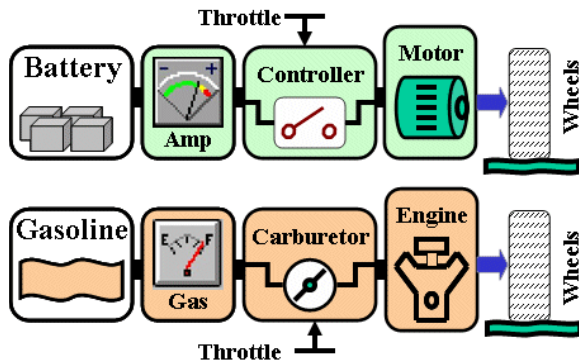


Overview

This FLYER is a summary of a **new Technical Note #010** which has been released on our web site www.alltraxinc.com and our "Document Depot". It described very important information about EV design that will help chose the right components for your application.

Lessons are learned when rebuilding EV cars such as wrong motor & controller combination, old or worn motor brushes, stock wiring used with a 600 amp controller, or a hunting buggy plowing through the bog with stock gearing and large tires.

Electric vehicles provide "motive power" in a different way; they utilize a large battery pack as the source of power (fuel), controlled by a DC motor controller to modulate power (carburetor) based on throttle input, and an electric traction motor (engine).



Large amounts of current are required to operate an electric vehicle, especially a modified EV with larger tires, stock gear ratios, or pulling heavy loads. If something goes wrong, the batteries are capable of unleashing potentially large currents. It is very important to have the right combination of components when increasing performance or capabilities.



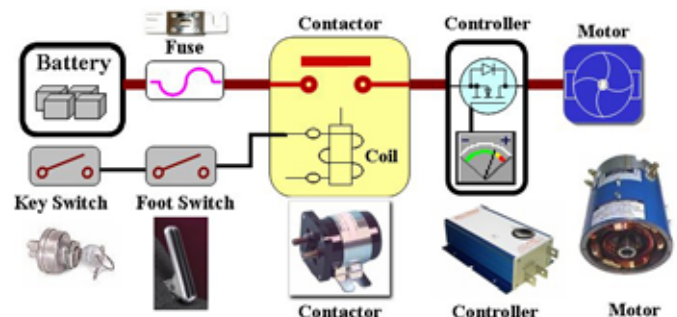
Equipment Design:

The **Technical Note #010** locate on our web site is a **9 page report** that will discuss - **IN DETAIL** - each component and safety device for a more reliable and safer design.

- **FUSE** interrupts battery power during a short circuit situation. Main purpose to protect the wiring and batteries, with secondary protection for controller or motor failure (direct short).
- **CONTACTOR** (sometimes called a solenoid) is controlled by the throttle footswitch. If the motor or controller fails, the operator removes the throttle which opens the contactor and disconnects battery current. Since the arc current is well below the main fuse current, the only defense is using the contactor as the protection device to disconnect the arc or plasma event.
- **DIODE** is a protection device across the contactor coil. The contactor coil is a magnetic device. When the contactor is turned off, the magnetic field collapses causing a "voltage spike" that can damage the controller. The diode safely clamps this energy.
- **PRE-CHARGE RESISTOR** is a device that slowly charges the capacitors within the electronic controller. Without this resistor, closing the contactor would generate large amounts of current and arc the contacts.

Interlock Diagram:

The Key Switch and the throttle footswitch control power to the contactor coil.



Brief Summary of Technical Note 010:

Fuses:

Any application where there is a battery pack, a fuse must be installed. A fuse will open the battery circuit and prevent any serious damage from occurring.



Controller Amperage	Fuse Rating
400A or less	250A
450A or more	400A

Contactors (called Solenoids)

A contactor is basically an “electromagnetically driven switch” capable of carry large amounts of current. Inside the contactor are a set of fixed contacts and a set of moving contacts.



Stock 70 amp contactor



Stock OEM 100 amp contactor



Performance 200Amp Contactor



Heavy Duty 400Amp Contactor

If a controller or motor fails, a plasma arc may form. When the foot pedal is released – the contactor opens and disconnects power. Undersized contactors may weld the contacts closed and continue to feed the arc.

Pre-Charge Resistor:



The resistor typically seen across the contactors big terminals pre-charges the filter capacitors in the controller. This minimizes arcing across the contactor terminals when closing and reduces peak currents in the controller.

Battery Pack Voltage	Resistor Value
12V-36V	250 Ohm 10W
48V	470 Ohm 10W
72V	1000 Ohm 10W

Contactor Coil Diode:

A contactor is basically an electromagnetic switch. When the contactor is energized, a magnetic field is created that pulls (or pushes) a movable bar or plate to make a connection with a set of fixed contacts.

The diode across the coil terminals safely dissipates the energy when the coil is turned off and protects the controller.



Wire and Batteries:

Wiring and battery health in an electric vehicle are very important and overlooked during performance upgrades. Wiring size is important, see the tech note for details on batteries.

Controller	Min wire AWG Standard Duty	Min Wire AWG Heavy Duty
300 Amp	OEM – 6AWG	4AWG
400 Amp	4 AWG	4 AWG
450 Amp	4 AWG	2 AWG
500 Amp	2 AWG	2 AWG
600 Amp	2 AWG	1/0 AWG
650 Amp	2 AWG	1/0 to 2/0 AWG

Conclusion:

Please download the Technical Note #010 on our web site for the 9 page detailed report how to protect your investments by choosing the correct components.