



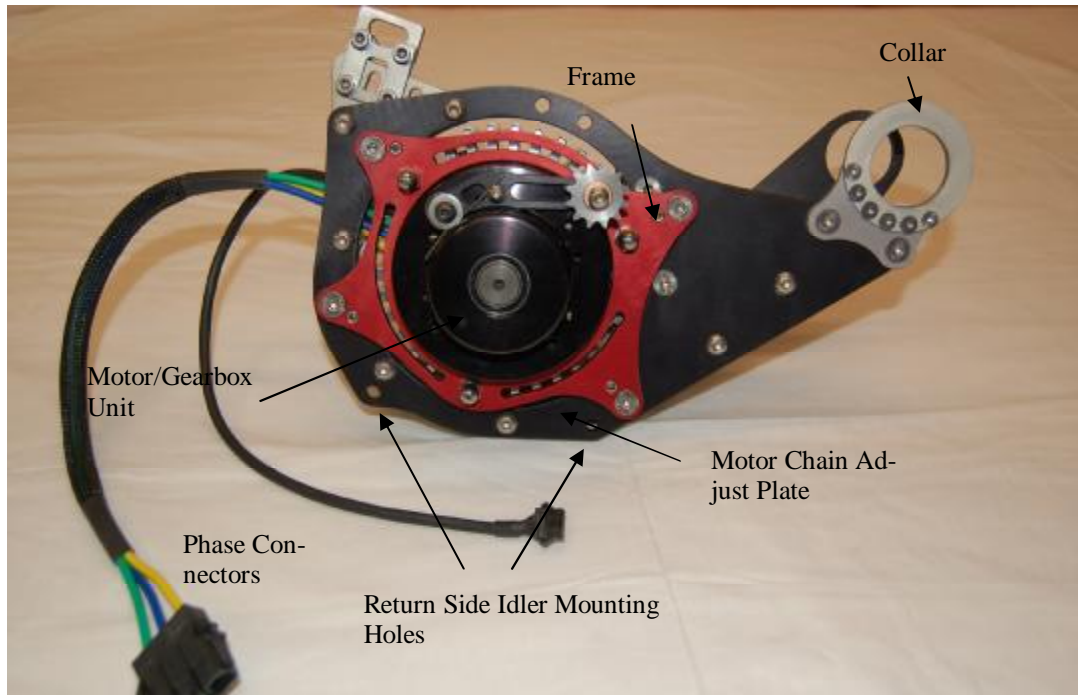
*Electric Mountain Drive™*

## Installation and Assembly Instructions, Type 2A

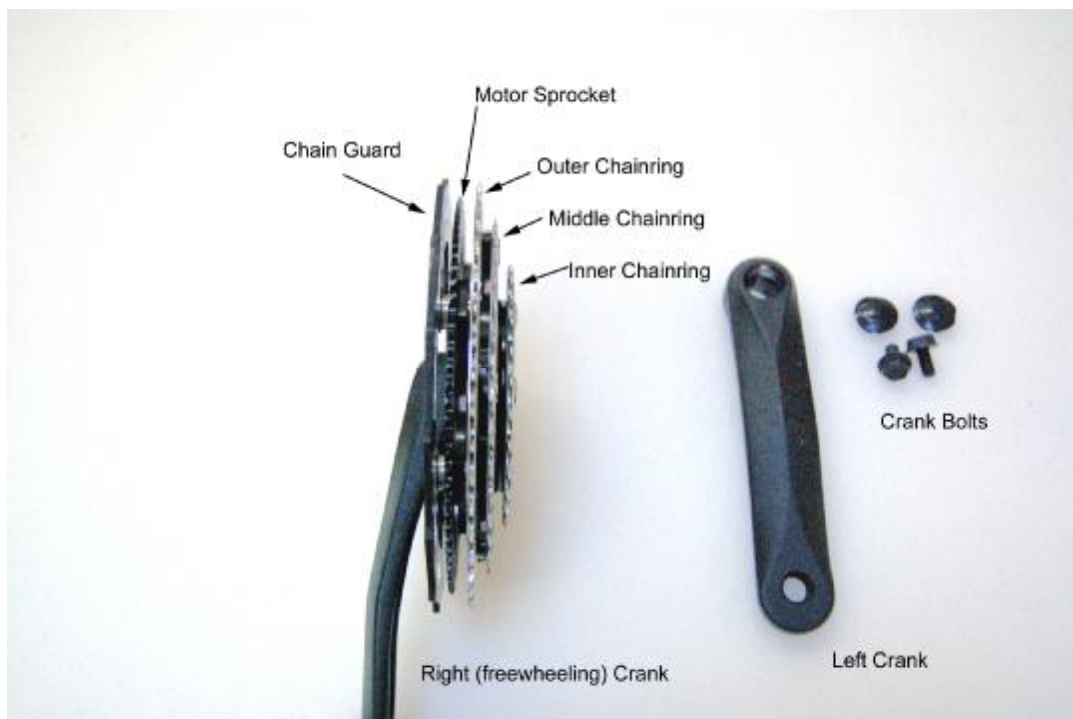
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[http://www.ecospeed.com/docs/emtnd2a\\_assy](http://www.ecospeed.com/docs/emtnd2a_assy)

