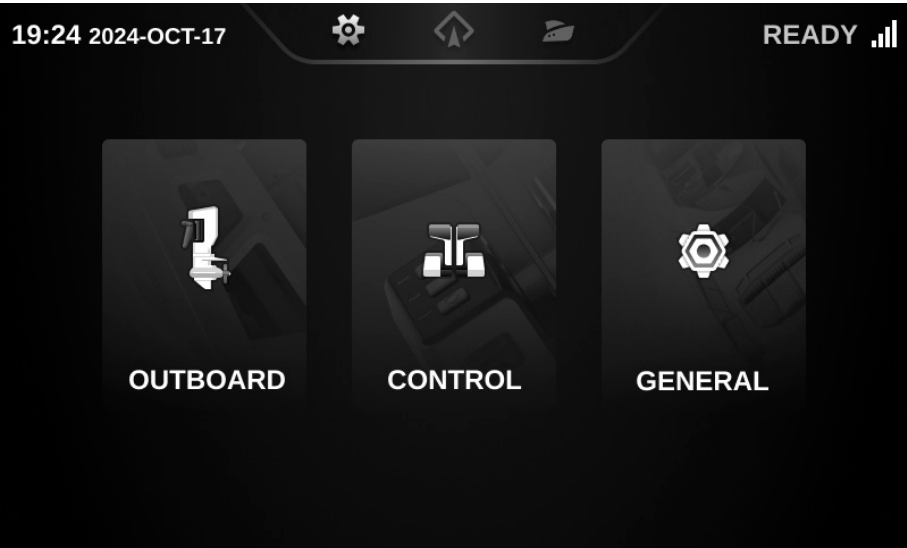


Click on the Motor icon(s) to view current power, rotational speed and cumulative run time.



5.7 Setting

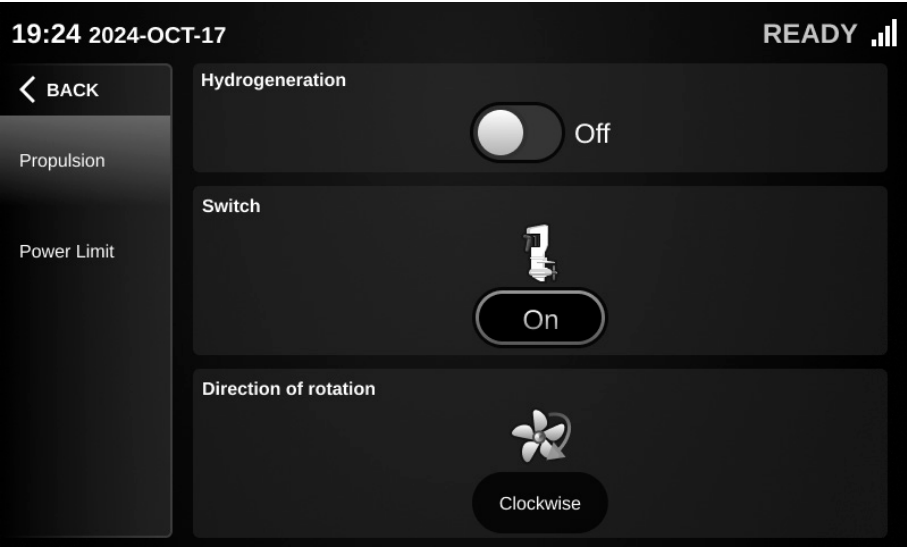
The Settings page is accessed by clicking the gear icon, just to the left of top centre on the screen. This covers three groups of settings: Outboard, Control and General.



Button	Function
OUTBOARD	Click to enter the propulsion setting page, you can set the motor switch and reverse propeller switch.
CONTROL	Click to enter the console setting page, you can set single-throttle assembly, dual-throttle FN function, Smart display, etc.
GENERAL	Click to enter the general setting page to set firmware update, maintenance, connectivity and more.

5.7.1 Propulsion Setting

5.7.1.1 Propulsion switch



Function	Description
Hydrogeneration	If enabled, the machine will reverse to charge the battery during its operation.
Switch	Click to switch on or off the motor. If the switch springs back, the setting has failed.
Direction of rotation	Click to switch the rotational direction of the propeller. If the switch bounces back, the setting fails.

5.7.1.2 Power Limit Setting



Normal Power Limit

After turning on the normal power limit, the maximum power for F and R gears can be adjusted. Clicking the increase/decrease buttons increments or decrements the power by 1 kW, while a long press allows for rapid adjustment. The maximum power for the R gear is set at 50% of the full power.

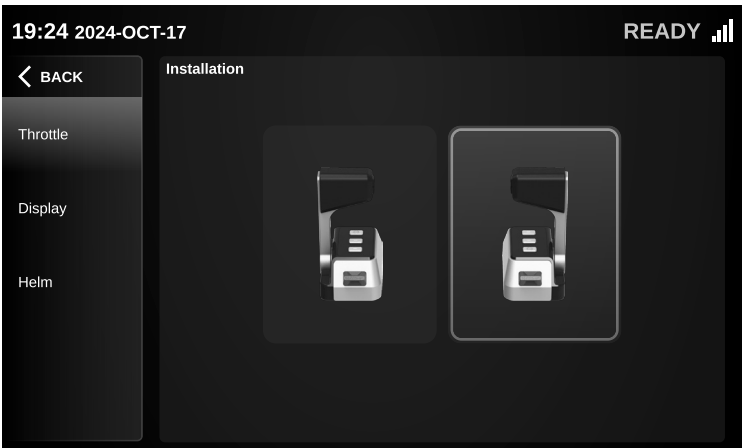
Dock Power Limit (under development)

In DOCK mode, the adjustable range for the maximum power in F gear is up to 70% of the full power, while the maximum power in R gear is set at 50% of the full power. When the normal power limit is enabled, the maximum power in DOCK mode cannot exceed the maximum power of normal mode.

5.7.2 Control console Settings

5.7.2.1 Smart throttle settings

1. Single-throttle Settings



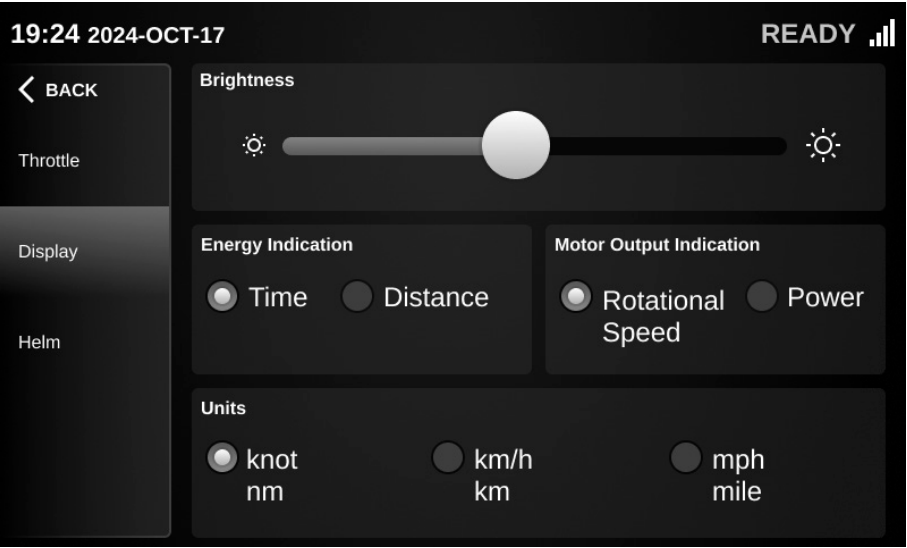
Function	Description
Starboard	Click and set the smart throttle installation mode to starboard installation. If it springs back, the setting fails.
Port	Click and set the smart throttle installation mode to port installation. If it springs back, the setting fails.

