

# **E-Steering Owner's manual**

## **Model: E-150-1**

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# Owner Responsibility and Intended Use

The E-150-1 electric steering system is specifically designed for use with outboard motors rated up to 200 horsepower or 150 kilowatts on motorboats. It is intended to provide reliable and responsive control during normal maritime operation. As the owner, it is your responsibility to ensure the system is used strictly in accordance with the instructions, specifications, and limitations outlined in this manual. Any misuse, unauthorized modification, or operation outside the intended application may compromise safety, performance, and warranty coverage. Periodic maintenance and inspections, as well as adherence to recommended operating procedures are essential to maintaining safe and effective steering functionality. Please read this manual thoroughly to understand the proper use and limitations of your steering system.

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# System Overview

The electric steering system consists of three main components that works together to provide smooth and reliable steering of your outboard motor:

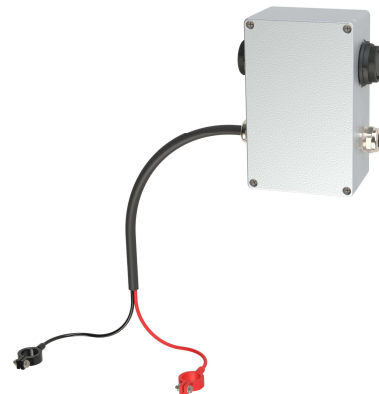
**Steering actuator:** A DC motor driven linear actuator that controls the outboard engine position based on input from the Steerer (Steering wheel hub).



**Steerer:** A steering wheel hub which controls the steering actuator, with a Ø19 sloped 2° cone (3/4" standard cone) for steering wheel attachment. It contains a buzzer and LED for signaling during system startup and in case of system failure.



**Connection box:** Filters electrical currents to limit the unintended emission of electromagnetic energy, while connecting and powering the steering actuator and steerer. Comes in 3 variations: "Standard", "Master" and "Link". In addition to the basic functions, the Master box provides connections for Garmin autopilot and has a contact for the Link box, which enables chain connection of multiple outboard engines.



**Emergency steering:** A mechanical steering system that can be mounted to the steering actuator in case of system failure, enabling the user to maneuver the craft manually.

**Important!** The emergency steering should be stored in an easily accessible location in case of emergency, together with a 6mm hex key and a 13 mm wrench for installation (Provided in case).



## Technical Specifications

This section provides technical specifications and operational characteristics for the electric steering system.

### System Specifications

Steering type	Electric power steering
Max. outboard motor power	200 hp / 150 kW
Battery Voltage	12V DC
Standby current draw	0.1A to 0.3A
Peak current	30A
Operating temperature range	-25°C to +70°C
Storage temperature range	-40°C to +85°C
Certified in accordance with	EN ISO 25197:2018 and ABYC P-28

### Operational Characteristics

Steering angle range	$\pm 20^\circ$ to $30^\circ$ (Depending on connection to engine)
Steering ratio	4 rotations of steering wheel, from hard over to hard over
Maximum steering rate	3 seconds, from hard over to hard over
Response time	$\leq 0.2$ seconds
Steering effort (torque)	Adjustable
Speed sensitivity	Constant
Feedback	Steering wheel resistance at max. position of steering range

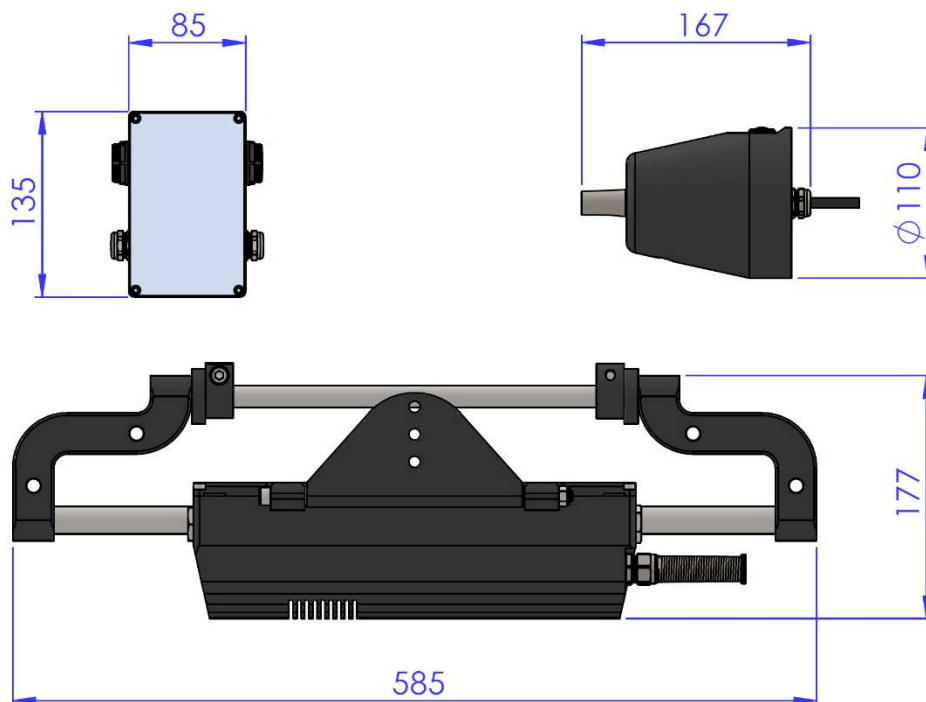


Figure 1: Size of system components in mm.

