



Welcome

*Australian Electric Vehicle Association
Adelaide Branch*

July 2010



Bits & Pieces

*all those minor parts that are so
important in an EV conversion...*

Many thanks to Ian Hooper and
EV Works for supplying the
circuits and many of the photos
used in this presentation.

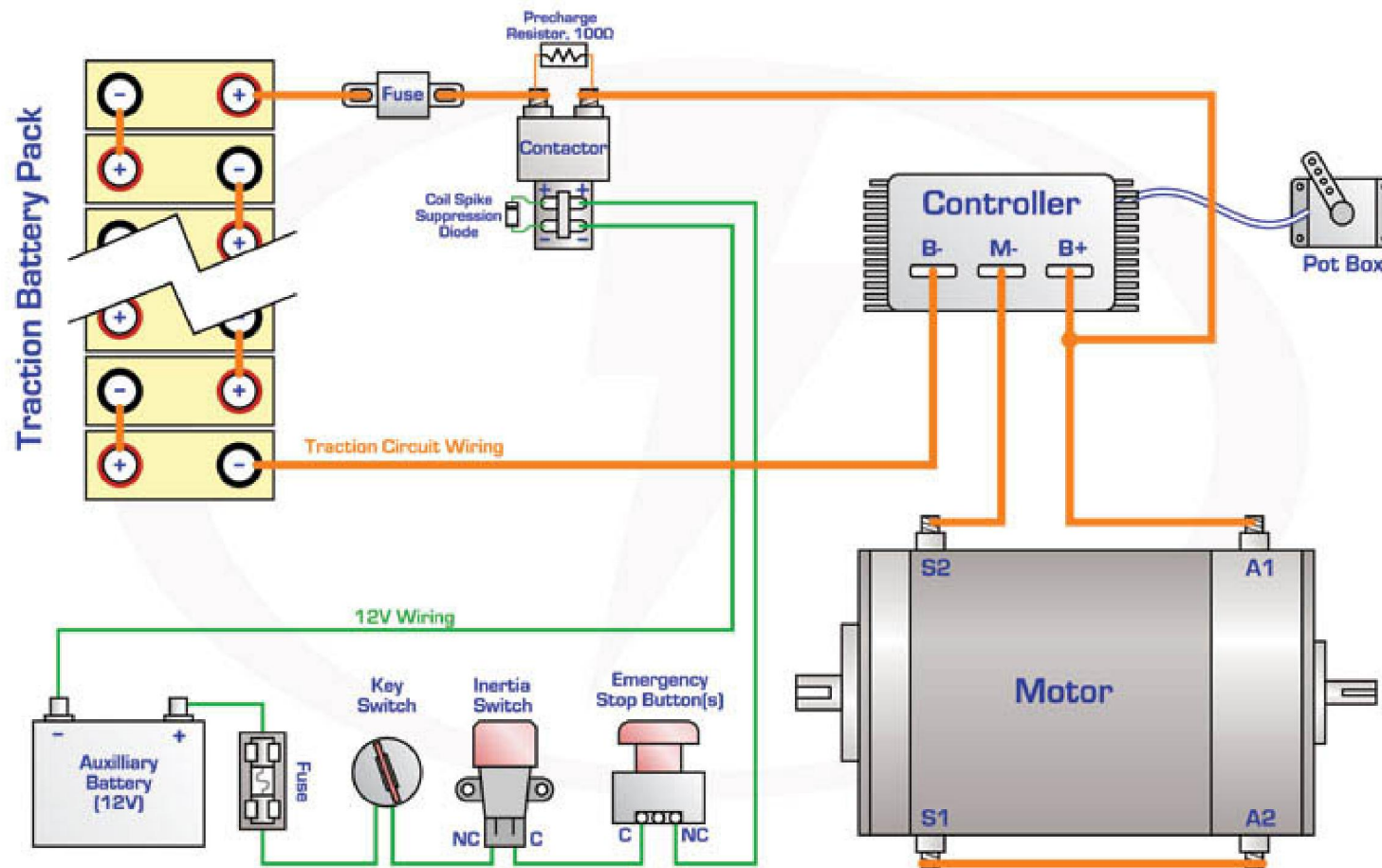
AEVA Presentation - Eric Rodda – July 2010