2. Set dual-throttle



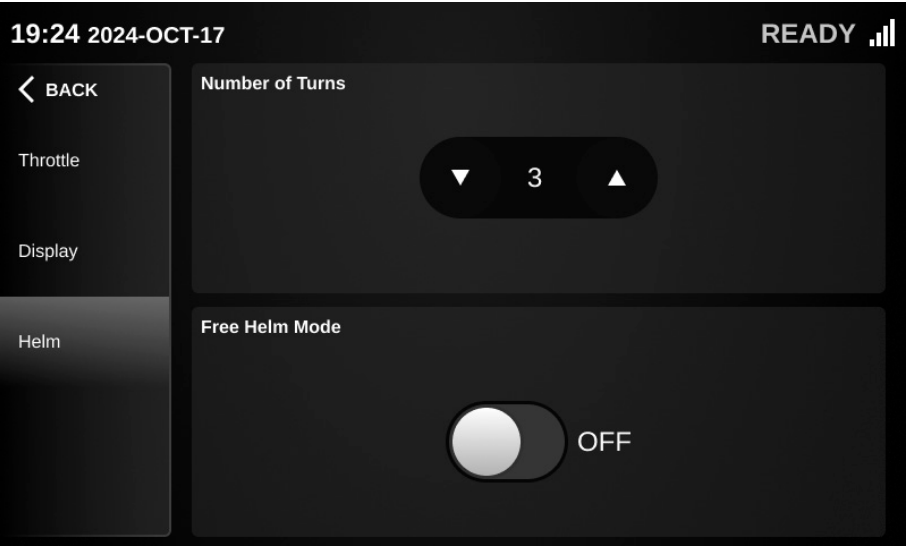
Function	Description
None	Set the FN function of smart throttle as invalid after clicking.
Sync	<p>Set the FN function of smart throttle to sync left and right handle after clicking.</p> <p>When the throttle values of the left and right throttle are not much different, the system will forcibly synchronize the throttle values of the two sides into one value. When the throttle values of the left and right throttle differ greatly, the respective throttle values of the two rockers are maintained.</p>

5.7.2.2 Display settings



Button	Function
Brightness	Drag to adjust the brightness of the display. This setting is still saved after powered off.
Energy indication	Switch between the time and distance to remaining energy, and the home page will change accordingly after the switch.
Motor output indication	Switch between the rotating speed and power of the motor, and the home page will change accordingly after the switch.
Units	The unit can be switched between knot, km/h and mile/h. After the switch, the speed limit unit of the home page and ePropulsion setting page will be changed accordingly.

5.7.2.3 Helm Settings



Function	Description
Number of turns	Adjust the number of turns required to turn the steering from lock to lock , Range: 1 to 9 turns
Free Helm Mode	When at Free Helm Mode, the helm wheel will not unlock when the electric steering is at the limit positions. The helm wheel can rotate but the electric steering will not move.

5.7.3 General setting

5.7.3.1 System firmware information



Function	Description
System version	Display the propulsion version.
Serial number	Click Device List to go to the device serial number list page. You can view all device SN and software and hardware version.
New version update	<p>When there is a new version to be updated, you will be prompted with the content of the new version and the estimated time. Users can choose to update immediately or in the early morning. If they choose to update in the early morning, they will be updated at 02:00 of the next day.</p> <p>Note:</p> <ol style="list-style-type: none">Update must meet two conditions: 1) 12V supply voltage > 10V; 2) The system has no operating power.The system cannot run during the update process, so it is recommended to choose early morning update or update when the ship is not needed.

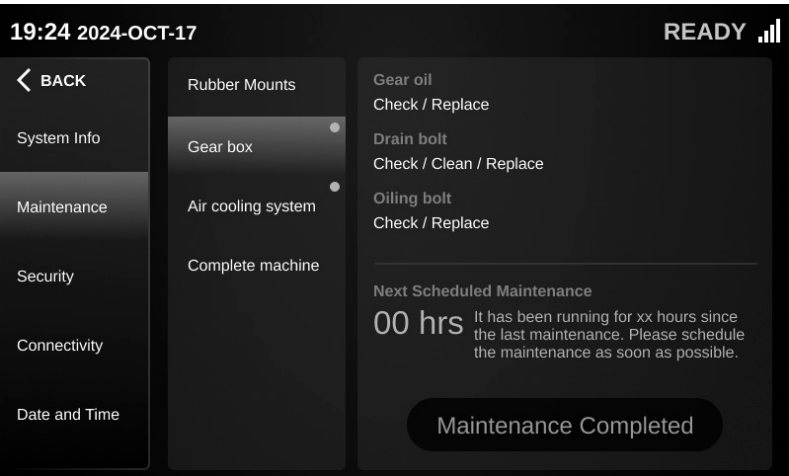
Device list page

- 1. Click Reset to reset the device to its factory device state.
- 2. Device List displays the SN and software and hardware versions of all components of the propulsion.

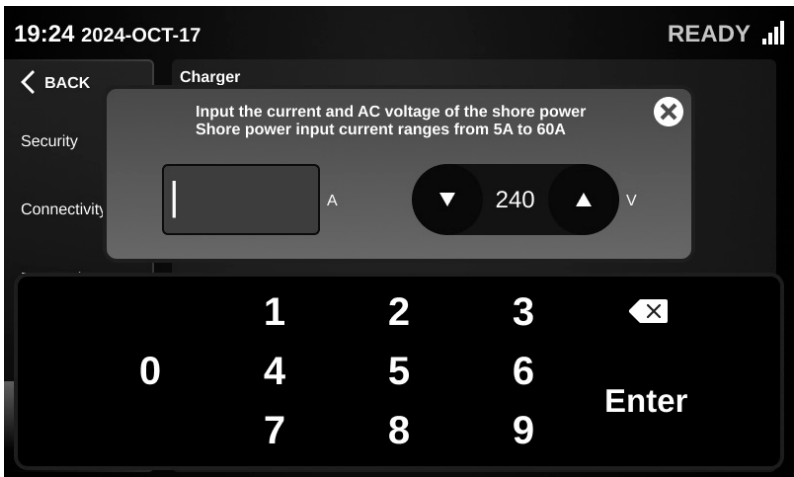
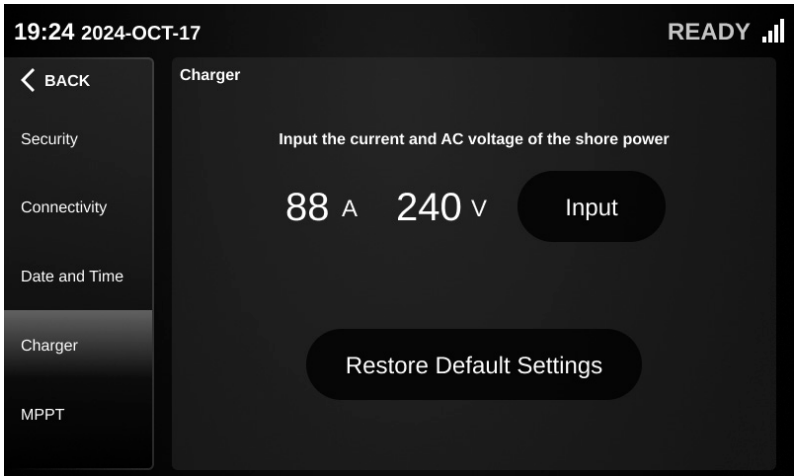


5.7.3.2 Maintenance - All maintenance timing tips

- 1. The system automatically calculates the maintenance schedule based on various maintenance items. When the maintenance time is due, the user will be notified on the display. After completing the maintenance, the user can reset the timer by clicking on "Maintenance Completed."
- 2. Regular maintenance helps to improve the machine's lifespan. Please perform the maintenance promptly upon receiving the notification.




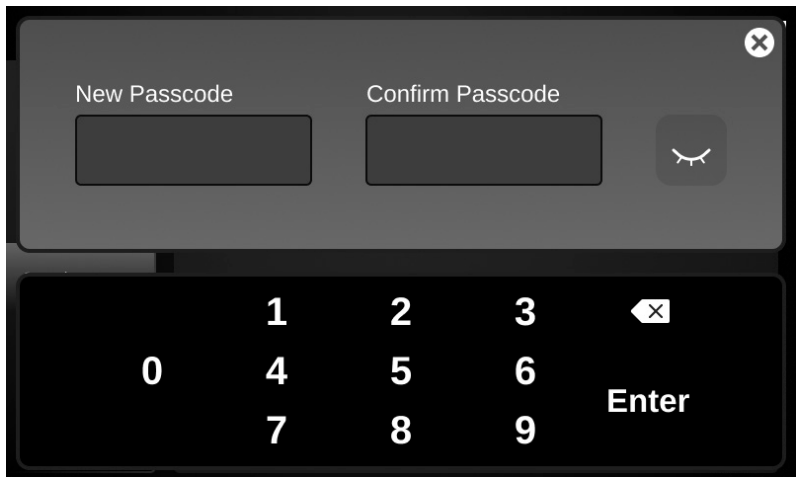
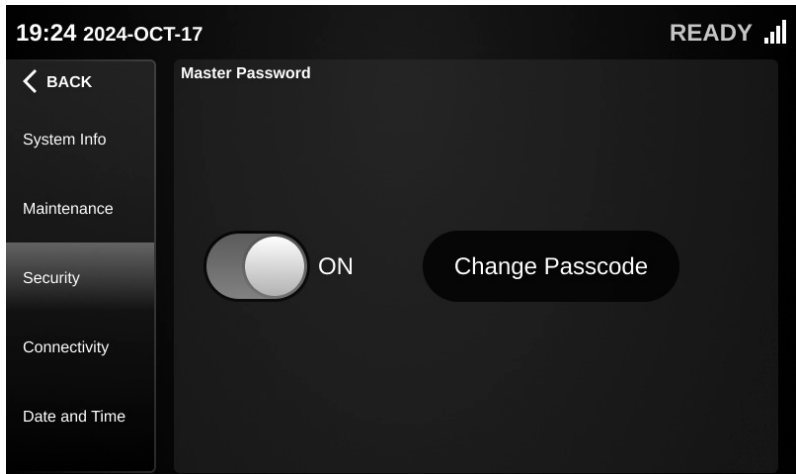
5.7.3.3 Charger Power Setting







- 💡 Press Input to set the maximum charging current and voltage.
- 💡 The maximum charging current range is 5 to 60A.
- 💡 The voltage can choose between 220V, 110V, 100V, 120V, 127V, 230V, 240V.
- 💡 Close the pop-up window once the settings are completed. The system will automatically save the settings. If failed, it will prompt "Setting Failed".
- 💡 Press Restore Default Settings to restore all the settings by default.

