

DC Electrical System

Intro

We're going to use 1 relay with 4 or 5 pins, and if you want a more complex system, a second 5 pin relay.

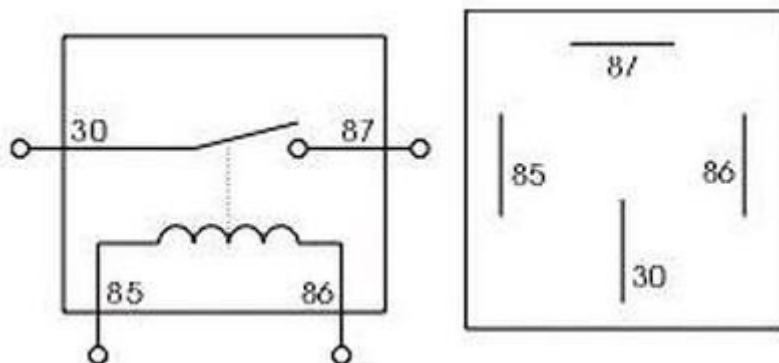
A relay is a very simple electrical mechanism, it has 4 or 5 pins (could have more or less pins, but we're going to use relays with 4 or 5 pins). The working principle is very simple: It has a coil that will turn into a magnet when electrical current goes through it and when that happens the magnet will attract a switch that will let current through it.

Now you ask, why use a relay and not simply connect what we want to feed to the wire that has 12v DC while the key and engine are on? Simple, that wire was made (in this case, the brake light wire) to withstand a certain current, in this case around 1.75A at 12v, and the maximum it could withstand could be around 2A. If we connect for example a pair of heated grips, mine for example uses 1.86A at 12v, so 1.75 plus 1.86 equals 3.61A, if the wire only withstands 2A we're going to have problems... The relay only needs 0.13A so it's fine.

If you want to connect some LED's you don't need this tutorial, just find the wire and connect the LED's since consuming more than 0.2A is very difficult.

The relay pins are numbered, all of them have pins 85 and 86, the coil pins. One connects to the bike ground, and the other to the wire that will activate the relay coil. Then we have the pin 30 that will connect to the battery positive pole and the pin 87 will connect to what we want to feed. On the 5 pin relays we have to 87 pin, the 87 and 87a. It's the 87a ("a" from always opened) that is connected to the pin 30.

In the picture, a 4 pin relay:



This modification is very simple to do and you have 2 ways of doing it (very, very similar) and an extra to it.

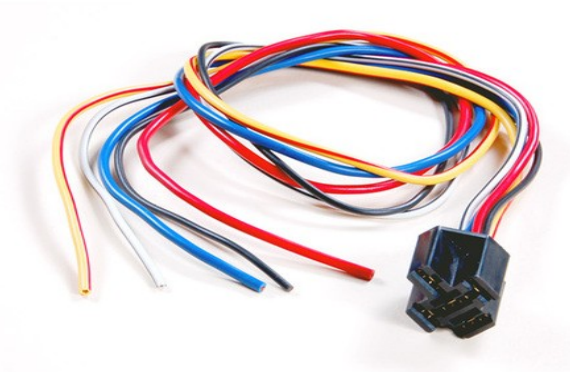
- The basic one only requires a 4 pin relay. The only thing it will do is let the current from the battery flow from it to the DC circuit when the relay is activated (meaning, when you turn the key on). When you shut the engine off the circuit is deactivated.