Bits & Pieces

Simple Wiring Diagram for DC Electric Vehicles

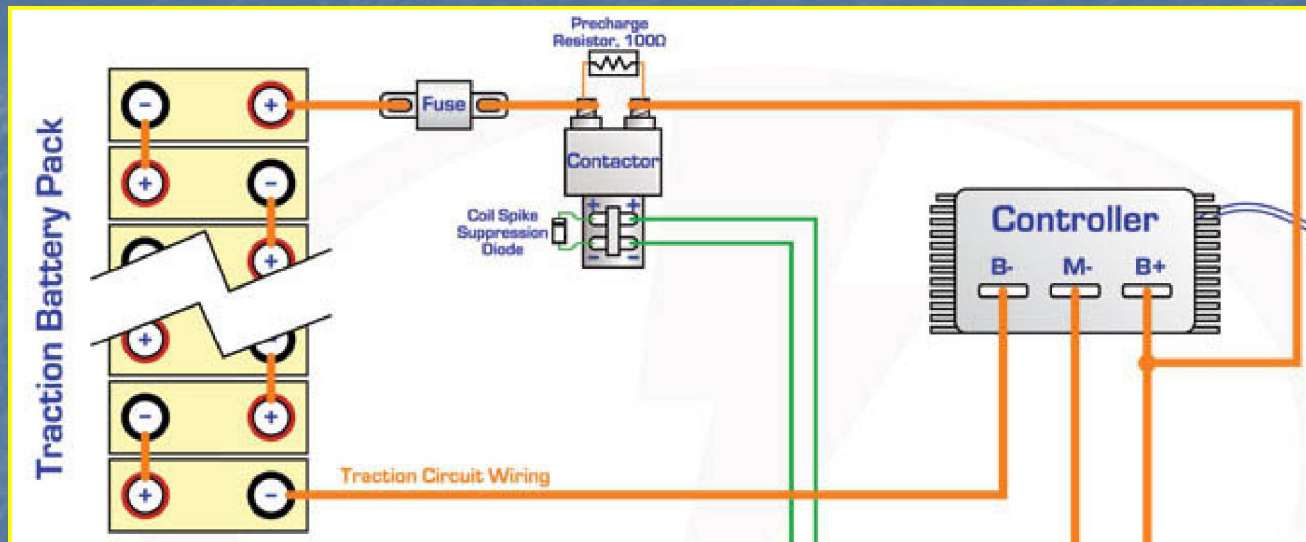
Zero Emission Vehicles Australia, 2009



AEVA Presentation - Eric Rodda – July 2010



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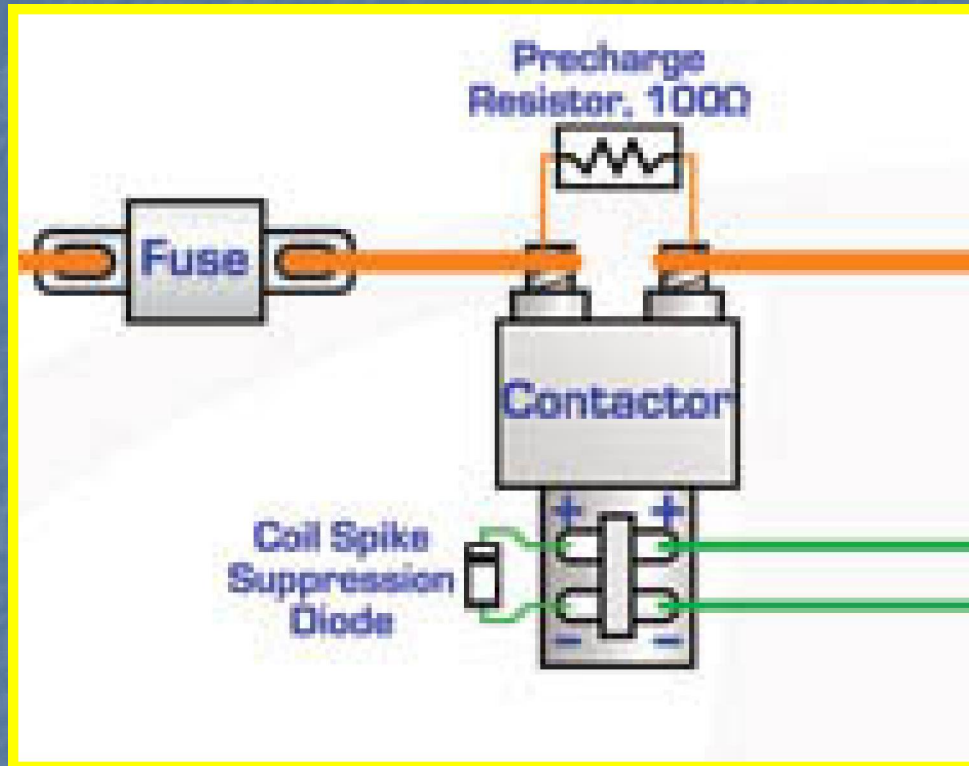


- **Contactor** – To connect the Traction Pack voltage to the motor/controller using a 12 Volt signal.