5.7.3.4 Master Password Mode

 It is under development.



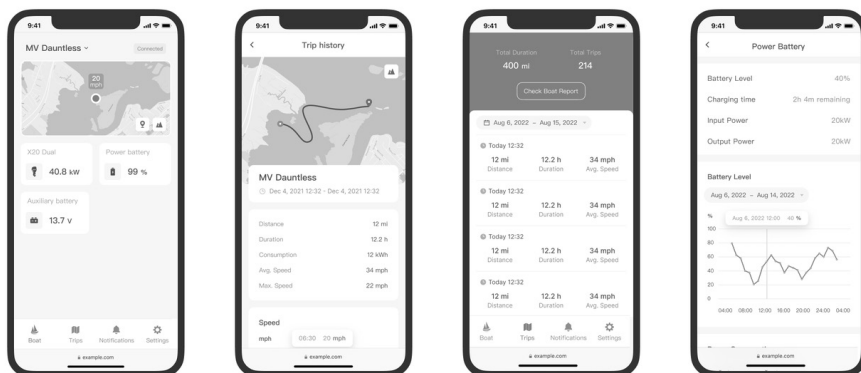
-  After turning on the Master Password mode, input the same 4-digit password twice to activate.
-  After turning on the systems or entering IDLE mode, only after inputting the proper password to sail the ship.
-  If forget the password or the display does not work, manually disconnect the display communication cable, and the system will unlock automatically.
-  Please contact after sales processing for further usage.

5.7.3.5 Connectivity

The ePropulsion Link

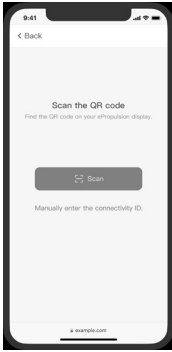
X20 offers connectivity capabilities by communicating with the ePropulsion cloud through its 4G antenna. You can link your product to the ePropulsion Link, a user-friendly software designed for personal boat owners, enabling them to monitor their boat's status remotely on their mobile devices. ePropulsion Link offers various features, including but not limited to:

- Real-time location and speed tracking
- Monitoring the battery level and estimating remaining charging time
- Creating geofences and monitoring speed violations
- Automatically generating trip histories and boat reports
- Sharing data access with co-owners
- Setting up text message notifications



To connect your ePropulsion system to the ePropulsion Link, follow these steps:

1. Visit <https://link.epropulsion.com>.
2. Click "Sign Up" and create your account.
3. Upon visiting the home page for the first time, click "Create Boat" to register your first boat.
4. After registering your first boat, click "Connect Now" to access the connection page. Additionally, locate the QR code for connection on the boat's display by navigating to Settings > General > Connectivity. You can either scan the QR code or manually enter the serial number to establish a connection.
5. Once successfully connected, you can access real-time information such as the boat's location and battery level on your home page.



OTA Update

An over-the-air (OTA) update involves wirelessly delivering new software to local devices. Regular OTA updates not only introduce new features but also enhance the user experience. Boat owners benefit from both time and cost savings as remote software updates eliminate the need to physically visit a dealership.

To check if a new software version is available, access the boat display through the following path: Settings > General > System Info.

If your ePropulsion system is connected to the ePropulsion Link, you will also receive notifications about new software versions within the ePropulsion Link. OTA access can be found on the propulsion system page.

You can choose to either install the update immediately or schedule it for later, typically during the night. The installation time varies depending on the changes and the number of components involved but usually takes less than 30 minutes. After a successful installation, you will see that your system is running the latest version on the boat display, and you will receive a notification of the successful update within the ePropulsion Link.



5.8 Operation

5.8.1 Checks before starting

1. Ensure the propeller is correctly installed on the outboard motor.
2. Ensure the outboard motor is correctly installed on the boat.
3. Before turning on the power, ensure the throttle and steering wheel are properly positioned.
4. Ensure the smart throttle is correctly installed, and the throttle is calibrated for smooth operation.
5. Before connecting the battery, check that the cables are not damaged and connectors are not loose.
6. Check and ensure the main switch can start and stop the motor properly. Afterward, turn off the main switch.
7. Ensure the battery has sufficient charge.

5.8.2 Starting the Outboard Motor

1. Complete the checklist in section 5.7.1.
2. Remove the kill switch from the smart throttle or smart tiller.
3. Return the throttle to the neutral position.
4. Turn on the main power switch.
5. Press and hold the Power button for 1 second to power on the motor. Wait until the Power button light turns steady green and the display shows "READY" before operating.
6. Adjust the outboard motor to an appropriate tilt angle, normally between -4° to 16° .
7. If necessary, adjust preference settings.
8. Put the kill switch in place on the throttle.
9. Gently push the throttle to start the outboard motor.

5.8.3 Adjusting the Power

When the battery is connected and switched on, power on the control system to start the outboard, then slowly push the throttle forwards to increase the power.



Before switching on the smart throttle, the throttle must be in the neutral position.



If you find a blinking "RESET" on the display, you are reminded to reset the throttle to neutral position.



If you pull the throttle directly from forward to reverse, the motor will stop briefly before entering reverse gear. This is to protect the gearbox from damage.

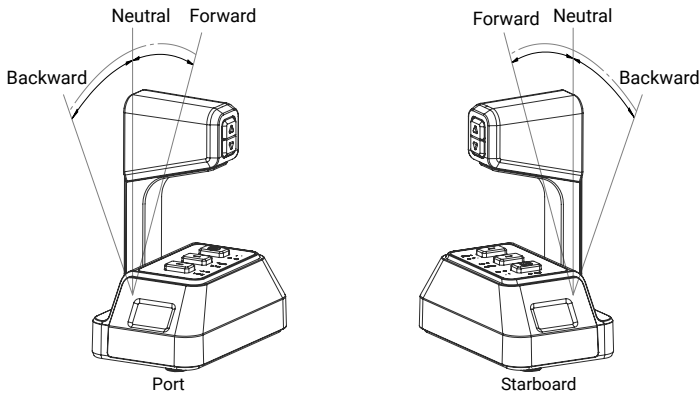


Figure 5.7

5.8.4 Steering Control

5.8.4.1 Steering Control with Digital helm

Secure the digital helm on the dashboard using screws, then connect the system's CAN communication cable to the communication interface at the bottom of the digital helm (see section 4.3). This integrates the digital helm into the entire system. Long-press the power button on the smart throttle to turn on the entire system. The steering wheel then changes the direction of the outboard, as you'd expect.

5.8.5 Trim Angle Adjustment

The trim angle of the outboard motor helps determine the position of the boat's bow in the water. Correct trim angle improves performance and reduces stress on the outboard motor. The appropriate trim angle depends on the combination of the boat, outboard motor, and propeller. Other factors, such as the boat's load, sea conditions, and operating speed, also influence the correct trim angle.



Excessive trim (either upward or downward) during operation can make the boat unstable and steering more difficult, increasing the risk of accidents. If the boat becomes unstable or challenging to steer, reduce speed and readjust the trim angle.