# Safety Information

Please read and understand the following safety warnings before installing, operating or maintaining your electric steering system.

## WARNING

Indicates a potentially hazardous situation that, if not avoided, can result in serious injury or death.

## NOTICE

Indicates information considered important, but not hazard related, e.g. relating to property damage.

## Installation Guide

Proper installation of your electric steering system is crucial for ensuring safe and reliable operation. While professional installation is recommended, this section provides guidance for qualified installers.

## WARNING

Improper installation can lead to steering failure, which could result in loss of control and serious injury or death. If you are unsure about any aspect of the installation, consult a qualified marine technician.

### Required Tools and Materials

- Hex key set
- Adjustable wrench
- Drill and drill bits
- Hole saw (*case dependent*)

### Requirements for Wiring

- All cables shall be supported throughout their entire length by conduits, cable trunking or by individual supports, at maximum intervals of 450 mm.
- Cable connections shall be placed above areas where water can accumulate and at least 25 mm above the level at which the automatic bilge pump switch activates.
- Cables shall be routed away from exhaust pipes and other heat sources which can damage the insulation. The minimum clearance is 50 mm from water-cooled exhaust components and 250 mm from dry exhaust components, unless an equivalent thermal barrier is provided.
- If used, solderless crimp-on terminals and connectors shall be attached with the type of crimping tool designed for the termination used and be able to withstand a tensile force equal to at least 60 N.

