

X12 User Manual



Model: X12-S, X12-L

2024.09 Version 1.1

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THANK YOU

Thank you for purchasing a product from ePropulsion, world leaders in clean, safe and reliable electric marine propulsion systems. We are sure you'll be pleased with your new motor and welcome your feedback at www.epropulsion.com

Conditions of Use

Before using this product, please read this user manual thoroughly to understand how to use the product correctly and safely. By using this product, you indicate that you have fully read and understood, and agree to, all the contents of this manual. Do not use the electric outboard motor until you have understood how it operates. Do not lend the outboard motor to anyone who is not familiar with its operation. ePropulsion is not responsible for any economic loss or personal injury resulting from operations that do not comply with the instructions in this manual.

Please note that ePropulsion has a policy of continuous product optimisation, and reserves the right to update the contents of this manual at any time. Please visit www.epropulsion.com to obtain the latest version. If you find any discrepancies between your product and this manual or have any questions about the product or this manual, please visit the website www.epropulsion.com or contact us. ePropulsion reserves the right to make the final interpretation of this manual. This manual is available in multiple languages, and in the event of any discrepancies between different language versions, the English version shall prevail.

ePropulsion also retains all relevant intellectual property and industrial rights, including copyrights, patents, trademarks, and designs.

Safety Warning

ePropulsion attaches great importance to safety and reducing risk to individuals and property. We advise any person who comes into close contact with our products to exercise caution, use common sense, follow the instructions in this manual, and pay particular attention to the safety information in the manual and on product labels. Such persons include those who install, operate, maintain and service the product.

The following information symbols are found in the user manual and/or on labels attached to the product:

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 points of information that 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 servicing ePropulsion products, there are many safety risks. 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, PTO shaft and propeller. Keep hands, feet and tools away from all moving parts.



Electric shock hazard:

These areas or components may pose a risk of electric shock. The equipment uses 102.4V DC power. When accessing or opening electrical connectors, switches, cables and other electricity-related items, turn off the power to prevent electric shock.



Burn hazard:

Some parts of the outboard become very hot during operation and may remain hot when turned off. Keep hands and other body parts away from these areas.



Do not approach when the outboard is running:

These parts of the outboard are potentially dangerous when operating - keep clear of these areas when the outboard is running, or about to start.



Do not connect or disconnect when the outboard is running:

These parts of the outboard may pose a risk of electric shock if connected to or disconnected from the power supply during operation.



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

The serial number is located as shown below. Please note and keep in a safe place, as it may be needed when purchasing accessories, or if you need service or warranty, or if your motor is stolen.

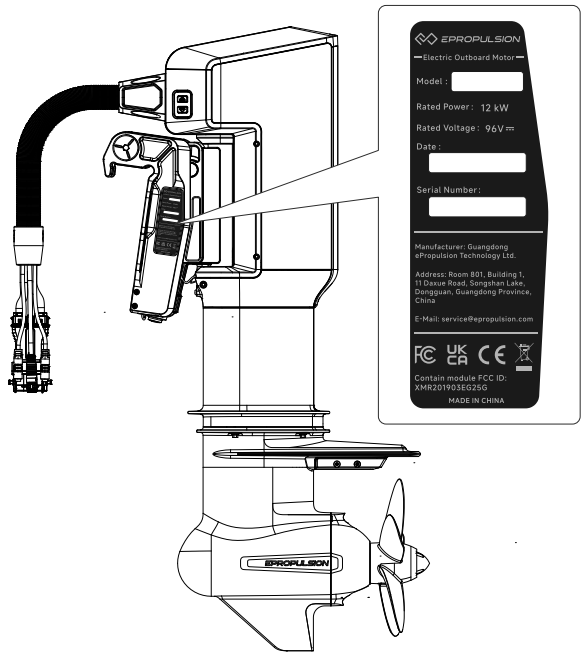


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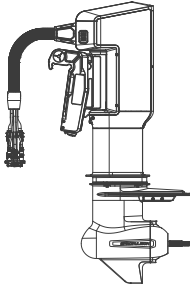
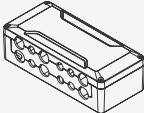
1 Product Introduction

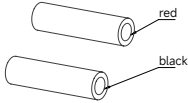
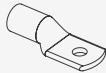
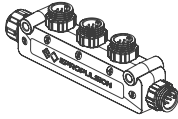
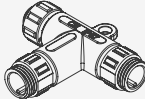
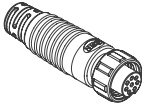
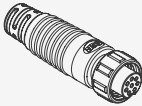
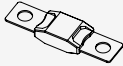
The X12 Electric Outboard Motor is an electric propulsion system with an input power of 12kW. It can be controlled by using the digital helm, smart throttle, and smart display 5". The X12 Electric Outboard Motor is environmentally friendly, clean, and efficient. It is available in two models: X12-S and X12-L.

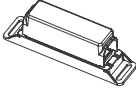
1.1 In the Package

When opening the packages, please check contents against the list below. If anything is missing or damaged, please contact your dealer.

1.1.1 X12 Packaging List

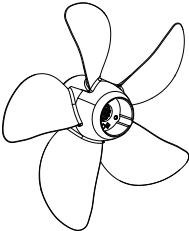
Items	Qty.	Figure	Function
X12 Outboard motor w/o propeller	1		Provide the main propulsion of the boat
Bus box	1		Transfers electrical energy from the power system's main circuit to different components or modules within the circuit.
96V Power Cable 5m	1		Transfer DC power from the battery to the power input of the motor.
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.

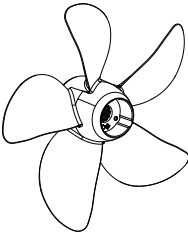
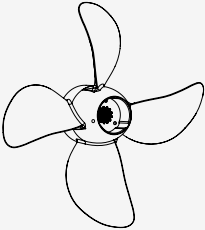
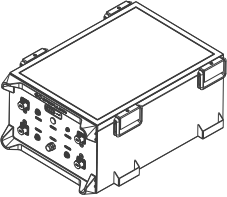
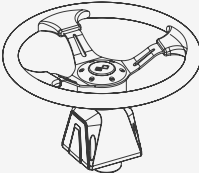
Items	Qty.	Figure	Function
Heat Shrink Tubing	2		Protect the main power cable after stripping it
Cable connector	6		Terminals to fit on cut ends of 96V power cable
eSSA Communication 5-way T Connector	1		Connect the motor and each device to the CAN communication network (controller LAN)
eSSA Communication 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		/
12V Fuse	1		/

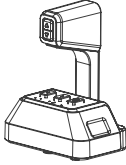
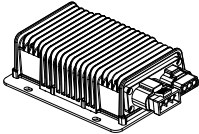
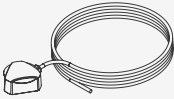
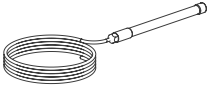
Items	Qty.	Figure	Function
12V Fuse Base	1		/
X-Series Outboard Motor Installation Accessory Pack	1	Hexagon Bolt M10x1.25x110*4 Hexagon Nut M10x1.25*8 Plain Washer Extra Large Series M10*4 Plain Washer M10*8 Eye Bolt M8*1 Plain Washer M8*1	Motor installation
User manual Warranty card	1		Give information about the features, functions, performance, purpose and maintenance of the product.

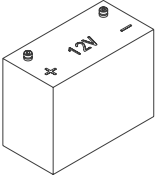
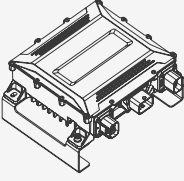
1.1.2 Optional Accessory List

Other accessories not included in the package are also required to operate the outboard motor such as propellers, smart tiller, 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
X12 Propeller 11 13/16" x 10 5/8"RH		Suitable for heavier boats at lower (displacement) speeds. Right hand rotation.

Items	Figure	Function
X12 Propeller 11 13/16" x 9 13/16" RH		Stainless steel propeller, suitable for heavier boats at lower speeds, right hand rotation.
X12 Propeller 11 13/16" x 15 3/8" RH		Stainless steel propeller, Suitable for lighter boats at higher (often planing) speeds, right hand rotation.
G102 Battery and Cables		ePropulsion LiFePo4 system battery, 10kWh capacity. Provides safe and reliable electrical power.
Digital Helm		Outboard motor steering control.

Items	Figure	Function
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 Converter 96V/12V 500W		DC-DC Converter to charge the 12V battery from the high voltage batteries.
GPS module		For use if signal from motor's inbuilt GPS antenna is weak. Provides information including position and speed.
4G antenna		For use if signal from motor's inbuilt 4G antenna is weak. Enables high speed data transmission for remote control, monitoring and backup

Items	Figure	Function
12V battery		Provide power to the system's 12V equipment.
G battery charger 16A		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 22km/h or less, it is recommended to choose the X12 Propeller 11 13/16" x 10 5/8"RH or X12/P12 Propeller 11 13/16" x 9 13/16" RH.
- If the expected speed is higher than 22km/h, it is recommended to choose the X12 Propeller 11 13/16" x 15 3/8" RH.



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, the user or installation engineer needs to prepare the following tools.

Tool	Specification	Qty.	Purpose
3mm Allen key (hex key or hex bit)	3mm, suitable for M4 hexagon socket cap screws	2	To disassemble the outboard's top cover, facilitating the installation of eye bolts and hoisting
17mm Hex socket	17mm, suitable for M10 hexagon bolts	2	To install the main bolts in the boat's transom
10mm Hex socket	10mm, suitable for M6 hexagon bolts	1	/
13mm Hex socket	13mm, suitable for M8 hexagon bolts	1	To connect and fix the bus box to the BDU busbar assembly
27mm Socket wrench	27mm, suitable for M16 nuts	1	To install the propeller
M10 Torque Wrench	Torque range: 0~100Nm	1	To control the torque during the installation of the outboard 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 outboard
Lifting Rope	Bearing capacity $\geq 500\text{kg}$	1	To lift and install the outboard
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 requirement: $\phi 11\text{mm}$	1	Drill holes in the boat for outboard installation
Drill bit	Hole requirement: $\phi 11\text{mm}$	1	Drill holes in the boat for outboard installation
Hole saw	Meet the hole size: 100mm	1	Make holes for cable routing
Sealant	Structural adhesive	1	Seal up holes to prevent water ingress

1.2 Parts and Diagram

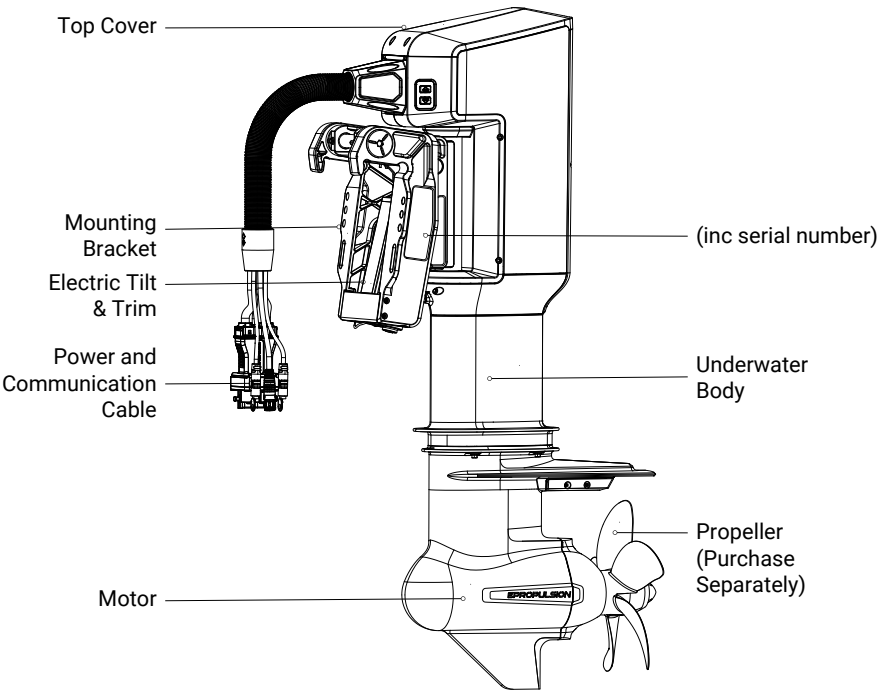


Figure 1.1

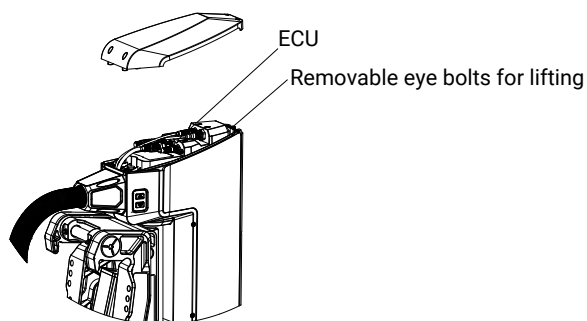


Figure 1.2

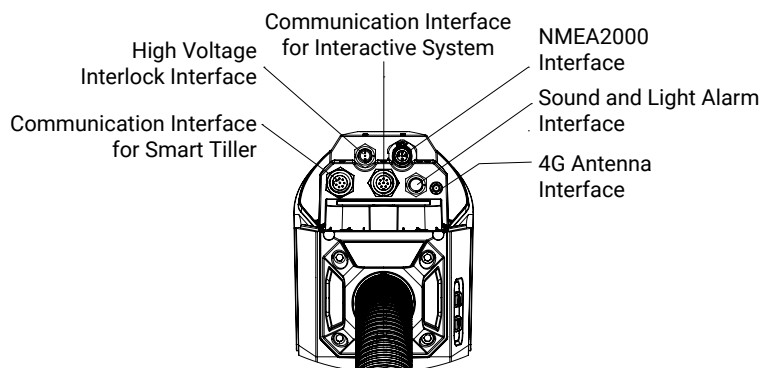


Figure 1.3

1.3 Specification

Model	X12-S / X12-L
Rated input power	12 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	S: 46kg L: 47kg
Shaft length (from bracket clamp to anti-cavitation plate, see Figure 1.4)	S: 381mm L: 508mm
Dimensions (Length * Width * Height)	S: 560mm x 266 mm x 978 mm L: 560mm x 266 mm x 1105 mm
Cooling method	Natural water cooling
Rated rotational speed	1700 rpm
Rated power rotational speed range	1100-2000 rpm
Operating Temperature	-5-55 °C
Storage Temperature	-25-70 °C
Control System	Smart Tiller, Digital Helm, Smart Display 5"
ePropulsion Connectivity Service	Supported
Assisted Driving	Supported ADAS L1
Suitable propeller (purchase separately)	X12 Propeller 11 13/16" x 10 5/8" RH X12 Propeller 11 13/16" x 9 13/16" RH X12 Propeller 11 13/16" x 15 3/8" RH
Trim adjustment device	Standard electric power tilt & trim
Tilt Angle	-4°-61°
Steering device	Standard electric steering device
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
< 440mm	X12 - S
440mm~550mm	X12 - L

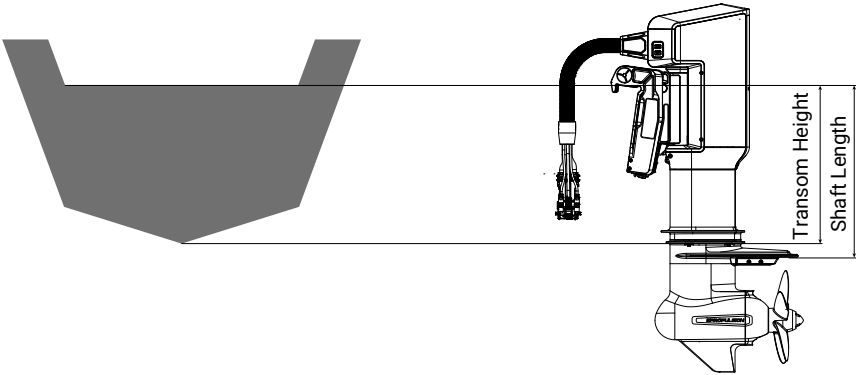


Figure 1.4

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 X12 (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.

