

How to modify a car starter for forward/reverse operation

Ok, start by choosing a starter. I took a starter out of an older style Nissan Sentra. I chose this particular starter for two reasons:

1. It was easy to remove from the vehicle that contained it and
2. It was the cleanest one I could find in the whole yard!

Nope, no technical reason at all... Pretty much most starters are built similarly so you should encounter most of the stuff you're about to see in your starter, should you decide to take on this project.

Items you will need include but are not limited to:

1. Soldering Iron or some way to tack on copper conductors.
2. Phillips screwdriver
3. Small sockets
4. Maybe some gloves so you don't get so dirty. My hand's are still quite filthy since the day I took this starter and I've washed them many times!
5. Diagonal cutters or something similar.
6. Small flathead
7. Several pieces of 10 gauge wire, at least 3 different colors.
8. You may need additional tools depending on your starter.

So here we have it, the starter:



You will begin by removing the two circled bolts that retain the solenoid in place. You will not be using the solenoid so do as you will with it.



Remove the nut that attaches the positive lead of the motor to the solenoid so that you can completely remove the solenoid from its location.



You will now be able to completely remove the solenoid and any other related parts.



You may cut or remove the extra piece that remains on the top cover as it will no longer be used for anything and just takes up space.



Next, you will focus on the rear end of the starter and remove the two long bolts that hold the whole thing together. These are circled in red.



Once you take off the top, be sure that the rotor (surrounded by blue) does not fall out because it's a pain to put the commutator back into the piece that contains the brushes. It's up to you if you want to completely remove it though.



Next remove the brushes from the rear cover by removing the two phillips screws on the rear. you will also need to remove the plastic cover (arrow) because there is an E clip underneath holding the rotor in place.



You will then see something like this:



As we can see, there is electrical tape on some of the conductors inside this motor, which leads me to believe that this is a remanufactured unit and that could be the reason why it was so clean looking to begin with! the conductors underneath the tape will need to be separated from each other as I will show later on.



The brush circled in yellow in this next picture is the ground. Most motors you will find will have two brushes, both opposite each other, which are attached to the metal plate holding all of the brushes. I don't know why but this starter only had three brushes when most have four.



Most starters that have not had anything done to them will have two of the brushes contacts tacked together to the field magnet coils instead of being soldered together, as is the case with this particular starter.



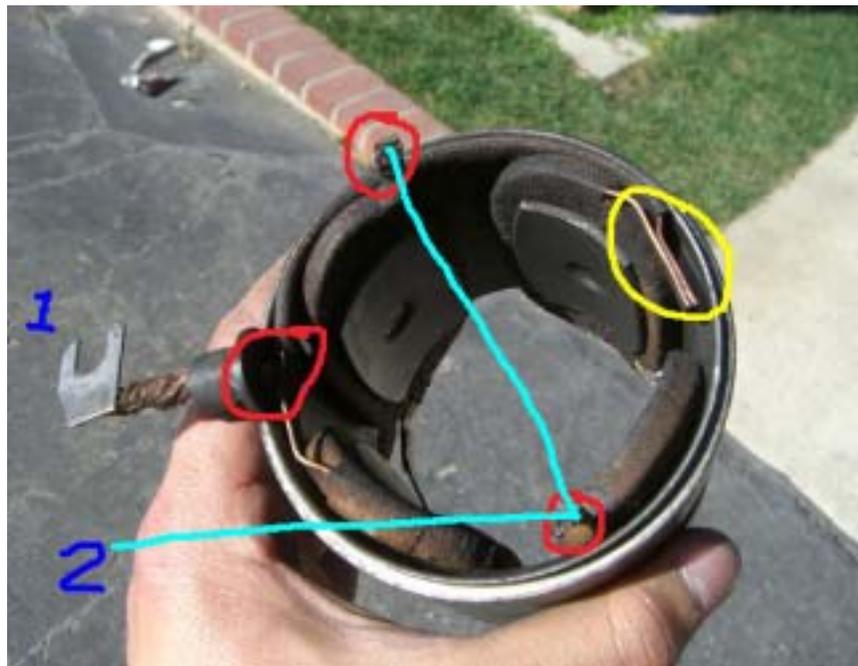
Once you break those two contacts, you will be able to separate the field coils from the brushes. and you will have this:



In the next two pictures, I circled where the three brushes are in one and where there is a brush missing in the other. Most of the time you will have four brushes total. The little red X is where that brush would have attached to.



Going back to the field magnet coils, the blue number 1 is one of the contacts and number two will be the second contact. The contact on top circled in red will need to be connected to the contact circled in red on the bottom. As we can see, the point circled in yellow already has a cable running behind the top contact and connecting to the red circle in the middle where contact 1 is.



Here I have removed the copper wire attached to contact point 1 and soldered a piece of yellow 10 gauge wire to it. I ran a piece of blue 10 gauge from one of the other contact points to the other and soldered an additional piece that will lead out of the case. The field coils are now complete.



Next, I soldered a red piece of 10 gauge wire to one of the brushes that originally lead to the field coils. The yellow line will be where a second piece of wire will attach to the brush on the opposite side of this one. You will want to protect these wires with some heat shrink so that they're not touching anything else. You will probably want to do the same with the field coil wires.



Once you solder all the wires into place, assemble the brush plate with the rotor and the field coils together to see how they will fit and to make sure that none of the contacts short out with each other. Make sure that none of the cables will be getting in the way of any moving parts. This picture does not show the yellow wire running to the second brush because it was taken prior to me soldering the other wire into place. I was trying a little experiment which failed.



Once you have made certain that nothing is shorting out and that nothing gets in the way of any moving parts, re-assemble the starter by replacing the rear screws and bolts and the E clip. Make sure you can get all of the wires to exit the case. It's possible that you may need to drill a bigger hole to get all of the wires through.



You may now be wondering as to how to connect the starter to get it to do anything. In the example I have given you, there are a total of four terminals:

1. The casing itself for the rotor
2. Field coil #1, yellow,
3. Field coil #2, Blue
4. The red wire for the rotor.

The normal way you would want to connect this motor would be to have one of the wires, say the yellow one from the field coil going straight to the positive of the battery and have the other, blue, going to either the casing or the red wire. If you connected the blue to the red, the casing would go to negative to make the motor spin in one direction. If you reversed it and connected the blue to the casing, the red would need to go to the negative and the motor would spin in the opposite direction. You could also just leave the casing connected to ground and you would just have to reverse the polarity on the field coils to make it spin in different directions.

One thing I haven't mentioned yet is that you will probably need to either remove the one way bearing on the shaft or weld it in place so that you can make use of it.

And there you have it!