- **Fuse** – Protects batteries, contactor and controller in case of an unusual overload condition in the Traction circuit
- **Precharge Resistor** – Prevents damage to the controller by limiting inrush current to the controller
- **Coil Spike Suppression Diode** – Prevents 'Back EMF' from contactor coil effecting (damaging) any 12V circuits.



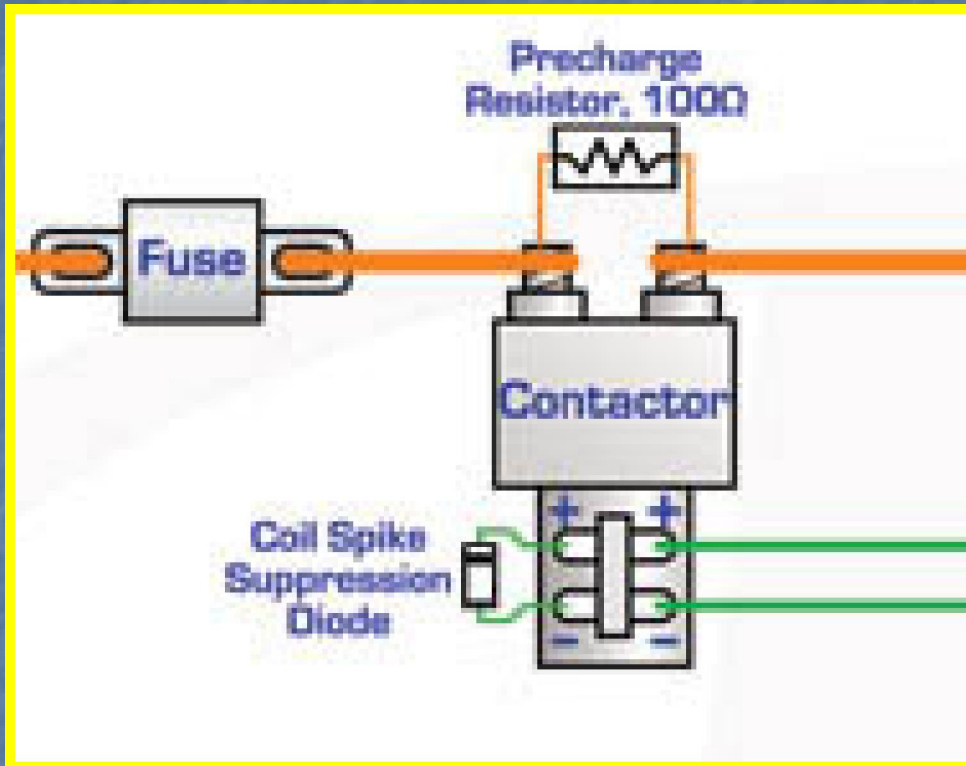
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- **Contactor** – This is basically a solenoid (a big coil of wire around a rod of soft iron) which, when 12 Volts is applied to the coil terminals, the pole piece is attracted to the 'electromagnet', hence the very heavy duty contacts are brought together, connecting the Traction Circuit to the next stage, usually the controller.



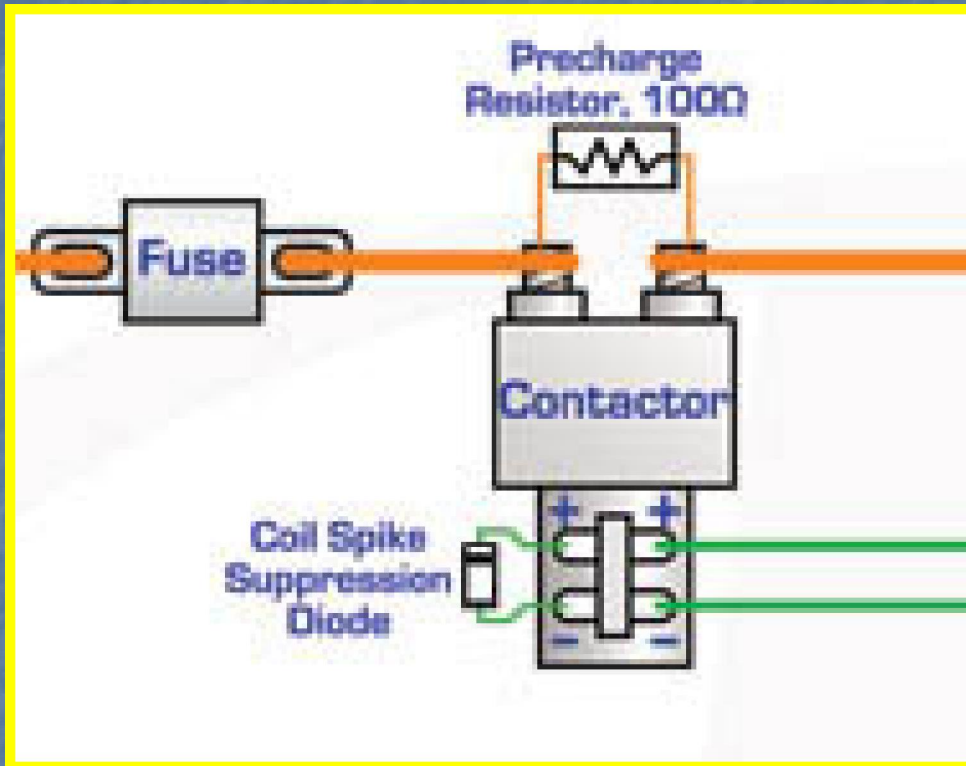
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- **Fuse** – This usually has a value rating in the hundreds, sometimes thousands of amps. It must be rated at a voltage higher than the nominal voltage of the Traction Pack voltage Typically: 600 Volts.



