Phoenix II Power System
Owner's Manual

Welcome to the growing family of people who have discovered electric transportation! We care about you. When enjoying your vehicle powered by one of our Phoenix II power systems, be sure to ride safely, defensively, and within the limits of the law and your abilities. Always wear a helmet and eye protection, clothing and other safety gear as appropriate for the ride. Never ride while under the influence of alcohol or other medication. Know your bike, and know your personal limits.

Phoenix II owners: High-speed biking is similar to motorcycling. For your safety and enjoyment, we suggest you take a motorcycle safety course, either online or in a classroom. A web search will reveal a number of good choices of free material if you want a self-paced course. These classes teach awareness and defensive skills that could possibly save your life.

Your electric power system is designed and manufactured to be the best value in its class. We believe quality improvement is an ongoing process, so we continue to make investments in new and better technologies to broaden the appeal of electric alternatives. This also means that the specifications in this manual may be changed without notice.

This manual is designed to acquaint you with the operation, care, and maintenance of your power system, and to provide you with important safety information. Follow these instructions carefully for maximum performance and for your personal cycling safety and pleasure.

CUSTOMER SERVICE
Most sales or service issues should be resolved by the dealer from whom you purchased your system. If your problem is not resolved, call our service center at 325-227-6903.

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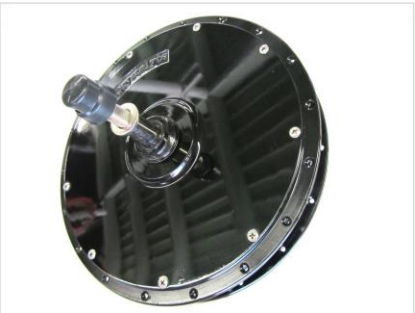
How it Works

The major components of the system consist of a **battery pack**, a **controller with APM-Display**, a **throttle**, and a **hub motor**. The battery pack can be any type of battery that can supply the correct voltage and current required by **Phoenix II** system. All major components are connected to the controller, the "brain" of the system. The controller's basic operation is similar to an electric light dimmer. It adjusts the amount of power going to the motor based on the throttle setting. *Brushless* hub motors are very efficient. Inside, there are three separate windings. Each winding is responsible for turning the wheel one-third of the way around. While there used to be sensors inside the motor to tell the controller which winding to apply power to, now the controller does all the work! Since there are no longer sensors inside the motor, there is nothing inside the motor that can be damaged, other than bearings! This allows the energy to be more focused, and changing windings is all electronic – done completely by the controller. There is no physical connection between the stationary part of the motor and the moving part of the motor, so there is no theoretical limit to their life. Brushed motors work differently - Power is transferred to the motor by brushes making contact with the moving part of the motor. This means that brushes must be replaced periodically, which can be expensive and can cause down-time. All **Phoenix II** motors are brushless, so the only fixed cost of owning one is battery replacement, and the occasional tire, tube, and brake replacement. Yes, you will go through more brake pads with a power system installed on a bike with rim brakes, but all **Phoenix II** motors are disc brake compatible. Disc brakes require less adjustment, and fewer brake pad replacements, but they do put more strain on the spokes than rim brakes.

Kit Components

Hub Motor
Your **Phoenix II** motor is one of two types: Cruiser (5304), or Brute (5305). The decal on the motor indicates the model. **Phoenix II** motors are three-phase brushless motors, and may or may not have hall effect sensors.



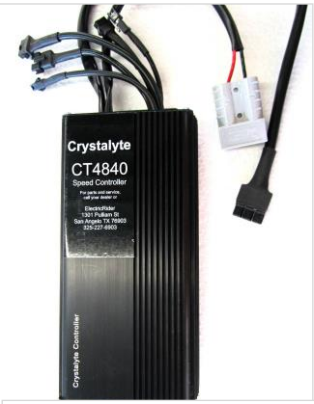
Phoenix II Rear Motor

Controller
The controller is the brain of the system. All connections go to the controller.

Phoenix II controller options are:

Part #	Volts	Amps	Watts
X-CT3625E	36V	25A	900W
X-CT3640E	36V	40A	1440W
X-CT4825E	48V	25A	1200W
X-CT4840E	48V	40A	1920W
X-CT7240E	72V	40A	2880W

The higher the voltage and the higher the current, the more torque and speed your motor will deliver, but over-volting a controller will blow it every time, so don't do it. If you want more power, email us about a controller upgrade.



4840 Controller for Sensorless Motors

Your controller has a power switch (or optional keyswitch) to turn power to the system off and on. Note that turning the system off still allows a tiny amount of current to be drawn from the batteries. If your vehicle is not going to be used for several days, the battery should be disconnected from the controller at the large gray connector.