6. Always report your voyage plan to family, friends and authorities where relevant.
7. Do not operate the boat under the influence of alcohol or drugs. About 50% of boating accidents are related to alcohol consumption

During Operation:

1. All members of the crew should be equipped with, and wear, a PFD (personal flotation device, eg life jacket, buoyancy aid). Please always wear a PFD when boating.
2. Driver should always wear the kill cord (kill switch), by attachment of the lanyard to a secure position on their wrist, ankle, or item of clothing (buoyancy aid, jacket etc). If the driver falls overboard (or accidentally leaves the helm), the lanyard will pull the kill cord off the throttle and stop the outboard.
3. Watch carefully for other vessels, swimmers and other objects in the water. Proceed with particular caution when near to harbour, shore or beach and avoid swimming areas if possible.
4. If someone falls overboard, or there's a collision, stop the outboard motor immediately (fastest method is to pull kill switch off throttle).

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

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

Object of the Declaration:

Product: Electric Outboard Motor

Model: X12-S,X12-L



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

EC REP

Name: REP Europe GmbH
Address: Werner-von-Siemens-Str. 264319 Pfungstadt Germany
Phone: +49 157 51253212
info@rep-europe.de

Manufacturer

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

Signature:  **Date:** 15th of September, 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 of 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 environmentally safe recycling.

2 Unpacking

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

- 💡 Prepare unboxing tools, such as a rubber hammer, phillips screwdriver, etc.
- 💡 Utilize a forklift or other appropriate equipment for transportation.

2.3 Check the Package

- 💡 Check for any noticeable damage or transportation-related issues with the packaging.
- 💡 Verify that the labels on the packaging 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 crate is stably positioned and will not tilt.

Step 2

Remove the carton straps and the carton.

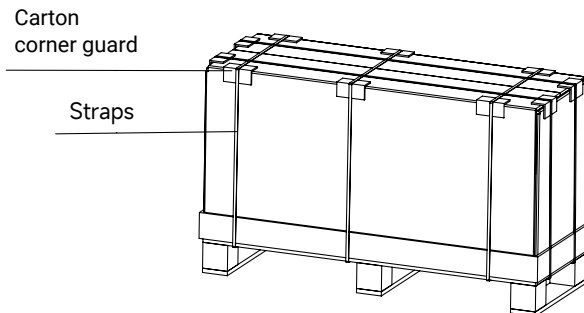


Figure 2.1

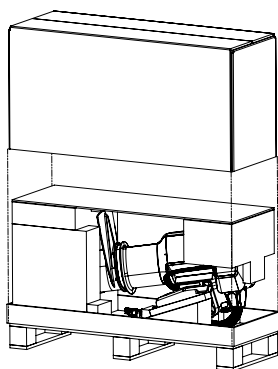


Figure 2.2

Step 3

Remove the top cardboard, take out the buffer material, the accessory box and the user manual.

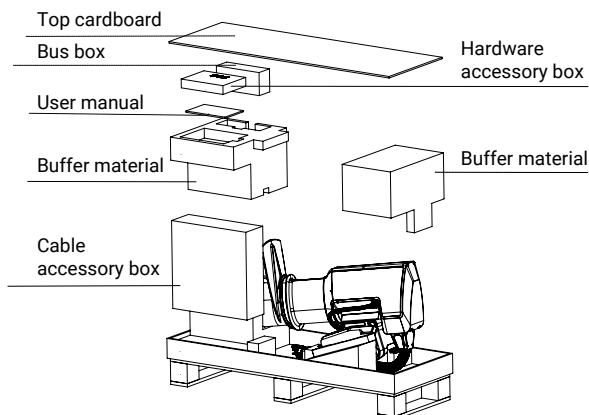


Figure 2.3

Step 4

Remove the top cover and screw in the lifting eye bolt and washers. Attach the lifting strap to the lifting the eye. Apply gentle upward tension to the strap, such that the outboard won't fall over as you detach it from the base. Hoist the outboard for transfer to the stern for installation.

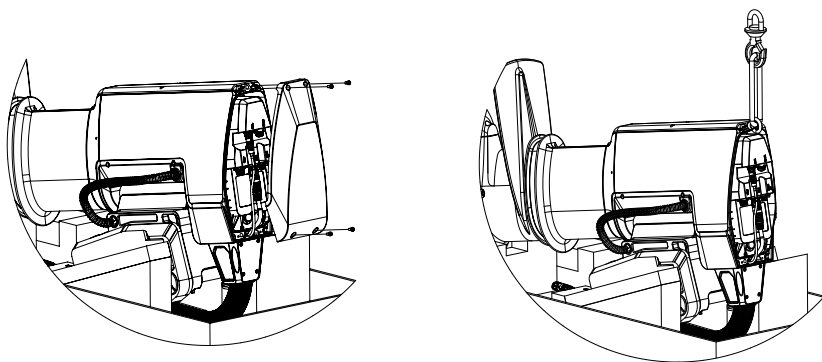


Figure 2.4

- 💡 Please check the product for any damage 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 outboard 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 Installation

1. Preparation:

- (1) Motor main part: Check the X-Series outboard motor for any 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 that there won't be any obstructions to the steering, tilting or other operational functions of the outboard, when installed where you intend.

- (1) The installation bolts for X-Series outboard motors are M10, and the recommended hole size is $\varnothing 11.5-12\text{mm}$. 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 and other parts of the system.
 - ② Design layout: Read the user manual and consider the entire system's layout and design. Ensure that the outboard 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 before drilling holes etc, to ensure a low-risk installation process.
 - ④ Organise the boat interior: based on the simulation process, clear away items that may obstruct the installation, and make sure the interior is dry and tidy. This will all help to ensure a smooth installation and debugging process.

3.2 Outboard Motor Installation

Step 1: Drilling Boat Hull

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

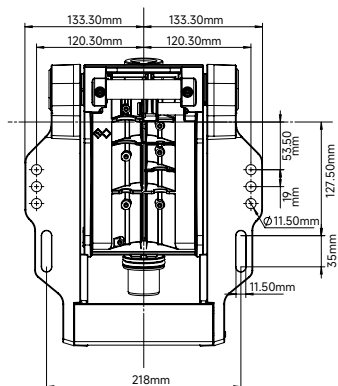


Figure 3.1

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) having first considered how to secure the cables in place using appropriate fixing and sealing hardware (not supplied, as boat specific).

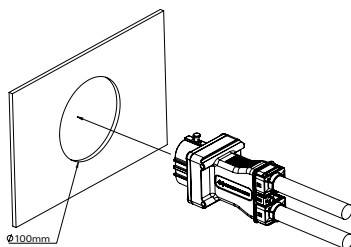


Figure 3.2

Step 2: Removing the Outboard Cover

Before lifting, tidy up the cables and secure them to the motor. Remove the four M4 screws from the outboard motor cover.

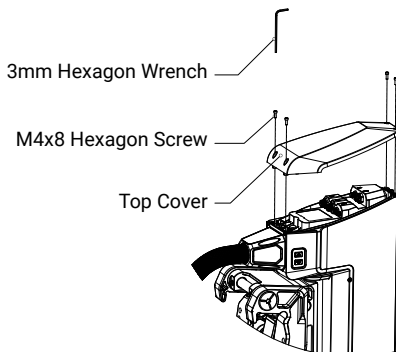


Figure 3.2

Step 3: Lifting Outboard

Screw in the M8 lifting ring and M8x16x1.6 plain washer. Use a lifting rope to attach the outboard to the hoist. Slowly adjust the hoist during a trial lift. If the outboard remains stable without tilting or swinging, you may proceed with the proper lift.

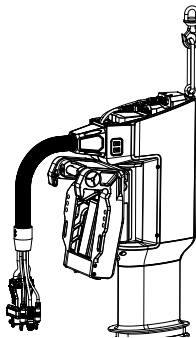


Figure 3.4



Lifting objects hazard: when hoisting the outboard keep well clear of people and objects that may be crushed or damaged in the event of a fall.

Step 4: Installing the Outboard Motor

Slowly move the outboard motor to the installation position using the hoist. Position the hooks of the outboard'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.

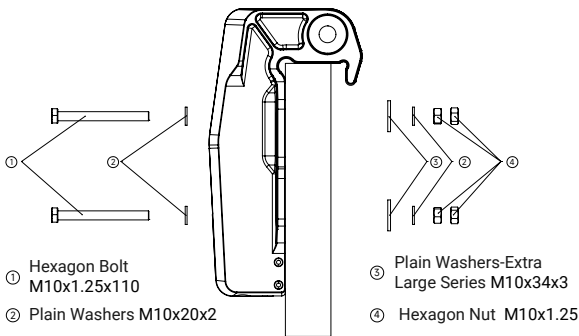


Figure 3.5



During this part of the installation, apply marine sealant to the bolts, bracket clamp, and hull holes to prevent corrosion and water ingress.

Step 5: Installing the Motor Cover

Remove the lifting strap and unscrew the lifting eye. Reinstall the cover, and fasten it with four M4 screws. Tighten the screws by the standard torque: 0.8 N·m (0.08 kgf·m, 0.6 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/Replacement

Steps 1 to 9 apply to propeller replacement, steps 6 to 9 apply to both propeller replacement and first installation:

1. Turn the motor off and disconnect the power.
2. Remove the screws fixing the propeller tail fairing.
3. Remove the propeller tail fairing.
4. Remove the locknuts and washers securing the propeller.
5. Pull the propeller straight out along the shaft. 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 (or other marine grease) containing polytetrafluoroethylene (PTFE) to the propeller shaft to prevent the propeller from sticking to the shaft.
7. Slide the thrust washer and propeller onto the shaft. Then, install the lock washers and castellated nut onto the propeller shaft.
8. Use socket to tighten the castellated nut and align one of the slots in the nut with the hole in the propeller shaft. Insert the cotter pin and open the ends out, such that it cannot fall out of the castellated nut and the bent ends will fit inside the tail cone.
9. Secure the tail cone to the propeller tail fairing using four M4 screws.

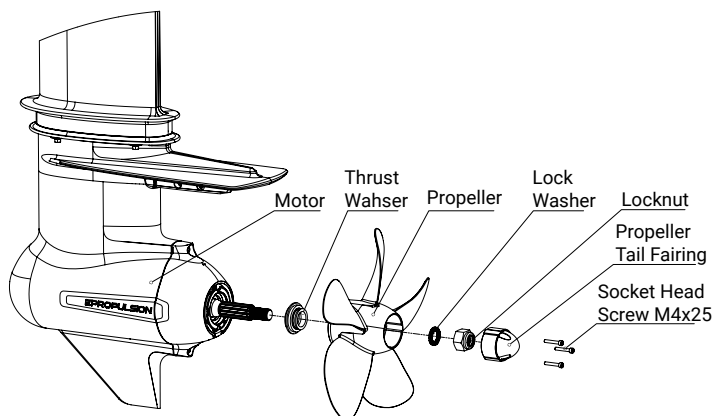


Figure 3.6



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.

4 Connections

4.1 X12 Examples System Setup

4.1.1 Single Motor 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.



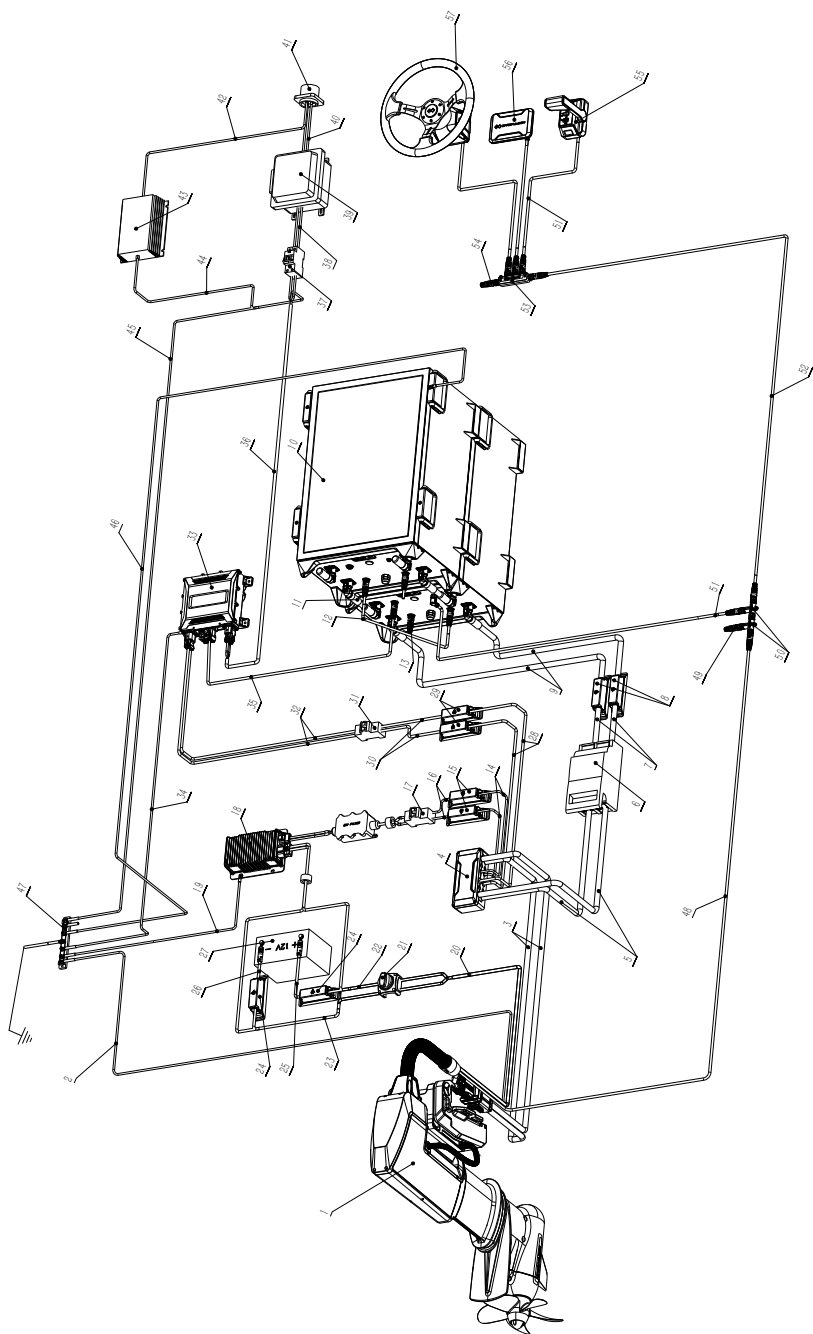
When the communication cable length is insufficient and a communication extension cable is necessary, please contact the ePropulsion authorized dealers. When the length of the communication cable from the inboard to the interaction system or battery exceeds 30m, the communication terminators need to 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 X12 system can support up to four motors and two consoles. For setups not shown here, please contact your ePropulsion dealer for assistance.



