

# Instructions for Installing Your Electric QuietTorque™ QT 5.0 or QT 10.0 Motor System



## List of Equipment Supplied:

- 1 - Motor Assembly
- 1 - Sheet metal cover (p/n 40182)
- 1 - Shaft coupler and square keys (size for your propeller shaft)
- 1 - Battery Power Switch
- 1 - Class-T Fuse and holder
- 1 - Relay (also commonly called a “contactor” or “solenoid”)
- 1 - Throttle assembly w/ key switch and attached cable (p/n 01005)
- 1 - Battery Monitor (display) w/ attached cable (p/n 01056)
- 1 - Mounting hardware kit (p/n 01022)
  - 4 - L-Brackets
  - 4 - Mounting feet w/ ½-13 jackscrews
  - 8 - 3/8” x 2 1/2” lag screws
  - 8 - 3/8” flat washers
  - 8 - ½”-13 hex nuts
  - 8 - ½” flat washers
  - 8 - 5/16-18 x 7/8” hex bolts
  - 8 - 5/16” flat washers
  - 2 - #6 x 1” Phillips head screws (for mounting display)
  - 2 - #6 x 1 ¾” Phillips head screws (alternate screws for mounting display)
  - 6 - 10-24 x ½” screws and flat washers (for mounting cover)
  - 8 - #8 x ½” Phillips head screws (for mounting throttle)
- 1 - Charge Current Sensor (Optional)

## **List of Tools Needed for Installation:**

1/2" combination wrench (open and box end) or socket  
9/16" combination wrench or socket  
3/4" combination wrench  
1/8" hex wrench (Allen wrench)  
3/16" hex wrench  
#2 Phillips screwdriver  
3" hole saw  
1" drill or hole saw  
5/16" drill  
5/32" (0.156") drill  
Electric drill

## **Unpacking:**

You will have received your motor kit in a cardboard carton. In it are several smaller cardboard cartons containing the components shipped with your order. Unpack both boxes, making sure there are no components buried in the packing material.

NOTE: We only use biodegradable packing materials. However, some of our suppliers do not. Rather than send the non-biodegradable packing materials directly to a land fill, we use them as filler inside the outer carton, getting a second use and reducing the amount of new material needed.

## **Installation Preparation:**

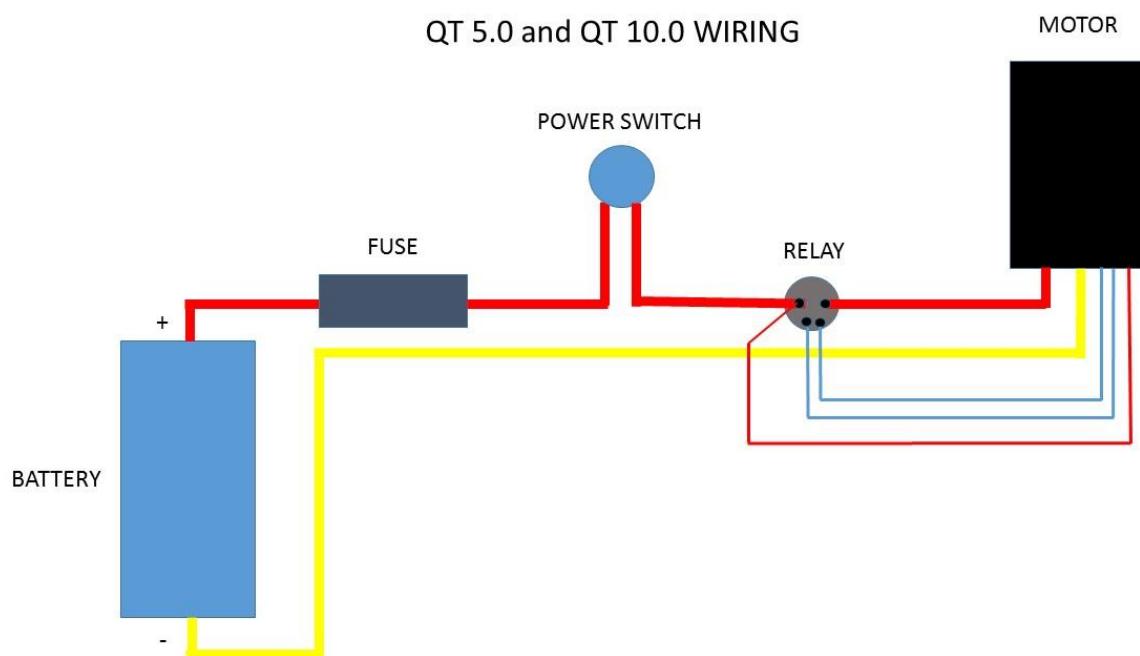
If you are repowering, you likely have a situation where many years of oil, grease and dirt have accumulated in your engine compartment. It is strongly urged that you take the time to degrease, sand and paint the wood and fiberglass in this area. This will greatly help in getting rid of the fossil fuel smell that commonly permeates this space. It is much easier to do this when the old engine and associated hardware have been removed and before installation of the batteries and electric motor have begun.

## Battery Installation:

**Warning:** It is very important to provide sufficient ventilation in your battery compartment area. Flooded lead/acid batteries routinely give off hydrogen gas when charging. Even AGM and GEL batteries can outgas, if overcharged. Since hydrogen gas is lighter than air, always provide ventilation at the TOP of the compartment. Also, provide ventilation at the bottom to help facilitate airflow.