APM-Display (Active Power Management Display)
The APM is covered in your APM-Display Owner's Manual.

Forward/Reverse Switch
Phoenix II controllers can operate in reverse for trikes and four-wheelers. The optional **reverse switch** mounts on the handlebar and connects to the controller.

Throttle

We offer a number of throttles. They are all compatible with our entire product line. If your throttle has a gauge, it must be the same voltage as your system to give a correct reading, but the throttle will still work with any of our systems. When using the APM-Display unit, a non-lighted throttle is best. If you have twist shifters on your bike, you will need to choose a thumb throttle. Otherwise, a half-twist or full twist may be used.

	**Thumb Throttle** – Most commonly used, fits most vehicles. If using twist grip shifters, you must use the thumb throttle due to lack of space on your handlebars. Requires 1 inch of handlebar space.
	**Half-Twist Throttle –** Twists like a motorcycle throttle, but only uses half the space of your handlebar, which leaves a stationary part of the handlebar to rest your hand on. You cannot use the half-twist if you have twist shifters. **Requires 2.8 inches of handlebar space**.
	**Full-Twist Throttle –** Most like a motorcycle throttle, where it covers the entire right-handlebar. You cannot use the half-twist if you have twist shifters. **Requires 4.5 inches of handlebar space**.

Cruise Control with Brake Inhibit

Cruise control is a now a feature of the APM. Older Phoenix systems used a separate cruise control shown below. With either, you have the ability to set a speed and release the throttle. Our cruise control works just like the one in your car. Turning the unit off by pressing the CRUISE button, twisting the throttle or engaging either brake will shut off the unit. The brake inhibit also prevents the throttle from operating.

Cruise Control

Brake Inhibit

Connections

General

We have designed our systems so that it is easy to tell which connectors go together. Small connectors on the throttle, cruise control, and brake inhibits are indexed so that they will only go in to the correct mate, and only in the correct direction. The motor connection is the same. All components connect to the controller.

Connector to Battery

The battery pack uses an Anderson 50 Amp connector that mates with the same on the controller. If you purchased your battery elsewhere, we strongly recommend you change the connector on the battery to an Anderson SB-50, which will mate with the controller. This connector is readily available and has proven itself over many years.

Battery Connector – 50A Anderson

Motor

There are 3 wires leading to one connector on the motor. These "phase" wires are used by the controller to select the motor winding that will receive the power. The silver connector goes to the hall-effect sensors. Connecting this cable is not necessary, but will result in a smoother start from a dead stop.

Everything else

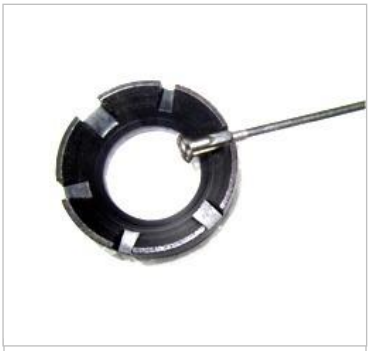
The controller has matching connectors for all components. There will likely be extra connections not used for your installation. All connectors are indexed so that you cannot (without forcing) make an incorrect connection.

Tips

Tires
The higher the pressure, the less rolling resistance. Tires capable of higher pressure will give you better range and speed. The smoother the tire, the less rolling resistance. Slicks give you better range and speed than knobbies. Kevlar lining is a great feature to have on tires for your new Phoenix II system, anything that will lower the risk of a flat tire is recommended.

Controller Placement / Battery Portability
If you must take your batteries off your bike on a regular basis, it may make sense to mount your controller on the bike frame itself. The throttle, cruise, brake inhibits, and motor can remain wired to the controller. The only connection you will have to mess with is the one from the batteries to the controller. We use a heavy-duty, durable, large, easy-to-use connector from battery pack to controller that you will find much easier to deal with than the small ones.

Using other types of batteries
There are a number of battery chemistries available to choose from. Be sure your battery pack can deliver 40 amps continuous current at the voltage of your controller.



Spoke Wrench for 12g Spokes

Wheel Maintenance
Your Phoenix II kit includes a spoke wrench for 12g spokes. The 12g spokes we use are much thicker than regular bike spokes, and require a 12g spoke wrench for adjustment. While your new Phoenix II motor will be completely laced and trued when you receive it, new spokes do have a break-in period in which they loosen a bit. You'll need to check your spoke tension periodically throughout the first 200 miles, more frequently in the beginning and less frequently as you go. Eventually the spokes will stop stretching. NOTE: Keeping your spokes tight is very important. As spokes get loose, they begin to move. Once they begin to move, they take quite a beating. You WILL break spokes if you do not keep them tight. Most bike shops charge $30-$40 to true a wheel, which is the ounce of prevention. If you are not comfortable truing your own wheel, we recommend you take it to your local bike shop to make sure it's done right.

