

# How to replace the hall sensors in a direct drive hub motor\*

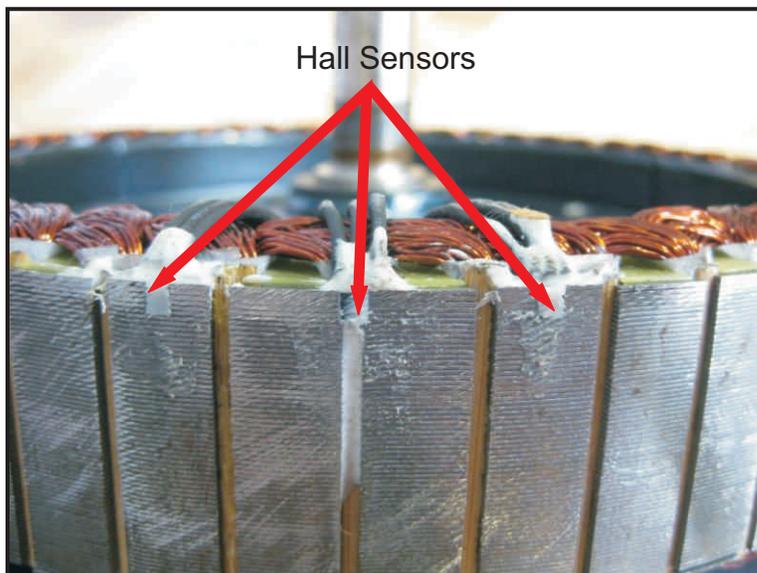
\*This guide assumes you have already removed the motor stator from the hub to give access to the hall sensors. If you have not done so, please see the guide entitled "How to take apart a hub motor". It also assumes you know which hall sensors you will be replacing - if you don't please see the guide entitled "Hall Sensor Testing".

## Tools Needed:

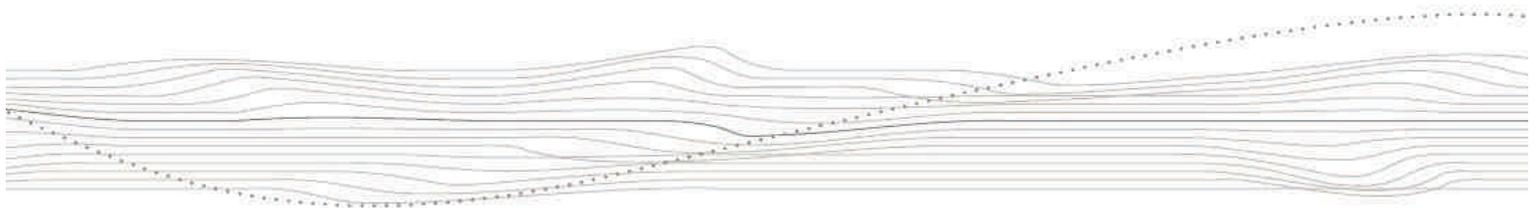
1. Side Snips
2. Soldering Iron and Solder
3. Hall Sensor(s)
4. Epoxy
5. Heatshrink

## Optional:

5. Rare earth magnet
6. Zip lock bag
7. Small flathead screwdriver
8. Heatgun (although a hairdryer will do the job too)
9. Multimeter



First, locate the three hall sensors inside the motor.



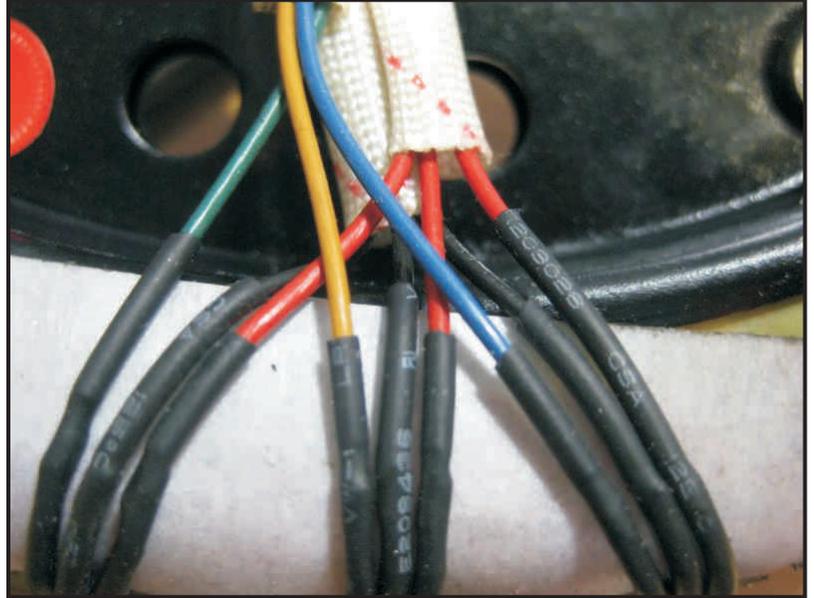
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In most hub motors you will have five different colours of wire: red, black, yellow, green, blue.