1. Before starting, measure up your desired spaces and make sure the batteries you wish to use will fit. Be sure to allow some space and access above the batteries for watering and/or terminal cleaning.
2. Locate all the batteries and secure in place. This is usually the most time consuming part of the installation.
3. Connect all the batteries in a series string in a (-) to (+) configuration. Always use a wrench with plastic coated handles when tightening battery terminals. If one is not available, wrap the handle with electrical tape. Batteries can produce very high currents in a short circuit situation that will melt (weld) metal and cause serious burns.
4. Use a volt meter and verify the correct voltage at the (-) and (+) battery terminals. A fully charged 48V (nominal) lead-acid battery bank will measure 50Vdc – 51Vdc.
5. Run a cable from the battery (-) to the area where the motor will be installed. Traditionally, black was used. Current ABYC standard calls for yellow jacketed cable for this connection. We recommend 2 AWG (or larger) marine grade battery cable for a QT 5.0 installation and 2/0 AWG for a QT 10.0 installation. Refer to ABYC standards for additional guidance.
6. Install fuse as close as practical to the (+) battery terminal. Leave the connection to the (+) terminal of the battery disconnected for now. Use red cable for the positive side connections.
7. Install the master power switch.
8. Make sure master power switch is off.
9. Install the relay (also sometimes called a “contactor” or “solenoid”) after the power switch. Notice there is a (+A1) polarity marking on one of the large studs. This stud should be on the battery side. Connect the cable from the master power switch and the red 18AWG wire from the motor controller. The terminal on the red 18AWG wire should be on top of the current carrying cable. Normally, the relay is installed near the motor, but can be anywhere between the master power switch and the motor.

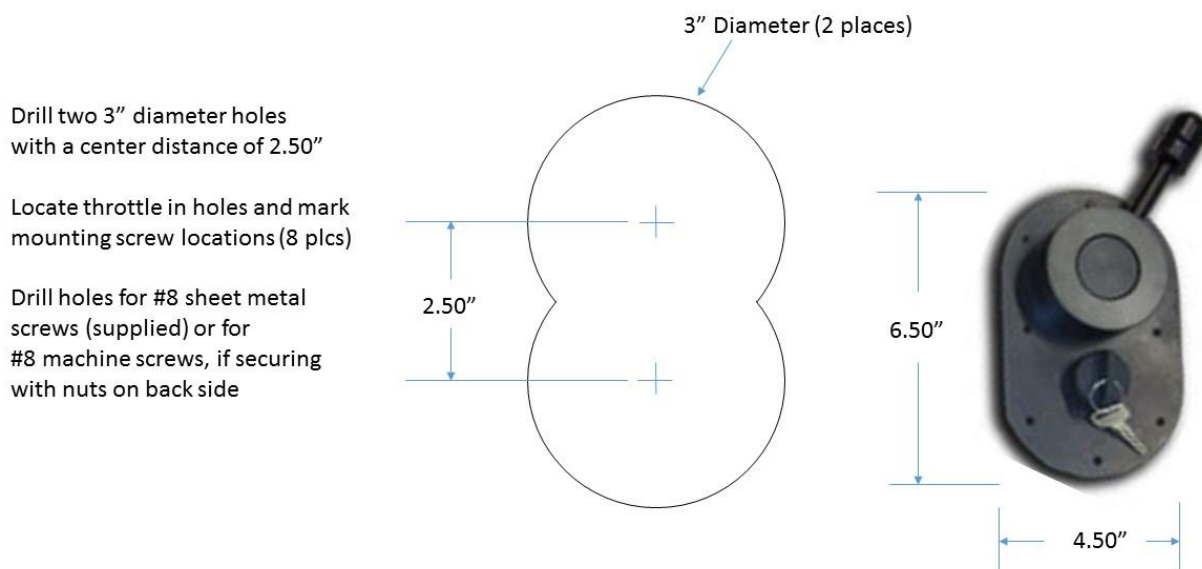
10. Connect the two blue wires to the two smaller coil connections on the relay. They are not polarity sensitive.
11. Connect a cable to the other large stud and run to the area where the motor will be installed.
12. Route cables together, as shown in the sample connection drawing below. This helps minimize electrical interference to your VHF radio and minimizes any risk of magnetic interference that could affect your compass. Long runs may also be twisted. Do not bundle with other wiring.



## Throttle Installation:

1. Locate a convenient area in the cockpit. This should be a flat surface. Often, there is already a hole where the old engine controls were. A sheet aluminum plate can be cut to fit, in this case.
2. If you have a throttle with a key switch mounted (standard), cut two 3" (80mm) holes with a 2.50" (64mm) center distance between the holes. Typically, these are aligned vertically, but can be in any convenient orientation. If you have a separate throttle and key switch, cut a 3" (80mm) hole for the throttle and a 0.875" (22mm) hole for the key switch.
3. Put throttle control in place and mark the screw holes.
4. Drill holes for the desired screws and secure in place. Use a sealant such as 3M 5200 around the flange of the throttle quadrant to make it water tight. #8 x 1/2" Phillips head screws (provided) or #8-32 x 1/2" machine screws with backing nuts are typical choices.
5. Run the cable(s) to the area where the electric engine will be installed and secure in place.