Troubleshooting

No power light on controller	Batteries supply the power. A fuse is installed during final assembly. Never bypass the fuse! The fuse is there to protect the batteries and the wiring. It will NOT protect the controller. A blown fuse is almost always an indicator of a bad controller or something wrong with the wiring. If you blow a fuse, check the wiring for missing insulation. If the wiring is correct, replace the fuse with one the same size and rating. If the replacement fuse blows immediately upon turning on power, the controller is probably bad and must be repaired or replaced.
Axle turns in dropout	Axle nuts not tight enough, or dropouts were not steal, and not able to support the torque of the axle. If this happens, it will happen on your first ride, and most likely upon your first start from a dead stop. Note: Damage from this problem is NOT a manufacturing defect covered by your warranty.
Short range or low power	Batteries not fully charged or batteries weak.
Stops then restarts 5-10 minutes later	Controller overheating. Be sure batteries are good and that the controller is positioned where it can get air for cooling.
Controller overheats	Revision E and above controllers will even run a shorted motor without destroying themselves. To test for a shorted winding, use an ohmmeter or continuity tester. You should show a short from each of the three motor windings to the others, and you should see an open from each motor winding to the axle. If your results are any different, call us.

Warnings

- Do not use on aluminum front fork! Phoenix motors are stronger than the dropouts. Eventually, the motor will take off, leaving you and the bike behind.
- Use good judgment when riding. It only takes a few reckless riders to create a call for local ordinances that would otherwise be unnecessary.
- If your system's performance suddenly changes, discontinue use and determine the root cause. There is no self-healing, and problems don't go away. Almost all problems are easy to fix, and cost little or nothing. Allowing a problem to go unresolved can be costly, both in terms of your personal safety and

Safety Checklist

For the safest and best performance of your Crystalyte conversion kit, these steps should be taken before each ride when new, and periodically thereafter:

- Check battery mounting system to make sure it is tightly secured to the vehicle.
- Check bag for tears or rips. Potholes, or other rough terrain can lead to bag damage due to the weight of the batteries and friction.
- Check ALL nuts and bolts on the bike. This includes both wheels, the battery rack, brake system, etc. If the nuts are not tight on the electric wheel, the axle can spin in the dropouts leaving broken wires and damaged forks. These nuts must be very tight to assure the proper performance. However, please use judgement and do not over-tighten, as that could cause damage to the threads which could render your motor useless. Damage to axle threads is not covered under your manufacturer's defect warranty.
- **Check spokes on both wheels**. The electric wheel requires more attention due to the torque and weight of the motor. Spoke and wheel maintenance is part of normal bicycle maintenance procedure. If you think the spokes are not tight enough, you are probably right. Please do not take chances. The spokes should all have the same tension. To check the tension, you can "pluck" the spoke like a guitar string, and you should hear very close to the same tone on each spoke.
- Check the adjustments of your brakes. Traveling at electric-powered speeds, properly adjusted brakes are a MUST! Consult your bike owner's manual or a professional for proper adjustment procedure.
- Check the pressure in your tires. The required pressure can be found on the sidewall of the tire. Tires lose an average of 2-3 PSI per week. Low pressure will cause sidewalls to collapse, and that is how most blowouts occur. When filling a tire with little pressure in it, make sure it is seated properly on the rim. There is a bead, or line, that goes around the edge of the tire's sidewall just above where it meets the rim. That line must be even with the rim for its entire circumference on both sides. If the tire is not seated properly, the tube will blow itself out between the rim and the sidewall of the tire and burst. Tires aired to their full recommended pressure create less rolling resistance, increasing speed and range.
- When riding at night, we strongly recommend the use of a headlight and rear light. A bike is much harder to see at night than a car, so extra precautions are necessary. One way to reduce your chances of being cut off, or side clipped by a vehicle is to use either an air horn, or a loud enough device that will make drivers aware of your presence. We recommend a motorcycle safety course. They teach very useful skills and tips that can be applied when riding a high speed bike.
- Examine welds and frame members for cracks or evidence of tearing.

Periodic Electrical Checks

- Check all electrical connections making sure that they are all tight. Bad contact means energy is wasted as heat, which can cause a breakdown of wire insulation. Any wire with melted insulation indicates a poor connection nearby. Disconnect the batteries and do not operate if insulation is melted or wire is exposed. Replace with 10 gauge or call us for replacement wiring.
- Make sure the battery terminals are not exposed. Things like charger ports can end up across both terminals creating a short circuit, which may ruin 1 or more batteries.