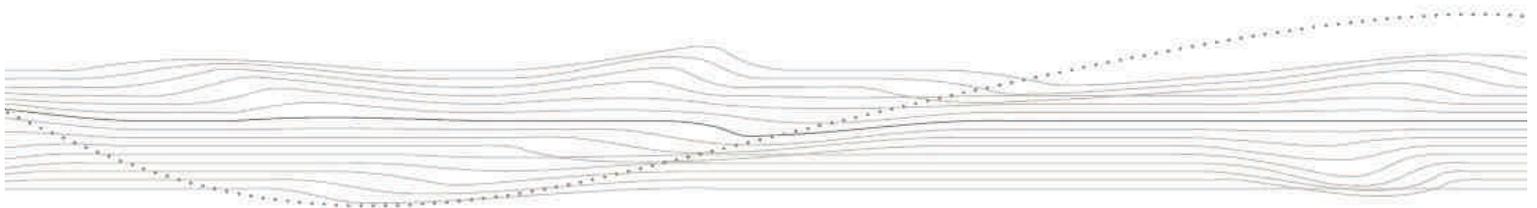
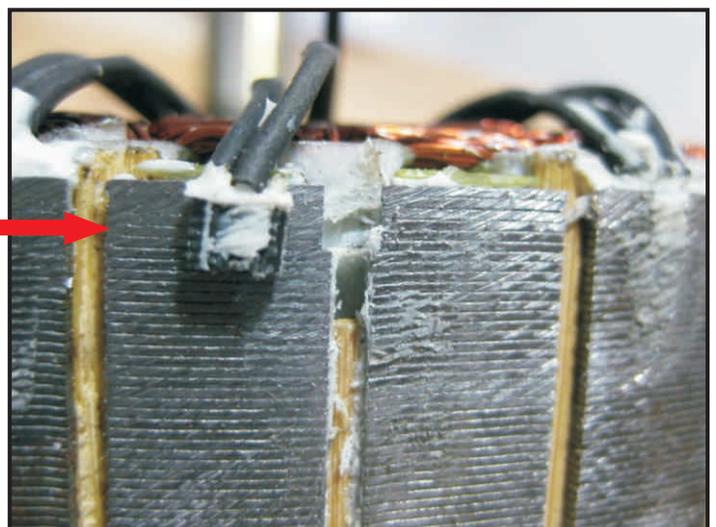
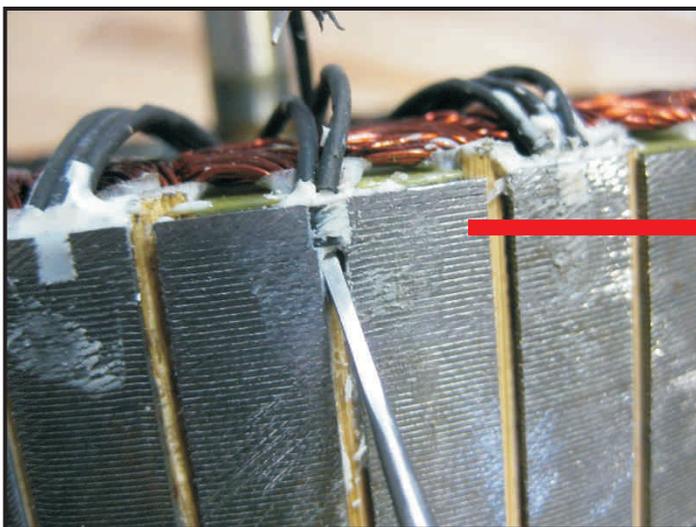
The red wires will go to each of the three hall sensors for power, the black wires will go to the hall sensors for the ground and then the yellow/green/blue wires are for the signal line.