Revision 0  
p/n 7-16-2A

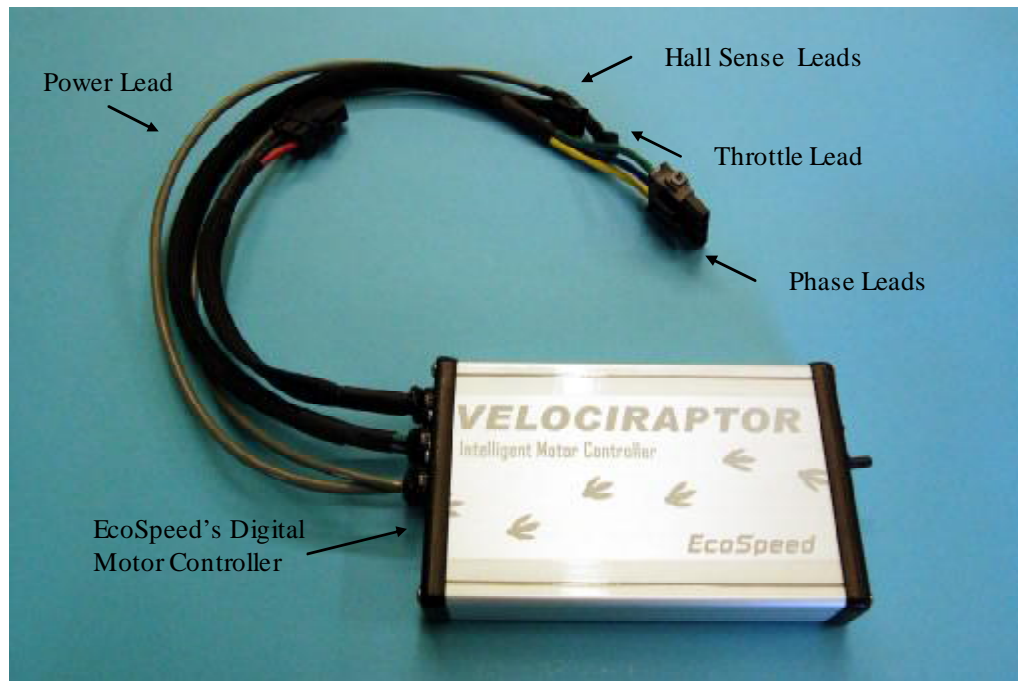


**Drive Unit**  
(connectors may differ depending on motor)

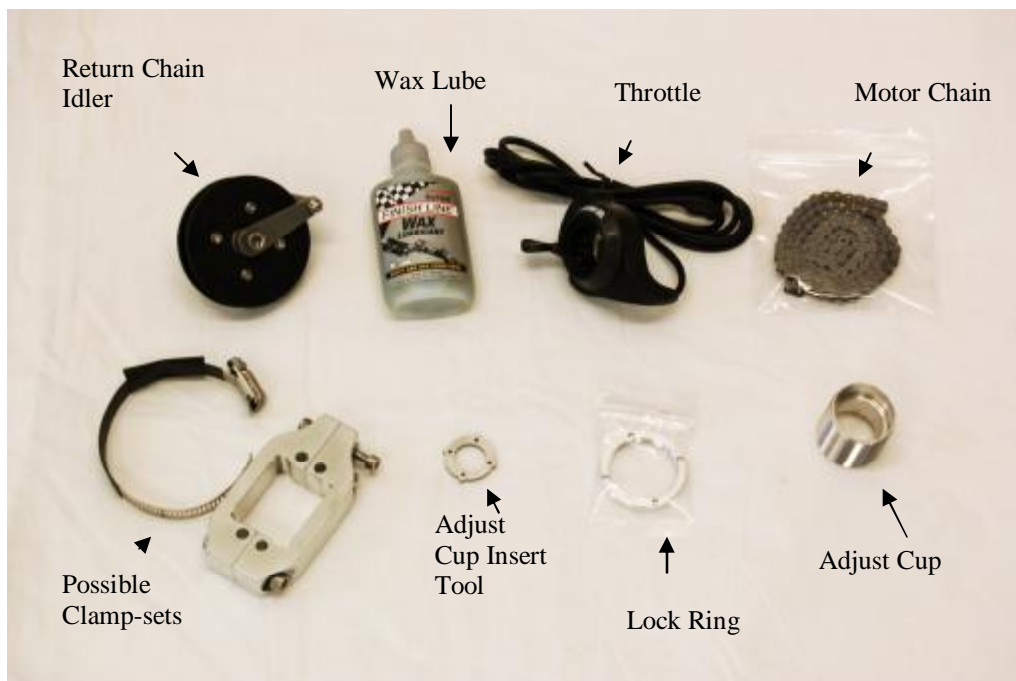


**Freewheeling Crankset**  
(triple shown)

## Electric Mountain Drive Components



**EcoSpeed Motor Controller**



**Other Parts**

## Electric Mountain Drive Components

Congratulations on your purchase of EcoSpeed's Electric Mountain Drive, Type 2. The Type 2 Electric Mountain Drive is the world's best multi-speed, throttle operated, electric-assist conversion and the only electric-assist designed specifically for the power needs of short wheelbase recumbent bikes and tadpole trikes.

These instructions will guide you step by step through what we hope will be a simple and painless installation of your EMtnD. The mechanical skills involved are modest and, we give you hints and tips at every step that reflect what a professional mechanic knows. If at any time you have problems, call us at 1-866-EcoSpeed (866-326-7733) for friendly technical assistance or e-mail us at [support@ecospeed.com](mailto:support@ecospeed.com).

A word on how these instructions are organized: Each step is under a major heading – Step 1, Step 2, etc. If you've installed an EMtnD before, you can just read the major headings and ignore the explanatory text. Below each major heading is a list of sub-steps. The important information in each sub-step is in bold text. If you're a competent bike mechanic, you can just read the bold text and safely ignore the rest. The remaining text is there to clarify things for non-mechanics. *We've also included tips and hints in Italics.*