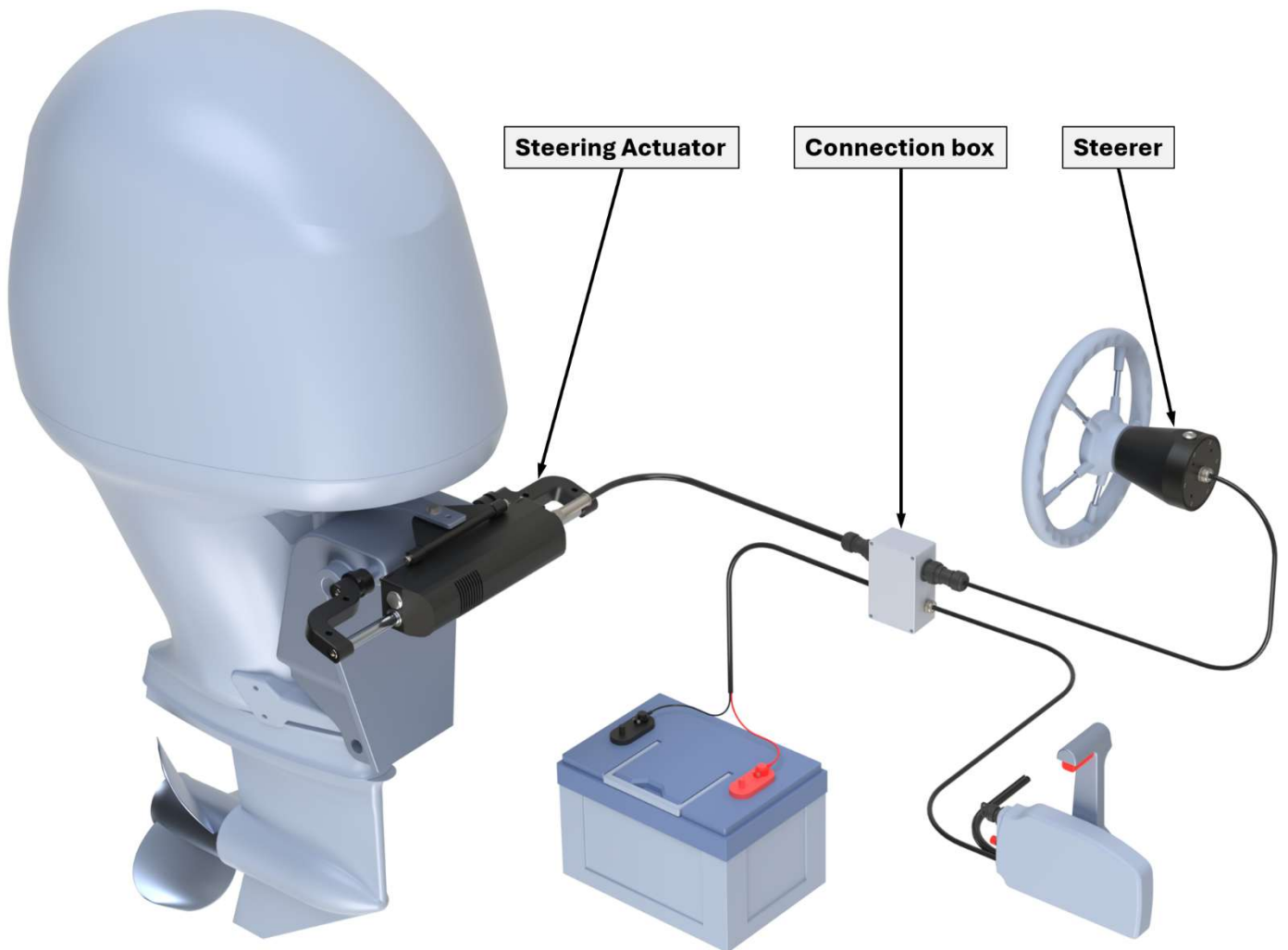


Figure 2: Installation of electric steering system, with connections to outboard motor, battery and to kill switch in motor controller.

## **i** NOTICE

Self-locking nuts with plastic inserts shall be used for fastening the Steerer and Steering actuator.

### Installing the Steerer

1. Holes for mounting the steerer are drilled in the dashboard/pedestal. Hole specifications are stated in the drawing in figure 3.
2. The cable for the EMC-box is passed through the center hole.
3. The four M6 bolts are installed with washers and tightened.
4. Route the cable to the desired installation location of the Connection-box.

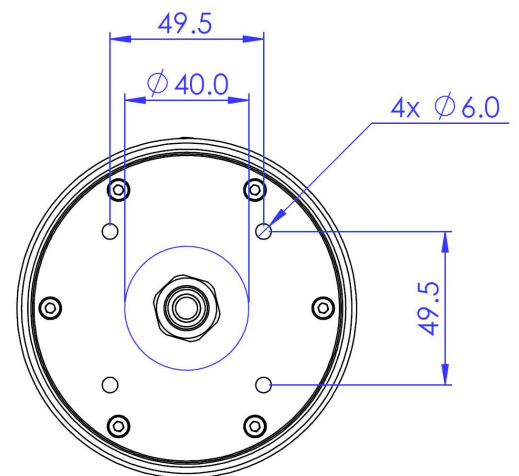


Figure 3: Cutout dimensions for Steerer installation.

## Installing the Steering Actuator

1. The mounting nuts are screwed onto the outboard motors tilt axis on the transom bracket. (*Components for installation is shown in figure 4*)
2. By removing one of the mounting forks connecting the actuator steering axle and the connection rod. The connection rod can be passed through the hole in the mounting nuts and the outboard motors tilt axis.
3. Use the included spacers and adjust the mounting nut to avoid any play in the axial direction, for the mounting rod, before reattaching the mounting fork and tightening all components. When installing the M10 bolts, for attaching the mounting fork, use Loctite Blue threadlocker and tighten using a tightening torque of  $35 \pm 2 N \cdot m$ .
4. Attach the outboard motors steering arm to one of the holes in the actuator's attachment plate. By reattaching the lid of the actuator housing and the attachment plate in their two alternative positions, respectively, a total of 4 configurations can be achieved.
5. Route the cable to the desired installation location of the Connection-box.

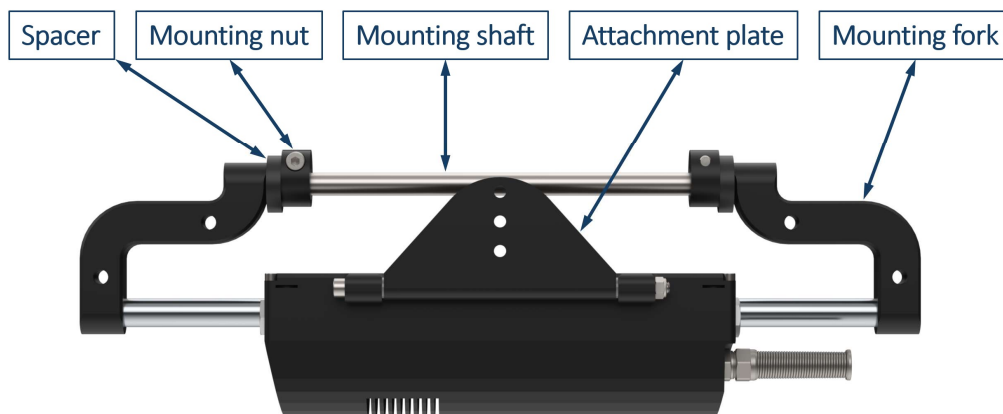


Figure 4: Components used in installation of steering actuator.