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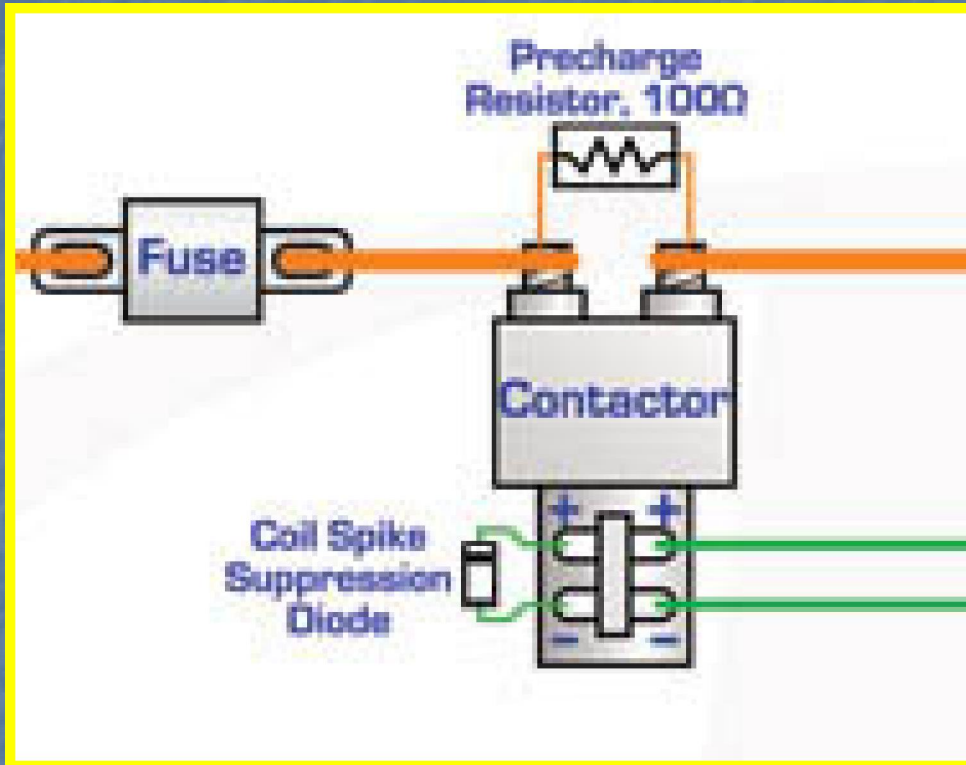
Precharge time ?

This is usually in the vicinity of 3 to 10 seconds.

- **Precharge Resistor** – Prevents damage to the controller by limiting inrush current to the controller. **The Traction Battery must be connected before the contactor is actuated**, so that the Precharge Resistor can charge the large capacitors in the controller with a small current which is not enough to allow the car to move.