5.8.5.1 Trim Angle Adjustment

The X-series outboard motor incorporates an electric hydraulic tilt and trim system, and the trim angle can be adjusted using the following methods:

- **Tilt Adjustment Button on the Motor**

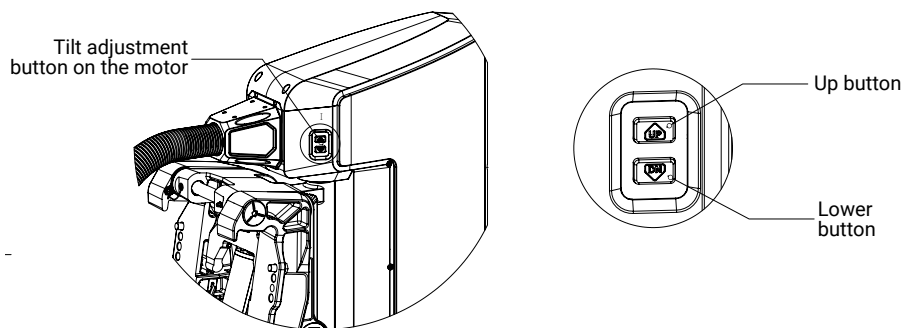


Figure 5.8

•Tilt Adjustment Button on the Smart Throttle

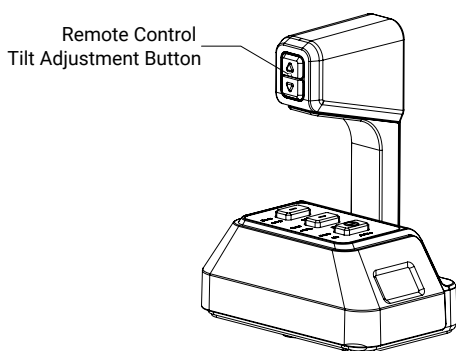


Figure 5.9

• Tilt Adjustment Button on the Display

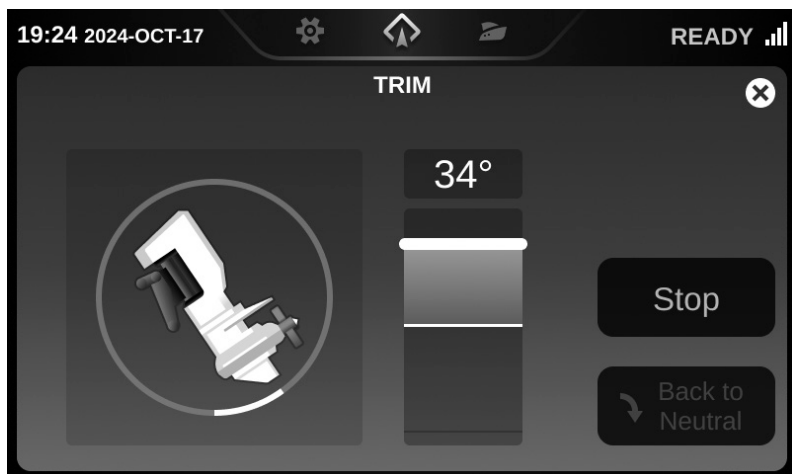
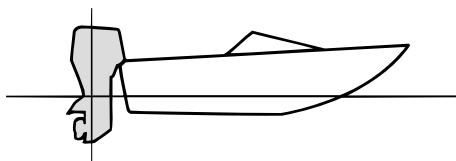


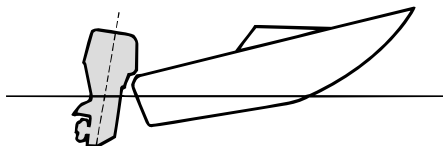
Figure 5.10

5.8.5.2 Adjusting the Boat's Trim Angle

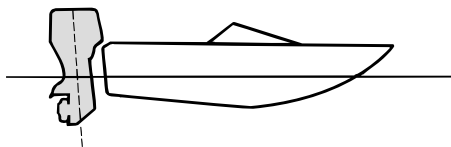
When the boat is planing, raising the bow reduces resistance, improves stability, and enhances efficiency. Typically, the boat's centerline is raised by 3° to 5° . When the bow is raised, the boat tends to turn to one side or the other, requiring compensation during steering. Lowering the bow makes it easier to accelerate from a standstill to planing speed.



Excessive outward trim raises the bow too high in the water, causing increased resistance, reduced performance, and fuel efficiency. It can also lead to the propeller partially coming out of the water, further reducing performance, and causing the boat to "porpoise," ejecting the operator and passengers.



Excessive inward trim makes the boat "plow" through the water, leading to difficulty in accelerating. Running at high speeds with excessive inward trim can also make the boat unstable. The resistance at the bow significantly increases, making steering difficult and hazardous.



5.8.5.3 Cruising in Shallow Water

The outboard motor can be partially tilted upward to operate in shallow waters.

5.8.5.4 Motor Tilt

If the outboard motor is going to be shut down for a period or the boat will be parked in shallow water, the outboard motor should be tilted upward to prevent damage to the propeller and motor housing due to collision with obstacles. This action also helps reduce corrosion.

When tilting the outboard motor, always stop its operation. Otherwise, the outboard motor may be damaged.



Do not tilt the outboard motor upward by pushing the steering handle, as it may break.

The X20 outboard motor has an automatic limit for tilting at a specific angle (approximately 65 degrees).

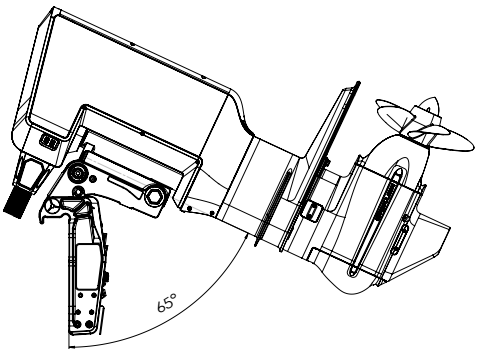


Figure 5.11

5.8.5.5 Tilt Limit Release

When holding the smart throttle's tilt-down button for 1 second or using the display screen to drag and release the tilt limit, the motor will perform an automatic limit release action. The motor will tilt counterclockwise and then rotate clockwise to reduce the tilt angle until the tilt button is released.

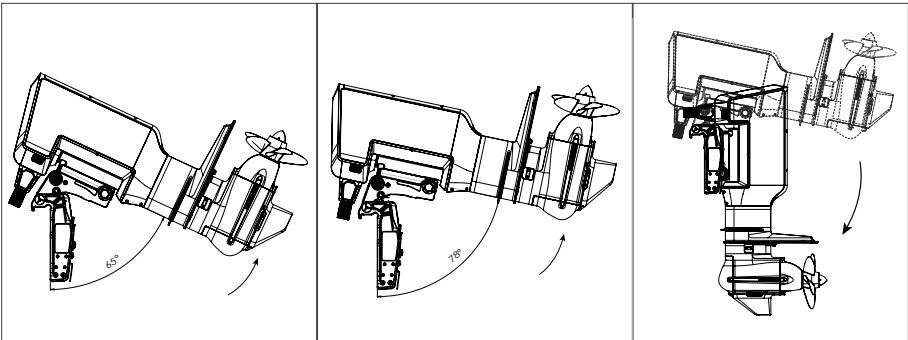


Figure 5.12



During the automatic limit release process, you can interrupt it by releasing the button and then re-triggering the smart throttle tilt button or the stop button on the display screen, allowing you to manually adjust the tilt angle.

5.9 Hydro Generation Function

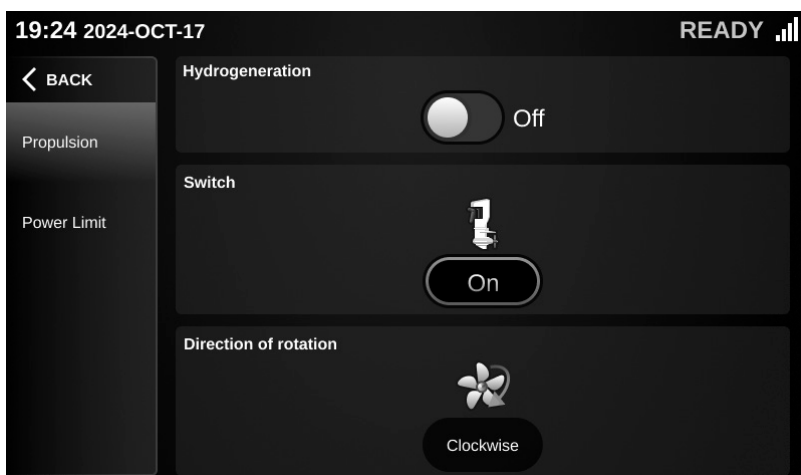
X series outboard can drive the propeller to charge the battery (only the ePropulsion battery) through water flow.

The machine will enter the hydro generation state if the following conditions are met:

1. The control system is set to turn on the hydro generation function (enabled by default).
2. The control system is in the zero position.
3. The ePropulsion battery power is below 90%.
4. The machine will enter the hydro generation state after the boat speed is above 6km/h stable for 4 seconds.
5. The hydro generation function can be used only when connecting ePropulsion batteries and the communication cable is connected correctly.