## Installing the Connection Box

1. Mount the Connection box in a practical location where cables can be routed to a source of power, while accessing the connection cables from the actuator and steerer. **Note:** The Connection box is not compliant with ISO 8846 (Ignition Protection – IPG) and therefore must not be installed in any petrol tank or other space containing fuel vapors.
2. The cable for system power is connected to the power supply. The fuse should be placed as close to the source of power as possible, not exceeding 1.8 m.
3. The plugs from the steering actuator and steerer can now be attached to the corresponding contacts on the EMC-box, completing the installation.

*If you have a system with a Master/Link box:*

4. Link boxes are chain linked to a Master box using the attached cable with plug. Each box shall be connected to power.
5. Garmin connectors and/or additional steering actuator connection cables are plugged in.

The following installation is optional and requires components not supplied by Jefa Steering. *You will not be compensated for any damage done to the steering system or outboard engine resulting from this installation.*

### Installation of kill switch to shut of the outboard engine, in case of steering system failure:

The installation requires a cable with two conductors, a 12V normally closed (NC) relay and a toggle switch.

The relay is connected to the kill terminal on the CDI (Capacitor discharge ignition) system and to engine ground. This will result in the relay shorting the connection between the flywheel and spark plugs to ground, when the signal from the connection box stops. Thereby stopping spark generation immediately. As it's the same wires used for the standard outboard engine kill switch, the relay can be connected in parallel. The wire to the kill terminal on the CDI is typically black and yellow or white and the wire for ground is typically black.

The toggle switch is installed in series with the relay to reenble the engine, to continue sailing using the manual emergency steering system.

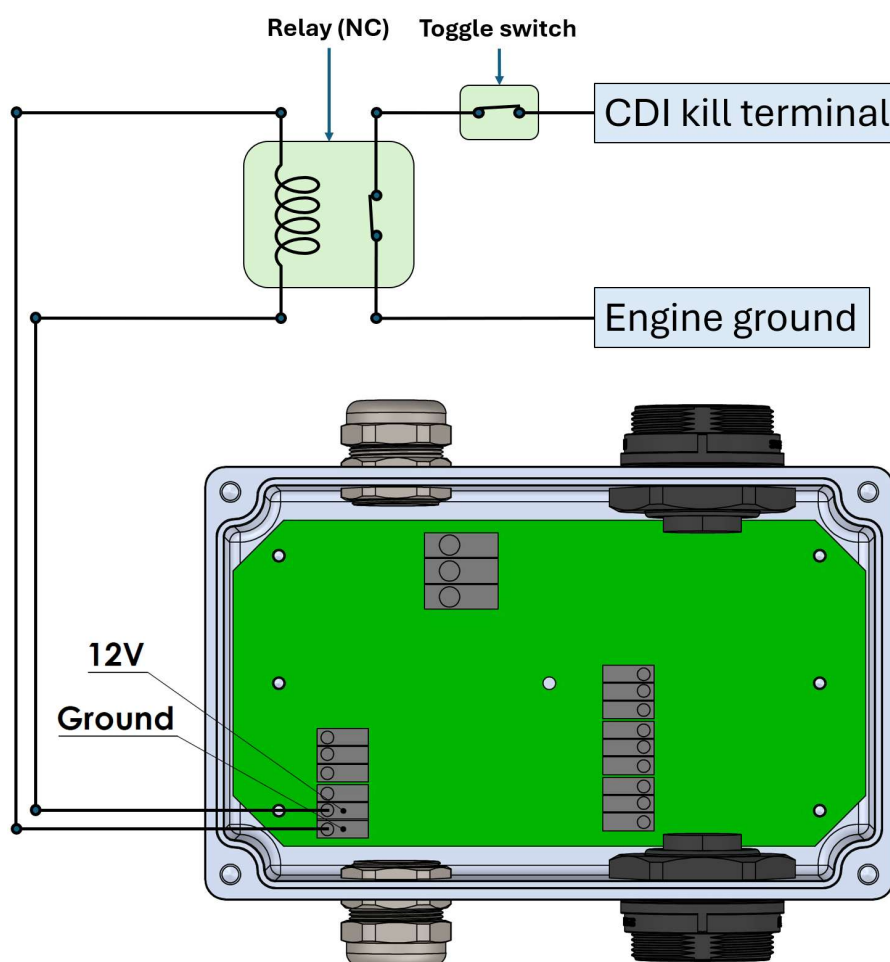


Figure 5: Kill switch installation diagram, with location of 12V and ground terminal in connection box.

The terminals for the 12V signal and ground, used to energize the relay coil, can be accessed through the plugged cable gland beside the steerer contact on the connection box.

## **i** NOTICE

The first time installing the Steering actuator, the Emergency steering shall be tested to ensure that there is enough space for proper installation, and to gain experience with the installation process in case of emergency.