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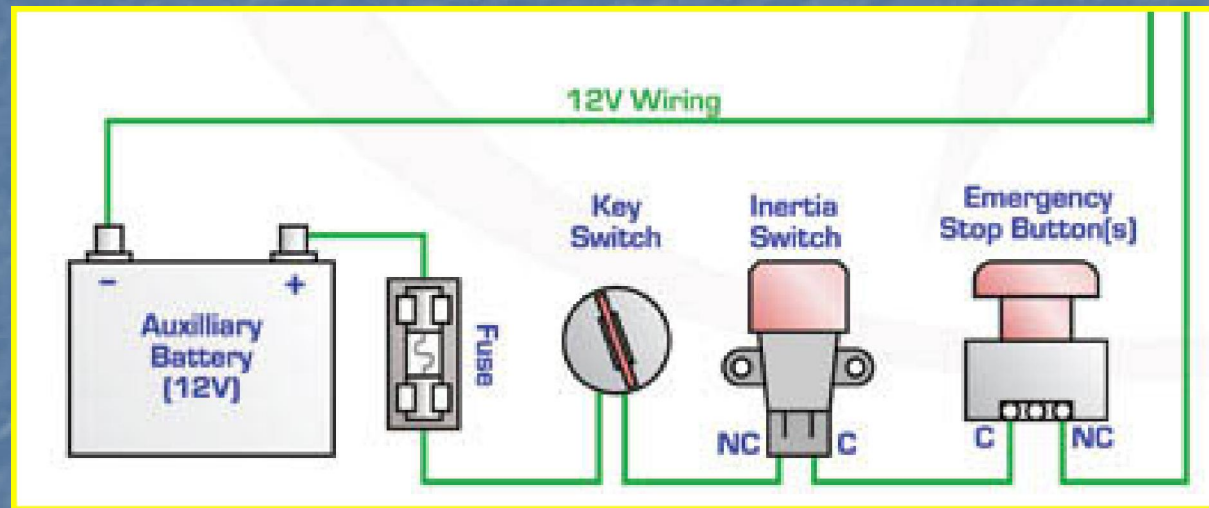


- **Coil Spike Suppression Diode** - Back EMF (a high voltage with the reverse polarity) is produced as the magnetic field collapses when the voltage is removed from the contactor coil. This diode prevents damage to any 12V circuits by shorting out this 'Back EMF' voltage.



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12V to contactor coil



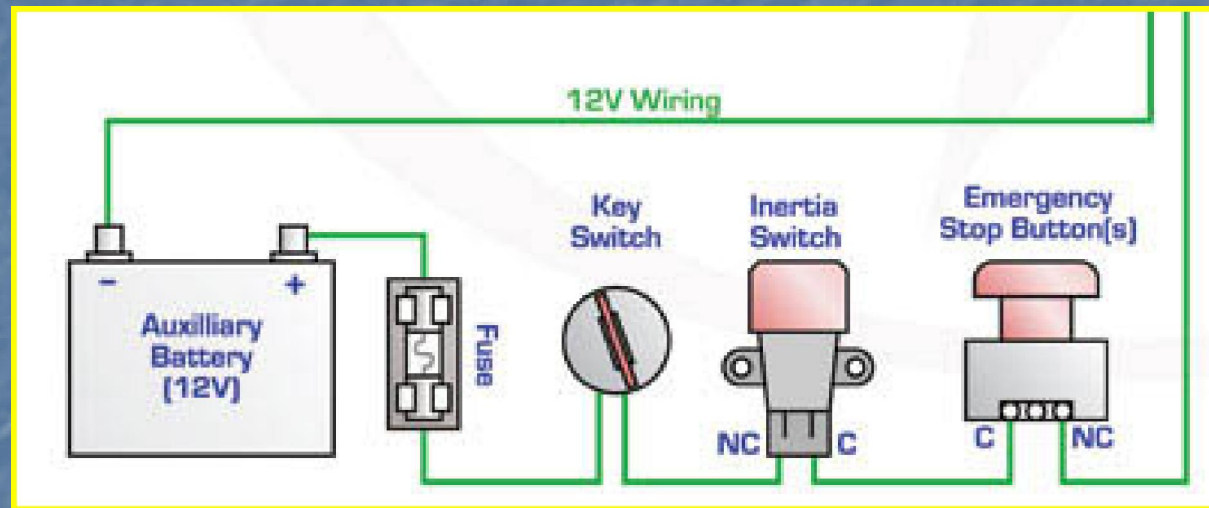
- Fuse
- Key Switch
- Inertia Switch
- Emergency Stop Button

All the items mentioned here are all in 'Series';
if one opens, then the contactor also opens,
removing the traction pack voltage from the controller.