- Other way of doing it is using a 5 pin relay instead of a 4 pin one. It will do the exact same

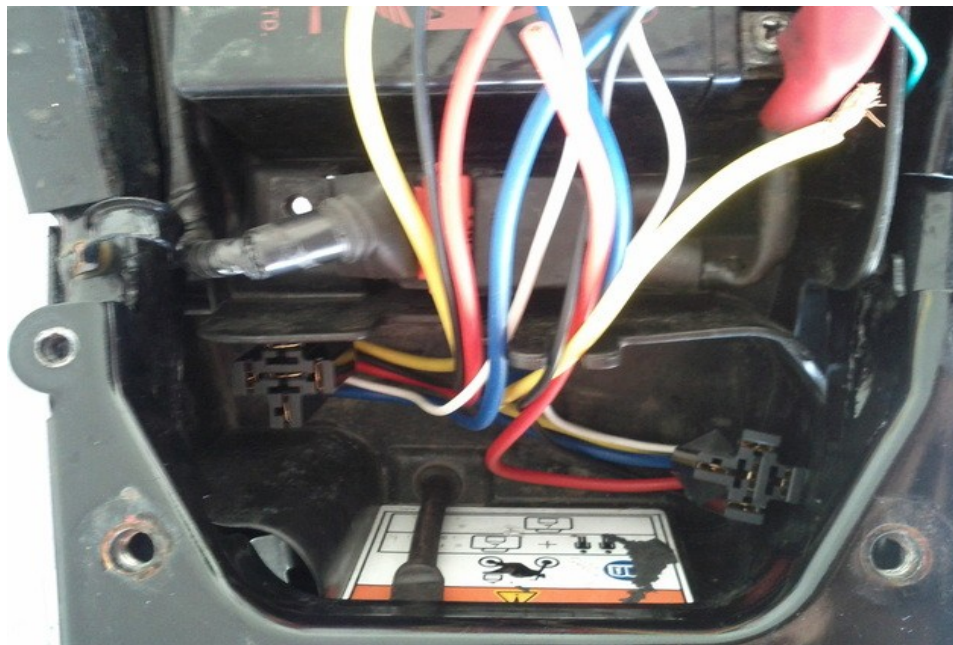
thing, the difference is that a 4 pin relay either don't let or let current trough pin 87, a 5 pin relay switches between pin 87a and pin 87. That way you can connect something to the pin 87a that you only want to work while the bike engine is off. In my case is for the alarm so it won't go off while riding. You can for example connect a dummy LED alarm, that way you won't need to turn it off when riding the bike. You can see that guide [here!](#)

- After using on of the above ways you can add an extra 5 pin relay. This relay will cut off all that is connected to the DC circuit while the starter motor is running. Just like any other car, when you start it the radio, powered windows, lights, etc, will go off. That way you'll save the starter motor, battery and everything connected to the DC system.

How you make the connections is your criteria, I went to ebay and bought some relay socket's. I also bought the relays on ebay. Also the wire connections we're all soldered and using connectors.



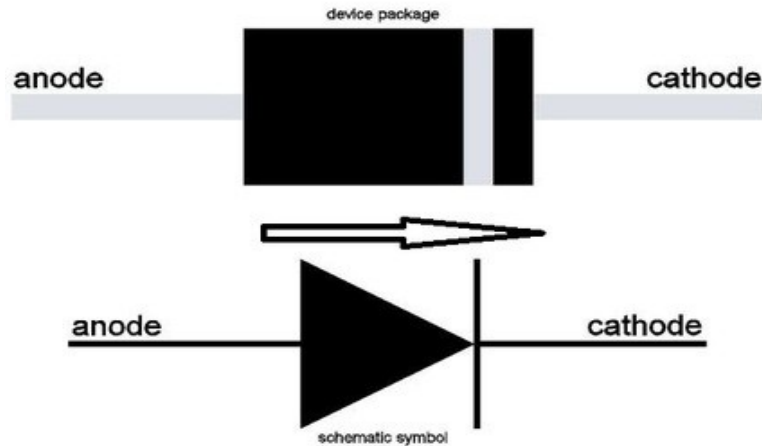
The relay localizations is also your criteria, I have put them in the back of the battery, where there where the bike tools.



1st Way

The 1st way is very simple, just pick up your 4 pin relay and do the connections. The connection scheme is on the 2nd way.