When any of the following conditions occur, the hydro generation will be stopped:

1. The control system is set to turn off the hydro generation function.
2. The control system is in the forward / backward state (not in the zero position).
3. Currently in intelligent function mode.
4. The ship is not traveling or traveling too fast (speed is higher than 40km/h or the rotational speed is higher than 8000rpm).
5. The battery level is higher than 90%.
6. Only when connecting with ePropulsion batteries, the hydrogeneration function can be turned on.



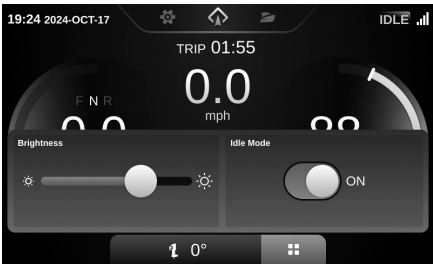
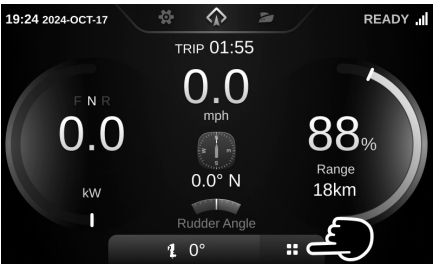
5.10 Idle Mode, Sleep

For convenience and enhancing experience in various scenarios, the X-series outboard motor is equipped with idle mode, sleep mode, and wake-up function.

5.10.1 Idle Mode

In scenarios such as short-term anchoring, leisure, or entertainment, press the function button at the bottom of the smart display to enter the anchoring mode page and the activate idle mode to prevent accidental triggering of the interactive system and avoid potential risks to users. In idle mode, the main propulsion, electric steering, and electric tilt and trim will stop. After maintaining the idle mode for 30 minutes, the display will turn off, and the screen can be reactivated by operating the interactive system.

Exiting idle mode requires manual operation through the interactive system to return to normal operation mode.



5.10.2 System Sleep

The X-series outboard motor system performs regular self-checks to ensure the outboard and system are in a safe and fault-free state. When the user powers off the system by long-pressing the throttle POWER ON button, the system switches to sleep mode. For the system to function properly during sleep, please ensure that the 12V battery remains connected and the power is turned on continuously. During sleep mode, if the 12V battery voltage is detected to be low, boat network registered users will receive messages via the App or other means notifying them of the low 12V battery level. Please charge your battery promptly to avoid any inconvenience during the next voyage. In the event of system malfunctions, we will upload the fault information through the boat network, and registered users can view the relevant information on the App or other platforms. Please refer to section 5.12 for fault handling and contact the after-sales service and dealers to address any issues.

5.11 Cautions

1. In case of emergencies, such as a crewmember falling into the water, you can pull the kill switch off the throttle to stop the outboard.

The product will automatically shut down if it is not running properly. It will shut down in the following situations:

- When the throttle lever is turned to the neutral position.
 - When the "POWER" button is pressed and held to power off.
 - When the kill switch is pulled off.
 - When the power cable is disconnected, or the outboard motor is unable to connect to the battery.
 - When the high voltage battery is low on power.
 - When the 12V battery voltage drops below 10.5V.
 - When the propeller hits an object.
2. When the outboard is running, parts such as the output shaft and propeller rotate continuously and should be avoided. If you need to go near these moving parts, avoid wearing jewelry, unbuttoned cuffs, ties, or loose clothing, and always tie back long hair. Keep hands, feet, and tools away from all moving parts.



3. During the operation of the outboard, it will continuously dissipate heat, causing some surfaces to become hot. Be careful to avoid burns.



5.12 Troubleshooting

5.12.1 Common mechanical troubleshooting

Failure	Reason	Solution
Abnormal tilting	Tilt and trim system damage	Check and restart. If it occurs repeatedly, contact after sales processing.
Trim limit and release abnormality	Mechanism damage such as trim limit	Check and restart. If it occurs repeatedly, contact after sales processing.
Abnormal steering	Steering system damage	Check and restart. If it occurs repeatedly, contact after sales processing.
Abnormal noise	Outboard motor and hull are not fastened	Tighten
	Housing bolt loose	Tighten
	Propeller not installed in place for fastening	Tighten
Abnormal vibration	Propeller not installed in place for fastening	Tighten
	Propeller damage	Replace
	Parts or fasteners loose	Tighten
Pump failure	Control Abnormality/Fan Failure	Check and restart. If it occurs repeatedly, contact after sales processing.
Over temperature alarm	Pump failure	Check and restart. If it occurs repeatedly, contact after sales processing.
	Robotic underwater partial biological attachment	Clean
	Insufficient or leaking coolant	Add coolant. If there is a leakage of coolant, please check cause and repair.

5.12.2 System troubleshooting list and treatment methods

Fault position	Fault name	Fault code	Solution
Drive motor	Encoder fault	P101003	1. Check the external wiring
	Power tube pass-through failure	P100F03	1. Check the external wiring 2. Check the insulation of the motor
	Motor overspeed	P101113	1. Check the operating conditions
	Emergency stop	P101603	1. Check if the emergency stop button is pressed
	Phase current overcurrent hardware failure	P100C03	1. Check the operating conditions 2. Check whether there is a short circuit in the system power supply
	Phase current overcurrent software failure	P100D03	1. Check the operating conditions
	Stagnation	P101203	1. Check the operating conditions 2. Overhaul the transmission system
	Severe overvoltage of bus	P100603	1. Check the high voltage power supply circuit
	Severe bus undervoltage	P100813	1. Check the battery SOC 2. Check the main contactor status
	General overvoltage of bus	P100712	1. Check the high voltage power supply circuit.
	General bus undervoltage	P100912	1. Check the battery SOC
	MOS severe overtemperature	P100003	1. Check the operating conditions 2. Check whether the heat dissipation channel is blocked 3. Check coolant level

Fault position	Fault name	Fault code	Suggested measures
Drive motor	The motor is seriously overheated	P100203	1. Overhaul the motor or drive system 2. Check whether the heat dissipation channel is blocked 3. Check coolant level
	MOS general overtemperature	P100402	1. Check the operating conditions 2. Check whether the heat dissipation channel is blocked
	Motor general overtemperature	P100502	1. Check the operating conditions. 2. Check whether the heat dissipation channel is blocked
	Auxiliary power overvoltage	P100A13	1. Check the external input 12V power supply
	Auxiliary power undervoltage	P100B13	1. Check the external input 12V power supply
	Busoff fault	P101443	1. Check the cable and end point resistance 2. Confirm whether there is interference
	Communication loss	P101543	1. Check whether the communication cable or motor controller is disconnected
X-ECU	GPS antenna short circuit	P130321	1. Check the GPS antenna line.
	Open GPS antenna	P130421	1. Check the GPS antenna line.
	CAN_A BUSOFF	P130843	1. If recoverable, no processing is required 2. Troubleshoot the cable for poor contact
	CAN_B BUSOFF	P130941	1. If recoverable, no processing is required 2. Troubleshoot the cable for poor contact
	CAN_C BUSOFF	P130A43	1. No need to process if recoverable 2. Troubleshoot the cable for poor contact

Fault position	Fault name	Fault code	Suggested measures
X-ECU	Auxiliary power overvoltage	P130B11	1. Check the external input 12V power supply
	Auxiliary power supply undervoltage	P130C11	1. Check the external input 12V power supply
	BMS node lost	P130D41	1. Check the BMS line and cable 2. Confirm whether the BMS is connected and the power supply is normal
	Drive motor controller node missing	P130E43	1. Check the drive motor controller circuit and cable 2. Confirm whether the drive motor controller is connected and the power supply is normal
	Wired remote operation box node is lost	P131143	1. Confirm whether the cable remote operation box is turned on 2. Check the cable remote operation box line and cable 3. Confirm whether the cable remote operation box is connected and the power supply is normal
	Display node missing	P131441	1. Check the display line and cable 2. Confirm whether the display is connected and the power supply is normal
	High voltage interlock 1 signal failure	P132002	1. Re-check the high voltage interlock signal 1 wire device 2. Replace the high voltage wiring harness
	High voltage interlock 2 signal failure	P132102	1. Re-check the high voltage interlock signal 2 wire device 2. Replace the high voltage cable

Fault position	Fault name	Fault code	Suggested measures
Wired remote operation box	Throttle calibration data abnormal	H120203	1. Keep away from strong magnetic fields and recalibrate 2. If it occurs repeatedly, contact after-sales processing
	Abnormal throttle angle	H120003	1. Keep away from strong magnetic fields and recalibrate
	Kill switch abnormality	H120403	1. Check whether the kill switch is properly pulled in the slot
Display screen	CAN BUSOFF	H110041	1. If recoverable, no processing is required 2. Troubleshoot the cable for poor contact
	ECU LOST	H110141	1. If recoverable, no processing is required 2. Troubleshoot the cable for poor contact

5.13 Lameness

5.13.1 Main driver lameness

When encountering a fault in the following table, the system will automatically or require the user to manually trigger the interactive system to enter the main drive lameness for different faults to ensure the safe return of the user.