Throttle Mounting Template



### **Battery Monitor Installation:**

1. Find a location in the cockpit to install the Battery Monitor. This should be a flat surface with good visibility from the normal steering position.
2. Use Fig. 1 at end of these instructions to determine hole placement for mounting. If desired, cut out and use as a template.
3. Drill the appropriate holes.
4. Apply sealant around the holes and drive in provided screws from the back side. You will see two white dots on the back of the monitor. These are pre-drilled holes and have been filled with white silicone sealant. The sealant will be pushed out of the way as the screws are tightened. Use the shortest #6 screw that will provide at least  $\frac{1}{4}$ " (6mm) engagement with the holes in the back side of the battery monitor. #6 x 1" and #6 x  $1\frac{3}{4}$ " Phillips head screws are supplied and will work for most installations. They should protrude no more than 1" into the battery monitor.
5. Run the cable to the engine area and secure.

## Electric Engine Installation:

1. If the boat is out of the water, it is a good idea to remove the shaft and check it for straightness and signs of corrosion. Also, renew the packing and, if necessary, the cutlass bearing.
2. After removing the old coupling flange, clean the end of the shaft with an abrasive pad, or fine sandpaper. If the boat is in the water, be very careful not to push it out. File off any burrs caused by the old coupling, etc.

Note: A wheel puller or a reciprocating saw (Sawzall) may be needed to remove an old coupler. If cutting with a saw, cut lengthwise being careful not to cut into the shaft.

3. If the boat is in the water, tighten a hose clamp around the shaft to prevent it from being pushed out through the stuffing box accidentally.
4. If the aft end of the existing engine stringers extend to within 7" (17.8cm) of the forward end of the propeller shaft, you should have adequate shaft length. If not, you will need to extend the engine stringers or purchase a shaft extension from us.



New drawing

5. If the space between the engine stringers is at least 8" (20.3cm) AND the mounting feet can be mounted on 10" (25.4cm) – 17.5" (44.5cm) centers, you can proceed without modification to the engine beds. If the distance is greater than 18" (45.7cm), contact us. We can supply longer spacers.



6. If the center distance is less than 14.5" (36.8cm), assemble the mounting foot hardware without spacers.





7. If at least 14.5" (36.8cm), assemble the mounting foot hardware with the supplied spacers.



8. Four sets of mounting feet are supplied. Loosely bolt the two aft mounting feet to the motor frame at the height that matches up with the propeller shaft. Use removable (blue) thread locking compound on the threads. In many cases, the L-brackets will need to be inverted.



9. Move motor into position.
10. Adjust the height and location to get the shafts into alignment.
11. Drill holes through the hole at each end of each mounting foot and secure to engine beds with 3/8" lag bolts (supplied), or other appropriate hardware.
12. Remove the top caps from the shaft coupler.
13. Place the square keys into the slot on the other half of the coupler. The motor side will be a 1" shaft size with 1/4" square key. The other side will be sized for your shaft.

14. When the motor is properly aligned, the coupler will fit on the two shafts easily.



15. Secure the two halves of the coupler with the  $\frac{1}{4}$ "-28 x  $\frac{5}{8}$ " cap screws provided. Use removable thread locking compound on the screws. The screws should tighten easily without moving the shafts, if the alignment is good. Tighten screws firmly. Also, tighten bolts securing the L-brackets to the frame.