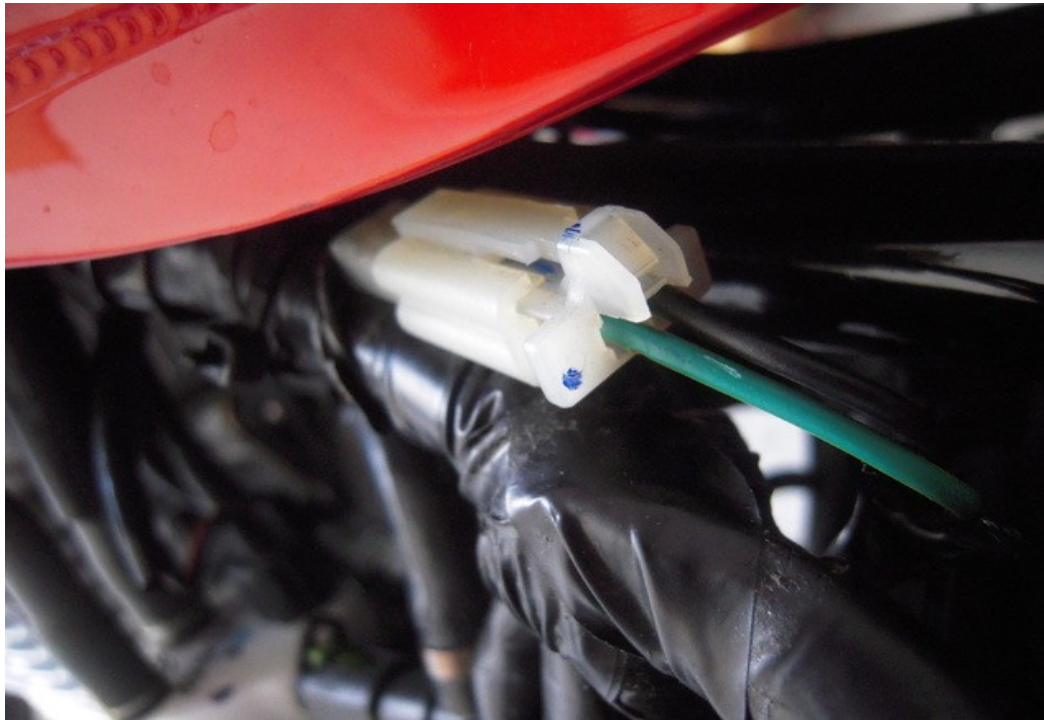
1) Let's connect pins 85 a 86 first. There's is nor connection order unless the relay socket has a diode should respect the diode current flow. See the picture below, also normally the connection is pin 85 to positive wire and 86 to negative wire.