Since the EMtnD2 will fit both bikes and trikes, for simplicity we will just refer to them all as bikes unless we are pointing out something that applies only to trikes. In this first version of the EMtnD2 manual, most photos show the EMtnD1 on an upright bike. The installations steps are the same except the unit clamps to the front boom rather than the down tube as shown in the photos.

**Before getting started check that all the pieces needed were included in your shipment:**

**Check the packing list included with your shipment.**

**You will also need the following tools:**

- 1) 2.5mm, 3mm, 4mm, 5mm, and 8mm hex (or Allen) wrenches.** *(The standard "L" shaped hex wrenches sold at bike shops and hardware stores. Get long handled versions if possible.)*
- 2) 10mm box or open end wrench.**
- 3) 8mm and 10mm nut drivers or sockets. Also 14mm if your bottom bracket uses this size bolt.**
- 4) Wire clippers or scissors.**
- 5) Small screwdriver.** *(For adjusting front derailleur.)*
- 6) Needle nose pliers.**
- 7) Crank puller tool.** The Park Tool CWP-6 would be an example of this *(Standard bike repair tool. Available from almost any bike shop.)*
- 8) Bottom bracket tool.** Such as Shimano TL-UN74. *(Standard bike repair tool. Available from almost any bike shop.)*
- 9) 15mm pedal wrench.** The Park Tool PW-5 would be an example of this *(Standard bike repair tool. Available from almost any bike shop.)*
- 10) Torque wrench (optional).** A small one, reading in inch-pounds.
- 11) Pin Spanners.** Both the red and green handled Park tool pin spanners. Once you have all the parts and tools you need, it's time to clear a nice space to work, find several of hours time, and get to it!