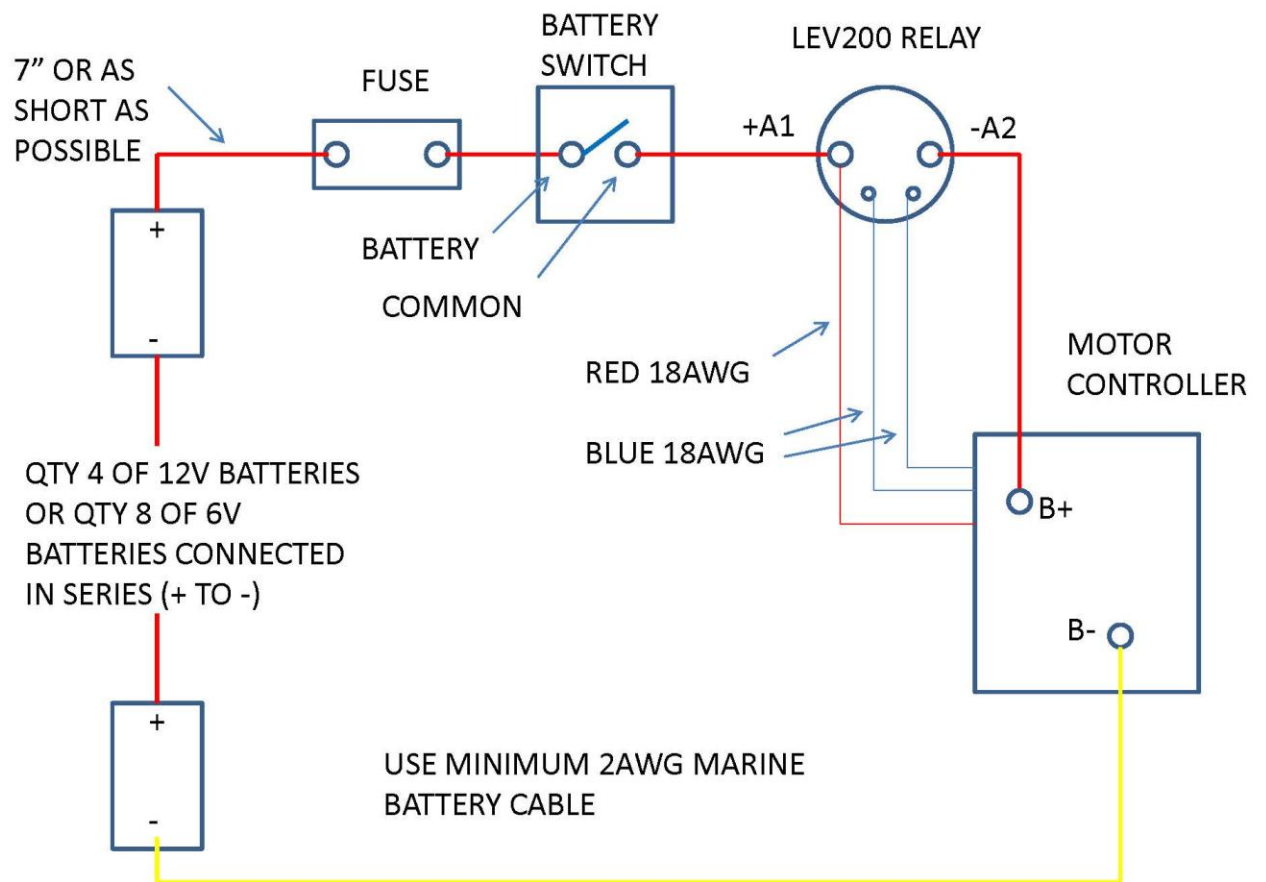


16. Install the forward mounting feet and L-Bracket. Do not tighten the ½” nuts at this time.
17. Connect the yellow (-) cable to the (B-) terminal on the controller. There will also be one or two smaller black wires with 5/16” terminals. Put these on top of the battery cable terminal and secure with the supplied bolt.
18. Connect the red (+) cable to the (B+) terminal on the controller. Also, connecting the cable that was already connected. MAKE SURE THIS POLARITY IS CORRECT. Reconnect the cable between the (+) battery terminal and the fuse or circuit breaker.
19. Connect the Throttle Control cable and Battery Monitor cable. They secure with a twist and are waterproof. The display connector has 8 pins and is marked “COMM” (for communication) on the controller. There are two connectors on the controller allowing for two displays, or communication to another Electric Yacht product. Either connection can be used. The throttle has 6 pins (female) and is marked “THROTTLE” on the controller. They also have an alignment post. Make sure to connect the correct connectors together and rotate until the alignment post is aligned. Do not force them together. They go together easily when properly aligned. Rotate the locking collar clockwise to secure.



20. Install and connect the (optional) Charge Current Sensor. It plugs into the connector labeled “CHG CURR” on the controller. See wiring diagram “Charge Current Sensor Connection.”

**\*\*\*Note: If you have a diesel generator, or intend to motor frequently with an auxiliary (suitcase) generator, this device is highly recommended. It will insure accurate state of charge and time to discharge information is displayed.\*\*\***



### Initial Checkout:

1. With the key switch in the “OFF” position (it can be removed in this position), turn on the Master Power switch. The Battery Monitor should display data. It takes several seconds to stabilize.
2. Connect a volt meter between the (B-) terminal on the motor controller and the (+) terminal on the relay. Verify correct voltage and polarity.
3. The Battery Monitor should say “KEY OFF” in small text at the bottom left corner of the display screen.



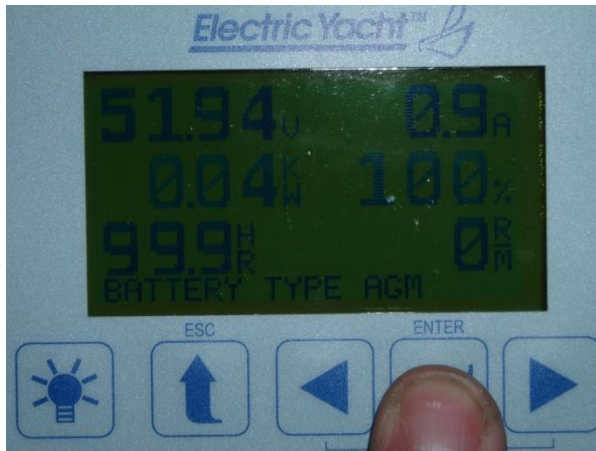
Press and hold the left arrow and right arrow buttons on the battery monitor (display) about 10 seconds until the bottom line of the display changes to show battery type. You are now in programming mode. Press the “ESC” key at anytime to exit programming mode and return to normal operation.

4. The “light bulb” key sets the backlight brightness for night time use.

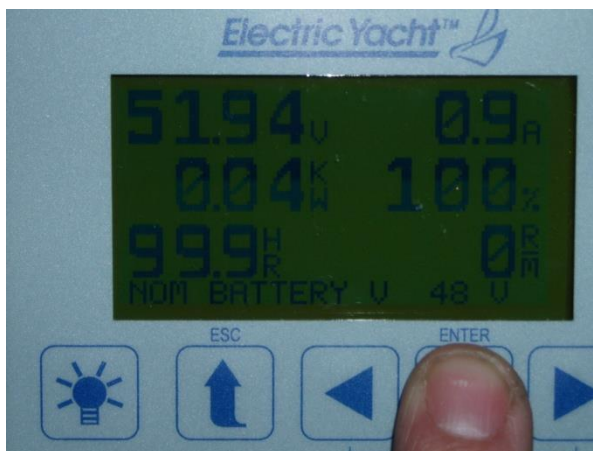


5. Use the left or right arrow to choose your battery type. Press the “ENTER” key.

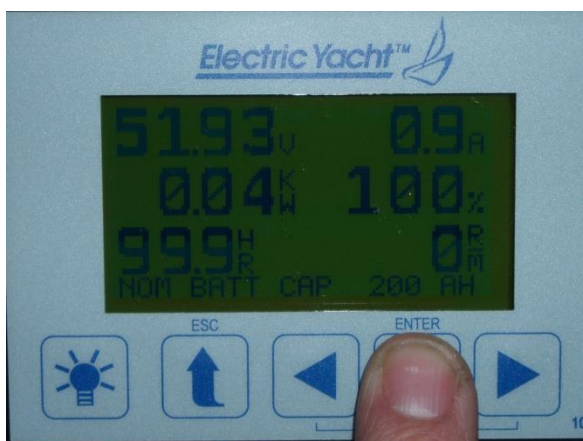




6. Use the left and right arrows to choose the nominal battery voltage. In most cases, this will be 48V. Press the “ENTER” key.