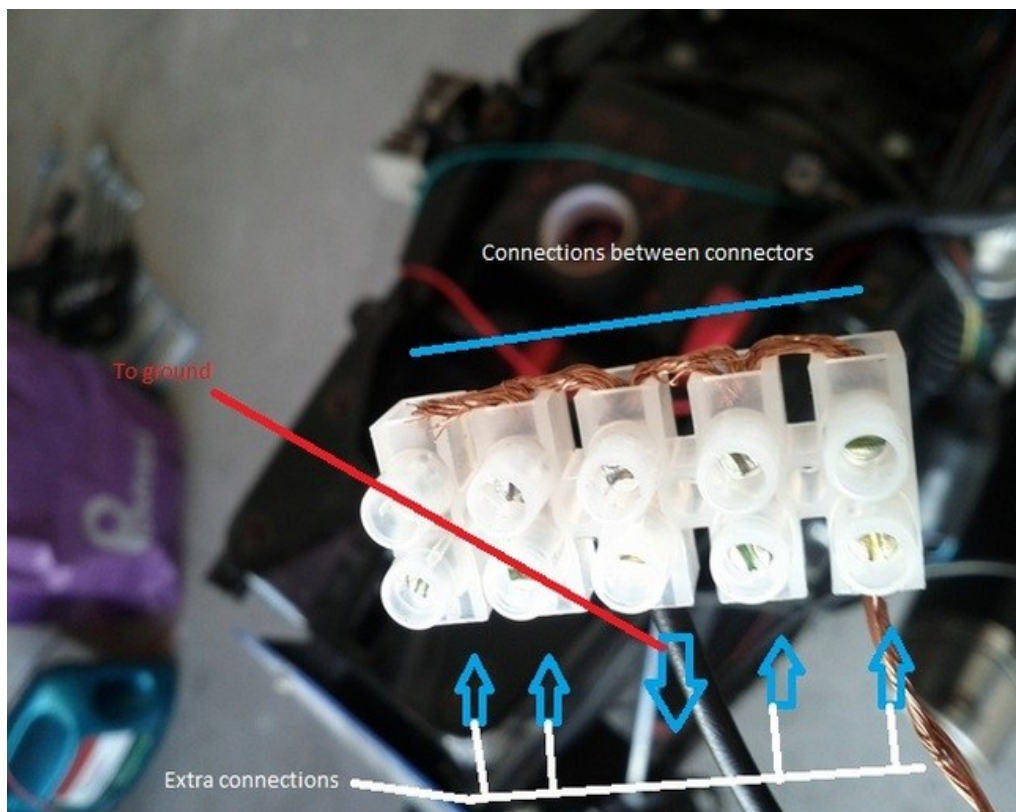
Let's presume the socket has a diode (mine have), so the pin 86 connects to the ground, and pin 85 to the wire that has 12v when you turn on the ignition key. There are some wires like that, I used the wire that feeds the rear brake switch. It is located on the left side of the bike, you'll need to take off the black plastic part and the seats.



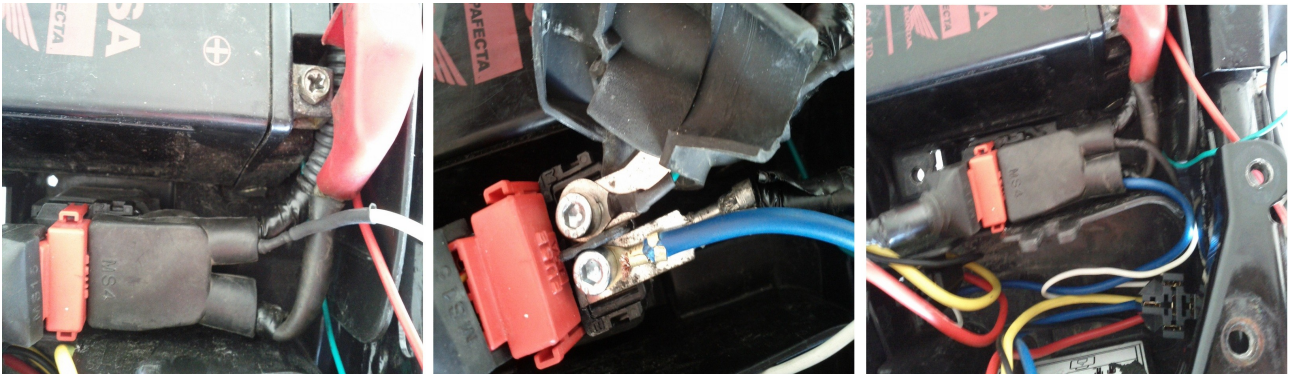
2) You'll find 2 wire, one feed the switch (black wire, the one we want) and the other only has 12v when you press the brake pedal. Cut the wire or insert a new inside the connector.



3) Then connect this wire to the pin 85, and the pin 86 to the ground or the battery negative pole. Since I had 4 connections (2 relays, the alarm ground and have pulled a wire to the front of the bike) I made a connector bridge. Made the same thing with the live wire.