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12V to contactor coil



- Fuse
- Key Switch
- Inertia Switch
- Emergency Stop Button

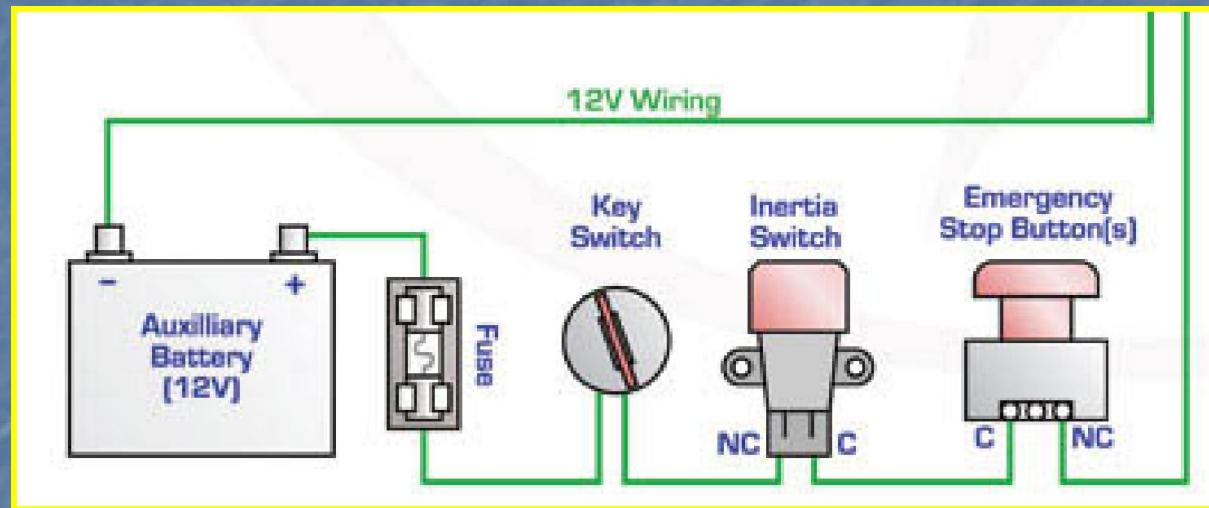
Fuse – This is important to protect the other 12V items, should a fault condition arise.

It is usually in the original car fuse box. For this application it could have a rating of approx 5 - 10 Amps.



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12V to contactor coil



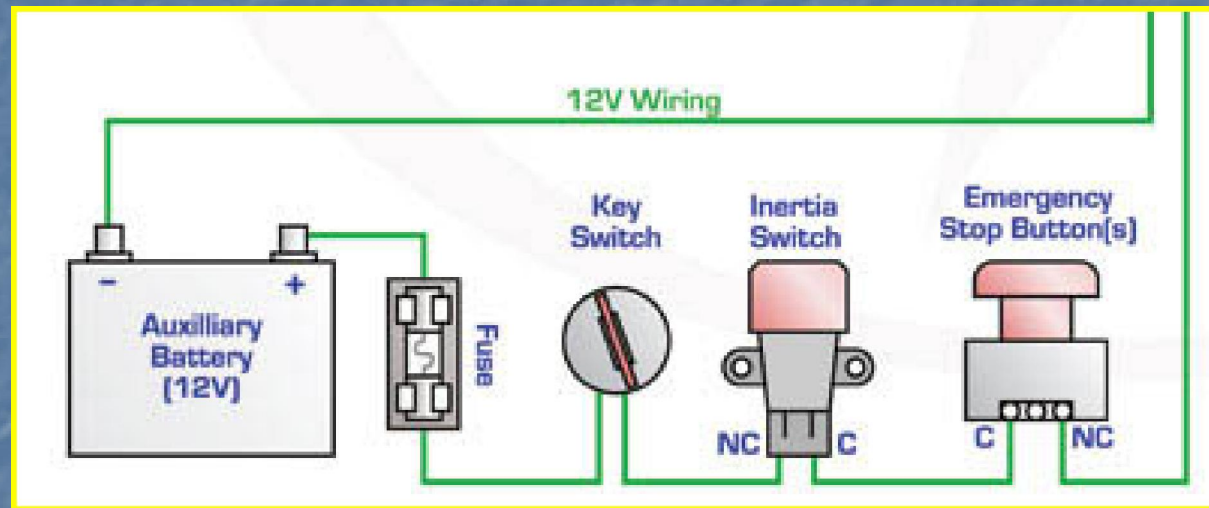
- Fuse
- Key Switch
- Inertia Switch
- Emergency Stop Button

Key Switch – This is usually the 'ON' or 'IGN' position of the Ignition Switch. This turns the car ON and, if all other conditions are right, the contactor will energise and supply Traction Pack voltage to the controller



