

# Installation Instructions

**For Electric Propulsion Systems**  
**Thoosa 6000, Thoosa 7000/7000HT, Thoosa 9000,**  
**Thoosa 13000, Thoosa 17000**  
**Ver. 2007.2**

# **Installation Instructions**

## **48 - 96VDC Electric Propulsion Systems**

Thank you for purchasing your Electric Propulsion System for your boat from **NGC Marine Products, Inc.** The quality and reliability of the systems will give you years of peak performance with a minimum of maintenance.

### **Before Installing**

**Important Note:** Even though 48-96VDC is not considered capable of causing death by electrocution, there are certain precautions to be taken when working and operating a system powered by high capacity batteries. Make absolutely sure that no conductive object, such as wires, cables, tools and other instruments made of metal or conductive material, touch both terminals of any battery or battery combinations at the same time. If necessary, cover opposite terminal(s) when working on a particular battery terminal. Failure to follow these guidelines, could lead to situations where severe injury would result. High capacity batteries are capable of delivering a tremendous amount of electrical current, which can cause serious burns, explosions and/or fire.

Touching bare battery terminals will cause a tingle or shock, although not lethal, the reaction to this sensation can cause indirect injuries.

If you are not comfortable with working on electrical systems, please contact a certified marine electrical installation technician.

### **Unpacking the System**

Before proceeding with the installation, make sure that all parts are included ready to install.

The system should consist of:

1. Motor Assembly w/ standard 4 bolt shaft coupler or other type coupler for 30mm console shaft.

**Important:** If coupling is attached to shaft, please remove and follow the installation procedure found at the end or on a separate instruction sheet obtainable from NGC Marine.

2. Mounting Rails

3. Controller with Motor and Battery Cables attached.

4. Key Lock (with cable + LEMO Plug)

5. Charger cable (if ordered)

6. Throttle w/ mounting hardware (depending on type). Throttle must be selected and ordered separately. In some cases, the controller must be set up to match the throttle. A cable with LEMO Plug is included.

And if ordered, optional Battery Monitor with cable and LEMO Plug.

If any part(s) are missing, please notify us as soon as possible.

## Tools needed

All fasteners are metric. Most of the assembly can be accomplished with a set of Allen wrenches 3mm – 10mm, socket set or wrenches 10mm – 17mm, misc. screwdrivers and tools for wire and cable work, including a heater for heat shrink tubing.

## Installation

Always connect the batteries LAST. Batteries should be installed in such a way that they maintain the balance of the boat and as low as possible to make sure that the center of effort for the boat is not raised.

Since the location of the motor assembly is given, find a location for the controller that is close to the motor and still in a fairly dry and well-ventilated position.

## Motor Assembly.

Attach the mounting rails as shown in the picture (Step 1). There is a little bit of play in the mounting rail slots, but the final alignment should be performed with the motor mount adjustments. Before selecting motor mounts, measure the distance that the propeller shaft is below (typical) the mounting level for the rails. The distance from the center of the motor coupling to the bottom of the rails is about 3.5". Find the approximate height of the engine mounts to use as 3.5" minus the distance measured for the propeller shaft level. Allow for some length for adjustment. Since all installations are different, the mounts are not included with the system.

Before attempting to align the motor assembly with the propeller shaft, make sure that the propeller shaft is suspended or otherwise supported in a position representing the best possible alignment of the shaft within the stuffing box or drip-less and cutless bearing, or similar depending on type of installation.

Next step is to determine the location of the mounts such that the two flanges meet.