4) Now connect the pin 30 to the positive pole of the battery, and if you prefer a cleaner job you can connect it to a connector that is protected by a black rubber, behind the battery. There are 2 connectors, the one with black wire is the starter motor wire (only use it in the extra part) and the one with the blue wire is connected to the battery.



5) The DC circuit is made, and now you can connect everything you want to it (pin 87), but you'll still have AC on the bulbs listed bellow:

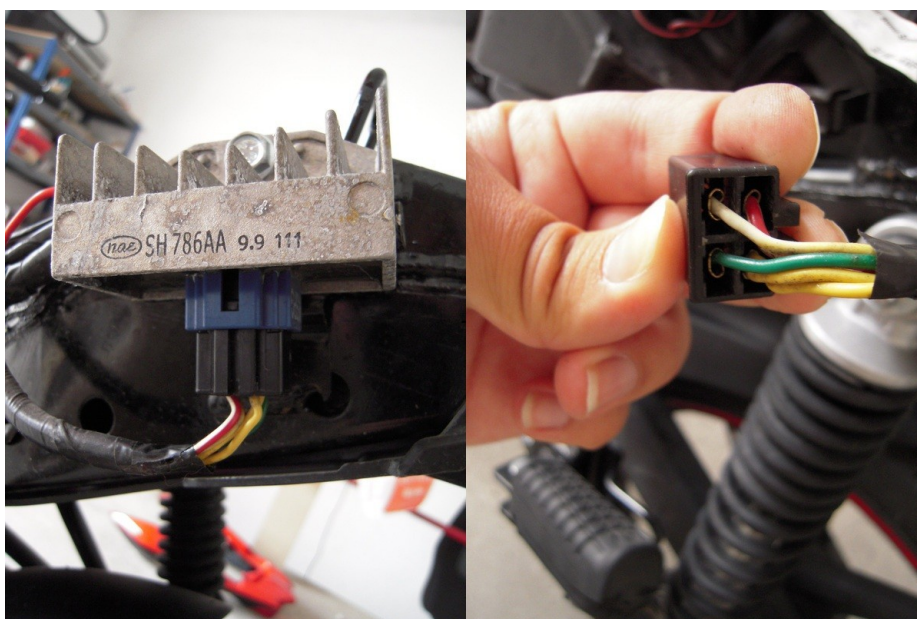
- Tail light;
- Parking lights;
- Clocks illumination;
- Headlight (low and high beam).

If you notice all these bulbs have a green wire (ground) and a yellow wire. This is the wire that comes from the rectifier that we will cut and connect to our DC system.

Attention: If you want to do the extra part cut the yellow wire but don't connect it yet to the DC system.

The pics in order:

- Rectifier localization;
- Push the wires;