### **Installing the Emergency Steering (In case of system failure)**

1. Disconnect the triangle attachment plate from the steering actuator lid, by removing the 220mm M8 bolt. Then thread the bolt through the bend ears of the Emergency steering attachment plate and the triangle attachment plate.
2. The bolt on the Emergency steering handle arm is passed through the hole in the attachment horn on the Steering actuator. A washer and locknut is used to secure the bolt.
3. The Emergency steering handle arm is connected to the attachment plate, through one of the 3 holes, using the included 30mm M8 bolt, 2 washers and locknut.
4. You should now be able to slowly steer the outboard motor manually by using the handle to turn the engine.

*The installation guide for the emergency steering can also be found on its storage case, for easy accessibility.*



*Figure 6: Emergency steering installed on steering actuator.*

# E-150-1 system variations and configurations

The Jefa electric steerer comes in 3 different versions as listed below:

## E-150-1S

The standard steering system, which offers basic steering functionality for a single outboard engine. This includes the Steerer, Actuator and the Standard box.

## E-150-1M

Has the same functions as the standard system but adds the possibility to connect with a Garmin autopilot and to connect a Link box for multi engine installations. This includes the Steerer, Actuator and the Master box.

## E-150-1L

Is an expansion to the E-150-1M system, made to steer one additional outboard engine. Multiple E-150-1L systems can be linked to one E-150-1M system. This includes the Actuator and the Link box.

For the different system versions there are three variants of the Connection box, with alternative plug setups:

- The **Standard box** offers basic steering functionality for a single outboard engine, without the ability to connect to a Garmin autopilot.
- The **Master box** has the same connection points as the Standard box, with the addition of an additional contact for connecting a Link box and plugs for drive and rudder feedback signals for directly connecting to a Garmin autopilot.
- The **Link box** has a contact for connecting a steering actuator and a power cable, like the other connection boxes. It also has a plug for connecting to the Master box, or other link boxes, and a contact for chain connecting additional Link boxes.

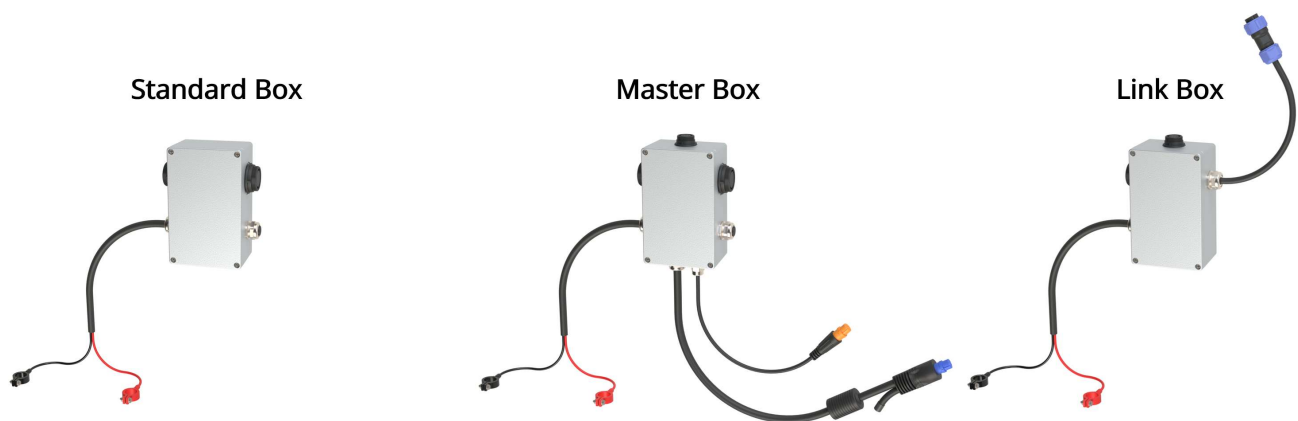


Figure 7: Connection box variations - Standard box, Master box and Link box.

## Garmin setup

The E-150-1M can connect directly to the Garmin autopilot (ECU) using the designated cables on the Master box.