The mounts are installed and the motor assembly is placed such that the motor side coupling meets the prop shaft side coupling and the adjustments of the mounts are used to position the motor assembly such that both halves rotate perfectly if the bolts are installed. When this is accomplished, the bolts can be installed. Make sure that the propeller shaft coupling is secured to the shaft with several setscrews (or the mounting bolts for Sleipner or Stafford couplings supplied by NGC Marine) or better with screws and a pin through the coupling and shaft. In case one or both coupling(s) are supplied by NGC, it is important that the instructions are followed without any deviation what so ever. If in doubt consult NGC Marine. It is **important to notice** that the motor side coupling may be attached to the 30mm shaft when delivered from NGC Marine, but it is **NOT** secured properly. This is easily recognized by the bolts being loose, but that is not necessarily the case. Please remove the motor side coupling and reattach

following the procedure at the end of this manual or as supplied on a separate sheet.

Final fine-tuning can take place when the controller and batteries have been installed.

## **Controller**

Select a suitable spot close to the motor assembly to mount the Controller. A good place is a solid surface such as at least ½" wood or a similar surface such as fiberglass. The Controller should be in a place that is dry and with space around it for sufficient ventilation and so it does not get direct heat from motor. The mounting surface can be vertical, horizontal or even at an angle. A vertical mounting will give the best circulation of air through the controller.

Next, cut the motor cables to fit the distance to the motor and attach lugs. The cables should be as short as possible for minimum losses, but allow for some length to twist the cables into what is referred to as a "twisted pair". Then attach the cables to the motor. Depending on circumstances and location the installed battery cables can be used as is. As with the motor cables, they should be trimmed to the shortest possible length. An AWG 2 (35mm<sup>2</sup>) marine grade (or Boat Cable) is installed. For longer distances than the cables will reach, heavier cable should be used. In this case, the heavier cable will cover most of the distance, but the entry to the controller can only be AWG2. Cut the attached battery cables to a convenient length and use the heavier cables for rest of the run to the batteries. This is to minimize watts losses as well as voltage drop between controller and battery terminals. Voltage drop will lower the performance of the motor.

## **Batteries**

Please use sealed batteries, such as GEL or AGM type batteries, not only can they handle the charge and discharge cycling much better than flooded cell, they are also maintenance free and because they are sealed, there are no emissions of explosive gasses. Storage is also easier, they can be placed in any position, except for up side down.

It may take some time and consideration to find the ideal spot for the batteries. The more batteries installed, the harder it is. Make sure the balance of the boat is maintained. Place them in a position as low as possible in the boat and evenly distributed around the centerline. As an example, if the electric propulsion system replaces a diesel, the motor, controller and batteries weigh the same as the engine they replace, the entire system will usually fit into the original engine compartment. Example: A Thosca 9000 powered by four 8G4D batteries replacing a Yanmar 3GM30 diesel.

Place the batteries in such a way that the Main Negative and Main Positive terminals are located close together and that the jumpers that connect the

remaining terminals are as short as possible. This can be a little bit of a puzzle, but it is worth the effort. Also keep the cables between the battery bank and the controller running close together in parallel. Cable ties could be used, as necessary. This keeps emissions of electrical disturbance to a minimum; a slight twist can pretty much eliminate it.

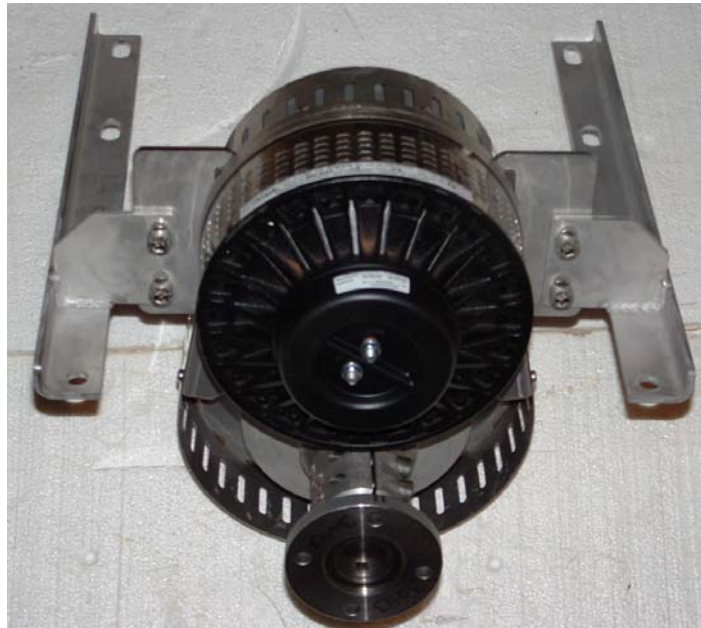
## **Cable preparation and installation.**