If you haven't had your bike tuned up by your local bike shop in a while, now would be a good time. Installing the EMtnD will place extra stress on your bike so it's important that it be in top condition.

**Step 1: Find a way to secure your bike while working. (photo 1)**

Trikes can simply be rested on all three wheels. Placing the trike on large table top can make it easier to work on.

*Note that the following two steps would take any competent bike shop about 5 minutes to do. If you would rather not hassle with them, take your bike to your local bike shop and have them remove the crankset and bottom bracket. Then start at step 4.*

**Step 2: Remove crankset.**

Remove the crank set including the left arm. Leave chain hanging from front derailleur. The tools involved will differ between crank models and brands.

The cranks are held in place by bolts, sometimes concealed under caps. Remove using a socket or hex wrench. Once the bolts are out, use your crank puller tool to pull the cranks off of the bottom bracket axle (photo 2).

**Step 3: Remove bottom bracket.**

The EMtnD is designed to work with frames that take standard 1.37" x 24tpi, 68mm wide bottom brackets. If yours is not, you will need to find a compatible wide bottom bracket to use with the EMtnD. The supplied one uses a 127mm square taper axle. There is quite a bit of adjustability built into the EMtnD, so a similar one should work fine.

There are different bottom bracket tools, so you will need to use the one appropriate for your bike. Photo 3 shows the tool used for Shimano cartridge bottom bracket nuts such as the one supplied with the EMtnD.

Note that the *right* nut is left-hand threaded, i. e. it tightens by turning left and loosens by turning to the right (clockwise). The *left* nut uses standard right hand threads (loosens counterclockwise).

Remove the left nut first. The cartridge will come out along with the right nut.



**(1) Bike on Work Table**



**(2) Removing Crank with Crank Puller**



**(3) Remove Bottom Bracket**



**Step 4: Install the new bottom bracket and attach the EMtnD**

**Slip the BB cartridge and right side nut through the collar on the EMtnD. Support the weight of the EMtnD, so as not to damage the threads, and screw in the right side BB nut. (Photo 4A+B)**

You may want to have an assistant hold the unit while you perform this step. The threads on the BB nuts are fragile aluminum, so be very careful when first engaging the threads. Remember that the right nut is left hand threaded so turn it counterclockwise to engage the threads.

*(Trick: to avoid cross threading, gently press the nut into the bike frame while turning **clockwise**. You will feel a periodic click as the end of the thread drops into the groove in the frame threads. When you feel the click, stop turning clockwise and turn counterclockwise to engage the threads.)*

Screw in the right side nut until the EMtnD collar is pressed against the bike frame but do not tighten. (Photo 4B)

Screw in the left side nut through the left hand collar, don't tighten. This involves the use of a proprietary tool made to fit our special left side cup. (Photo 4C+D)

You use a standard pin spanner, insert its ends into the special tool, and use this to thread in the left side cup. You can then thread on the lock ring, which will not be tightened yet. When you're done, the EMtnD will be hanging off of the bottom bracket by the collars as shown in Photo 6.

**Step 5: Swing the EMtnD up against the bottom of the trike's boom tube and install clamp sets.**

If the clamps interfere with exposed cables, they can be enclosed in a short length of cable sleeve and routed around the clamps.



**(4A) Installing New Bottom Bracket**



**(4B) Using a Park Tool**



**(4C) Left Side BB Nut Partly Installed**

Most kits will have an adjustable strap system that attaches the front of the EMtnD to the frame. The primary motor plate has cutouts to accommodate the head of the clamp, allowing it to be out of the way and streamlined.

