Double Relay Article
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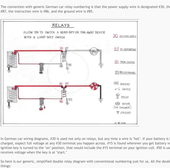
Double Relay Article

by **Armadajim** » Mon Dec 23, 2008 9:58 pm

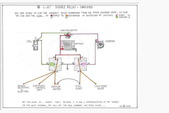
Relays allow you to switch heavy loads for our aging devices with light duty switches.
In the case of the rear energized PM, we get to instruct the far away starter to turn over the engine with a very light wire telling the starter relay to hook up the heavy duty battery cable with the equally heavy duty starter motor cable at the solenoid.

The connection with generic German car relay numbering is that the power supply wire is designated 85, the destination wire is 87, the instructor wire is 86, and the ground wire is 30.

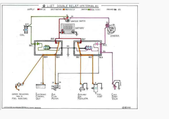


In German car wiring diagrams, 30 is used not only on relays, but any time a wire is "live". If your battery is hooked up and charged, expect full voltage on any 30 terminal you happen across. 87 is found wherever you get battery voltage when the ignition key is turned to the "on" position, that would include the 87 terminal on your ignition coil. 15 is used for any wire that receives voltage when the key is in the "run".

So here is our generic, simplified double relay diagram with conventional numbering just for us. All the double relay does is two things:
1) Supply voltage to the fuel injection system when the ignition is on.
2) Supply voltage to the fuel pump under two specific transactions,
a) when the ignition is on
b) when the engine has been informed by relay that it is the current time to crank the engine.

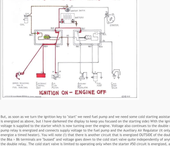


Also, it cannot be simpler. You will also see only little adherence to the German electrical system numbering convention at the double relay itself. But if you compare the colors used in the above generic diagram to the colors below in the actual current path diagram, you will see that the same wire colors are used for the same purpose. Black is always the ground wire, red is always the "power" circuit is connected to ground and it instructs the "power" relay to provide voltage to the injectors, via the voltage dropping "series resistor", and the Electronic Control Unit. The starting circuit is colored in pink. It runs the "fuel pump" relay which supplies voltage to the fuel injectors, and the Auxiliary and the Regulator.



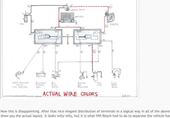
Let's run you through the sequence! First, we turn on the ignition. Power relay gets energized and the ECU and series resistors have voltage. The engine is not turning though, so we certainly don't need a fuel pump just yet.

Ignition On - Engine OFF



But, as soon as we turn the ignition key to "start" we need fuel pump and we need some cold starting assistance. (the ignition side is energized as above, but the new connections that the relay makes are only focused on the starting side.With the ignition key at ON, voltage is supplied to the starter which is now turning over the engine. Voltage also continues to the double relay where the fuel pump relay is now energized and supplies voltage to the injectors and the fuel pump. The Auxiliary and the Regulator are also energized by the relay at this time, new pink circuit is in fact there is another circuit that is energized OUTSIDE of the double relay function, the 86a - 86 terminals are "toased" and voltage goes down to the cold start valve supply independently of anything going on inside the relay. Voltage is also supplied to the Thermo Time Switch which is a temperature controlled switch. When it is cold outside the Thermo Time Switch sends voltage to the cold start valve, to the Auxiliary and Regulator, the Thermo Time Switch only needs voltage to energize an even faster timed heater than the Aux/Reg.
Starting.

When the engine starts, we release the ignition key. The starter circuit drops out. The CSV and TTS are cut off as well. And inside the double relay, the fuel pump relay is going to want to drop out as well.... but, it doesn't. Thanks to the 87 Flow Meter, the fuel pump relay is still being supplied with voltage. The Flow Meter is a "normally closed" switch and it supplies voltage to the 87A side of this time, new pink is return to the fuel pump relay through 86a, illustrated with a dashing black-and-red wiper wire. The 86a - 86 terminals are "toased" and voltage goes down to the cold start valve supply independently of anything going on inside the relay. Voltage is also supplied to the Thermo Time Switch which is a temperature controlled switch. When it is cold outside the Thermo Time Switch sends voltage to the cold start valve, to the Auxiliary and Regulator, the Thermo Time Switch only needs voltage to energize an even faster timed heater than the Aux/Reg.
Running.



Actual wire colors and locations are unfortunately not nearly as beautiful as depicted. This might be a good thing. All wiring in the actual vehicle appears in white. Nothing wring is color coded.
Actual Wire Colors:

Now this is disappointing. After that nice elegant distribution of terminals in a logical way in all of the above diagrams, I have to show you the actual layout. It looks silly-silly, but it is what VW/Bosch had to do to separate the vehicle harness from the fuel injection harness. Bosch wanted to be able to sell the fuel injection harness to other OEM's and VW wanted to be able to sell you just what it is that you need. Bosch wanted to be able to sell you just what it is that you need and VW wanted to be able to sell you just what it is that you need. The left plug is the vehicle harness, you can see multi-colored wires. The right plug is all white wires leading into their harness. People get confused because the wire numbers are different, but the wire colors are identical. Bosch uses the same terminal number since the correct plug "sort", as Bosch have labelled both the double relay terminals and the plug terminals.

CSV - SAME RELAY, Bosch
CONNECTOR
SOCKET
PLUG
CONNECTOR
SOCKET
PLUG
CONNECTOR
SOCKET
PLUG