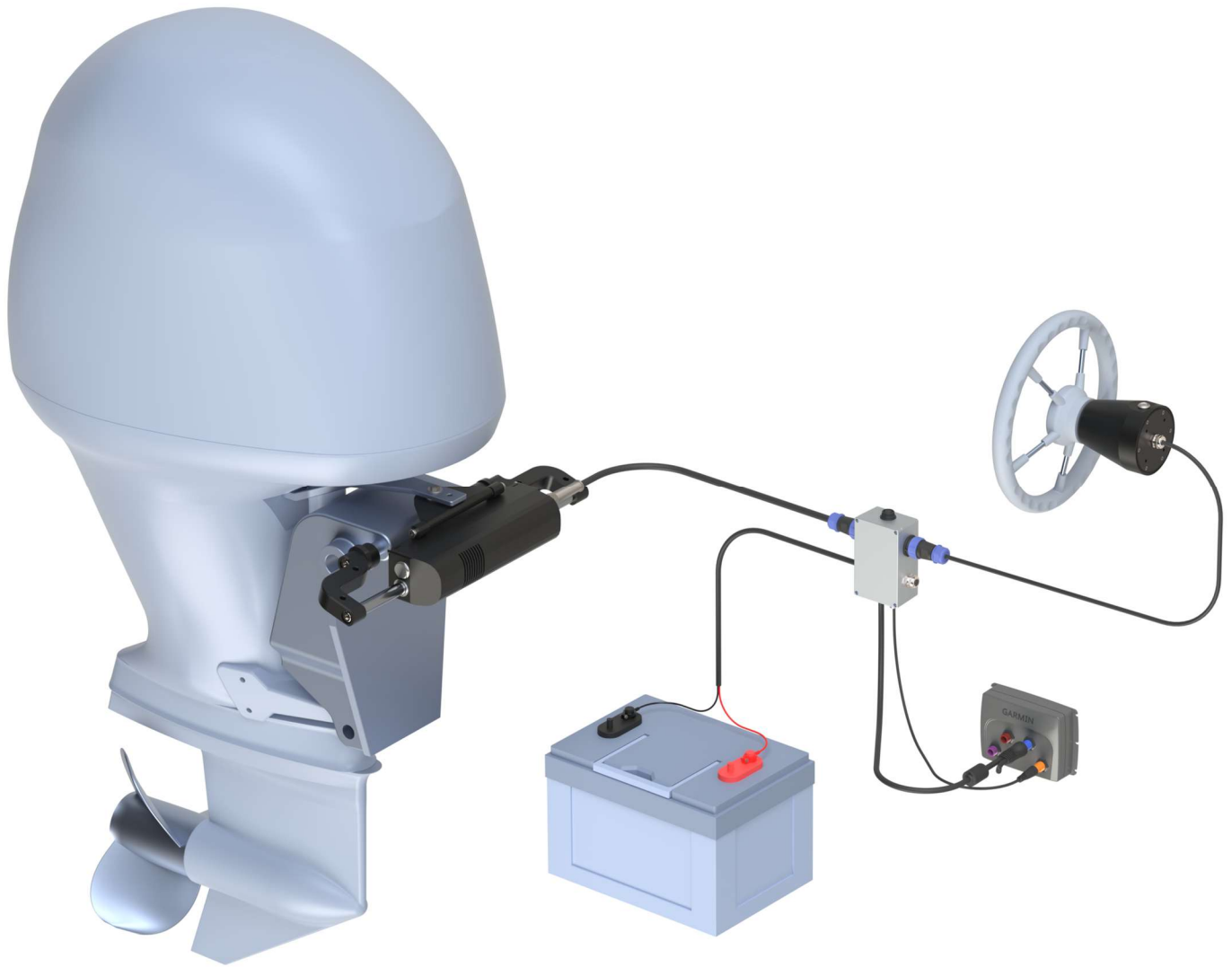


Figure 8: E-150-1M Garmin setup.

When the E-150-1M system is installed with a Garmin autopilot, as shown above, the Garmin autopilot can be calibrated, and the steering system will be ready to use. (*The Installation guide if found on pages 6-9.*)

### Shadow drive

For sailing with Garmin autopilot the Jefa electric steerer has a built in “Shadow drive” function. When the autopilot is actively controlling the steering system, you can take over control by moving the steering wheel. Then, after not having moved the steering wheel for 5 seconds, the Garmin autopilot will take back control and steer back to the set course. This enables quick and seamless takeover of steering control, while the autopilot is active.

## Multiple Outboard Engines Setup

By combining the E-150-1M system and one or more E-150-1L systems multiple outboard engines can be controlled using one steerer.