FAQ

Q. Is my Phoenix II system "steet legal"?

A. In most states, anything over 750W is considered an off-road vehicle. It is very unfortunate, as 750W is NOT going to be a real replacement for your gas vehicle! We believe these laws will become more electric-friendly as time goes on, and as electric transportation becomes more and more popular. Just like with dirt bikes or ATV's, it is the rider's responsibility to practice safe riding skills and to be aware of their local laws.

Q. How long will my Phoenix II system last?

A. Theoretically….Forever! When used as intended, Phoenix II systems should last forever, with the obvious exception of battery replacement. We have Phoenix I systems with over 35,000 miles on them and counting! One customer called to order his Phoenix II after selling his Phoenix I with 18,000 miles on it…..He sold it for more than he paid new! We wouldn't expect that to happen every time, although it is possible.

Q. What are the benefits of a Phoenix II system over a gas vehicle?

A. There are many benefits to riding an electric bike over driving your gas vehicle. Some of these benefits include paying about a penny per mile to recharge, free parking at your downtown office building, riding through traffic jams (safely), and just enjoying the wind in your face without the noise or smell of fumes to go with it! There's almost nothing more satisfying than powering past an avid cyclist on your Phoenix II without pedaling, and without breaking a sweat! Curious watchers will want to know what you are riding, so don't be surprised when you attract a crowd!

Q. If I start with one battery chemistry, can I switch to another battery chemistry later without having to purchase a new power system?

A. Yes! Any battery that is the correct voltage, and can supply 40A continuous will work with your Phoenix II system. You can be sure if we supply a battery for Phoenix II, it will be capable. If sourcing your battery elsewhere, we recommend doing research on forums to find reputable sources.

Etcetera

Disclaimers

This publication is **not** a substitute for a bicycle mechanic. **If you have any doubt about the safety of your bike, or if you doubt your ability to assemble it safely, take it to a bicycle shop now.** Charges are usually minimal to assemble and adjust a new bike, and your safety is well worth the money.

Truing wheels (keeping wobble out of wheels) is usually the most difficult maintenance challenge for cyclists. There are a number of good online "How To" resources for every type of bicycle maintenance, but many prefer to have their bike tuned up periodically by a professional. The electrical system and motor require no maintenance. *See: How To Video for "Wheel Truing" on www.electricrider.com.*

We have tried to be 100% accurate in the development of this guide, but we are human, subject to making mistakes, and cannot guarantee the absolute correctness or completeness of this guide. If you have any questions or concerns not covered by this guide, you should contact your Dealer.

Warranty

We have engineered our systems for maintenance and trouble-free operation. We test every system we ship, so we know it works before it gets into your hands. We also realize manufacturing defects do occur. Electronic component defects usually show up within the first two weeks of use. We stand behind our systems and will cover all manufacturing defects by replacing failed parts. We will not cover abuse. That is, we expect our customers to realize their light electric vehicles have limits. Most of the same kinds of rules apply to electric vehicles as gas-powered vehicles. You can't hold the throttle and brake at the same time for long or something is going to break. In the case of a car, it will probably be the transmission. In the case of an electric vehicle, it will probably be the controller. Several of our customers have over 30,000 miles on their Phoenix I systems. Driven responsibly, you can expect the same from your **Phoenix II** system!

For 90 days from date of purchase, we will replace any defective part of your Crystalyte power system. The warranty extends to 180 days for the motor, batteries and APM-Display. It extends to 1 year for the throttle, cruise control, and most chargers. Here's how it works: Contact your dealer or call EV Depot at 325-227-6903. Our technicians will listen to the symptoms you describe and ask you to ship the defect to us. We will repair or replace your unit and ship it back to you. Be sure to save your tracking number or postal confirmation number in case it doesn't arrive at EV Depot.

As you would expect, abuse of the system is not a manufacturing defect and is not covered under warranty. That includes increasing the voltage over the specification of the controller or motor. Over-volting a controller WILL blow it. Every time. Don't do it.

Running the motor without it being securely tightened to the frame will cause the axle to turn in the dropouts, requiring repalcement of the wires coming out of the motor. This type of failure is not the result of a manufacturing defect and is not covered by warranty.

Upgrades, Parts, and Accessories

Many of our Authorized Dealers stock a number of parts and accessories for electric and pedal bikes. Many offer upgrades and accessories to make your ride more comfortable. From faster chargers to speedometers to lights, they will try to satisfy your electric transportation needs.

Phoenix II systems are manufactured for and distributed in the U.S. by ElectricRider. We supply Bike Shops, EV specialty stores, and online resellers.