1. X12 Electric Outboard Motor			
2. Outboard Grounding Line 5m (Come with Motor)	20. Outboard 12V Power Cable 5m (Come with Motor)		39. G Battery Charger Input Fuse (24A)*
3. Motor to bus box power cable	21. 12V Battery Two-Way Switch*		40. G Battery Charger and Fuse Connecting Cable*
4. Bus Box	22. 12V Fuse to Switch Cable (Positive)*		41. G Battery Charger Input Port*
5. Bus Box and Battery Output Fuse Connecting Cable*	23. 12V Fuse to Switch Cable (Negative)*		42. Charging Port Grounding Line
6. 2 Way Fuse Switch Circuit Breaker (250A)*	24. 12V Fuse (150A)		43. Current Isolator*
7. Bus Fuse and Circuit Breaker Connecting Cable*	25. 12V Fuse Connecting Cable (Positive)		44. Current Isolator Grounding Line*
8. Bus Fuse (DC 400A)*	26. 12V Fuse Connecting Cable (Positive)*		45. G Battery Charger Input Grounding Line
9. Battery to fuse power cable	27. 12V Battery		46. G102-100 Battery Grounding Line
10. G102-100 Battery	28. G Battery Charger Output Fuse and Bus Box Connecting Cable*		47. Grounding Bus Bar
11. G Battery Bridging Cable (Positive & Negative)	29. G Battery Charger Output Fuse (45A) *		48. Outboard Communication Cable 10m (Come with Motor)
12. Battery Communication Cable	30. G Battery Charger Output Fuse and Circuit Breaker Connecting Cable*		49. eSSA Communication Terminator 120Ω
13. Battery Communication Terminator	31. G Battery Charger Output Circuit Breaker (40A)*		50. eSSA Communication 3-way T Connector
14. Bus Box to DCDC Input Fuse Connecting Cable*	32. Charger output power cable		51. eSSA Communication Cable 1m
15. DCDC Input Fuse(50A)*	33. G Battery Charger 16A		52. eSSA Communication Extension Cable 10m
16. DCDC Input Fuse to Circuit Breaker Connecting Cable*	34. G Battery Charger Grounding Line		53. eSSA Communication 5-way T Connector
17. DCDC Input Circuit Breaker (40A)*	35. Charger Communication Cable		54. eSSA Communication Terminator 360Ω
18. DCDC 96V-12V	36. Charger input power cable		55. Smart Throttle
19. DCDC Grounding Line	37. G Battery Charger Input Leakage Protector*		56. Smart Display 5"
	38. G Battery Charger Input Fuse and Leakage Protector Connecting Cable*		57. Digital Helm

4.1.2 Twin Motor 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.



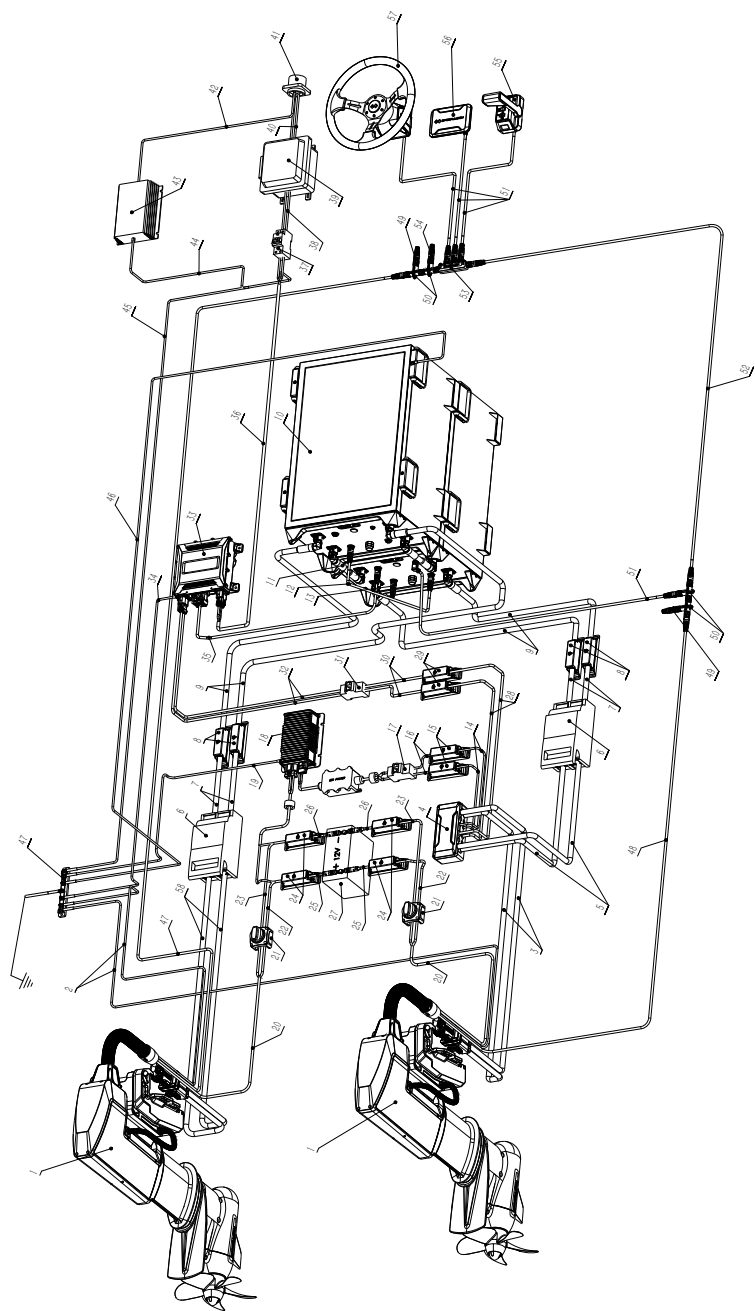
When the communication cable length is insufficient and a communication extension cable is necessary, please contact the ePropulsion authorized dealers. When the length of the communication cable from the inboard to the interaction system or battery exceeds 30m, the communication terminators need to 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.



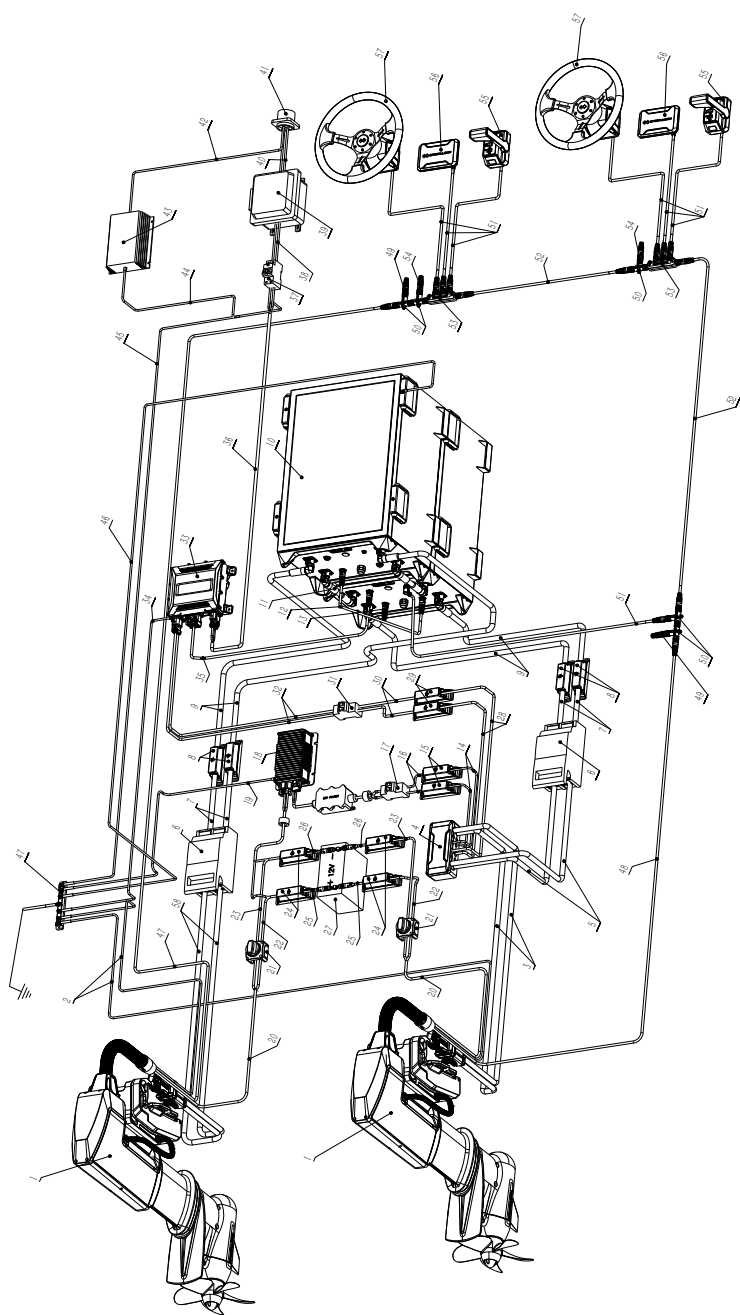
The X12 system can support up to four motors and two consoles. For setups not shown here, please contact your ePropulsion dealer for assistance.



1. X12 Electric Outboard Motor			
2. Outboard Grounding Line 5m (Come with Motor)	20. Outboard 12V Power Cable 5m (Come with Motor)		39. G Battery Charger Input Fuse (24A)*
3. Motor to bus box power cable	21. 12V Battery Two-Way Switch*		40. G Battery Charger and Fuse Connecting Cable*
4. Bus Box	22. 12V Fuse to Switch Cable (Positive)*		41. G Battery Charger Input Port*
5. Bus Box and Battery Output Fuse Connecting Cable*	23. 12V Fuse to Switch Cable (Negative)*		42. Charging Port Grounding Line
6. 2 Way Fuse Switch Circuit Breaker (250A)*	24. 12V Fuse (150A)		43. Current Isolator*
7. Bus Fuse and Circuit Breaker Connecting Cable*	25. 12V Fuse Connecting Cable (Positive)		44. Current Isolator Grounding Line*
8. Bus Fuse (DC 400A)*	26. 12V Fuse Connecting Cable (Positive)*		45. G Battery Charger Input Grounding Line
9. Battery to fuse power cable	27. 12V Battery		46. G102-100 Battery Grounding Line
10. G102-100 Battery	28. G Battery Charger Output Fuse and Bus Box Connecting Cable*		47. Grounding Bus Bar
11. G Battery Bridging Cable (Positive & Negative)	29. G Battery Charger Output Fuse (45A) *		48. Outboard Communication Cable 10m (Come with Motor)
12. Battery Communication Cable	30. G Battery Charger Output Fuse and Circuit Breaker Connecting Cable*		49. eSSA Communication Terminator 120Ω
13. Battery Communication Terminator	31. G Battery Charger Output Circuit Breaker (40A)*		50. eSSA Communication 3-way T Connector
14. Bus Box to DCDC Input Fuse Connecting Cable*	32. Charger output power cable		51. eSSA Communication Cable 1m
15. DCDC Input Fuse(50A)*	33. G Battery Charger 16A		52. eSSA Communication Extension Cable 10m
16. DCDC Input Fuse to Circuit Breaker Connecting Cable*	34. G Battery Charger Grounding Line		53. eSSA Communication 5-way T Connector
17. DCDC Input Circuit Breaker (40A)*	35. Charger Communication Cable		54. eSSA Communication Terminator 360Ω
18. DCDC 96V-12V	36. Charger input power cable		55. Smart Throttle
19. DCDC Grounding Line	37. G Battery Charger Input Leakage Protector*		56. Smart Display 5"
	38. G Battery Charger Input Fuse and Leakage Protector Connecting Cable*		57. Digital Helm
			58. Motor and Battery Output Fuse Connecting Cable

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 X12 system can support up to four motors and two consoles. For setups not shown here, please contact your ePropulsion dealer for assistance.



1. X12 Electric Outboard Motor	20. Outboard 12V Power Cable 5m (Come with Motor)	39. G Battery Charger Input Fuse (24A)*
2. Outboard Grounding Line 5m (Come with Motor)	21. 12V Battery Two-Way Switch*	40. G Battery Charger and Fuse Connecting Cable*
3. Motor to bus box power cable	22. 12V Fuse to Switch Cable (Positive)*	41. G Battery Charger Input Port*
4. Bus Box	23. 12V Fuse to Switch Cable (Negative)*	42. Charging Port Grounding Line
5. Bus Box and Battery Output Fuse Connecting Cable*	24. 12V Fuse (150A)	43. Current Isolator*
6. 2 Way Fuse Switch Circuit Breaker (250A)*	25. 12V Fuse Connecting Cable (Positive)	44. Current Isolator Grounding Line*
7. Bus Fuse and Circuit Breaker Connecting Cable*	26. 12V Fuse Connecting Cable (Positive)*	45. G Battery Charger Input Grounding Line
8. Bus Fuse (DC 400A)*	27. 12V Battery	46. G102-100 Battery Grounding Line
9. Battery to fuse power cable	28. G Battery Charger Output Fuse and Bus Box Connecting Cable*	47. Grounding Bus Bar
10. G102-100 Battery	29. G Battery Charger Output Fuse (45A) *	48. Outboard Communication Cable 10m (Come with Motor)
11. G Battery Bridging Cable (Positive & Negative)	30. G Battery Charger Output Fuse and Circuit Breaker Connecting Cable*	49. eSSA Communication Terminator 120Ω
12. Battery Communication Cable	31. G Battery Charger Output Circuit Breaker (40A)*	50. eSSA Communication 3-way T Connector
13. Battery Communication Terminator	32. Charger output power cable	51. eSSA Communication Cable 1m
14. Bus Box to DCDC Input Fuse Connecting Cable*	33. G Battery Charger 16A	52. eSSA Communication Extension Cable 10m
15. DCDC Input Fuse(50A)*	34. G Battery Charger Grounding Line	53. eSSA Communication 5-way T Connector
16. DCDC Input Fuse to Circuit Breaker Connecting Cable*	35. Charger Communication Cable	54. eSSA Communication Terminator 360Ω
17. DCDC Input Circuit Breaker (40A)*	36. Charger input power cable	55. Smart Throttle
18. DCDC 96V-12V	37. G Battery Charger Input Leakage Protector*	56. Smart Display 5"
19. DCDC Grounding Line	38. G Battery Charger Input Fuse and Leakage Protector Connecting Cable*	57. Digital Helm
		58. Motor and Battery Output Fuse Connecting Cable

4.2 High Voltage Cables Connection

4.2.1 Making the Power Cables

The 96V power cable included is 5m long, with the end connectors for the battery and motor already fitted. You need to cut it to allow for inclusion of the bus box, with the cut position determined by the relative positions of the motor, bus box and battery. Once you have made the cut you will need to fit 4 cable lugs SC50-8 (2 each side) for connection to the bus box. When this process is complete, you will have made the 96V power cable into a "battery to bus box cable" and a "bus box to motor cable".

Tools needed to make the cable:

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

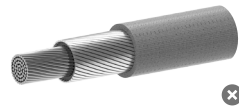
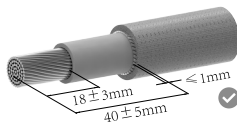
Crimping cable connectors:

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

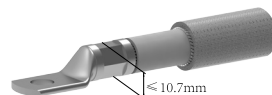
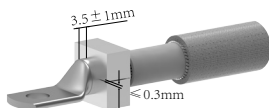
Cut one of the two 96V power cables into two pieces, paying attention to which end is which and the distance from each to bus box (battery and motor connectors are different). Then:

1. Strip back the insulation/shielding as follows:

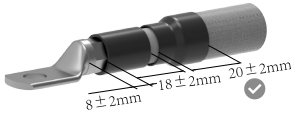
- outer sheath and metal shielding layer by $40\pm5\text{mm}$. When cut, the metal shielding layer must not extend more than 1mm beyond the outer sheathing. (Contact between the metal shielding layer and terminals or inner cores will cause insulation failure.)
- inner sheaths (on positive and negative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



2. 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).



1. 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 (for G102 battery)
- 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 96V 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.

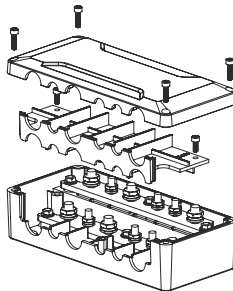


Figure 4.1

(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. The battery cable goes to BAT+, the motor cable goes to MOT+, the DC-DC module goes to 96V-2+, and the charger cable goes to CHG+.

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.

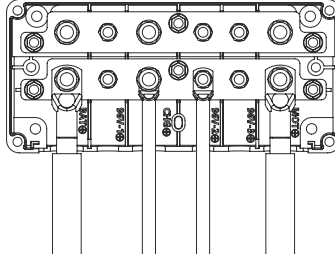


Figure 4.2

(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. The battery cable goes to BAT+, the motor cable goes to MOT+, the DC-DC module goes to 96V-2+, and the charger cable goes to CHG+.

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.

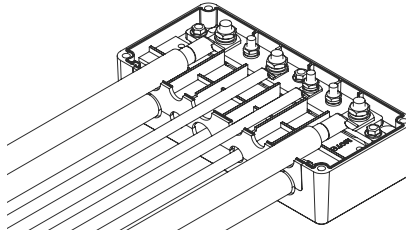


Figure 4.3



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.