7. Use the left and right arrow keys to select the amp-hour capacity of your battery. Press the “ENTER” key.



8. Turn the key switch on. A “click” should be heard as the power relay is energized. With the boat securely tied to a dock, or in an area of open water, slowly advance the throttle. Use the right or left arrow to advance the number on the screen until there is propeller rotation. If the propeller is driving the boat forward (ahead) direction, slowly advance the throttle to full and slowly advance the number on the screen until the motor does not increase in speed with further advance. If the propeller rotation is driving the boat in the reverse (astern) direction, press the other direction key to move the number through zero. Move the throttle fully ahead and advance the number until no further increase in motor speed occurs. Press the “ENTER” key. A reading around “70” is normal if using our standard throttle control.

**Note: If tested out of the water, the motor will spin up to full speed with only a low power setting. This is normal. Final settings should be made in the water.**



9. Press the “ENTER” key again. The next setting is regeneration. On the left is the regeneration relative value. The range is 0 to 125 in increments of 5. If you wish to allow the propeller to free wheel, set it to 0. If you wish to have the propeller rotate as slowly as possible, set it to 125. There will be very minimal rotation at this setting. In most cases, an initial setting should be established. A number between 20 and 30 is a good starting point. This value will be adjusted later. Press “ENTER” again. Several numbers will be shown briefly. Then, you will be returned to the normal operating screens and the settings will have been saved.



### Open Water Checkout:

1. In protected water with light to no wind and minimal wave action, slowly advance the throttle to full throttle and let the boat accelerate until running at a constant speed.
2. Observe the battery current.
  - a. If it is at least 85A (QT 5.0) or 175A (QT10.0), you have a good match between your reduction ratio and your propeller.
  - b. If it is less than 85A and the motor speed is over 2850RPM (QT 5.0) or less than 175A and over 2850 RPM (QT 10.0 with ME1012 motor or ME1114 motor) or less than 175A and over 1900RPM (QT 10.0 with ME0913B motor or ME1115 motor), you have a little too much reduction. As long as you are getting adequate performance, this is fine. If not, you will need to replace the top pulley with the next larger size. Contact us and we will supply.
  - c. If the maximum motor speed is less than 2700 RPM (QT 5.0 or QT 10.0 with ME1012 motor or ME1114 motor) or 1750 (QT 10.0 with ME0913B motor or ME1115 motor), you don't have enough reduction. This condition will result in slightly reduced efficiency. It is not harmful, but it is recommended to replace the upper pulley with a smaller size.
3. Check the reverse (astern) performance. Due to differences in propeller efficiency between forward and reverse, the current draw will likely be different.
4. If significant vibration is observed, loosen the top nuts securing the aft mounting L-brackets to the jack screws. Gently bump the motor from side to side and make adjustments to the jackscrew heights until vibration is minimized. This should be done with the boat underway to avoid excessive turbulence that can occur with the boat tied up. Some vibration is normal. The electric motor is much lighter than a diesel/gas engine. Therefore, any vibration due to turbulence, a slightly bent shaft, propeller out of balance, etc will show up as vibration of the motor. Once vibration is minimized, tighten the ½" nuts securing the front and back mounting feet to their L-bracket. This should eliminate any significant vibration.



5. Install the cover and tighten the screws that secure it to the motor frame.

The motor system is now ready to operate.

### **State of Charge (SOC) Alarms:**

The display will emit a beeping sound when the battery SOC reaches 50%, 20%, 10% and 5%. At 5% it will continue to beep until all power is depleted or the motor is turned off. At the other percentages, it will beep at 10 second intervals for 1 minute.

#### **\*\*\*Note for users of Li-ion batteries\*\*\***

Li-ion batteries have a very flat voltage discharge curve. This does not allow resetting the SOC based on voltage, which can be done with lead acid chemistries.

If the Li-ion batteries are charged with the motor power off, which is commonly done, the SOC may not reset to 100%. To correct this, press and hold the ESC key for 12 seconds, until you see the SOC reset to 100%.

### **Regeneration Fine Tuning:**

1. Go sailing on a day when the boat can be sailed at, or near, hull speed.
2. Press and hold both arrow keys to enter the programming mode as described in step 7 of the Initial Checkout section.
3. Press the “ENTER” key until the Regeneration screen is shown as in step 12 of the Initial Checkout section.
4. Use the arrow keys to adjust the regeneration amount to maximize the energy produced, as shown on the middle left section of the screen (in kW).
5. Press “ENTER” again to save the value and return to normal operation.