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12V to contactor coil



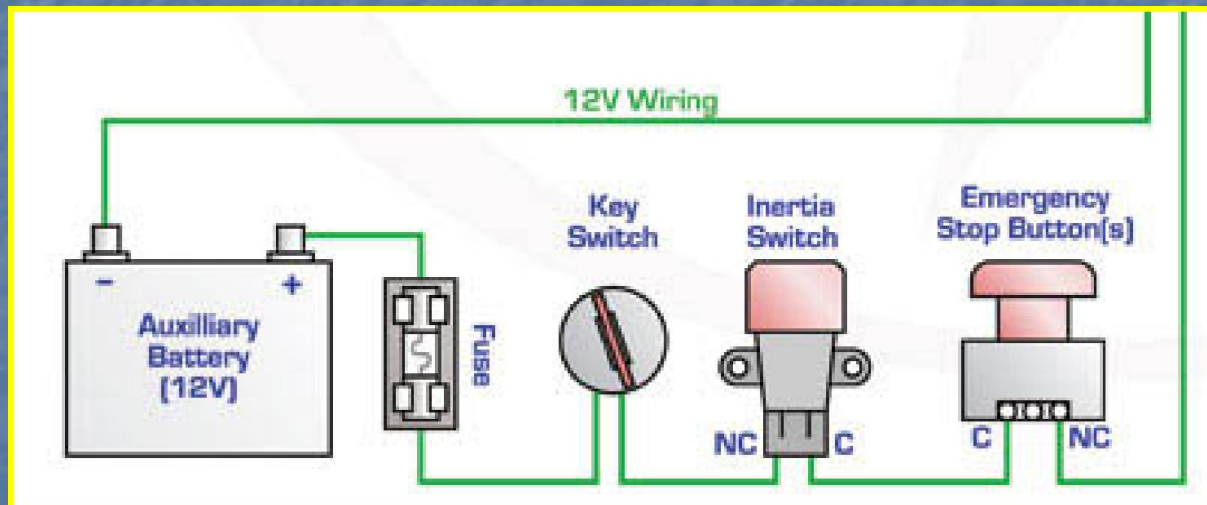
- Fuse
- Key Switch
- Inertia Switch
- Emergency Stop Button

Inertia Switch – This switch is designed to go open circuit when the vehicle is involved in an accident i.e. An extremely sudden stop in any direction. This switch is attached firmly to the firewall, and can be reset by pushing on the top section.