Fault position	Trigger condition	Processing strategy
Driver motor controller	Bus voltage general overvoltage	Linear power drop
	Bus voltage General undervoltage	Linear power drop
	MOS over temperature	Linear power drop
	Motor overtemperature	Linear power drop
	Controller temperature sensor failure	Reduce power by 50%
	Motor temperature sensor failure	Reduce power by 50%
	Single drive plate failure	Reduce power by 50%

Fault position	Trigger condition	Processing strategy
BMS	Low SOC	Linear power drop
X-ECU	High voltage interlock failure	5kw
Close operation	Secondary failure	Reduce power by 50%
Electric steering	Level three failure	Stop the machine first and push the throttle again, then limit the power to 10kW, and manually control the steering
	Secondary failure	Reduce power by 50%
	Node missing	Stop the machine first and push the throttle again, then limit the power to 10kW, and manually control the steering
Steering wheel	Level three failure	Stop the machine first and push the throttle again, then limit the power to 10kW, and manually control the steering
	Node missing	Stop the machine first and push the throttle again, then limit the power to 10kW, and manually control the steering



Warning: When the main driver is limping, the machine may experience significant shaking or noise. Limping can cause certain damage to the machine, so please use the lowest possible power output to reduce damage to the system.

5.13.2 Temporary Running Mode

When encountering the faults listed in the table below and the steering control circuit is intact, users can confirm system safety and choose to enter the limp mode through the display screen. In the limp mode, the steering needs to be manually controlled by the operator, and the maximum input power of the entire machine will be limited to 10kW.

Failure domain	Trigger condition	Processing strategy
Electric steering	Level three failure	Stop the outboard first and push the throttle again, then limit the power to 10kW, and manually release and lock the steering, adjust the direction and control the power
	Node missing	
Steering wheel	Level three failure	
	Node missing	



Warning: When in steering limp mode, the outboard steering is in an unlocked and free state. Please be cautious when steering manually.



Warning: Only when the throttle is at neutral position, the outboard direction can be adjusted after release the steering lock. Only after the direction is locked, the power output can be controlled.

5.13.3 Manual Trim

If the tilt and trim system fails, and not being able to adjust the trim angle would make it unsafe to return to port, the hydraulics can be released to allow manual adjustment by flathead screwdriver.



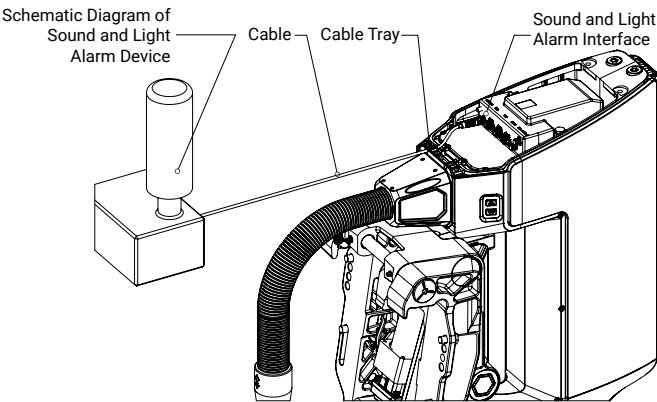
Figure 5.13

5.14 Other Interfaces

5.14.1 Sound and Light Alarm

The X-series outboard motor supports external sound and light alarm devices. Follow these steps to connect the alarm device:

- (1) Remove the machine's upper cover.
- (2) Connect the sound and light alarm connector as shown in the diagram and tighten it.
- (3) Secure the sound and light alarm wire in the cable groove.
- (4) Fix the upper cover.



5.14.2 NMEA2000 Device Expansion

The X-series outboard motor supports external NMEA2000 communication protocol devices.

Follow these steps to connect the NMEA2000 device:

- (1) Remove the machine's upper cover.
- (2) Connect the NMEA2000 connector as shown in the diagram and tighten it.
- (3) Secure the NMEA2000 communication line in the cable groove.
- (4) Fix the upper cover.

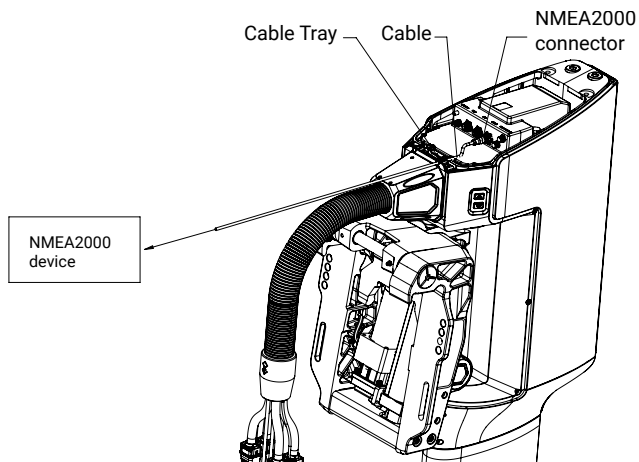


Figure 5.15

6 Emergency Situations ---

6.1 Collision

If the outboard strikes some object beneath the water, please follow below procedures.

1. Stop the outboard immediately and then turn off the main switch.
2. Check the mechanical structure to see if there are damages.
3. Return to the nearest harbor or pier in low power.
4. Call your dealer to check the outboard.

6.2 Sodden Outboard

If the outboard is sodden, stop it immediately and turn off the main switch then disconnect the battery. Bring the outboard to the dealer. And ensure the outboard is thoroughly inspected before operating it again.

6.3 Overtemperature Protection

When the operating temperature is high, the max input power will be limited within rated power, and the power will decrease with the rise of temperature. If the system temperature keeps rising and surpasses a threshold, the outboard motor will shut down automatically to avoid over-temperature. Users should stop operating the outboard and wait until the temperature falls within the normal range.

7 Maintenance

7.1 Maintenance

7.1.1 Routine maintenance

Maintenance items	Maintenance methods	Maintenance frequency
Fresh water flushing after use	After each use, rinse the soaked and splashed parts with fresh water after the machine is warped	After each use
Cleaning of external surface attachments	Please lift the machine after each use. If the surface of the machine is attached to organisms, the attached organisms need to be cleaned up	After each use
Regular inspection of cable wear, etc	Regularly check the reliability of the cable connection and whether there is wear and tear with the hull vias.	Each use period or periodic inspection (3 months)
Grease injection for warping shaft	Fill the grease in the grease nozzle until the grease flows out of the bushing	Six months
Lifting limit slide grease injection	Grease the limit slide	Six months
Replacement of Anode for the whole machine	If more than one-third of the anode is consumed and needs to be replaced, replace it	Regular check-ups every 3 months
Check the electric trim angle	1. Check whether the lowest point limit of the outboard is reliable; 2. Check whether the maximum and low limit release of the outboard is reliable;	Six months
Propeller and cotter pin inspection and replacement	Check the propeller for damage, coating damage, deformation, check whether the cotter pin is broken, bent stuck, falling off, etc	Periodic inspection (3 months)

7.1.2 Machine maintenance

Mainten- -ance items	Method of operation	Main work	Maintenance cycle					
			First maintenance			Every other time in the future		
			100 hours (Or 3 months)	200 hours (Or 6 months)	500 hours (Or 1 year)	200 hours (Or 6 months)	500 hours (Or 1 year)	1000 hours (Or 4 years)
Grease injection for warping shaft	Fill the grease in the grease nozzle until the grease flows out of the bushing	Inspection/ Grease injection		●		●		
Lifting limit slide grease injection	Grease the limit slide	Inspection/ Grease injection		●		●		
Check the hydraulic oil level of the electro-hydraulic tilt and trim	1. Raise the outboard to the highest position; 2. Spin down the injection hole cover and check the working fluid level. The working fluid level should be flush with the bottom edge of the injection hole. If necessary, add automotive automatic transmission fluid (ATF) can be used.	Check or fill hydraulic oil			●		●	
Gear oil replacement	1. Remove the output shaft end parts such as the propeller, remove the oil injection bolt, and drain the oil bolt to drain the old gear oil. 2. Tighten the new oil drain bolt (pay attention to torque control) and perform an air tightness test. 3. Fill the new gear oil or the machine vertically until the spill port overflows. 4. Tighten the oil bolts.	Inspection/ replacement		●				●
Loosening inspection of bolts and nuts of the whole machine	Check whether the screws are loose	Check	●				●	

7.2 Partial Maintenance and Care Guidelines

7.2.1 Gearbox Oil Replacement Procedure:

The gearbox contains gear oil for lubricating and cooling the transmission system. When adding or replacing gear oil, visually observe if water is present in the discharged gear oil. If there is water, it may precipitate at the bottom during discharge. Water can also mix with the gear oil, causing the gear oil to appear milky. If water is observed, immediately stop using the outboard motor and contact after-sales support for maintenance. Water in the gearbox can lead to damage in the transmission system. When adding or replacing gear oil, observe if there are metal particles in the discharged gear oil. A small amount of fine particles indicates normal gear wear, but if there are a significant number of metal shavings or larger particles (flakes), it may indicate abnormal gear wear, and you should contact after-sales support for further inspection. The method for discharging and adding gear oil is as follows:

Step 1:

Power off and shut down.