Tighten the clamp until there is significant tension holding the motor to the down tube. As you do this, feed the emerging clamp tail into the supplied piece of shrink wrap, this will prevent any exposed edges. When clamp is tight, shrink this with a heat gun, blow-dryer, pen torch, or lighter. If using flame, be sure not to burn the bike or yourself! (Photo 5)

If you have a machined clamp for your application, there will be 2 M5 bolts holding it to the motor frame, and 1 M6 bolt holding the halves together above the bike's boom.

Once both halves are installed, tighten the M5 bolts and nuts holding the clamps the EMtnD unit. Next, tighten the M6 bolt and nut. If you have a torque wrench, tighten them to 90 inch-lbs (10 N-m). Otherwise tighten firmly but not so much as to close the gap between the clamp top more than a couple of mm.

#### Step 6: Finish attaching the EMtnD unit.

Make sure all clamp bolts or strap is tight.

Tighten both bottom bracket nuts.

Tighten the bottom bracket in all the way before screwing the adjust cup in, leaving just enough threads for the lock ring. Use your pin spanners, and when the cup is in all the way, hold it in place and tighten the lock ring up against the collar.

It may take some time to get the hang of using the spanner with the EcoSpeed tool, just take your time and it will come. Do not lose the special tool, as you will need it to change bottom brackets, or remove the motor in case you change trikes, etc. (Photo 6)



**(4D) EMtnD Hanging from Collar on Bottom Bracket, Using Proprietary Tool.**



**(5) Clamps Installed On Frame**



**(6) Adjust Cup and Lock-ring Install**

**Step 7: Install the freewheeling crankset.**  
**(photo 7)**

Install the left side crank arm and the freewheeling crank and chainring assembly on the right. Tighten bolts firmly so that both arms are pressed onto the bottom bracket axle as far as they will go.

It's important that the right side crank arm is firmly seated onto the BB axle for correct alignment of the motor drive chain.

This step involves putting the drive chain onto the small chainring, and installing the Return Chain Idler in one of the two optional placements. The purpose of the idler is to route the return side of the bike chain around the gearbox. In the photo shown the idler is in the forward position. This is the desired position, but depending on the bike you may have shifting problems and need to place the idler in the rearward position.

As it will be hard to tell which position will work best during installation, put it in the forward position to start with, and then change it if there are problems.

**Step 8: Install the motor chain and align the gearbox sprocket to the chainring motor sprocket.**

Install the motor chain using needle nose pliers.

The gear box rolls easily in one direction, insert the chain and roll it around the sprocket and through to the other side. Now wrap it around the motor sprocket and bring the ends together with pliers as shown. (Photo 8)

The ends attach by inserting the 2 pinned link, covering it with the small plate, and then connecting them with the clip that should seat firmly into the pin's slots. (Photo 8)

**Align the motor chain.**

Sight down the line of the motor chain, and use the red tertiary plates' set screws and adjustment bolts to straighten out the line, where it is not going to rub against either chain-ring guards, and will give the best power transfer possible. You may want to use a thin straight edge, such as a



**(7) Installing Crankset, Drive Chain, and Return Chain Idler**



metal ruler, to help you sight down the chain-line to check alignment of the gearbox sprocket with the chain-ring motor sprocket. (Photo 8)

The set screws can go in a little more than half way into the plate if needed for proper alignment. When the desired chain line is found, tighten the pinch bolts next to the set screws. It is possible to put excessive force on the plate, a good guideline is to tighten down until you see the red tertiary plate start to bend slightly, and then leave it right there.

### **Step 9: Install all wiring**

While wiring up the system, do not secure any of the wires to the frame until everything is in place and tested. This will insure that everything is working and routed most efficiently before using the included zip ties.

### **Install the throttle**

If your bike has twist shifters, remove right side grip and shifter and install the thumb throttle between shifter and brake as shown in photo 9A.

You may need to move the right brake lever to the left to make room for the throttle. The throttle slides onto your handlebar and locks in place with a set screw visible on the bottom of the throttle body.

Reinstall the twist shifter making sure there is enough clearance to allow free movement of the throttle lever.

If your bike has thumb shifters: Install accessory mount on left hand side, and place the throttle on it so it is above the bars. Photo 9B

If you don't have the correct throttle to work with your bar and shifter setup, contact EcoSpeed for advice and/or a different throttle.