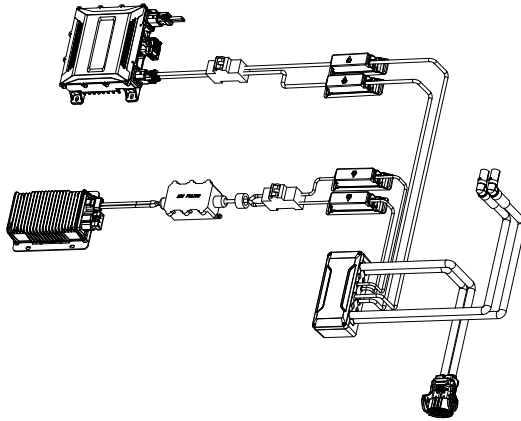


Figure 4.4



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.

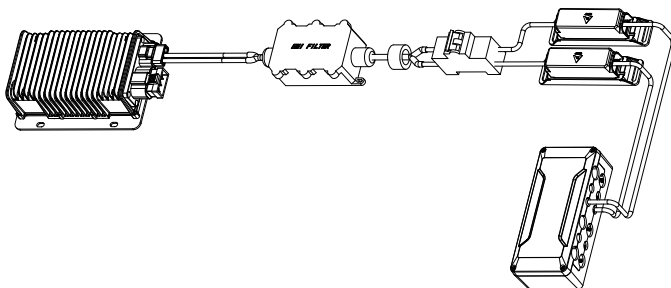


Figure 4.5

Step 2: Connecting the DC-DC Output and 12V Battery

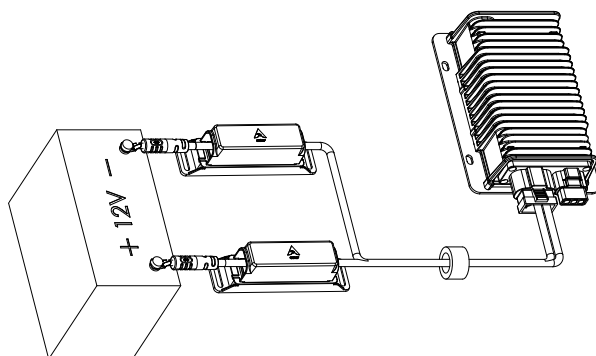


Figure 4.6



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
- 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 4.10.

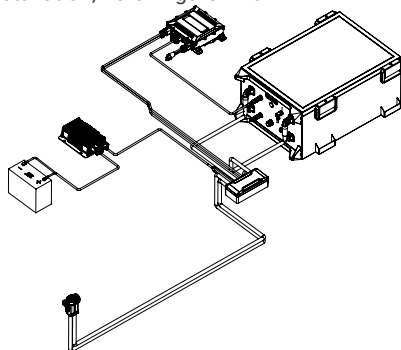


Figure 4.7



After the batteries are connected in parallel, the positive and negative poles of the battery power output cable need to be connected to the first and last batteries respectively. Otherwise, it may cause overcurrent alarms or parallel faults, thereby shortening the battery life.



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

4.2.5 Connecting the outboard motor's Main Power and 12 volt Cables

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 M8 hexagon screws and nuts
- ③ M8 hex socket wrench
- ④ Heat shrink tubing, electrical tape, etc.

4.2.5.2 Installation Steps

Step 1: Connecting the High-Voltage Motor Power Cable from the bus box

Connect the orange self-locking plug on the motor power cable from the bus box to the motor's orange connector. Follow these steps:

Open the locking mechanism of the orange self-locking connector, by sliding the latch as shown in Figure 4.8, and lifting the black handle as shown in Figure 4.9.

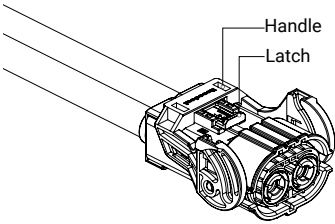


Figure 4.8 High-voltage interlock connector- Installation step 1

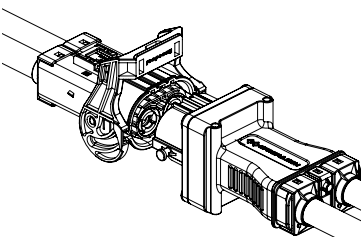


Figure 4.9 High-voltage interlock connector - Installation step 2

Insert the motor cable connector into the motor's orange plug, figure 4.10. Push down the black handle, figure 4.11.

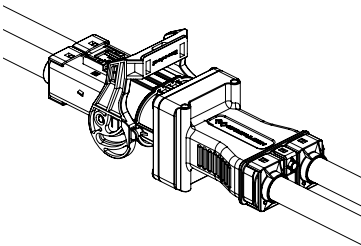


Figure 4.10 High-voltage interlock connector - Installation step 3

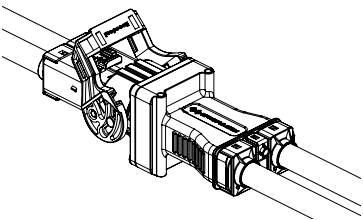


Figure 4.11 High-voltage interlock connector - Installation step 4

Press the black handle down firmly to secure the connector. Close the locking latch as shown in figure 4.12.

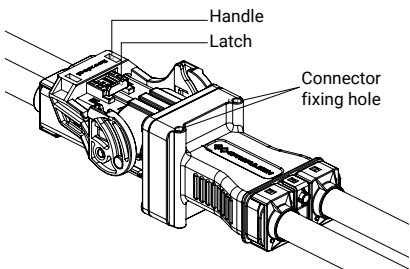


Figure 4.12 High-voltage interlock connector - Installation step 5

-  The high-voltage interlock plug can be fixed to the boat using two M4x80mm screws (not supplied) in the fixing holes shown above.
-  If the "96V power cable 5m" provided with the outboard 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.

Step 2: Connecting the Low-Voltage Power Cable

Connect the red and black twin cables from the outboard to the 12V battery. 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).

-  Whilst completing the above installation steps, the 12V cable can be shortened or extended 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 millimetres).
-  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 Connection of Communication Devices (helm, throttle etc)

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

-  This example is for a single-outboard system with a single group of G102 batteries. The setup and connections for other scenarios should be based on the "System Device Connection Plan." Contact an authorised ePropulsion dealer to purchase accessories and for further information. Professional installation recommended.

4.3.1.1 Required Accessories for Single Motor System Connection

- ① Digital helm ×1

- ② Smart throttle ×1
- ③ Smart display 5" ×1
- ④ G102-100 battery ×1 (More may be needed depending on range requirements.)
- ⑤ CAN Communication 1m Extension Cable ×4
- ⑥ CAN Communication 10m Extension Cable ×1
- ⑦ CAN Communication 5-Way T-Connector ×1 & CAN Communication 3-Way T-Connector ×2

4.3.1.2 Installation Steps

4.3.1.2.1 Connecting Interactive Devices and Accessories

Referring to Figure 4.16, connect the components using the cables as shown. The components are as follows:

1. CAN communication cable 10m.
2. eSSA Communication 5-way T-connector ×1
3. eSSA Communication 3-way T-connector ×1
4. Communication terminator(s) - see 4.5
5. CAN communication extension cable 1m (one end with a 90° right-angle connector, connected to the MOTOR interface of the G102 battery, digital helm, 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.

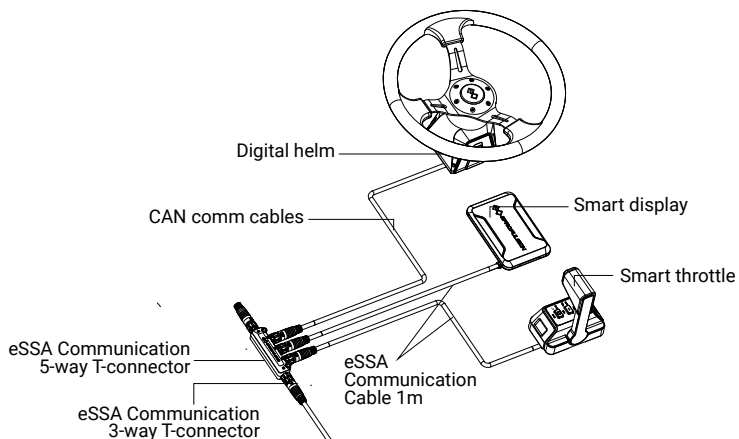


Figure 4.13

4.3.1.2.2 Smart throttle connection

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

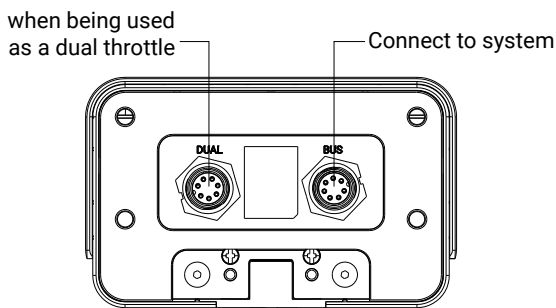


Figure 4.14

The ports are connected as follows:

- **Single Smart Throttle Installations**

Connect a CAN communication cable between the BUS port and the 5-way CAN bus T-connector. The DUAL port is not used.

- **Dual Smart Throttle Installations**

For the first 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 second 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 13-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.

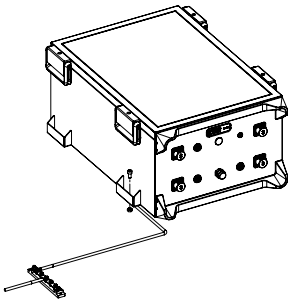


Figure 4.15

4.5 External 4G & GPS Antenna (if required)



The X-series outboard motor has integrated 4G and GPS modules under the top cover. Avoid covering this area if possible. If the installation does affect signal strength, external 4G and/or GPS modules can be used (not supplied, available as accessories).

4.5.1 Installation of the 4G Antenna

Step 1:

Undo the four screws in the top cover and remove.



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:

Insert the SMA connector at the end of the 4G antenna cable into the socket as indicated below. Fasten tightly. Route the 4G antenna cable through the wire slot.

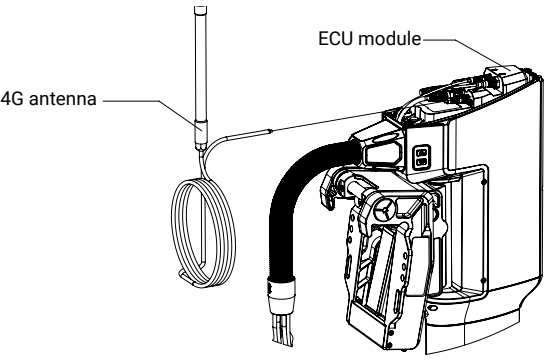


Figure 4.16 Connection between the 4G antenna and the outboard motor

Step 3:

Reinstall the outboard top cover.

Step 4:

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

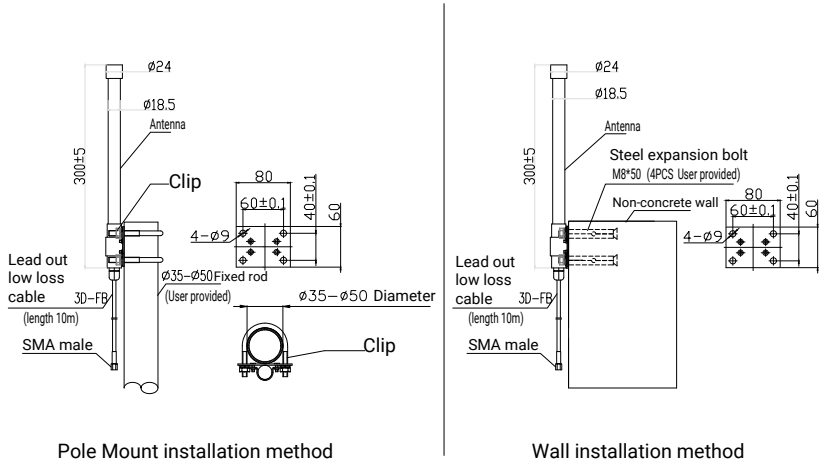


Figure 4.17

- 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**

Attach the double-sided adhesive pad to the back of the GPS module as shown below. Make sure the chosen location is clean and dry, then stick the module in place. The bond will take a few hours to acquire full strength.

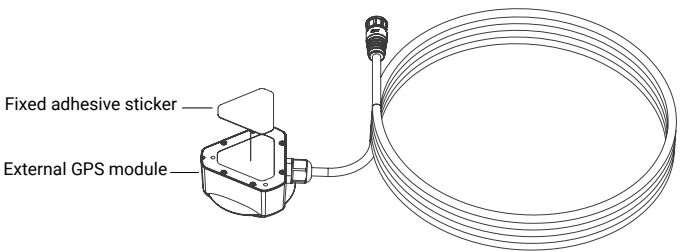


Figure 4.18 GPS external module adhesive pad fixing

• **Self-Tapping Screws**

Opening the decorative cover of the external GPS module, and use the three M3 self-tapping screws provided to secure the external GPS module in place. Check all three screws are tight and push the cover back on to the module, using the logos for alignment.

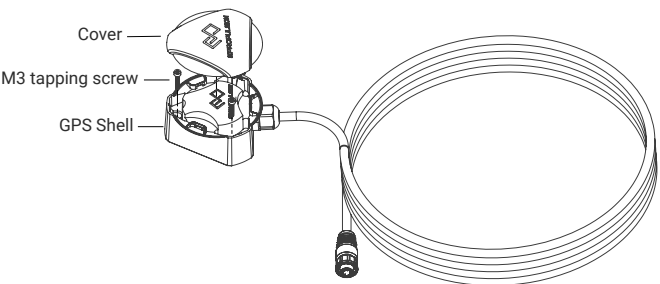


Figure 4.19 GPS External Module Screw Fixing

4.6 Communication Terminator Connection

Communication terminators are needed to ensure stable communication within the system. Different combinations are required, depending on how many motors are in the system and whether an external GPS module is connected, as shown in the table below. The resistance value of the terminator is marked on the tail.

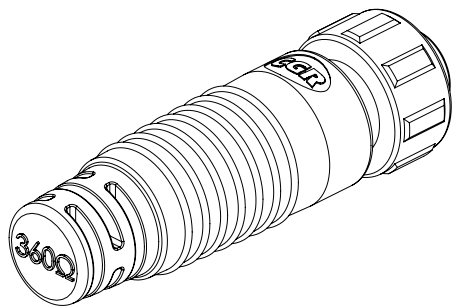


Figure 4.20

Quantity 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.
Hold	Direction holding function or anchor mode: Press twice to enter Hold mode, and when in Hold mode press once to exit.
Dock	Dock mode: Press once to enter Dock mode. In Dock Mode maximum power is limited to 50%, for smoother handling when mooring etc. When the throttle lever in neutral, press once to exit the Dock mode. Turbo mode: Only when the throttle is at the maximum of the forward, long press for 2 seconds to enter Turbo mode, and once to exit. In Turbo mode the maximum power is increased by up to 33%, ie from 12 to 16kW for the X12.

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. In Turbo mode the maximum power is increased by up to 50%, ie from 12 to 16kW for the X12.
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.

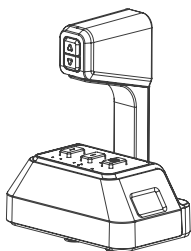


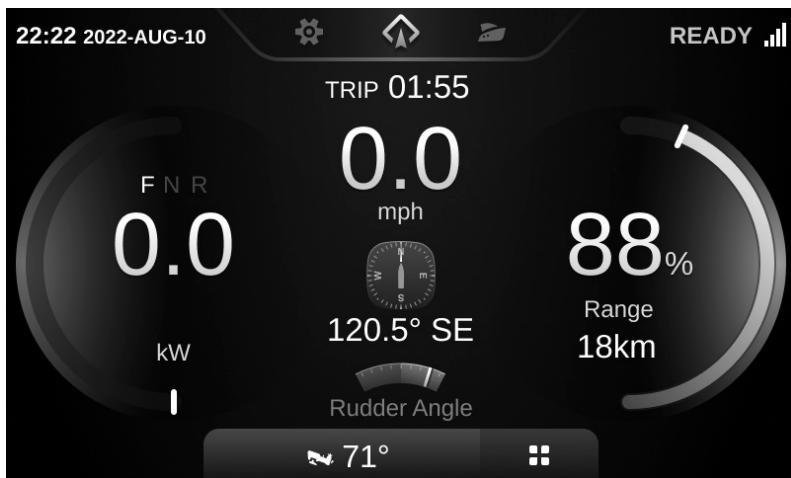
Figure 5.1

- Kill Switch can be placed on either end of the Smart Throttle, depending which way throttle is facing.
- Motor will not work without kill switch in place.
- Kill switch should be removed when motor is turned off.
- In an emergency, motor can be stopped by pulling kill switch off throttle.
- Motor can be restarted after emergency stop by first putting throttle in neutral position, then replacing the kill switch, and operating as normal

5.2 Starting the System

5.2.1 Start

-  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 "READY" shows on the smart display 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 Troubleshooting (section 5.11) to solve the problem.