This means it is easy to see which hall sensor needs replacing once you've tested with a multimeter. Once you've identified which hall sensor needs replacing you will need to remove it from the stator.

In the event the hall wires are not a consistent colour you can use a multimeter to probe for continuity between the hall connector and where the wires attach to the hall sensor.



Normally the hall sensor is held in place by a recessed slot in the stator - use a small flathead screwdriver or similar to gently tap the hall sensor out from the slot. Note which wire goes to which leg of the hall sensor as this is important when installing the new sensor.

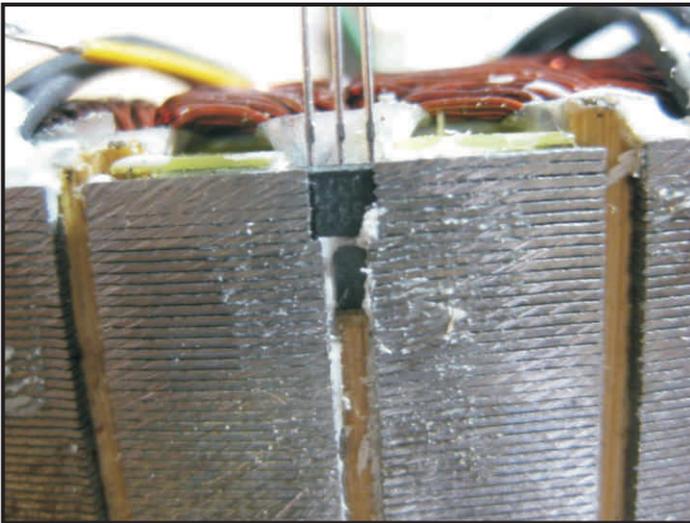
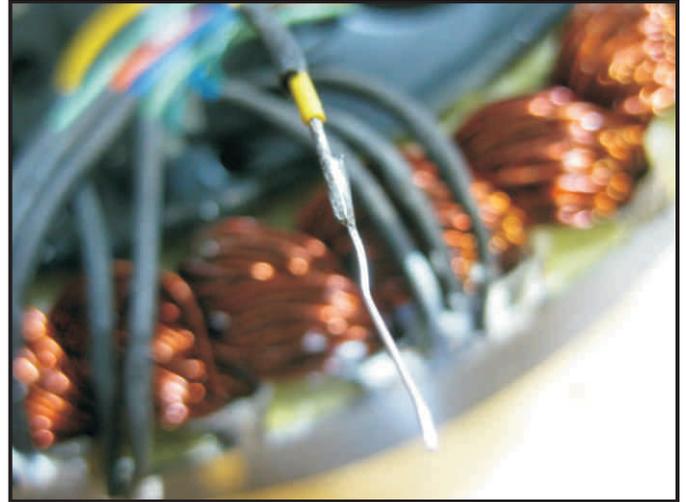




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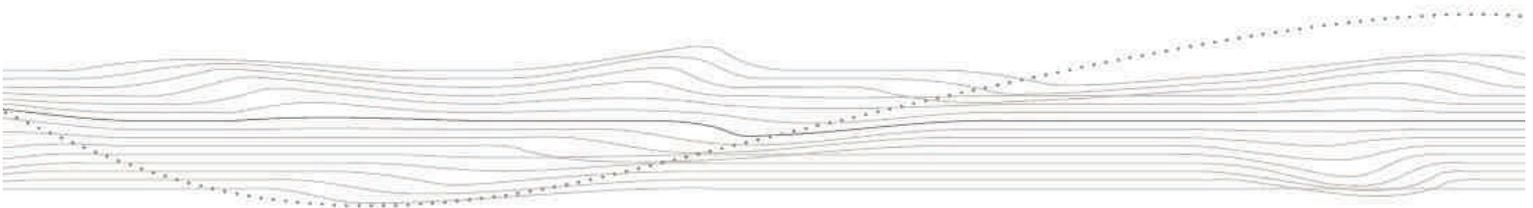
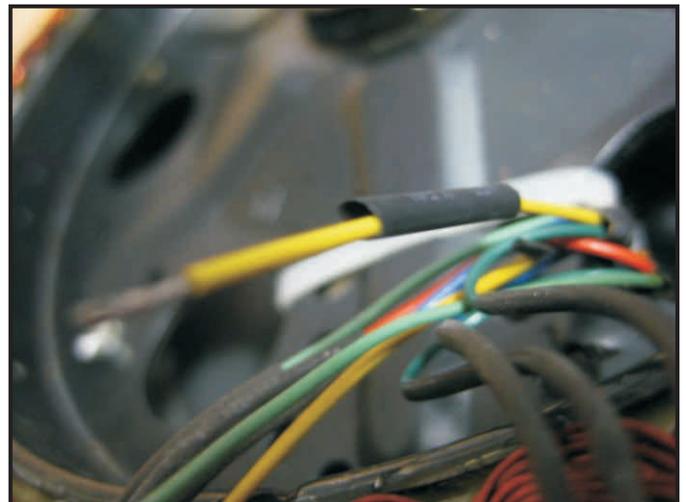
Once the hall is removed you will want to peel back the heatshrink from the legs of the sensor until you see the joint between the wire and the leg (in the picture to the right the leg actually became detached from the hall during slot removal).