### **Usage Guidelines:**

1. Take your time. Without the noise of the old engine, it is more enjoyable to cruise under power. Running at a slower speed will increase run time and range dramatically.
2. On light air days, dial in a few amps of current to keep the boat moving through dead spots.
3. Plan ahead. Minimize motor usage if you might need to make a long cruise home under power.
4. To maximize battery life, keep the AVERAGE discharge to 50% or less. Discharging to as low as 20% is not a serious issue. Do not discharge lower than this, unless necessary. Always recharge as soon as possible and never leave batteries in a discharged state for a long period of time.
5. Always turn off the Master Power switch when leaving the boat. The key switch does not remove power from the controller. There is a small current draw if the Master Power switch is not off.

## Maintenance:

Your electric system should require far less maintenance than your old gas or diesel engine. Following are general guidelines.

1. Grease the two bearings on the motor unit once/year or every 500 hours. Use a good grade of waterproof wheel bearing grease.
2. Check the water level of your batteries periodically, if you have flooded lead acid. Add distilled water if needed. Only add water when the batteries are charged. If you are using good "Smart" chargers, this should only be necessary once or twice a year. AGM or LiFePO4 batteries don't need watering.
3. Occasionally feel all of the connections after running the motor at high current for at least ten minutes. Any hot terminals should be cleaned and re-tightened.
4. Clean the battery tops and terminals once per year or when corrosion is evident. Recoat the terminals with dielectric grease.
5. It is recommended to replace the timing belt every five years. It can be done in about an hour with hand tools.

Happy Sailing!

### **Motor Controller connections (Rectangular connector):**

- 1 – Logic Power
- 2 – CAN Bus Termination
- 3 – Relay Coil (BLU)
- 4 – Relay Coil (BLU)
- 5 – Encoder U (WHT)
- 13 – CAN Bus High (RED)
- 15 – Encoder Power (-) (BLK)
- 17 – Encoder V (GRN)
- 18 – FWD
- 22 – Analog Speed Input
- 24 – CAN Bus Termination (GRN)
- 26 – Encoder Power (+) (RED)
- 27 – CAN Bus Low (BLU)
- 29 - Encoder W (WHT)
- 30 – REV
- 33 – Motor Temp Sensor

### **Battery Monitor Connector Pin Out:**

- 1 – Power (+12Vdc) (RED)
- 2 – RS-485 (+) (WHT)
- 3 – RS-485 (-) (GRN)
- 4 – Common (BLK)
- 5 – CAN Bus HIGH
- 6 – CAN Bus LOW
- 7 – Unused (+24Vdc)
- 8 – Unused

### **Throttle Connector Pin Out:**

- 1 – Potentiometer Power (+5V) (GRN)
- 2 – Potentiometer Wiper (WHT)
- 3 - +48V (RED)
- 4 – Logic Power to Motor Controller (ORG)
- 5 – Potentiometer Common (BLU)
- 6 – Unused

### **Motor Controller to Motor:**

- M1 to U (Stamped on motor near terminal)
- M2 to V
- M3 to W

## Motor Pulley Replacement:

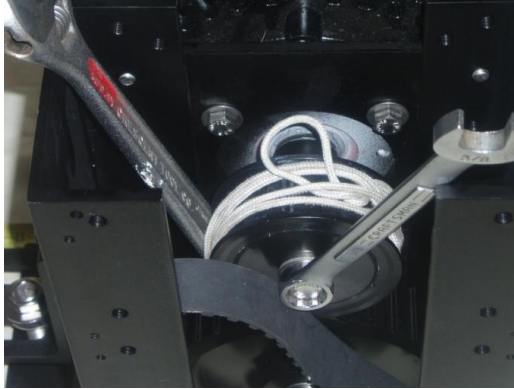
This procedure can be accomplished with the motor in the boat and boat in the water.

1. Disconnect the battery bank positive terminal.
2. Remove the sheet metal cover and motor controller. The cables can be left connected. Move the controller out of the way.
3. Loosen the four bolts (on back side of motor assembly) that hold the motor plate to the frame.



4. Slide the belt off the motor pulley.
5. Make a pulley holding tool by passing a 6' (approx.) piece of 1/8" or 3/16" rope line through the handle of a Crescent wrench (or similar) and tying the ends.

6. Wrap the rope around the pulley CW.
7. Loosen the bolt on the end of the motor shaft with a 5/8" box end wrench.



8. Slide off the old pulley, key and spacer washers that are under it. If it is stuck, use a gear or wheel puller to remove it. DO NOT hammer, as this can damage the motor bearings.
9. Put some fresh anti-sieze compound on the motor shaft.
10. Slide the pulley and key onto the motor shaft.
11. Wrap the rope around the pulley CCW.
12. Install and tighten the bolt, use removable (blue) thread locker on the threads.
13. Slide the belt back on the pulley.
14. If the motor is out of the boat, turn it upside down so the weight of the motor will tension the belt.
15. If not, push the motor upward until the belt is tight. Cog tooth timing belts do not need to be overly tight. A deflection of up to 1/4" with light pressure is ok.
16. Tighten the four motor plate bolts.
17. Re-install controller and sheet metal guard. Re-connect battery and you are ready to go.

## Belt Replacement:

This procedure can be done with the motor in the boat.