5.3 Perform initial configuration

Step 1: Read the system devices

After all accessories are assembled, power on, turn on the smart throttle, and the Smart display will automatically read the Serial Numbers (SN) of the devices in the system.

- 💡 Manually check whether the SN of all parts on board are displayed. If it is correct, click Confirm; If SN of any part is not displayed, check the connection connections and click Check again. The system will scan again for connected devices.
- 💡 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 motor, the system will automatically complete the system initialization settings and directly enter the home page.

If the system includes more than one console or motor, the user needs to configure the console accessories and the position of the motors. 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

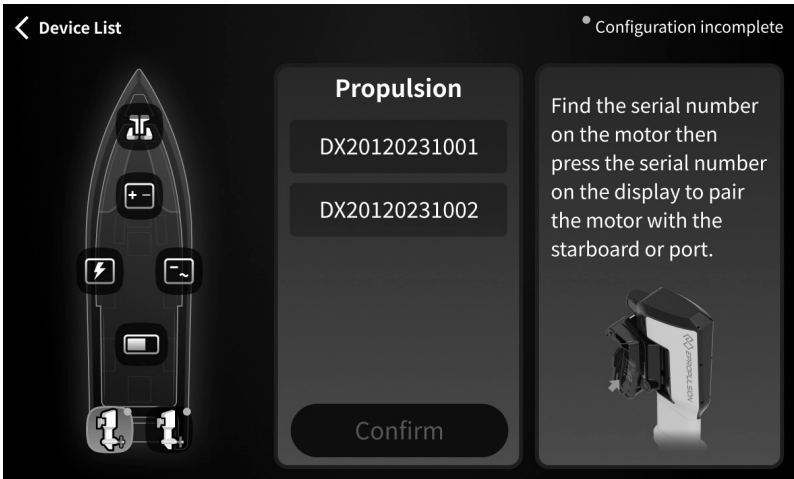
When it is a single-throttle, manually click any button of the throttle to match successfully.
When it is a dual-throttle, click any button of the left and right throttles respectively to match successfully.



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

5. Configure motors

Click the SN of the motors to configure them to the port and starboard sides of the boat.



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	System status	READY indicates that the system is ready to start.
5	4G network signal strength	/
6	Travelled time/ distance	You can switch between trip distance and time in settings.
7	Battery indicator bar	The indicator changes with battery level.
8	Battery level	Battery level
9	Remaining distance or time	The remaining distance/time supported by the current battery level. You can switch between distance and time in the settings.
10	Compass	/
11	Power indicator	The indicator will change as the power output changes.
12	Current power/ Current RPM	You can switch between current power or current RPM in the settings.
13	Gear	F: Forward gear N: Neutral R: Backward gear
14	Speed	Current speed, which can be switched between KNOTS, KM/H, and MPH in the settings.
15	Trim	Press Trim to enter the Trim control page, adjust the tilting angle of the motor.
16	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

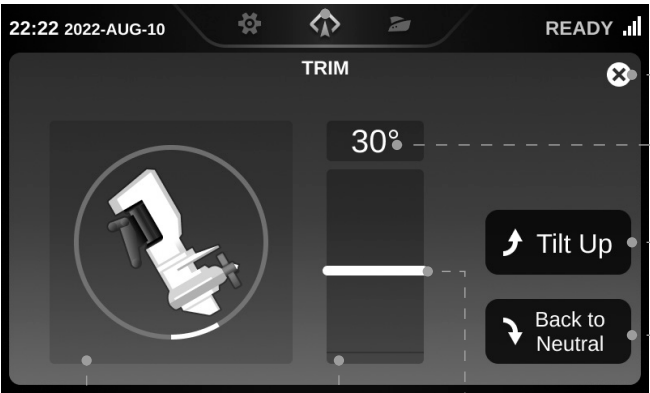
5.5.1.1 Single Motor Trim Pop-up



Figure 5.2 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.



The drawing of propulsion with the current angle.

Zero position

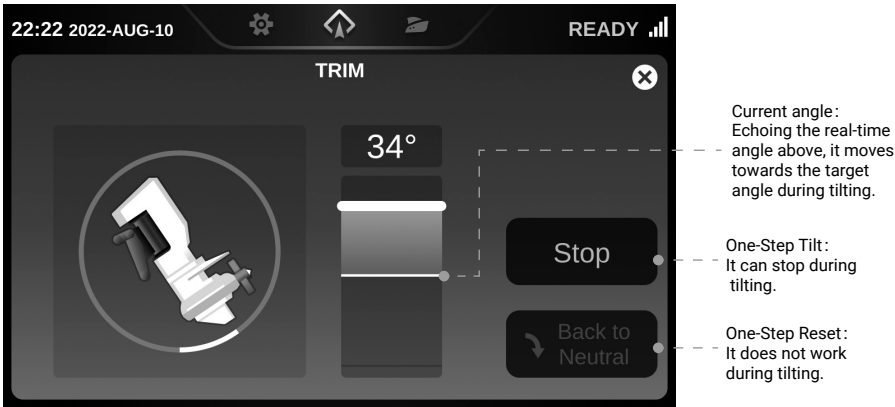
Bar:
Drag the bar to adjust the motor's trim angle. It will automatically move with the real-time angle when in One-Step Tilt or One-Step Reset.

Exit

The current angle of the propulsion

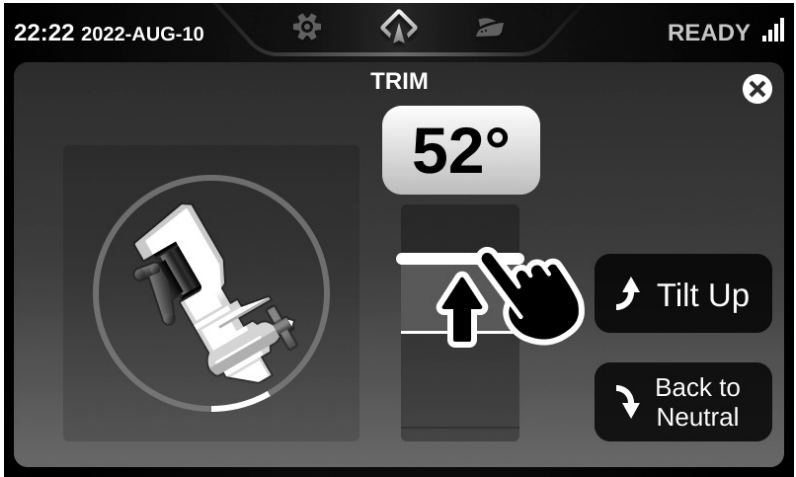
One-Step Tilt:
Click the one-step tilt button, and the outboard will automatically tilt to the top.

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



5.5.1.2 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.

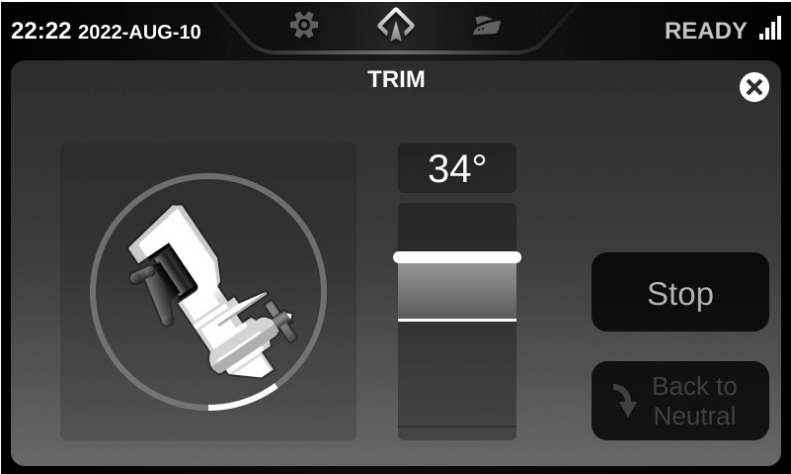
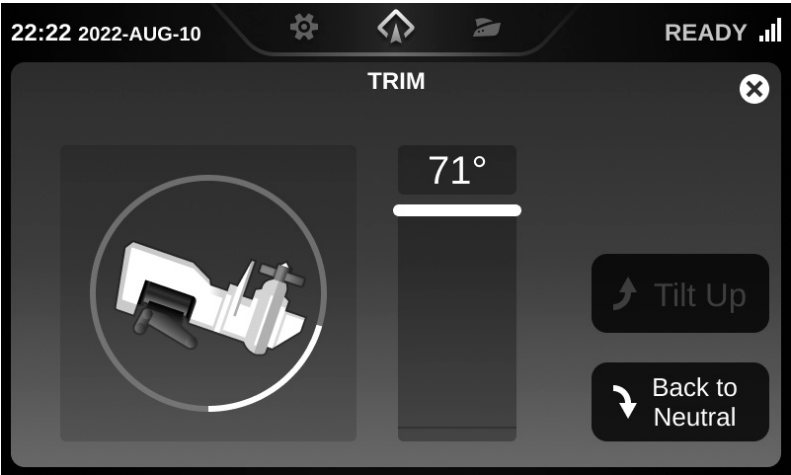


Figure 5.3 while the target angle is 52° and the real-time angle is 34°

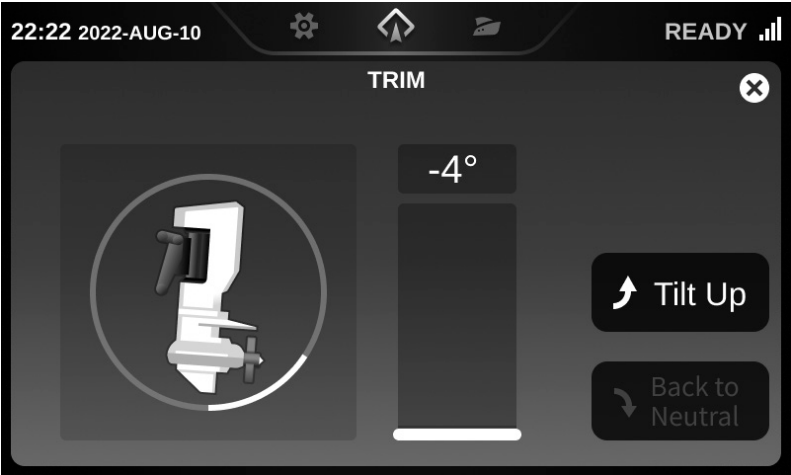
5.5.1.3 One-Step Tilt

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.



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.