You will want to desolder the connection between the wire and the leg and then clean up the wire by removing excess old solder and applying a small amount of additional fresh solder.



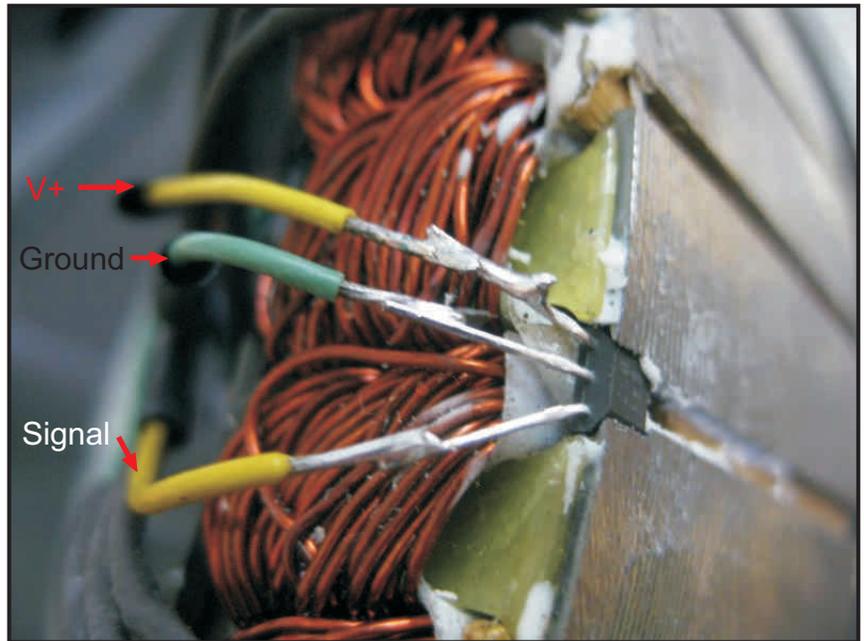
Once you have removed the hall legs from each of the three wires you can insert the new hall sensor into the slot. Be careful to insert it in the same orientation as before so that you do not solder the wires incorrectly. It is normally the case that the side of the hall sensor with writing on it faces outwards.

Add a small piece of heatshrink to each wire before soldering to the hall sensor - this will help prevent the hall from shorting against the stator or anything else.