All cable terminations should be finished with either a suitable ring lug or other solid connection, DO NOT use non-permanent connections like jumper cable clips or similar. The lugs should have heat shrink tubing covering the barrel of the lug plus 1 – 2 inches of the cable end. Special conductive grease may be used to minimize corrosion, if deemed necessary.

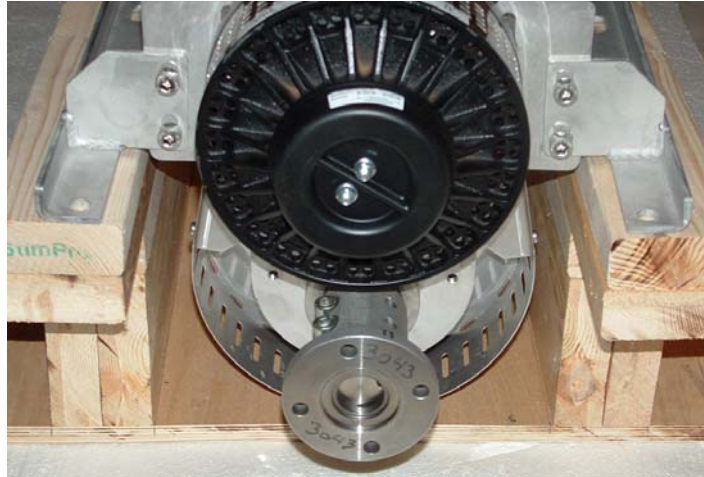
Connect the motor cable lugs to the motor terminals using suitable ¼ inch bolts with lock nuts and washer.