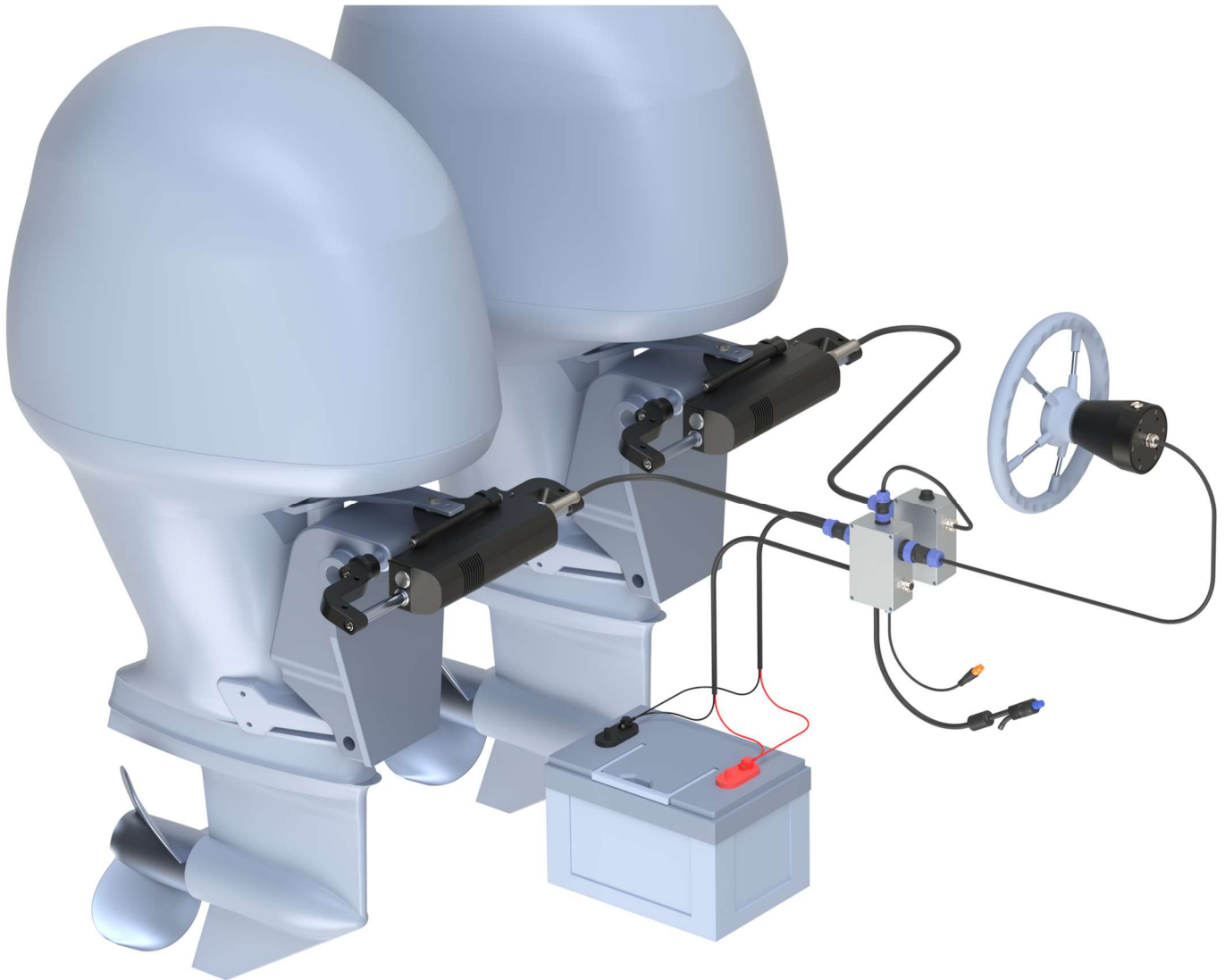


Figure 9: E-150-1M and E-150-1L multiple engine setup.

The Link box from the E-150-1L system is connected to the Master box from the E-150-1M system to add the connection point for an additional steering actuator. The steering actuator will receive the same steering signals as when connected directly to the Master box, for an immediate response. In addition, it will receive a position signal from the steering actuator connected to the Master box, to correct any misalignment. Multiple E-150-1L systems can be chain linked, and each connection box shall be connected directly to the power source.

### WARNING

A functioning steering actuator shall always be plugged into the Master box while steering. Not following this can result engine misalignment.

# Functions and Proper Use

## Operation

This section provides instructions for the safe and effective operation of your electric steering system.

### NOTICE

Do not operate the boat if any of the steering system appears damaged or functions abnormally. Have the system inspected and repaired by a qualified technician before use.

### Starting the System

1. Ensure the area around the outboard motor is clear of obstructions and people.
2. Turn on the boat's electrical system or ignition. As the system initializes the alarm and LED in the steering wheel hub will activate three times to indicate startup. Do not turn the wheel during this process.
3. Turn the steering wheel and verify that the steering system has established connection between the steering actuator and the steering wheel hub, linking their current position.
4. Make note of the engine position and, if necessary, adjust before sailing.

### Normal Operation

- The steering system operates similarly to a conventional steering system – Turn clockwise to steer to starboard (right) and counterclockwise to steer to port (left).
- The electric steering system provides a consistent steering feel regardless of boat speed or engine power.
- When the steering wheel reaches its maximum rotation in either direction, you will feel the steering wheel brake engaging. Turning the wheel against the brake won't affect the steering system.

### Shutdown Procedure

1. Center the outboard engine(s) using the steering wheel before shutting down the engine(s).
2. Turn off the boat's electrical system or ignition switch. (Alternatively at designated power switch depending on installation).
3. The electric steering system will automatically power down.