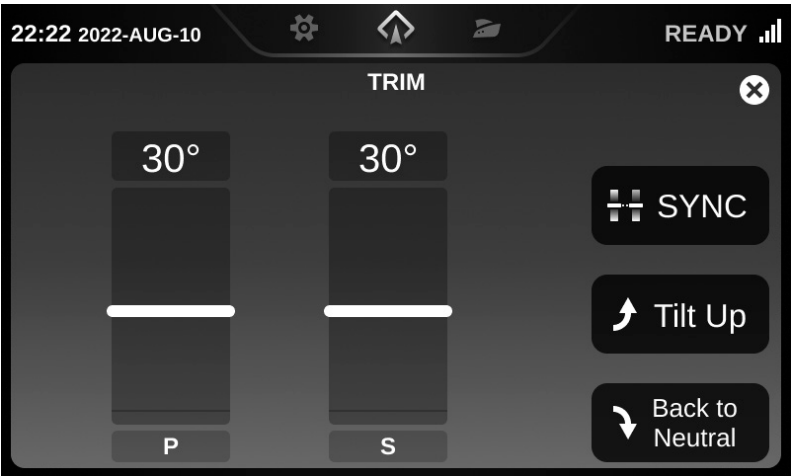


Figure 5.4 Not in SYNC mode

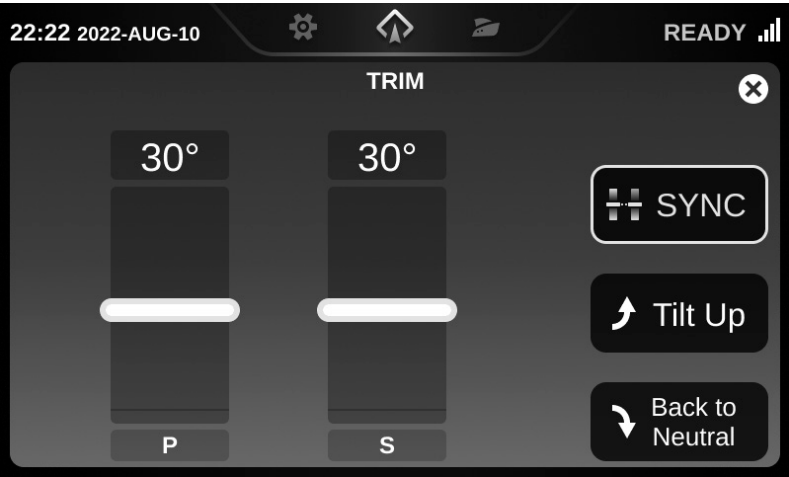


Figure 5.5 SYNC mode

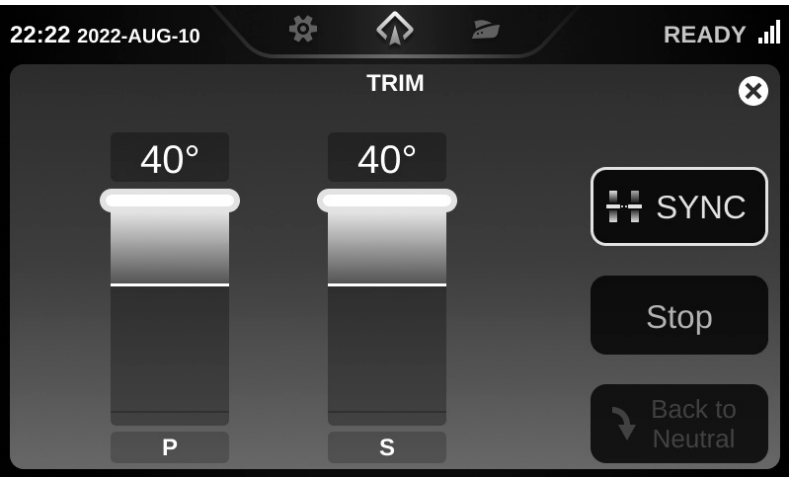


Figure 5.6 SYNC Trim

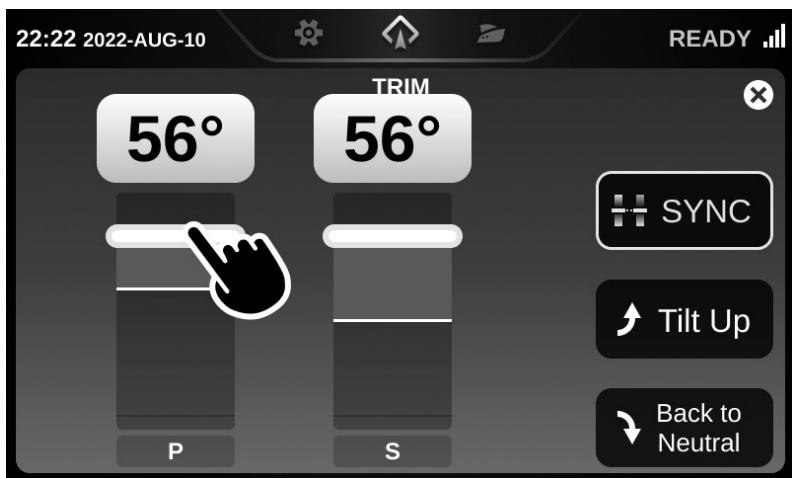


Figure 5.7 Different real-time angle to the same target angle

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

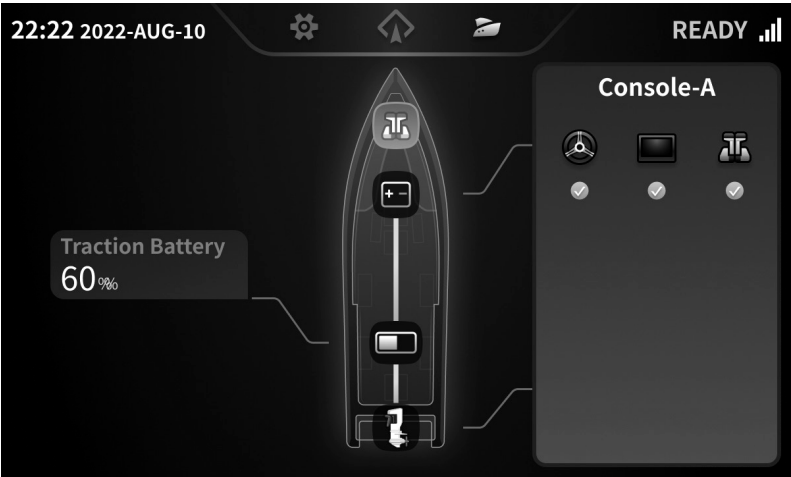
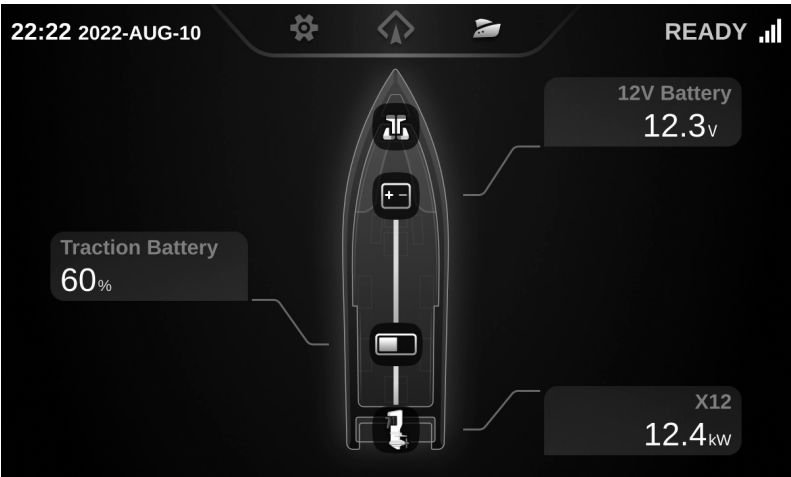


The propulsion system page is accessed by clicking the boat icon, just to the right of top centre on the screen.

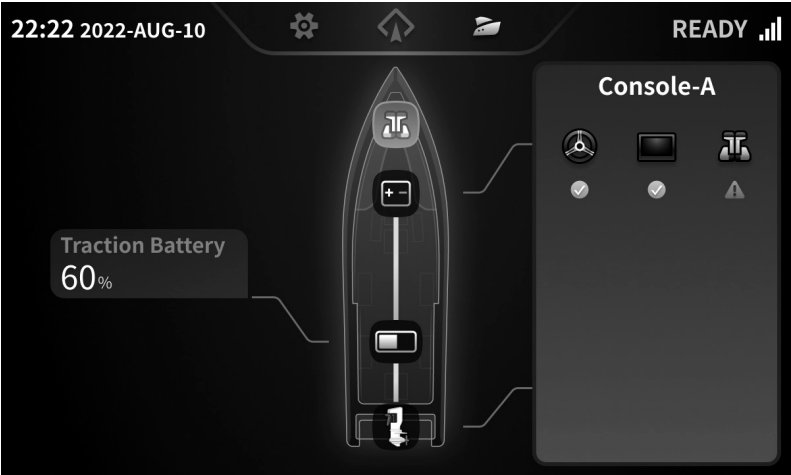
5.6.1 Control Console



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



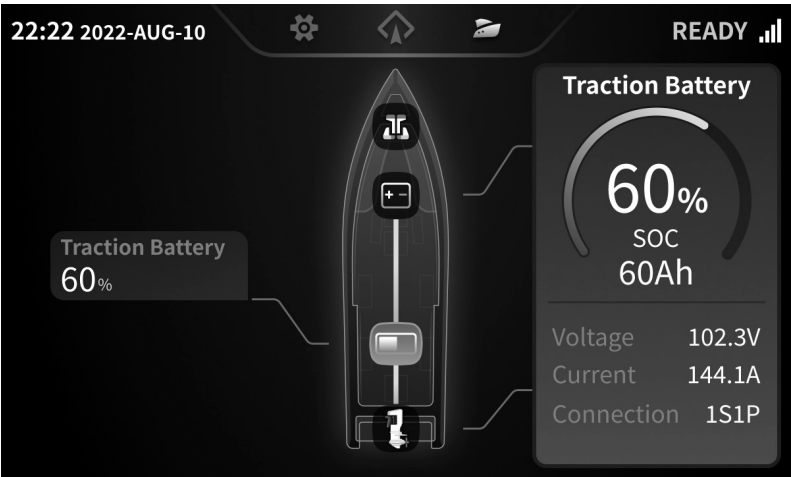
If an accessory fails, its icon will turn orange or red. Click the fault icon to view the problem in more detail.



5.6.2 Traction Battery



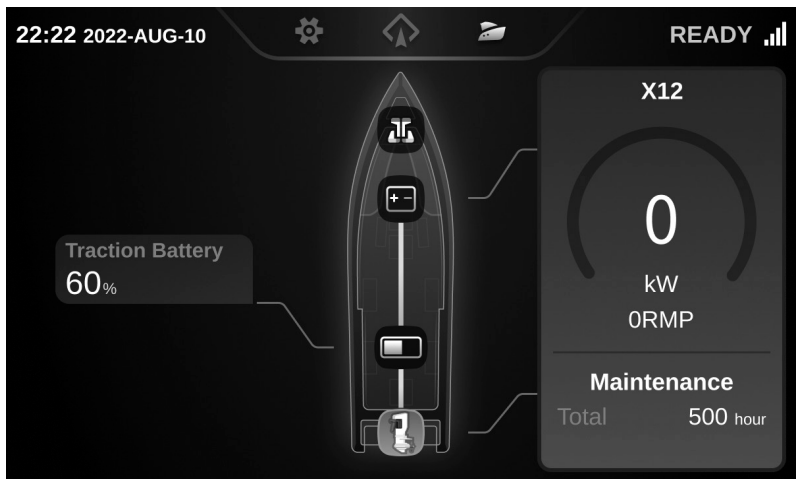
Click on the Traction Battery icon to view the remaining power, voltage, and current.



5.6.3 Motor(s)

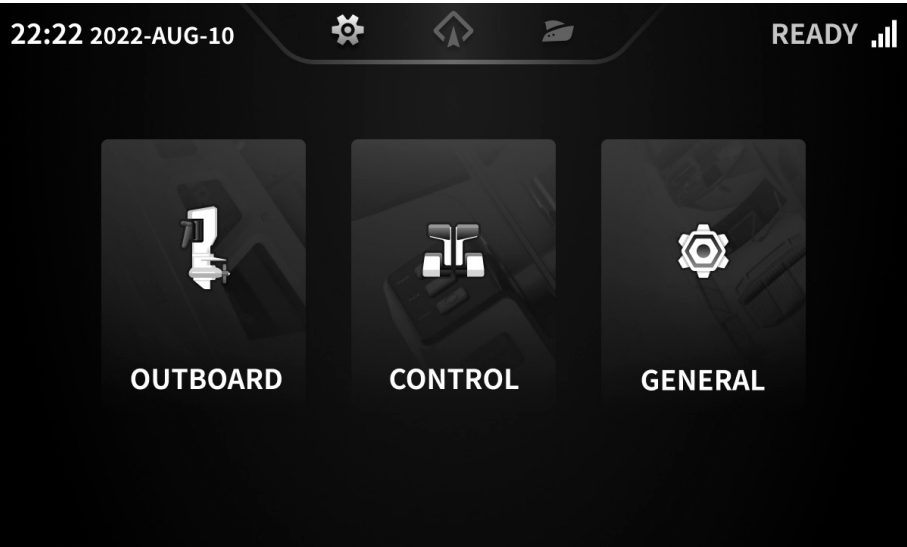


Click on the Motor icon(s) to view current power, rotational speed and cumulative run time.



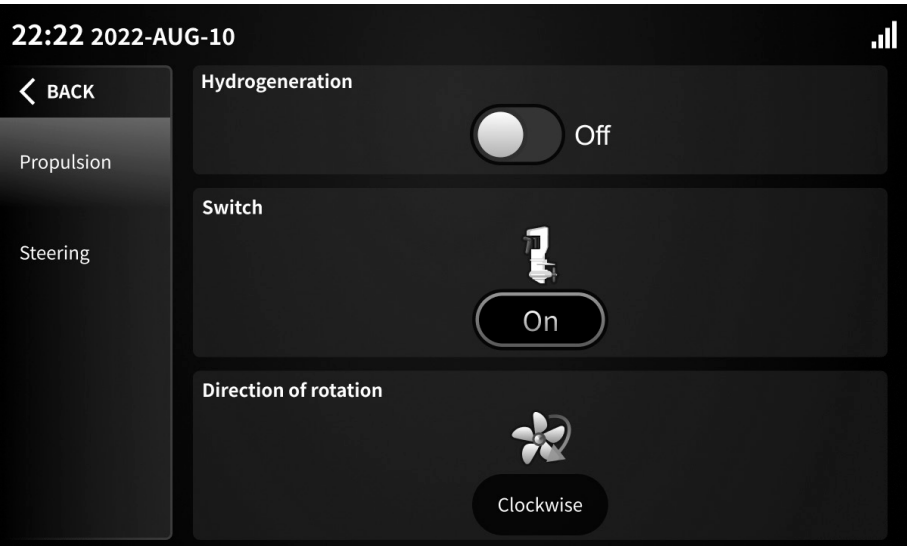
5.7 Setting

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.

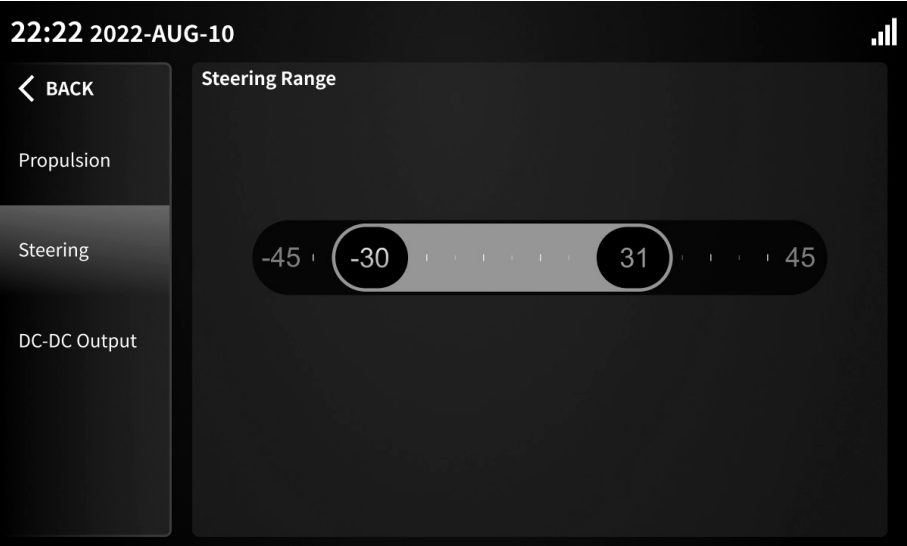


Button	Function
OUTBOARD	Click to enter the propulsion setting page, where you can access the propulsion and steering settings
CONTROL	Click to enter the console setting page, you can set single-throttle assembly, dual-throttle FN function, Smart display, etc.
GENERAL	Click to enter the general setting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

5.7.1 Outboard Setting



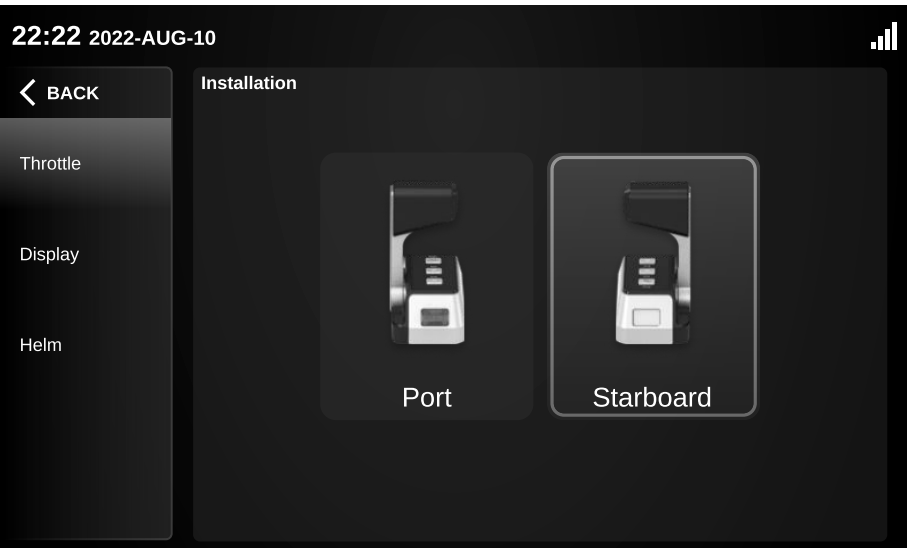
Function	Description
Hydrogeneration	If enabled, the outboard will reverse to charge the battery when the boat is propelled by other means, eg sailing. This will only work if connected to ePropulsion batteries.
Switch	Click to switch the motor on or off. If the switch springs back, the setting has failed.
Direction of rotation	Click to switch the rotational direction of the propeller. If the switch bounces back, the setting fails.



5.7.2 Control console Settings

5.7.2.1 Smart throttle settings

1. Single-throttle Settings



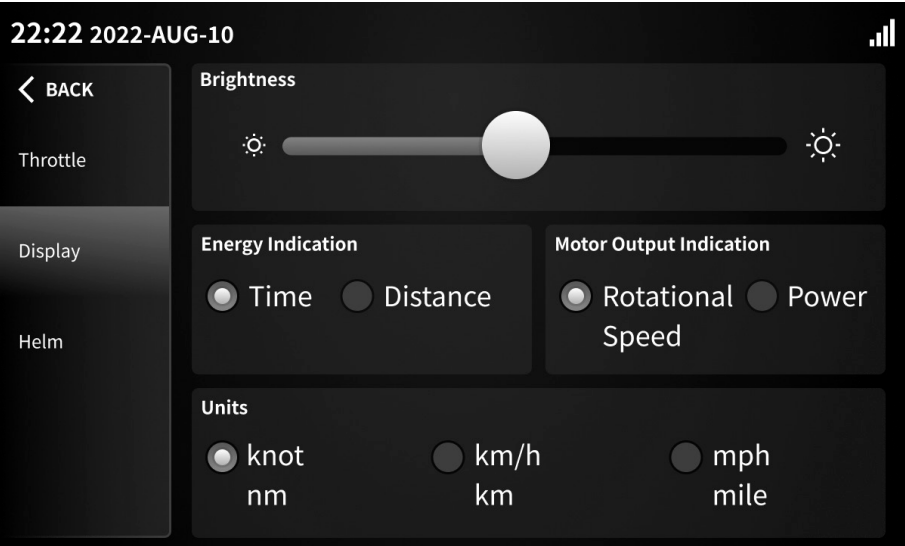
Function	Description
Starboard	Click and set the smart throttle installation mode to starboard installation. If it springs back, the setting fails.
Port	Click and set the smart throttle installation mode to port installation. If it springs back, the setting fails.