## **Installation Quick Guide**

### **Step 1. Mount the Rails**



**Step 2. Place assembly in Position (Mounts should already be placed)**



**Step 3. Connect Cables**

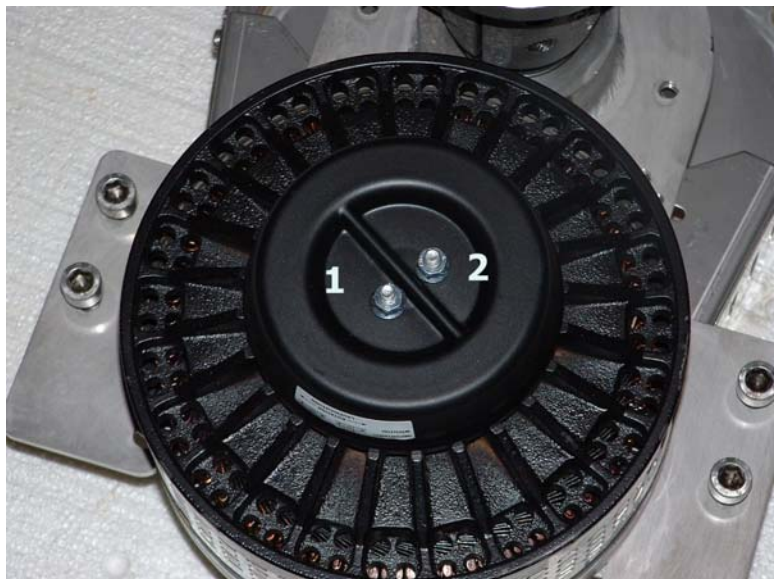
**B+ : Battery PLUS (RED CABLE)**

**B- : Battery MINUS**

**M1 : Motor Terminal 1**

**M2 : Motor Terminal 2**

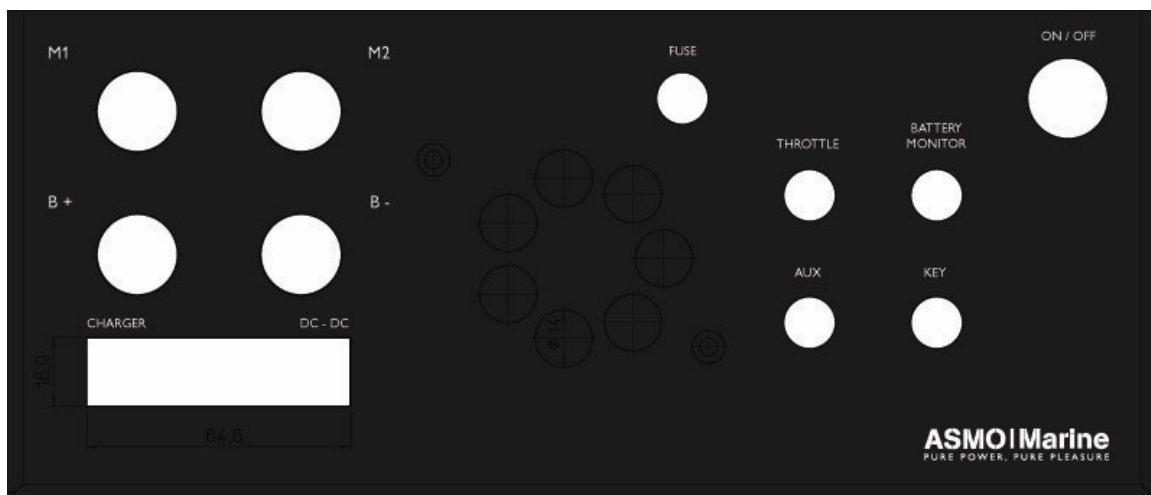
**Step 4a. Motor Terminals (Thoosa 6000 and 7000)**



### Step 4b. Mount Controller (Thoosa 7000HT and up)



### Step 5. Controller Inputs and Outputs



**ON/OFF:** Main Power Switch  
**BM :** Battery Monitor (Link 10 or XBM)  
**B+ and B- :** Battery Cable Glands  
**M1 and M2 :** Motor Cable Glands

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**Throttle :** Throttle Connector  
**KEY :** Key Lock Connector  
**AUX :** Unused

**CHARGER :** Charger plug, please use the included cables (if ordered)  
**DC-DC :** Attachment for DC/DC converter, please use included cables (if ordered).

The Key-Lock, Throttle and Battery Monitor cables come with matching LEMO plugs, locate the little red dot on the plug, it should be lined up with the text on the input connector. If it is necessary to remove the plug, pull back the outer part of the plug to un-lock it.

**Step 6. Mount Throttle (see separate instructions), Key Switch and Battery Monitor (see Link 10 or XBM Manual).**

**Step 7. Happy Sailing from NGC Marine Products, Inc**

**Motor Assembly and Controller dimensions and the end of these instructions.**

**In case you have any issues and questions about the performance of the system please let us know.**

**If repair of system parts is necessary please call us and arrange for a return of the product so we can take care of it as soon as possible. Product that are still under warranty (1 year) will be replaced free of charge.**

**IF the product returned is out of warranty, we will quote the cost of the repair after examining the returned product.**

## **Installation Instructions**

### **Shaft Couplings for Thoosa EP Systems**

### **Sleipner Type Couplings**

In order for the system to work properly, the following steps must be taken when installing the coupling(s). This is for both motor side and propeller shaft side. Failure to follow these instructions can result in severe system and vessel damage.

1. Remove any oil, grease, dirt and other foreign elements from the shaft surface in the area where the coupling will be located and from the inside mounting surfaces of the coupling. If any shaft modifications have been performed, de-burr the affected areas.
2. Insert a wedge or a large screwdriver in one slot and expand the slot until the coupling can slide over the shaft. Make sure that the tool used to expand the coupling does not protrude into the inside cavity of the coupling because it will not be possible to place the coupling on the shaft or at worst, the shaft will sustain damages.
3. Remove the wedging tool and tighten the bolts, starting with the two bolts closest to the flange followed by the next two bolts and so on.