### Emergency steering system deployment

1. Ensure the outboard motor is stopped and the area is clear
2. Locate emergency steering storage case with the components and tools for installation.
3. Follow the installation instructions as specified under the "Installing the Emergency Steering" section on page 7.
4. Verify secure attachment before attempting to steer.

## Considerations During Operation

For safe operation of the steering system the following guidelines should be followed.

### **WARNING**

The following considerations are important for the safe operation of the steering system, failing to do so could result in loss of control and, or serious injury or death.

#### **Keep at a safe distance from engine and actuator:**

When the steering system is active proper distance from the engine and actuator should be kept at all times. Dangers associated with being too close to the actuator and engine during operation are, crushing resulting from engine movement or damage to hand or fingers from getting stuck in the actuator.

#### **Do not leave helm station unattended:**

While sailing the helm station, where the steerer is located, should be attended at all times. Accidental changes to the steering wheel position could alter the crafts trajectory, which could lead to crashing or passengers losing their footing.

#### **Keep track of battery usage:**

The electric steering system draws power from the boat's battery. Extended use without running the engine may deplete the battery.

#### **Emergency steering:**

In the event of system failure, the steering system will maintain its last position but will not provide powered assistance. The manual emergency steering attachment should be mounted to the steering actuator immediately, to allow manual steering of the craft.

If system failure occurs the built-in alarm, in the steerer, will activate to notify the operator. To turn off the alarm, system power should be shut off. This is done by either decoupling the systems power connection to the battery or by unplugging the cables to the steerer and actuator from the connection box.

# Inspection and Maintenance

## NOTICE

Continuous failure to follow the inspection and maintenance requirements for the system might result in degradation of system performance, and or system failure.

All components should be regularly inspected (*≈ every 100 hours of use*) for rust or non-superficial damage.

### **Proper inspection should include:**

- Seals on actuator shaft.
- All exposed rubber grommets and O-rings
- Cable connection to the actuator housing.
- Cable connections on the connection box.
- Cable connection to the steerer (if exposed).
- Surface of actuator shaft.

Any significant rusting, degradation or non-superficial damage could impact the system's ability to keep out water and potentially result in system failure.

### **Regular maintenance should include:**

- Cleaning of actuator shaft. Minimizing the amount of dirt or salt accumulating on the shaft will aid in maintaining the integrity of the seals, smooth operation and extend service life.
- Replacement of any component with significant rusting, degradation or non-superficial damage.

Yearly maintenance should also include application of a light oil to the actuator shaft. Do not use grease as this can gather within the shaft seals, compromising waterproofing.

For component replacements, please contact Jefa Steering A/S using the contact information provided in the following section.

## Contact Information

Should you require assistance with your electric steering system, please contact Jefa Steering A/S using the information below.

-  **Phone:** +45 46155220
-  **Email:** sales@jefa.com
-  **Website:** Jefasteering.com
-  **Hours:** 9:00 AM – 3:00 PM (CET)

# Warranty Conditions and Limitations

## Warranty:

- JEFA Steering issue a two-year warranty on all their products covering manufacturing and material defects on condition that the products are used in normal fashion. The warranty shall apply for two years from the moment JEFA Steering sell the product concerned (to the first Purchaser).
- Within the period of the warranty, and in accordance with the terms of the warranty JEFA Steering undertake to replace or repair all defective components which have been used in normal fashion.
- However, the warranty is subject to the limitations and exceptions outlined below.

## Conditions and limitations:

- JEFA Steering liability shall be limited to repair or replacement of components which are defective owing to manufacturing or material defects.
- JEFA Steering assume no other liability than this, not even liability for indirect losses caused by the defect concerned, including operating losses, loss of profits, or damage caused to real property or moveable property occurring while the product concerned is the possession of the Purchaser.
- The Purchaser alone shall bear the responsibility and risk involved as to whether the products are suitable for the application intended. JEFA Steering assume no liability in this connection.
- JEFA Steering assume no liability for defects which occur due to use of their products for purposes for which they are not intended, or for defects which occur owing to incorrect installation, corrosion, ultraviolet degradation, lack of maintenance, or any alteration or repair of the product carried out incorrectly by the Purchaser. Finally, JEFA Steering assume no liability for normal wear and tear, or for depreciation of value.
- Nor do JEFA Steering assume any liability for service carried out by anyone other than authorized representatives of JEFA Steering, unless such service is carried out pursuant to guidelines laid down by JEFA Steering and in accordance with good craftsmanship.
- The Purchaser shall inform JEFA Steering in writing of any defects with no undue delay once defects have been registered. Products being dealt with under the warranty shall be returned to JEFA Steering for repair unless any other agreement has been reached in writing.
- JEFA Steering shall not cover costs incurred by the Purchaser in connection with the transport or wages involved in a warranty case. Such costs shall be met by the Purchaser in full.

## Document Information

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