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12V to contactor coil

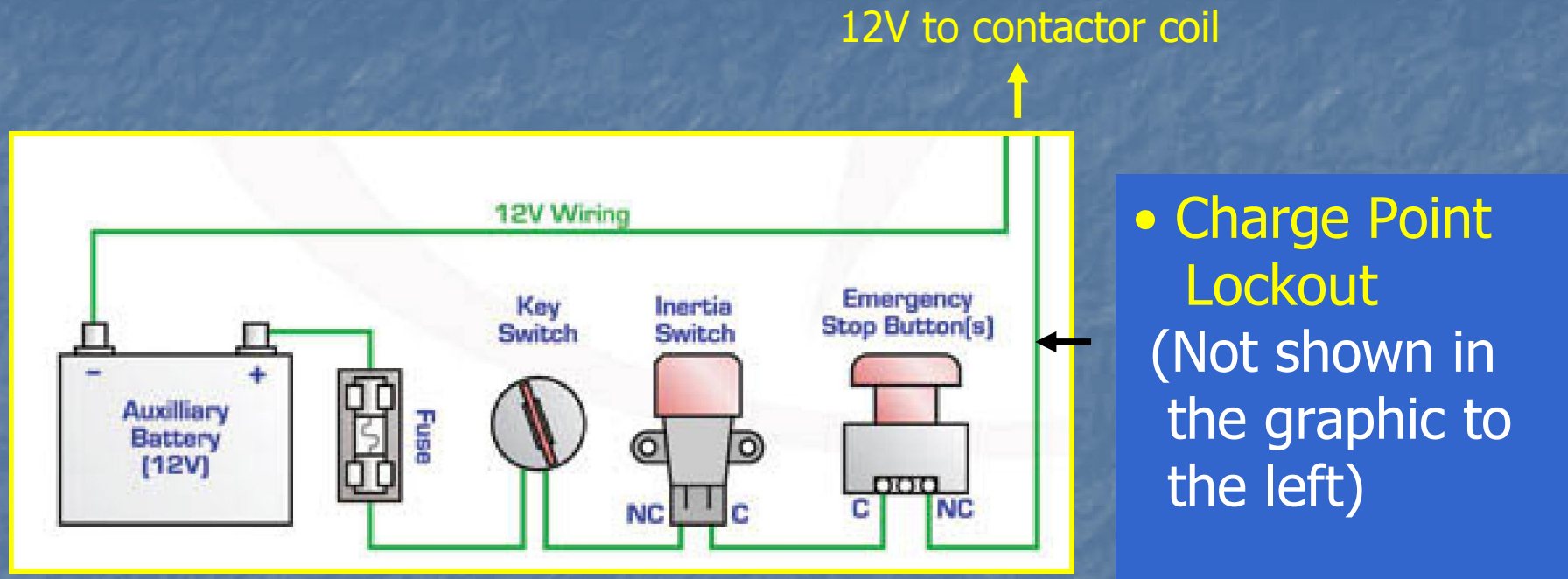


- Fuse
- Key Switch
- Inertia Switch
- Emergency Stop Button

Emergency Stop Button – An easily accessible push switch which can be punched off in an emergency situation eg. controller fault; causing full voltage to the motor. Some regulations say that this switch should be in the Traction Circuit.



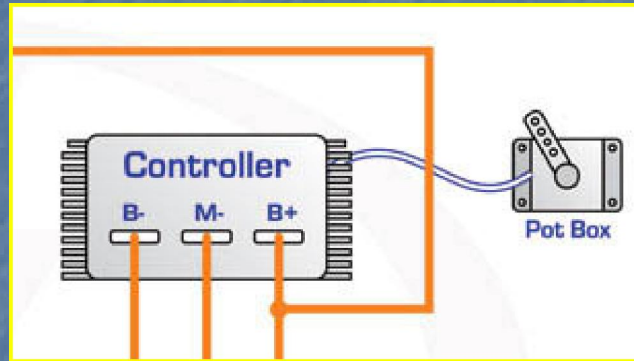
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Charge Point Lockout – Sometimes on the petrol filler door, there should be a switch attached so that when the door is open and the power cord is plugged in, the switch, also in series with the other items, should be 'open', preventing the car from 'starting'.



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Pot boxes are available in two types:

- Resistive – Older style
0-5K ohm, 5-0k ohm
0-5Volt (3 terminal only)
- Hall Effect – more reliable.
Only wearing parts are the shaft pivots. 0-5Volt

Pot Box – This is mechanically connected to the accelerator pedal, then that action can be transferred into a change of electrical resistance or voltage. This change is then fed to the controller which uses it to vary the speed of the motor.

Edwin Herbert Hall - 1879



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Vacuum Pump – An electric vacuum pump is used in electric vehicles to boost the vacuum needed for normal power brakes operation. The original IC Engine used to supply the vacuum required.

MES-DEA 70/6E shown here is made in Switzerland especially for electric cars and conventional cars which require this feature eg. cars with turbo. It features inbuilt vacuum switch and one way (non-return) valve and is relatively quiet (< 58 dBA) and low current usage (< 2.5 Amps) at 12 Volts.



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Vacuum Pump – An electric vacuum pump is used in electric vehicles to boost the vacuum needed for normal power brakes operation. The original IC Engine used to supply the vacuum required.

YT Stabletech VBS. These vacuum pump kits are produced by Taiwanese company YT Stabletech specifically for providing vacuum for brakes in vehicles. Available from EV Works WA.



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Vacuum Pump – An electric vacuum pump is used in electric vehicles to boost the vacuum needed for normal power brakes operation. The original IC Engine used to supply the vacuum required.

VBS100. Robust vacuum pump for electric vehicles, 4.3 Amps at 12 Volts. Supplied with vacuum switch. Available from EV Works WA.



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Vacuum Pump – An electric vacuum pump is used in electric vehicles to boost the vacuum needed for normal power brakes operation. The original IC Engine used to supply the vacuum required.

Very quiet vacuum pump for electric vehicles,
4.5 Amps at 12 Volts. Vacuum switch not supplied.
Available from EV Works WA.



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Vacuum Switch – Used with an electric vacuum pump to keep the vacuum in the brake booster system between the minimum and maximum levels, ie. To match the vacuum of the original car.

A “Tee piece” is then required to put this inline with the pump.





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Non-Return Valve (or Check Valve) – Used with an electric vacuum pump to prevent loss of vacuum from the power brake system.

The original brake booster fitted to the car may have this item included at the inlet or inline. If this is the case you may not have to purchase this item.





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Vacuum Pump system complete with vacuum reservoir – Vacuum switch on the left, non-return valve in the top centre, electric pump on the right and vacuum reservoir below (made from high pressure PVC tube with end caps).





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POWER STEERING -

Most cars these days have power steering which is driven from the IC engine.

This 12V/24V electric pump can bolt straight onto the pressure/return lines on the power steering in an EV conversion. (EV Works WA)

Electric steering pumps can also be found at the wreckers – eg. Mazda etc.



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ANY QUESTIONS ?

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