Torque for M10 bolts:	30 lb.ft. (40Nm)
Torque for others:	Consult NGC Marine

4. Re-tighten the bolts following the same order as under 3.

Torque for M10 bolts:	55 lb.ft. (75Nm)
Torque for others:	Consult NGC Marine

To remove the coupling, loosen the bolts and insert the wedging tool as indicated above and remove the coupling.

## **Installation Instructions Shaft Couplings for Thoosa EP Systems Stafford Type Couplings**

In order for the system to work properly, the following steps must be taken when installing the coupling(s). This is for both motor side and propeller shaft side. Failure to follow these instructions can result in severe system and vessel damage.

5. Remove any oil, grease, dirt and other foreign elements from the shaft surface in the area where the coupling will be located and from the inside mounting surfaces of the coupling. If any shaft modifications have been performed, de-burr the affected areas.
6. If necessary, insert a wedge or a large screwdriver in one slot and expand the slot until the coupling can slide over the shaft. Make sure that the tool used to expand the coupling does not protrude into the inside cavity of the coupling because it will not be possible to place the coupling on the shaft or at worst, the shaft will sustain damages.
7. Remove the wedging tool and tighten the bolts, starting with the two bolts closest to the flange followed by the next two bolts and so on.

Torque for 1/4-28 bolts:                      110 lb.in. (12 Nm)

8. Re-tighten the bolts following the same order as under 3.

Torque for 1/4-28 bolts:                      190 lb.in. (22 Nm)

9. To remove the coupling, loosen the bolts and insert the wedging tool as indicated above and remove the coupling.
10. This is for a 1" propeller shaft. For other diameters, there might be an adapter included. The procedure is basically the same for both pieces.
11. For information on the couplings, please visit:

<http://www.staffordmfg.com/pages/engdata.htm>

## **Instructions for Connecting Xantrex Battery Monitors**

Normally the battery monitor comes with the supplied cable attached, but in case they are disconnected or shipped separately, this instruction sheet helps with reconnecting the cable and the Battery Monitor.

There are basically two models of the Xantrex Battery Monitor, the Link 10 and the XBM. Note that the cables for the two types are NOT interchangeable. If the XBM was ordered, the cable supplied cannot be used with a Link 10. The cable supplied with the XBM must not be trimmed in length because the cable end that connects to the monitor has been prepared specially. Please leave as it is supplied.

<b><u>Wire Color</u></b>	<b><u>Link 10</u></b>	<b><u>XBM</u></b>
<b>Grey</b>	<b>1. -DC</b>	<b>-</b>
<b>Green</b>	<b>2. -I</b>	<b>I-</b>
<b>Yellow</b>	<b>3. +I</b>	<b>I+</b>
<b>White</b>	<b>4. Batt Voltage</b>	<b>Va</b>
<b>Brown</b>	<b>5. +DC</b>	<b>+</b>





## **Mounting Instructions for Throttle** **Side Mount Version for Thoosa**

- 1. If necessary, remove the throttle knob (6) from the body (4). Remove the nylon screw (7) form throttle knob.**
- 2. Locate a convenient position on bulkhead (2) for the throttle and cut a hole according the template.**
- 3. Pull the cable through the thin large diameter o-ring (3) and the cutout for the throttle body. Position the o-ring in the recess around the outer edge of the throttle body.**
- 4. From the back, pull the cable through the retaining ring (1) with the 4 PEM nuts and line it up with the holes drilled according to mounting template.**
- 5. Insert the screws (5) and fasten to the retaining ring until tight. Watch that the o-ring stays in place.**
- 6. Align the knob with the threaded hole in the shaft and push it in place. Insert nylon screw and fasten.**