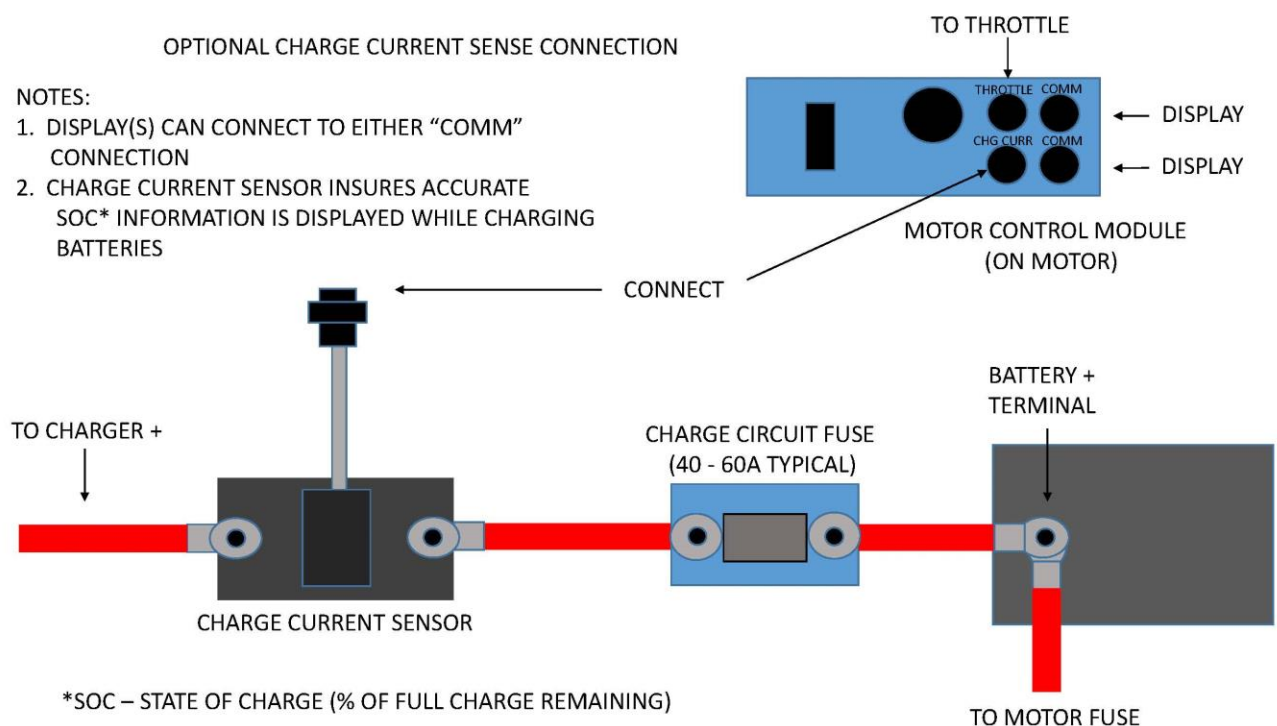
1. Disconnect the battery bank positive terminal.
2. Remove the sheet metal covers and motor controller. The cables can be left connected. Move the controller out of the way.
3. Loosen the four bolts (on back side of motor assembly) that hold the motor plate to the frame.



4. Slide the belt off the motor pulley.
5. Remove the four bolts securing the forward bearing plate to the motor frame and slide off bearing plate.



6. Remove the old belt and replace with the new one.
7. Replace the bearing plate and tighten bolts. Use removable (blue) thread locker on the bolt threads.
8. If the motor is out of the boat, turn it upside down so the weight of the motor will tension the belt.
9. If not, push the motor upward until the belt is tight. Cog tooth timing belts do not need to be overly tight. 1/4" deflection with moderate finger pressure is ok.
10. Tighten the four motor plate bolts.
11. Re-install controller and sheet metal cover. Re-connect battery and you are ready to go.





## LIMITED WARRANTY

This products of JASM, LLC d/b/a Electric Yacht, a Minnesota Limited Liability Corporation, are warranted to be free from defects in material and workmanship for a period of 36 months from the date of purchase by the first non-commercial retail customer and 12 months from date of purchase for commercial use customers. The above warranty shall be subject to the terms, conditions, and exclusions below.

For warranty service, contact JASM, LLC for instructions. For work required by the manufacturer, prior authorization will be obtained before part(s) are shipped to JASM, LLC.

This warranty is applicable to the first purchaser only and is not transferable. All requests for warranty service must be made within the warranty period.

During the warranty period, JASM, LLC, will repair or replace or refund the purchase price of any part that, upon examination by JASM, LLC, is found to be defective in material or workmanship under normal use and service. JASM, LLC shall in its sole discretion determine a defective part will be repaired or replaced or purchase price refunded. In the event of a refund, purchaser shall return the entire product to JASM, LLC, or its Authorized Service Dealer prior to receiving such refund. JASM, LLC, may retain all defective parts or components. Any repaired or replaced part or equipment will only be covered by the warranty period remaining on the original purchase.

### Warranty

JASM, LLC, does NOT warrant or make any representation in respect to installation errors made by a dealer, mechanic, installer, or individual.

This warranty applies to defects in material and workmanship only; it does NOT apply to the following:

- Normal Wear and Tear: Like all mechanical devices, this motor needs periodic parts and service to perform well. This warranty does not cover repair when normal use has exhausted the life of a part or the motor.
- Improper Installation and Maintenance: This warranty does not apply to equipment or parts that have been subjected to improper or unauthorized installation, alteration, or modification, or that have been improperly maintained, repaired, serviced, or stored., as per the Owner's Manual.
- Damage caused by fire, flood, storm, or other natural acts and natural disasters.
- Damage caused by an accident or collision. Nicks and normal wear are not covered. This includes damage incurred during shipping.
- Damage caused by misuse, mistreatment, negligence.
- Products and components not manufactured by JASM, LLC. Purchaser shall be limited to warranty, if any, provided by the manufacturer, and JASM, LLC will not be held liable for any such defects.
- Use in an application for which the equipment was not designed.
- Reimbursement for transportation or shipping charges, towing charges, in and out of water charges, technician travel time, labor supplied by anyone other than JASM, LLC.
- Growth of marine organisms on internal or external surfaces or components.