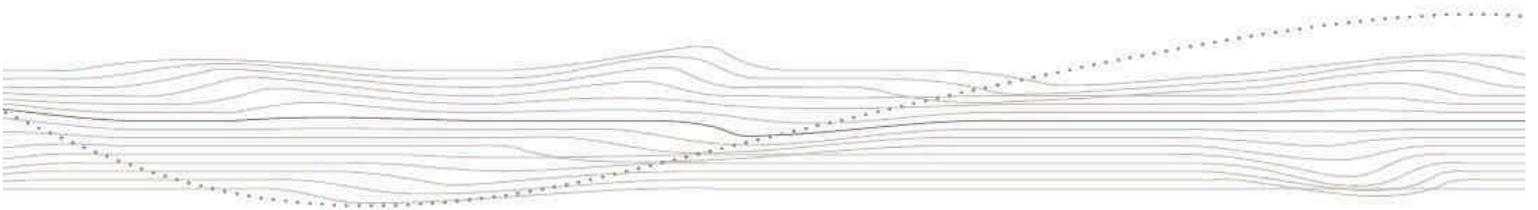
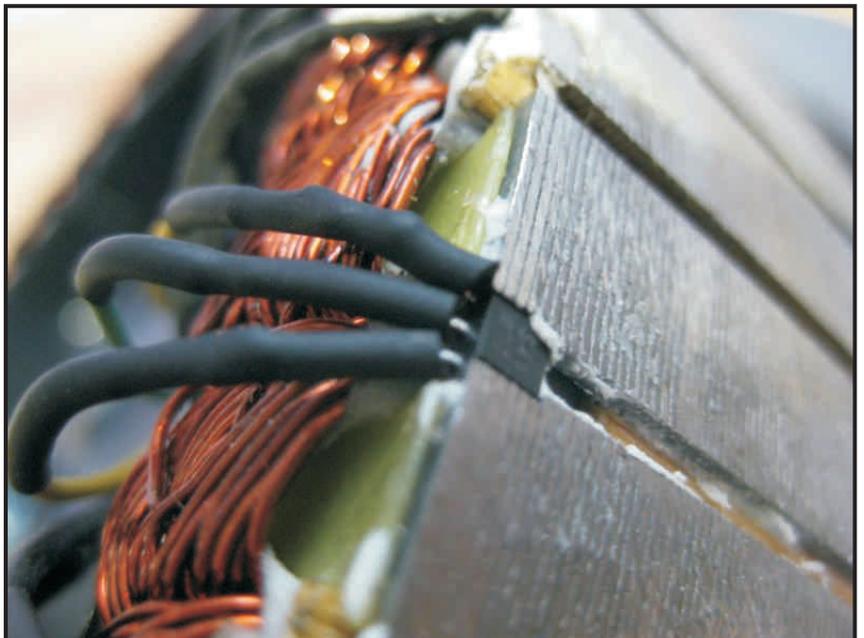


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Next, with a hot soldering iron attach the wires to each of the three hall legs - it sometimes helps to add a small amount of solder to the hall sensor leg and then join it with the wire.



Slide the heatshrink over the legs and shrink with the heat gun.

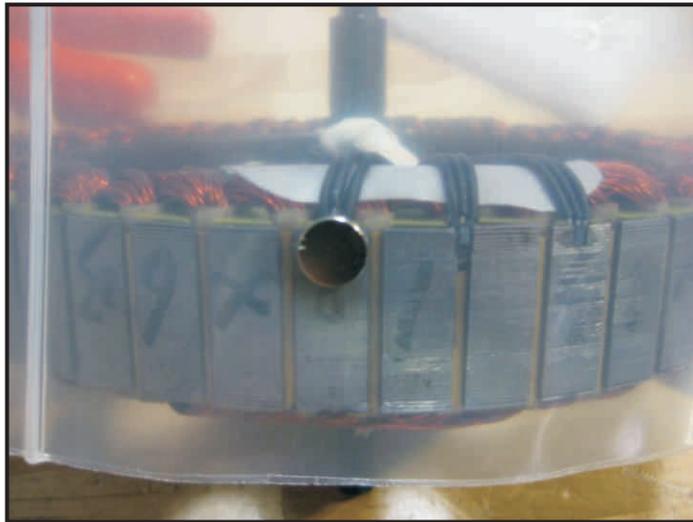




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Next you will want to secure the hall sensor in place with epoxy, which will also seal and protect the legs from shorts and water damage.

We normally use a standard store bought five minute epoxy. Epoxy is not something you really want on your hands so it is a good idea to wear protective gloves when completing this step.



You will want to apply epoxy over the hall legs and in the hall slot ensuring a good coating. Try to avoid spilling epoxy elsewhere in the motor, and if you do then wipe it clean before it cures.

Once you have applied the epoxy a good trick to hold the hall sensor in place while it sets involves resting a powerful magnet over the hall chip with a plastic film to keep the glue off.

Once complete it should look something like the picture on the right.

Congratulations, you have just completed a hall sensor replacement!

Before reassembling the motor, it is possible to test the hall sensors to verify that they all work and that the repair was a success. You can do this by plugging in the motor to a controller and moving a small magnet over the hall chips when everything is powered up. Each hall signal should alternate between 0V and 5V as the magnet's orientation is changed.