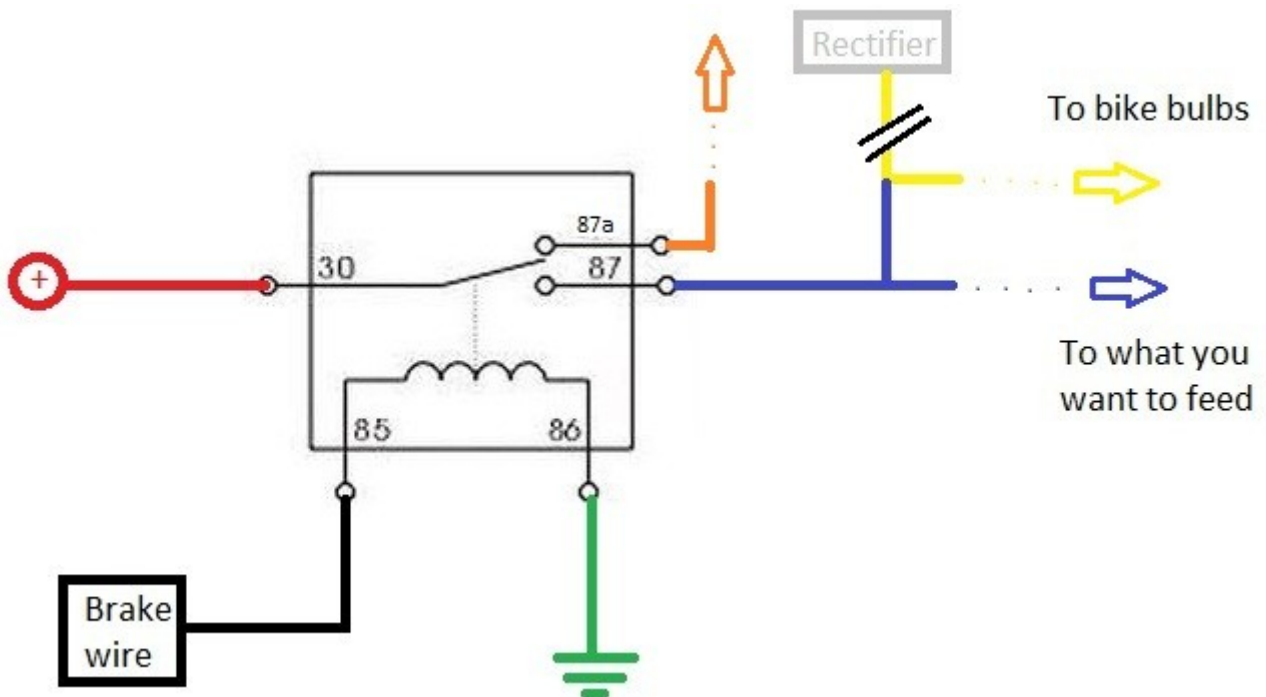
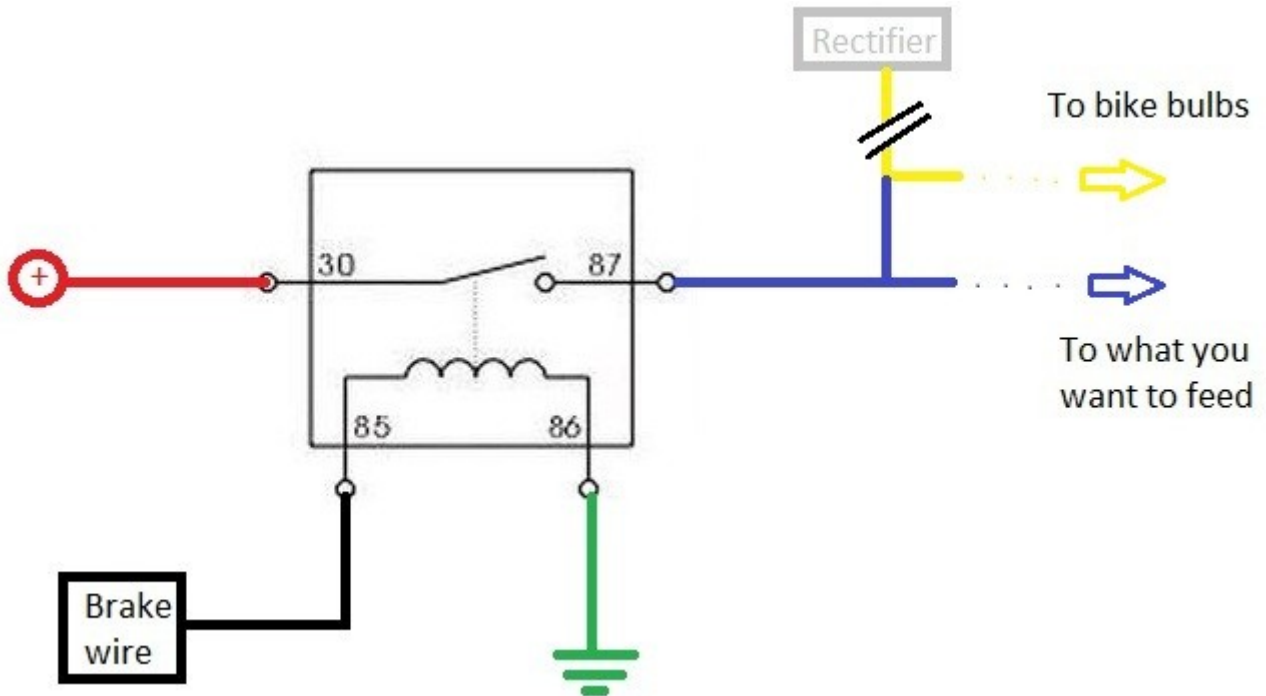
- Cut the 2 yellow wires;
- Isolate the yellow wires that come from the rectifier, and connect the the other 2 to the DC system, the pin 87. You can see I used a blue wire.