This warranty is void if the equipment has been altered or modified in any way.

**THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THIS WARRANTY IS PROVIDED IN PLACE OF ANY IMPLIED WARRANTY OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE TO THE EXTENT ALLOWABLE BY LAW. TO THE EXTENT SUCH WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE CANNOT BE EXCLUDED AS A MATTER OF LAW, SUCH WARRANTIES ARE HEREBY LIMITED TO ONE YEAR AND SUBJECT TO THE**

### Warranty

**EXCEPTIONS HEREIN TO THE EXTENT ALLOWED BY LAW. IN NO EVENT WILL JASM, LLC, INCLUDING THEIR OFFICERS, DIRECTORS, MEMBERS, EMPLOYEES OR AGENTS BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT, OR PUNITIVE DAMAGES, INCLUDING WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS,**

**BUSINESS INTERRUPTION, OR LOSS OF BUSINESS INFORMATION, ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT, AND ALL SUCH DAMAGES ARE EXPRESSLY EXCLUDED TO THE EXTENT EXCLUSION IS PERMITTED BY LAW. In any event, any liability of JASM, LLC for any cause of action (whether in contract, tort, including without limitation, negligence, or otherwise) shall be limited to return of the purchase price paid by purchaser. Some states or countries do not allow exclusion or limitation of implied warranties or consequential, incidental, or other damages, and the foregoing may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state or country to country. No distributor, agent, or employee is authorized to make any modification or extension to this warranty. JASM, LLC makes no other warranty, guaranty, promise, or representation of any kind whatsoever regarding the product. Any other warranty, guaranty, promise, or representation by others are unauthorized and are not binding on JASM, LLC.**

## Drill Template for Display

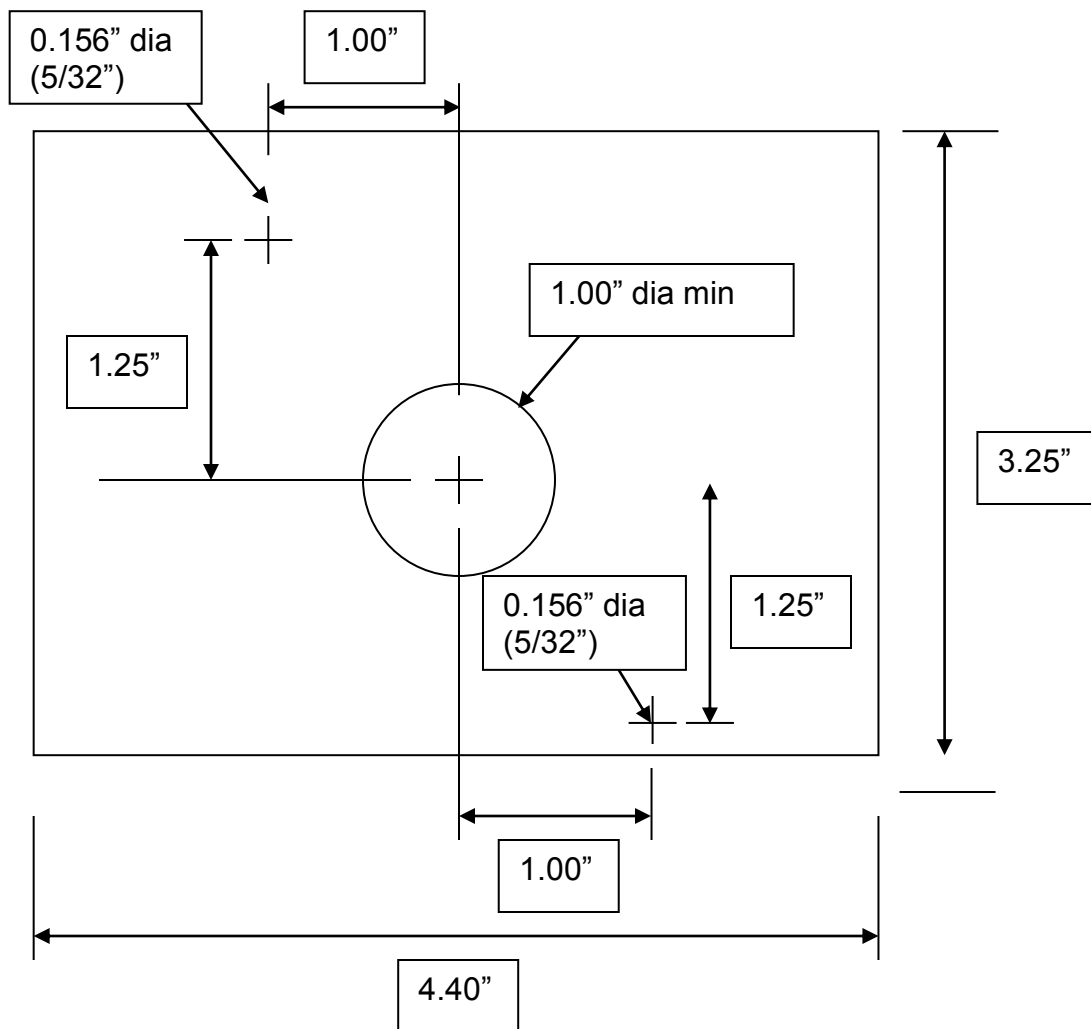


Fig. 1