Both right and left hand mounting are possible. It is up to your component set-up, and which you prefer.

Route the throttle wire so that it doesn't impair turning the bars, won't snag on anything, and reaches the throttle connector on the motor.



**(8) Installing Chain, and Align Using Set Screws**



**(9A+B) Left and Right Throttle Positions**

**If you have a Cycle Analyst for your kit, install it Now**

The Cycle Analyst will have a wheel sensor and a connection between the battery and controller. It is important to mount it now, as the throttle and analyst wires will follow some of the same paths.

### **Mount the Controller**

Attach the controller to your bike using the included adhesive foam and cable ties. Photo 9C shows possible mounting locations.

The controller is an electronic device that regulates motor speed and power levels in response to a signal from the throttle. It is small and light and so may be mounted in any number of places. The important considerations are cooling — the controller should be in open air and not enclosed, and locating it so that cables from the motor and throttle will reach.

### **Mount your Battery**

See the included separate instructions for your type of battery system.

### **Step 10: Connect all cables**

Connect the following cables:

- 1) **Throttle.** Black 4-circuit JST connector on throttle plugs into matching connector on throttle. Be careful when plugging in to avoid bending connector pins. (Photo 10A)
- 2) **3 Motor phase wires.** These can have various connector types depending on the motor and controller combination. The phase wires are the three heavy colored wires coming out of the motor. Connect them to the matching connector on the controller. If the phase wires have individual connectors, match them according to color. (Photo 10A)
- 3) **Motor Hall Sense Cable.** A gray cable coming out of the motor ending in a black JST connector with 5 or 6 circuits. Plug into the corresponding connector on the controller. Be careful when plugging in to avoid bending connector pins. (Photo 10A)
- 4) **Main Power Connection.** The heavy cable from the battery to the controller terminating in a gray 2-circuit MiniFit Sr connector. (Photo 10B)



**(9C) Possible Controller Locations**



**(10A) Optional Wire Wrap, Enclosing Connectors**



**(10B) Main Power Connector**

**WARNING:** Do not route the phase wires (2 above) and the Hall sense cable (3 above) next to each other over their entire length. Space them at least an inch (25mm) apart over most of their length. The high currents in the phase wires can interfere with the low voltage signals in the Hall cable and destroy the controller.



#### Step 11: Check front Derailleur Adjustment

Triple chainring version only: Test front derailleur adjustment and adjust as needed. It's especially important to adjust the derailleur so it doesn't over shift on the big ring and drop the bike chain onto the motor chain.

#### (11) Adjusting Front Derailleur

If you don't know how to adjust your derailleur you can ask your local bike shop to do it, or go to:

<http://www.parktool.com/repair/readhowto.asp?id=75>

on the Park Tool Company web site for an excellent how-to article on front derailleur adjustment.

Single chainring version only: If switching from a triple chainring to single chainring, leave the front derailleur in place and adjust it so that the bike chain is centered in the cage.

This will provide extra protection to keep the chain from coming off the front sprocket on sharp bumps.

#### Step 12: Finish up and Test.

1) With the rear wheel suspended off of the ground, turn on the battery pack switch and press the throttle to test the system. Run the bike through all of the gears to make sure the derailleur is properly adjusted. Look at the motor chain and verify that it is running smoothly. Make sure that all wires are out of the way of all moving parts. Make sure axle bolts or skewers are tight

2) Once you're satisfied that everything is operating correctly, neatly tie all wires out of the way of moving parts using the included cable ties.

Proper adjustment of the gears and making sure that the rear cassette and bearings are in good shape is especially critical given the extra load the drive train will be subjected to. Also, check that the rear axle skewer or bolts are fully tightened. Axle bolts should be torqued to about 20 ft-lbs (28 Nm). Skewers should be as tight as you can comfortably make them. It is possible for the motor to pull the axle right out of the dropouts if they are loose.

3) Road test. Run through all the gears making sure they are shifting smoothly. Use full throttle in each gear to check for skipping of the drive chain. Keep speeds low at first until you're sure that everything is functioning properly and you become familiar with riding with the motor assist.

**Congratulations! Your install is complete!**