2nd Way

Just like the 1st way, the difference is that the relay has 5 pin instead of 4. The connections are exactly the same, just connect what you want to feed while the engine/key is off to the pin 87a.

In the next 2 pictures you have the connections schematics for the 2 way's. The colors used are exactly the same has my relay socket's, but could be different in yours so stay with the pin-out numbers.

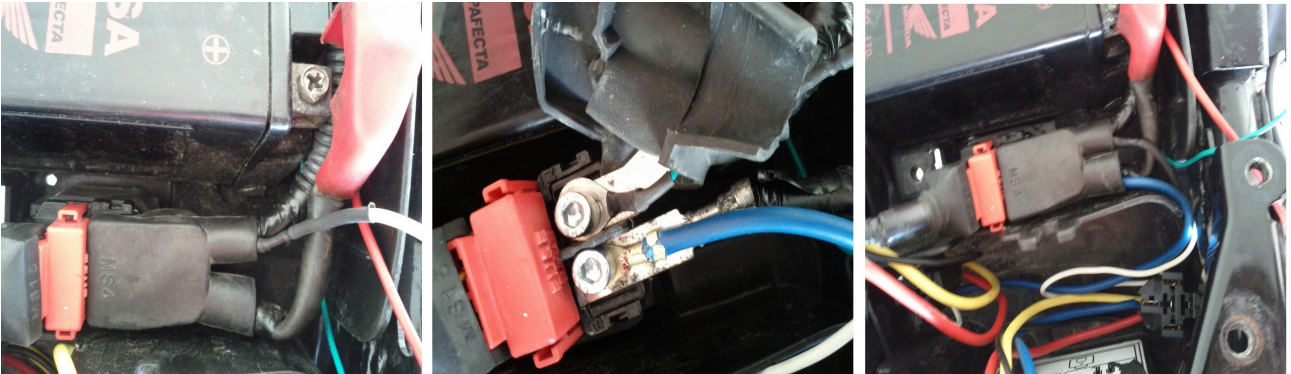


Extra

The objective is that everything connected to the DC system is cut off while the starter motor is running.

The next picture shows the connection scheme. When I made that “attention” notice was because instead you connect the yellow wire to the 1st relay pin 87, you'll be connecting it to the 2^o relay pin 87a. The 2^o relay pin 87 will only have power when the starter motor is running, therefore it is useless, isolate it. The wire we let lose before pin 87 from the 1st relay) will connect to the pin 30 of the 2^{sd} relay.

The pin 85 and 86 is exactly has the 1st relay, but the pin 85 will connect to the spare connector I talked earlier, the one that feed the starter motor.



And it is done..

I hope I have been useful. To make it easy there's a video in my [youtube channel](#) and on the [guide page](#) on my [logbook](#). In that page you can also see some videos showing the result and also the bike electrical diagram with the DC system.

Photos, text and tutorial by João José Maia ([jjmaia](#)) @ 2011