2. Set dual-throttle



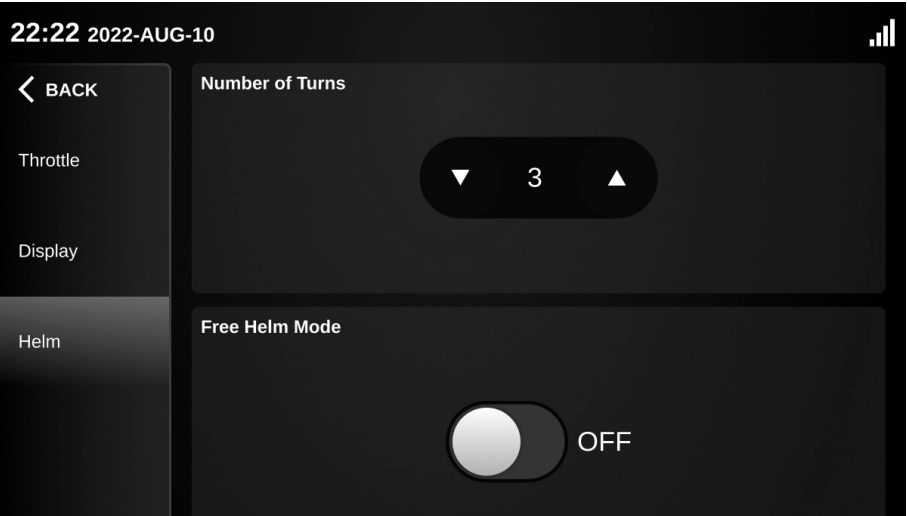
Function	Description
None	Set the FN function of smart throttle as invalid after clicking.
Sync	Set the FN function to synchronise left and right hand throttles when clicked. With Sync on, if the left and right throttle power settings are similar, the system will make them the same. If the power settings are significantly different, those different settings are maintained.
Limit	After clicking, set the smart throttle FN function to limit speed. The maximum speed of the limit can be customized on the Settings page. PLEASE NOTE: This function under development.

5.7.2.2 Display settings



Button	Function
Brightness	Drag to adjust the brightness of the display. This setting is retained between sessions.
Energy indication	Switch between Time or Distance remaining, taking current speed and battery level into account. This will change the display on the home page.
Motor output indication	Switch between the Rotational Speed (RPM) and Power input to the motor. This will change the display on the home page.
Units	Switch speed and distance units between knots (nautical miles per hour), km/h (kilometres per hour) and mph (miles per hour). This will change the display on the home page and ePropulsion setting page.

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: 1to 5 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 settings

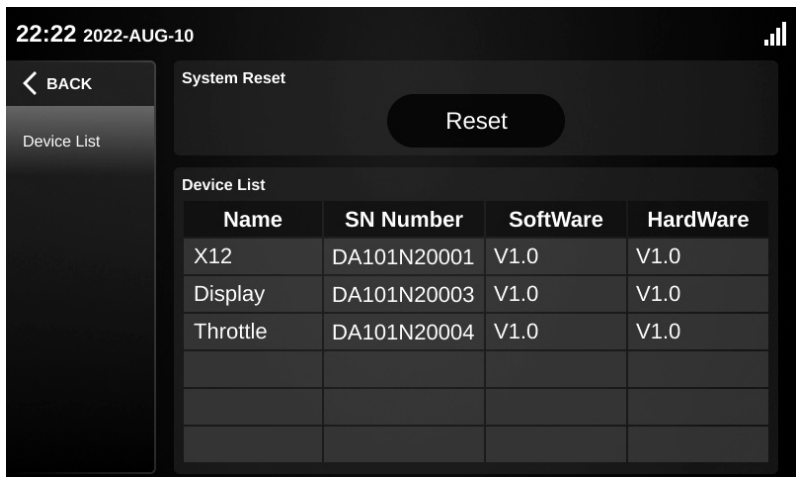
5.7.3.1 System firmware information



Function	Description
System version	Display the system/software 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	When there is a new version available, you will be prompted with the content of the new version and the estimated time to update.. Users can choose to update immediately or in the early morning. If early morning update is chosen, this will be at 02:00 the next day. Note: - Update must meet two conditions: 1) 12V supply voltage > 10V; 2) The system has no operating power. ie high voltage side is turned off. - The system cannot run during the update process, so it is recommended to choose early morning update or update when the boat is not in use.

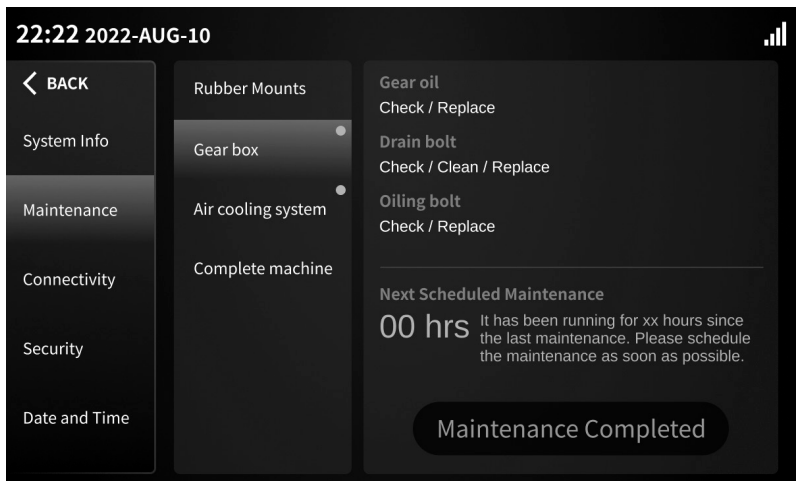
Device list page

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



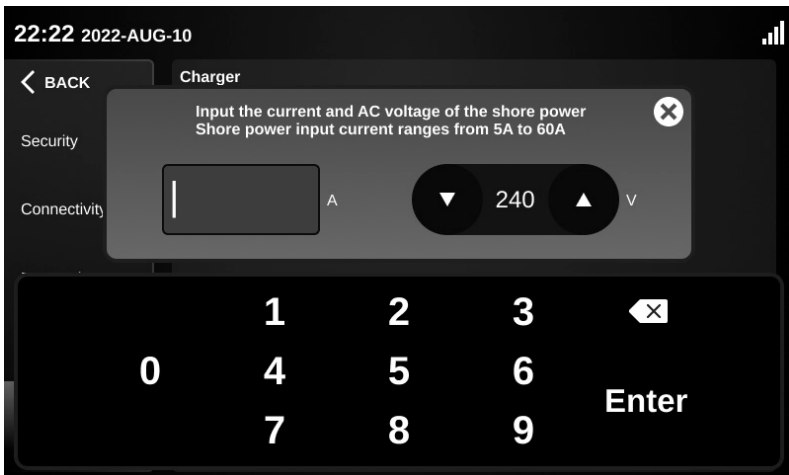
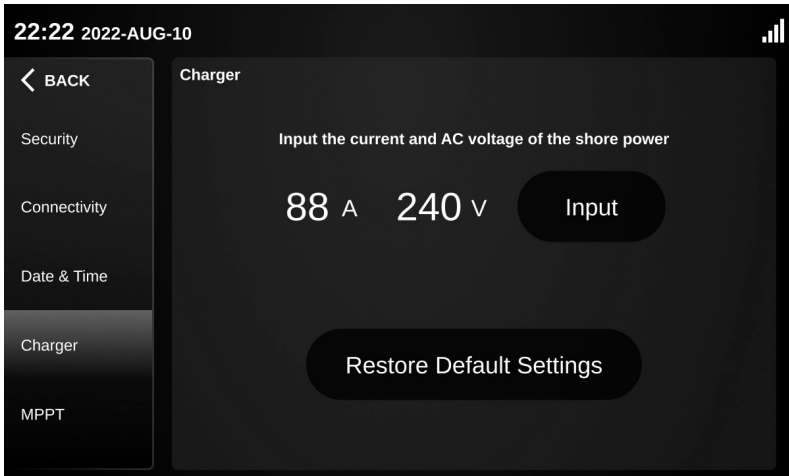
5.7.3.2 Maintenance - All maintenance timing tips

The system automatically calculates the maintenance time based on various maintenance items. When the maintenance time is reached, the system will notify the user on the display. After the user completes the maintenance, they can click "Maintenance Complete" to reset the timer.



Regular maintenance helps to improve the service life of the machine. Please maintain it in time after receiving the reminder.

5.7.3.3 Charger Power Setting

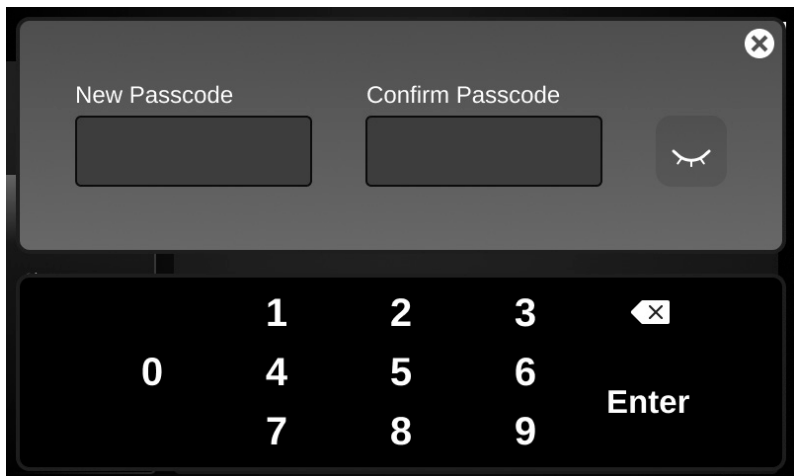
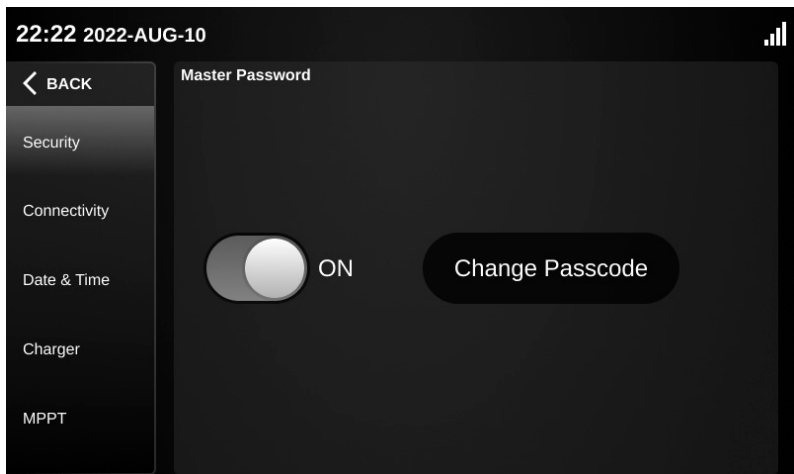


-  Press Input to set the maximum charging current and voltage.
-  The maximum charging current range is 5 to 60A.
-  The voltage can choose between 220V, 110V, 100V, 120V, 127V, 230V, 240V.
-  Press Restore Default Settings to restore all the settings by default.

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.
- 💡 If you need to retrieve your password, please contact eplink or after-sales services.

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. 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.
5. Adjust the outboard motor to an appropriate tilt angle, which is normally between -4° to 16°.
6. Put the kill switch in place on the throttle.
7. 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.

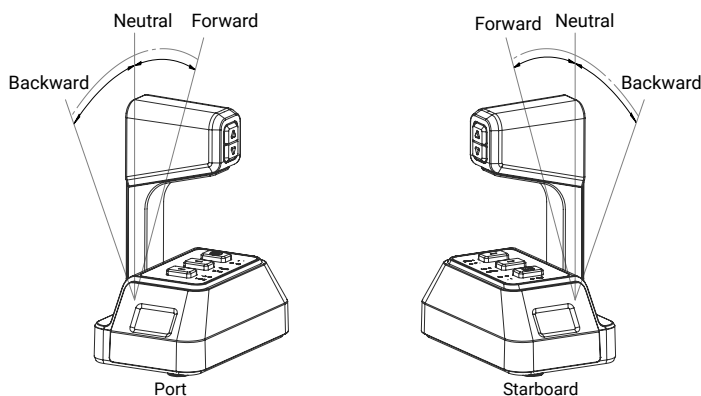


Figure 5.8

5.8.4 Steering Control

5.7.4.1 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 tilt and trim system, and the trim angle can be adjusted using the following methods:

• **Tilt Adjustment Button on the Motor**

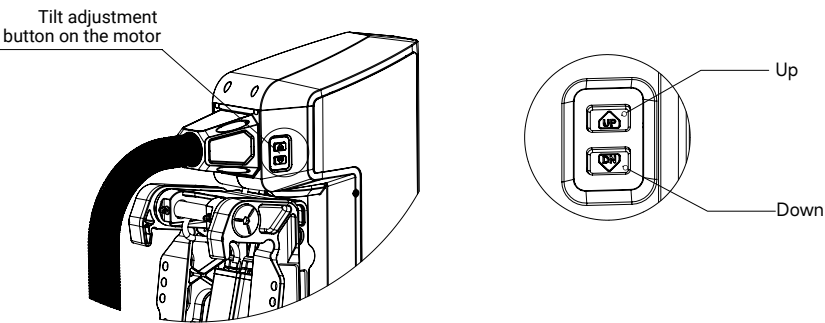


Figure 5.9

• **Tilt Adjustment Button on the Smart Throttle**

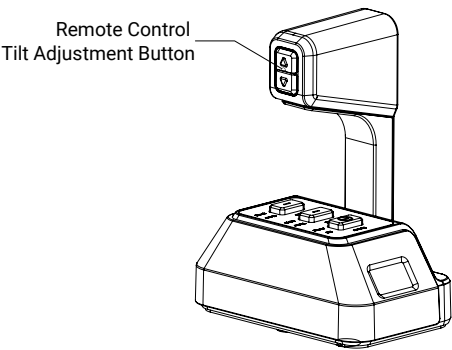


Figure 5.10

• **Tilt Adjustment Button on the Display**

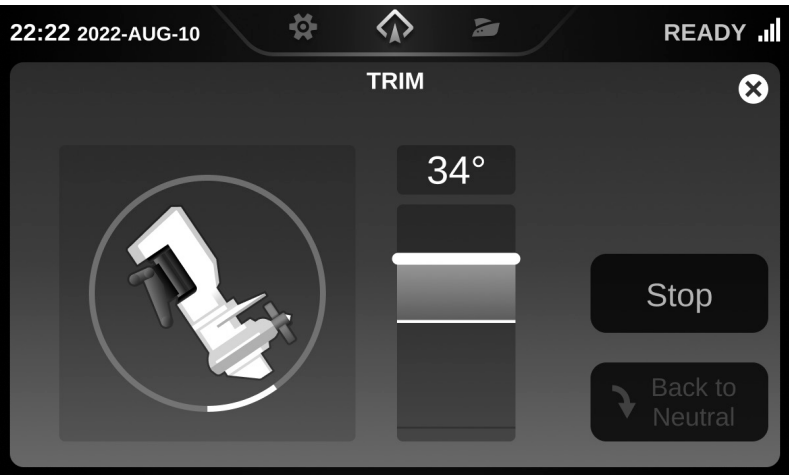
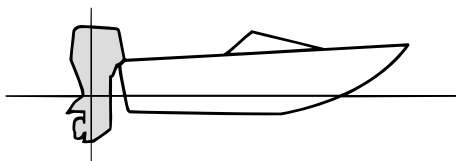


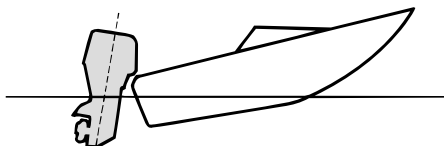
Figure 5.11

5.8.5.2 Adjusting the Boat's Trim Angle

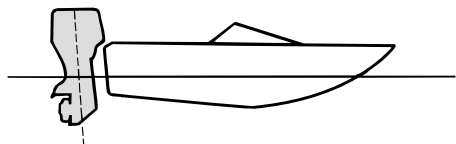
When the boat is planing, raising the bow appropriately reduces resistance, improves stability, and enhances efficiency. Typically, the boat's centerline is raised by 3° to 5°. If the bow is raised too far, the boat tends to turn to one side or the other, requiring compensation during steering. Lowering 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 reduced 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. The boat should be driven at reduced speed if this is necessary.

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 underwater obstacles. This action also helps reduce corrosion and fouling.



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

The X12 outboard motor has a maximum tilt angle of, and tilt lock at 61° (shown in the display, and the tilt angle to the transom is 73°).