Step 2:

Remove the propeller.

Step 3:

Tilt the outboard motor to make the oil drain pconnector at the lowest point. Place a pan under the lower oil drain bolt, remove the lower oil drain bolt, then remove the upper oil drain bolt, and completely drain the gear oil.

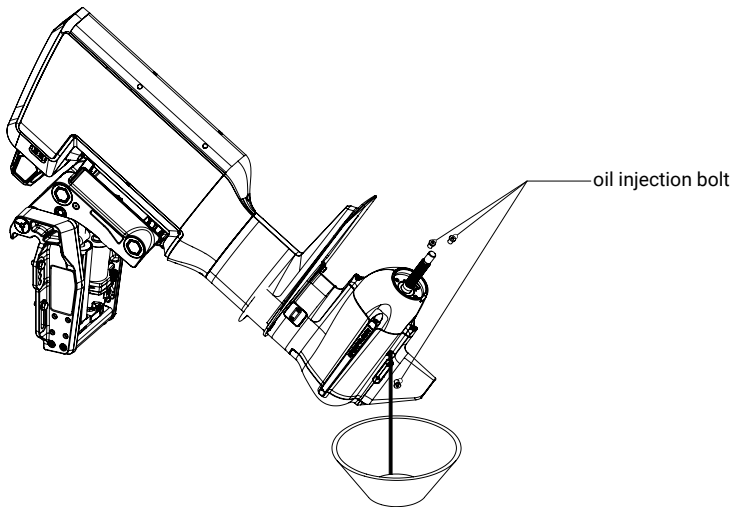


Figure 7.1

Step 4:

Place the outboard motor in a vertical position and screw the new oil drain bolt into the oil drain hole to secure it.

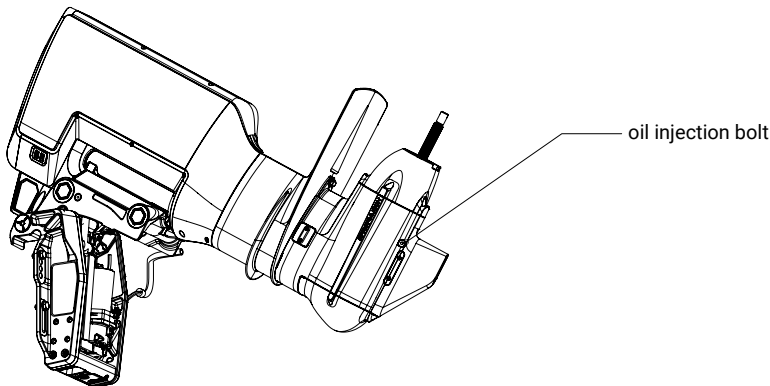


Figure 7.2

Step 5:

Add 500 ml of new gear oil from the oil filling hole.

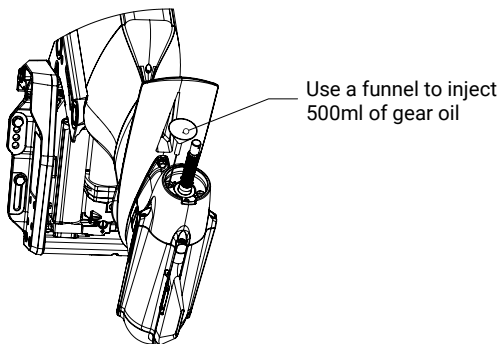


Figure 7.3

Step 6:

Tighten the oil filling bolt.

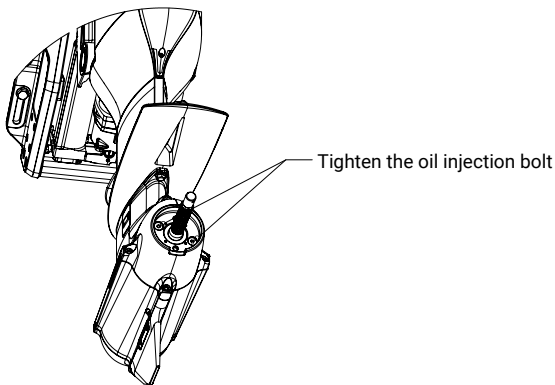


Figure 7.4

Step 7:

Refer to 3.1.3, and install the propeller.



When adding gear oil, please add exactly 500 ml. Too little oil can result in insufficient lubrication and reduce the overall lifespan or damage the sealing components. Too much oil can lead to increased system inefficiency and severe gearbox heating.

7.2.2 Anode Replacement

(1) Clamp Anode Inspection and Replacement

The clamp base is installed with a anode, which corrodes itself to protect the machine from corrosion. It needs to be inspected regularly as the requirements in 8.1.1, especially when navigating in seawater, as this can accelerate corrosion. The anode must be replaced before it is completely eroded. Note: The surface of the anode and the gearbox surface it contacts with should not be painted or coated with protective coatings; otherwise, the corrosion resistance of the Anode will be reduced.

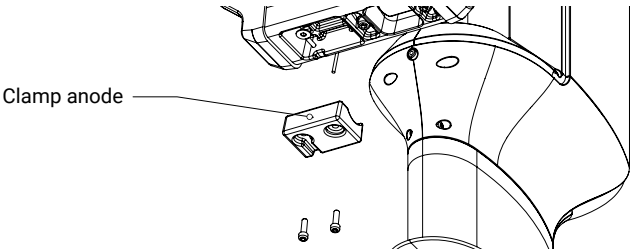


Figure 7.5

(2) Underwater Part Anode Inspection and Replacement

As shown in the figure below, the underwater part of the machine is equipped with a Anode, which corrodes itself to protect the machine from corrosion. It needs to be inspected regularly as the requirements in 8.1.1, especially when navigating in seawater, as this can accelerate corrosion. The Anode must be replaced before it is completely eroded. Note: The surface of the Anode and the gearbox surface it contacts with should not be painted or coated with protective coatings; otherwise, the corrosion resistance of the Anode will be reduced.

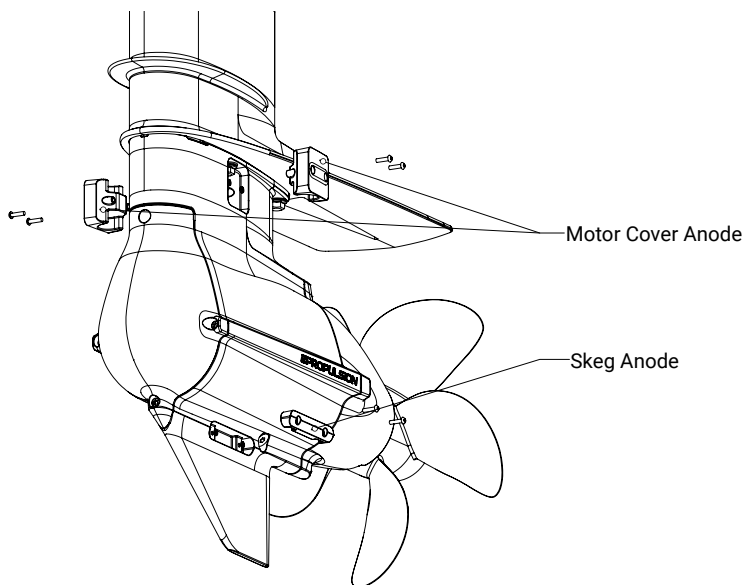


Figure 7.6

7.2.3 Propeller

The propeller is an important component of the outboard motor. To ensure safe navigation and optimal performance of the outboard motor, the propeller should be regularly disassembled and inspected. During the inspection, pay attention to the following:

- (1) Check if each blade of the propeller has any wear or other damage.
- (2) Check if the propeller shaft is damaged.
- (3) Check if there are fishing lines, water plants, or other foreign objects wrapped around the propeller shaft.
- (4) Check whether the propeller shaft oil seal is damaged. For the propeller disassembly and installation methods, please refer to section 3.1.3 - "Propeller Installation".

7.2.4 Exterior Surface of the Outboard Motor

The exterior surface of the outboard motor is protected by paint. It should be regularly cleaned with marine-grade cleaning agents, waxed, or coated with other protective layers.

7.2.5 Greasing Points

Apply lubrication with 2-4-C lubricating grease containing polytetrafluoroethylene to the following lubrication points. For locations equipped with grease nipples, use a grease gun for greasing lubrication.

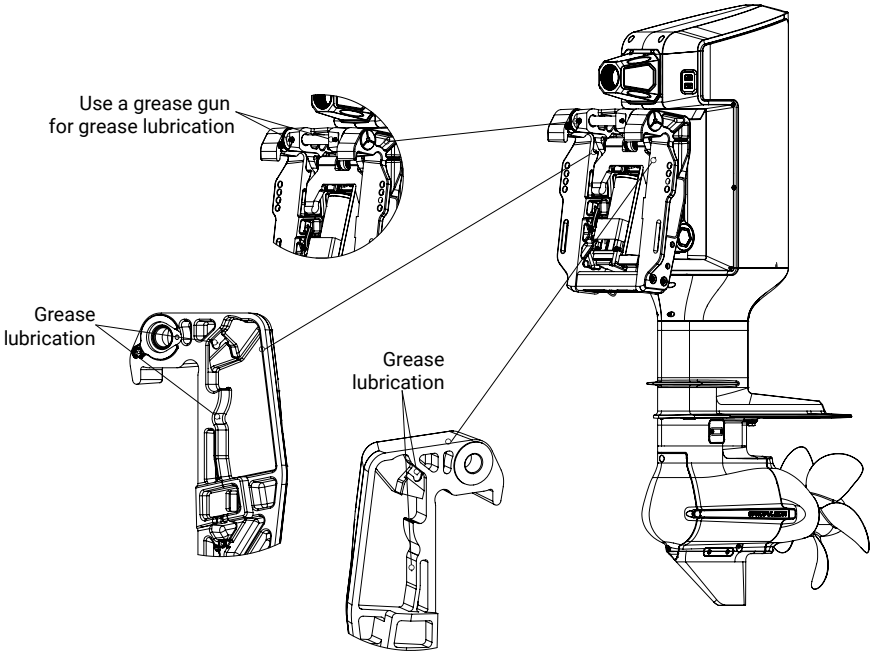


Figure 7.8

7.2.6 Check Grounding Wires

Inspect each grounding wire to ensure it is securely fastened, as shown in the diagram below.

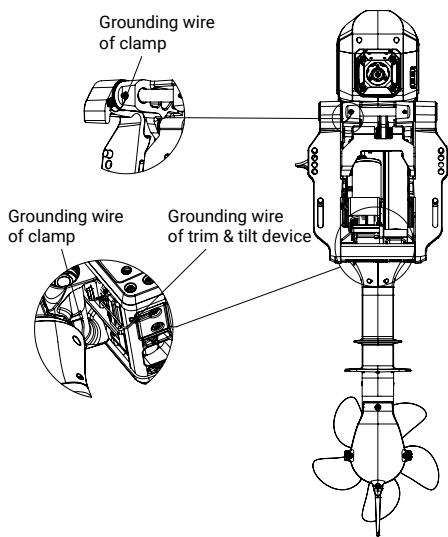


Figure 7.9

8 Limited Warranty

Guangdong ePropulsion Technology Co., Ltd. ("ePropulsion"), China, warrants its products to be free of defects in material and workmanship under normal usage with proper installation and routine maintenance for a period of twenty-four (24) months from the date of delivery of invoice (the "Limited Warranty Period"). The Limited Warranty is provided to the first end customer of ePropulsion products ONLY. The Customer is entitled to free repair or replacement of defective or non-conforming parts. Any warranty claim must be made within six (6) months of discovery of issues as provided below.

If the Limited Warranty Period has expired, you can still enjoy maintenance services from dealers/distributors authorized by ePropulsion (the "ePropulsion Service Partners") who will endeavour to keep costs to a minimum.

In all warranty cases, ePropulsion will only bear the repair or replacement cost for items that are covered by the Limited Warranty. Any costs not covered by the Limited Warranty – such as those related to product installation, disassembly, transportation, financing, rental, etc – shall be borne by the customer alone.

Beyond the Limited Warranty, the Customer may have statutory rights in their jurisdiction according to applicable laws. Nothing in this Limited Warranty affects such rights. The Customer may have warranty claim rights arising from the purchase contract with ePropulsion Service Partners in addition to the rights granted by this Limited Warranty.

Products used for commercial or professional purposes*, even if only temporarily, are not covered by the Limited Warranty. Instead, the statutory warranty in your jurisdiction shall apply. You are encouraged to consult with ePropulsion Service Partners for applicable warranty and advice before engaging in such use.

*** Commercial/Professional Purposes include those where the product is used with the intention of making profit, or high frequency, or very high reliability requirements, etc .**

To keep your warranty valid, please note the following:



Products without the original product label will not be covered by ePropulsion's Limited Warranty. Keep the product label intact and record the serial number from it. Never remove the label from the product;



The Limited Warranty is not transferable and will not be reissued;



The Limited Warranty may change from time to time. Please visit our website (<http://www.epropulsion.com>) for the latest version.

Capacity guarantee for high-voltage batteries

A guarantee of the capacity of the high-voltage batteries, in addition to the standard guarantee. Depending on the long-term average temperature and the usage profile, this guarantee runs for a longer life.

Comment on average temperature:

The average temperature is calculated using the Arrhenius equation; this means that higher temperatures are given a greater weighting.

8.1 Warranty Exclusions

ePropulsion may refuse a warranty claim if:

- The product is operated in contradiction to what is written in the user manual;
- Damage is caused by accident, misuse, dropping, improper care or storage, wilful abuse, physical damage, unauthorized repair;
- Water ingress is caused by external sources such as fishing nets, submersion, etc;
- Product has been modified, altered, dismantled, or had parts/accessories attached in any way not expressly permitted or recommended by ePropulsion;
- Due to failure of, or damage caused by, any 3rd party products;
- The high-voltage batteries have been repositioned in the boat, without contacting ePropulsion service. Repositioning may result in changes to cabling, and other risks to system operation;
- The battery has been incorrectly charged, overcharged, over-discharged, or operated in temp out of scope described in the user manual;
- Consumables (such as replacement propeller, anodes, oil/fluids...etc.);
- Purchases of products from unauthorized dealers or sellers;
- Normal wear and tear and routine servicing;
- Damage caused by improper packing or handling of the product during its return. The additional damage part will be deemed out of warranty;
- Incorrect shipping of lithium batteries. These are classed as a UN9 hazardous item, and must be shipped in accordance with regulations in your jurisdiction. Non-compliance may result in warranty exclusion.

8.2 Limited Warranty Claim Procedures

The process shown below must be followed in order to make a Limited Warranty claim:

1. Contact your nearest ePropulsion Service Partner with details of the problem. They will advise if such defects are covered by the Limited Warranty or any additional rights you may have from your purchase.
2. Send the defective product to them (or the Service Partner they advise) together with Proof of 1(st)-time (first time) Purchase (e.g., receipt, invoice, etc., with information of product purchased and date of purchase), the Confirmation of Online Warranty Registration, ex-factory Serial Number, etc. Note that all labels must be kept intact. Warranty claims will only be valid only when the information above is correct, genuine, and complete.
3. Make sure the product is properly packed during delivery, the original packaging is highly recommended.
4. The ePropulsion Service Partner will examine and diagnose the defective products to check the validity of the warranty claim.
5. If your warranty claim is accepted, the Product or its defective components/parts will be either repaired or replaced free of charge. Note that any delivery cost incurred in the process shall be borne by you.
6. If your warranty claim is rejected, a repair/replacement cost and fee with round trip delivery cost will be estimated and sent to you for confirmation. ePropulsion Service Partners will only begin the work after your written confirmation that you wish to proceed with the repair/replacement and will pay for it.

ePropulsion

(*In order to validate warranty, please fill in this form first and read the Warranty Policies.)

|| OWNER INFO. ||

Owner Name			
Address			
Phone		Email	

|| DEALER INFO. ||

Store Name			
Address			
Phone		Email	

|| PRODUCT INFO. ||

Date of Purchase (mm/dd/yyyy)	
Serial No.	



Thanks for reading this user manual.

If you have any concerns or find any problems while reading, please don't hesitate to contact us. We are delighted to offer service for you.

Guangdong ePropulsion Technology Limited

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