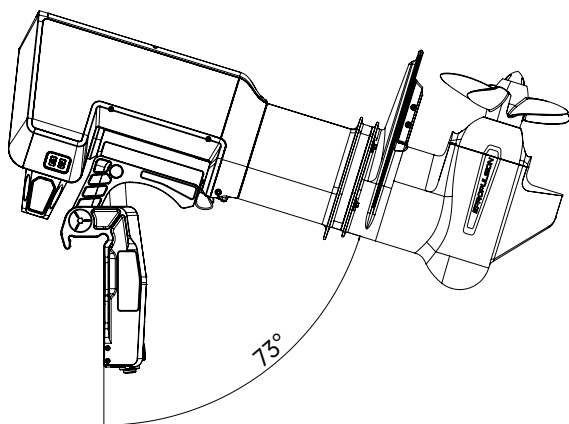


Figure 5.12

5.9 Hydro Generation Function

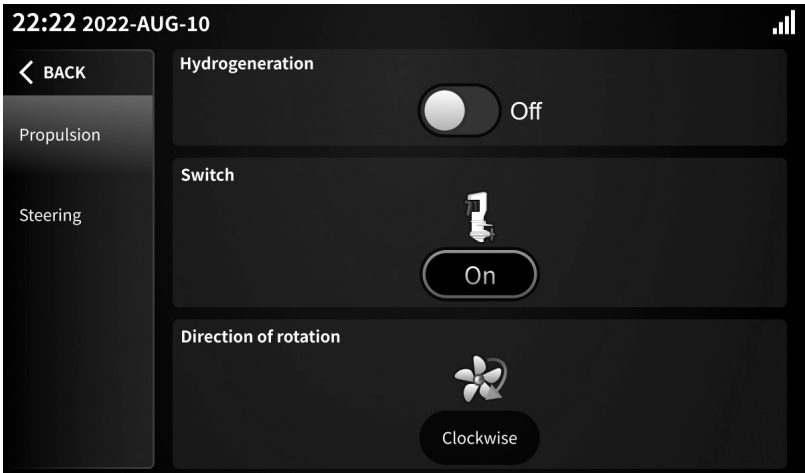
If the boat is propelled by other means - such as under sail - X-series outboards can be set to charge ePropulsion (only) batteries by leaving the propeller in the water.

The outboard 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 (tiller or remote throttle) is in the neutral position.
- 3. The ePropulsion battery charge state is below 90%.
- 4. Boat speed is above 6km/h or the shaft rotation speed remains above 400rpm for 4 seconds.
- 5. ePropulsion batteries are connected, including a communication cable (as well as main power cables etc). It will not work with other manufacturer's batteries.

When any of the following conditions occur, the hydro generation won't work:

- 1. The hydro generation function is turned off (in control system).
- 2. The control system (throttle) is in the forward / reverse state (not in the neutral position).
- 3. The system is currently in intelligent function mode.
- 4. The boat is stopped, not travelling fast enough, or travelling too fast (speed is higher than 40km/h or the shaft rotation speed is higher than 1500rpm).
- 5. The battery level is higher than 90%.
- 6. Batteries from a supplier other than ePropulsion are in use.



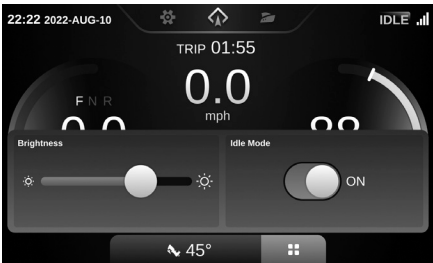
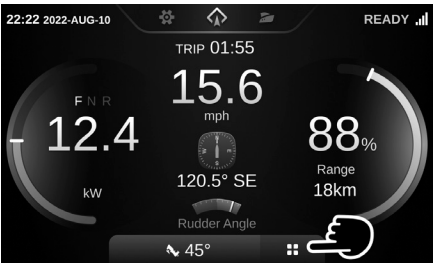
5.10 Idle Mode, Sleep

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.

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 Mechanical Faults/Solutions

NOTE: most "abnormalities" are caused by external factors such as weed or rope around propeller, foreign objects caught in steering mechanism, etc. Please check for such issues before assuming there is a mechanical fault!

Failure	Possible Reasons	Possible Solutions
Abnormal tilting	Tilt and trim system damage	Repair or replace the tilt and trim system.
Abnormal steering	Steering system damage	Repair or replace steering module
Abnormal noise	Outboard motor is loose on hull	Tighten mounting bracket bolts
	Housing bolt loose	Tighten
	Propeller loose on shaft	Tighten
Abnormal vibration	Propeller loose on shaft	Tighten
	Propeller damage	Replace
	Parts or fasteners loose	Tighten
Over temperature alarm	Water intake fouled by seaweed or other marine life	Cleaning

5.12.2 System Faults/Solutions



The operating environment of the machine is relatively complex, such as extreme weather, extreme waters, etc. If you cannot find an effective solution from the following troubleshooting list, or if the fault occurs repeatedly, please contact the after-sales service in time, and we will provide you with professional advice.

Fault position	Fault name	Fault code	Solution
Drive motor	Encoder fault	P101003	1. Check the external wiring. 2. Replace the rotary encoder. 3. Replace the motor controller.
	Power tube pass-through failure	P100F03	1. Check the external wiring. 2. Check the insulation of the motor. 3. Replace the motor controller.
	Motor overspeed	P101113	1. Check the operating conditions 2. Replace the rotation 3. Replace the motor controller
	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
	Motor stalled	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 supply undervoltage	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. 2. Replace X-ECU and contact after-sales processing
	Open GPS antenna	P130421	1. Check the GPS antenna line. 2. Replace the X-ECU and contact after-sale processing
	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
	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 located 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 Control Failures & Limp Home Modes

5.13.1 Main Driver Limp Home mode

If any of the following faults occurs the system will need to enter "limp home mode" to ensure safe return of the boat, at reduced speed/power.

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	Limit the maximum power to 5kW
Close operation	Secondary failure	Reduce power by 50%
Electric steering	Level three failure	Stop the outboard first and push the throttle again, then limit the power to 6kW, and manually control the steering
	Secondary failure	Reduce power by 50%
	Node missing	Stop the outboard first and push the throttle again, then limit the power to 6kW, and manually control the steering
Steering wheel	Level three failure	Stop the outboard first and push the throttle again, then limit the power to 6kW, and manually control the steering
	Node missing	Stop the outboard first and push the throttle again, then limit the power to 6kW, and manually control the steering



When the main driver is in limp mode, the outboard may experience significant shaking or noise. Limp mode can cause damage to the outboard, so please use the lowest possible power output to reduce damage to the system.

5.13.2 Temporary Running Mode

If any of the following faults occur but the steering circuit is intact, users can confirm system safety and choose to enter the limp mode through the display screen. In the mode, the steering needs to be manually controlled by the operator, and the maximum power to the outboard will be limited to 6kW.

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	



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



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 electric tilt and trim can be released by using 25mm socket and corresponding wrench to remove the plug and using 14mm socket to rotate the bottom release nut to allow manual adjustment.

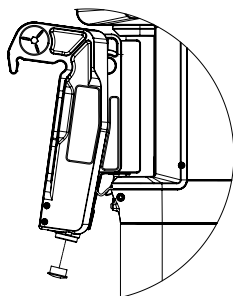


Figure 5.13

5.14 Other Interfaces

5.14.1 Connection to external sound or light alarm

The X-series outboard motors can support external sound and light alarms (not included).

Connection as follows:

- (1) Remove the outboard'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) Reinstall the upper cover.

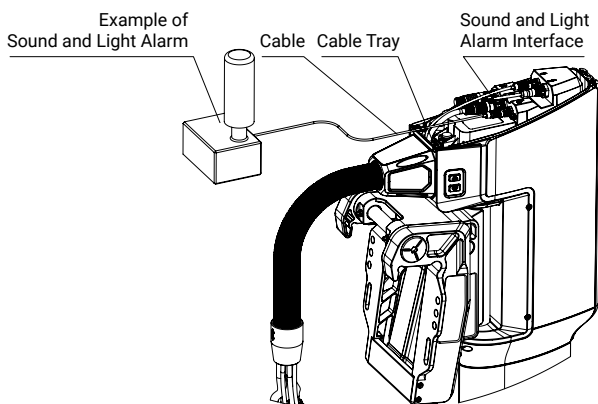


Figure 5.14

5.14.2 Connection to external NMEA 2000 devices

The X-series outboard motor supports communication with external devices using the NMEA 2000 protocol. Follow these steps to connect the NMEA2000 device:

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

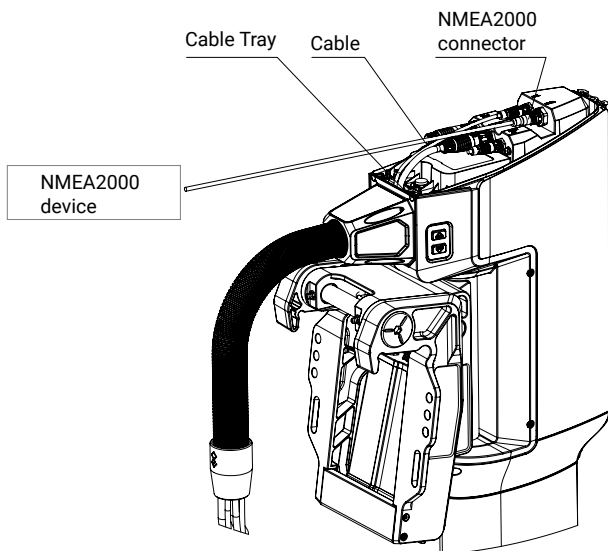


Figure 5.15

6 Emergency Situations ---

6.1 Collision

If the outboard strikes an object beneath the water, please:

1. Stop the outboard immediately and turn off the main power switch.
2. Check the mechanical structure to see if there is any damage.
3. If you believe it's safe to use the outboard, return to the nearest harbor or pier in low power.
4. If you believe it's unsafe to use the outboard, call for assistance and a tow.
5. Call your dealer to check the outboard.

6.2 Swamped or Submerged Outboard

If the outboard is swamped or submerged, then turn off the main power switch and disconnect the battery. The outboard should be thoroughly inspected (by an authorised ePropulsion dealer), and repaired as necessary, before further use.

6.3 Overtemperature Protection

If the outboard's operating temperature is too high, input power will be limited, and further reduced if it continues to get hotter. If the safe limit is exceeded, the outboard will shut down to avoid risk of damage. At this point the outboard cannot be used again until the temperature falls back to within safe limits.

7 Maintenance

7.1 Maintenance

7.1.1 Routine maintenance

Maintenance items	Maintenance methods	Maintenance frequency
Fresh water flushing after use	All parts of the outboard that have been underwater, or splashed, should be rinsed with fresh water after each use	After each use
Removal of marine organisms	Please lift the outboard after each use. Any marine life that's attached to the outboard, such as seaweed or barnacles, should be cleaned off.	After each use
Regular inspection of cable wear, etc	Regularly check the security of the cable connection and whether there is any wear and tear where cables pass through holes in the hull etc.	After each use or periodic inspection (3 months)
Regular inspection of grounding wires (see 7.2.5)	Regularly check whether the grounding wires are damaged or broken, and whether the fixing bolts are loose.	After each use or periodic inspection (3 months)
Replacement of Anode	Replace any anode that has lost more than one third of its size	Regular check-ups every 3 months
Check function of trim system	Check trim system works correctly, including the upper and lower limits	Six months
Propeller and cotter pin inspection and replacement	Check the propeller for damage, coating damage, or deformation. Check if the cotter pin is broken, bent stuck, falling off, etc. Replace if damaged.	Periodic inspection (3 months)

7.2 Partial Maintenance and Care Guidelines

7.2.1 Anodes Replacement

(1) Clamp Anodes

The outboard has one anode at the base of the clamp. The anode is essential for corrosion protection, and must be inspected/replaced regularly in order to maintain warranty cover. This is especially the case when used in seawater, which can accelerate corrosion. Anodes must be replaced well before they are completely eroded (recommended when between 33 and 50%).

NOTE: the surface of the anode and the metal it touches should not be painted or coated, as this will reduce the protection given by the anode.

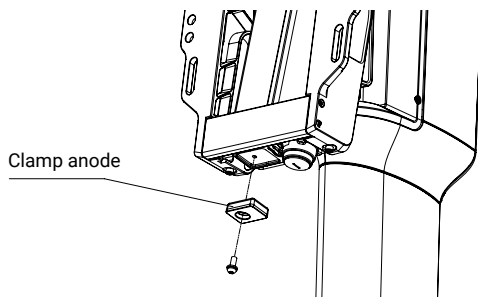


Figure 7.1

(2) Underwater Part Anodes

The outboard has one anode on the underwater body. The anode is essential for corrosion protection, and must be inspected/replaced regularly in order to maintain warranty cover. This is especially the case when used in seawater, which can accelerate corrosion. Anodes must be replaced well before they are completely eroded (recommended when between 33 and 50%).

NOTE: the surface of the anode and the metal it touches should not be painted or coated, as this will reduce the protection given by the anode.

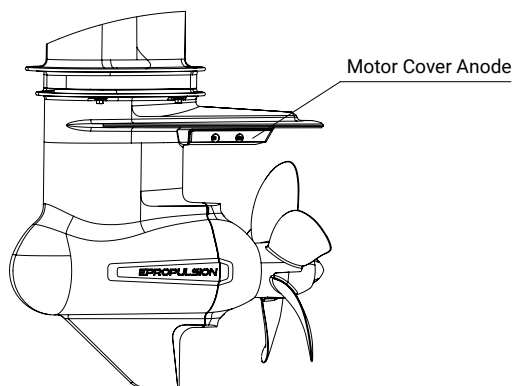


Figure 7.2

7.2.2 Propeller

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

- (1) Check the propeller blades for 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, and remove if necessary.
- (4) Check whether the propeller shaft oil seal is damaged.
- (5) For propeller removal and installation methods, please refer to section 3.3 - "Propeller Installation".

7.2.3 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.

7.2.4 Greasing Points

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

Use a grease gun
for grease lubrication

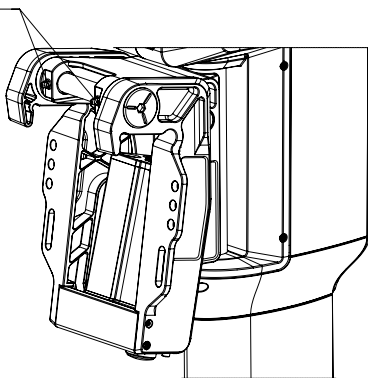


Figure 7.3

7.2.5 Check Grounding Wires

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

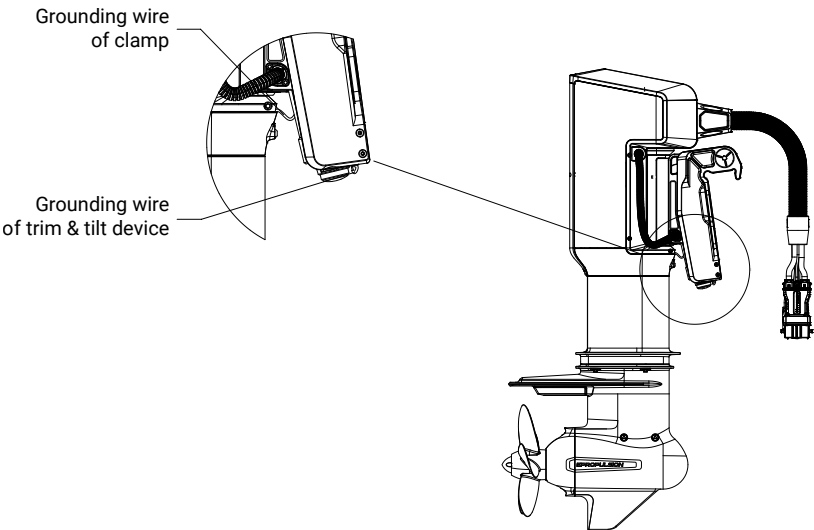


Figure 7.4

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.

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;

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

Website: www.epropulsion.com

E-Mail: service@epropulsion.com