

## Rebuilding a Series Starter Motor

Before you begin on your quest of rebuilding your starter motor, the first thing you should do is check all your grounds, and leads. These should be clean and well connected. A good way to have your grounds wired is a large cable from the battery's negative post to the frame, and another large cable from the frame to a starter mounting bolt. The positive lead goes from the battery to the starter button, then from the starter button to the positive terminal on the end of the starter motor.

So now that you're sure the starter motor is getting sufficient power and it is necessary for you to rebuild the starter, we can begin. Series Land Rovers have very simple electrics, and so is the starter motor. It's actually very easy to repair your own starter if you understand the principles behind DC motors. In the picture below you can see the major components of your starter motor. The armature, coils, rotor, brushes, and inside the yoke is the field coil.

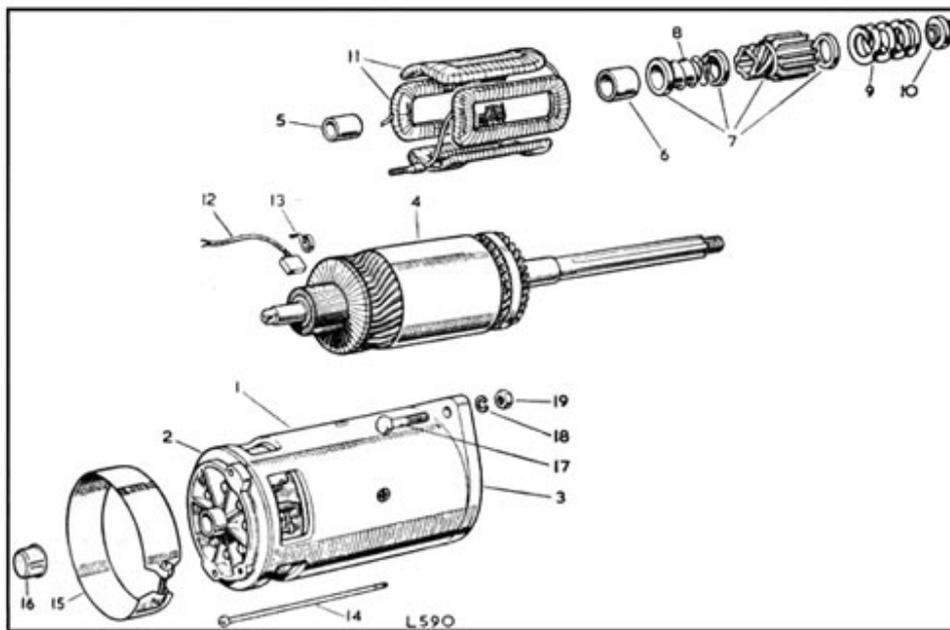


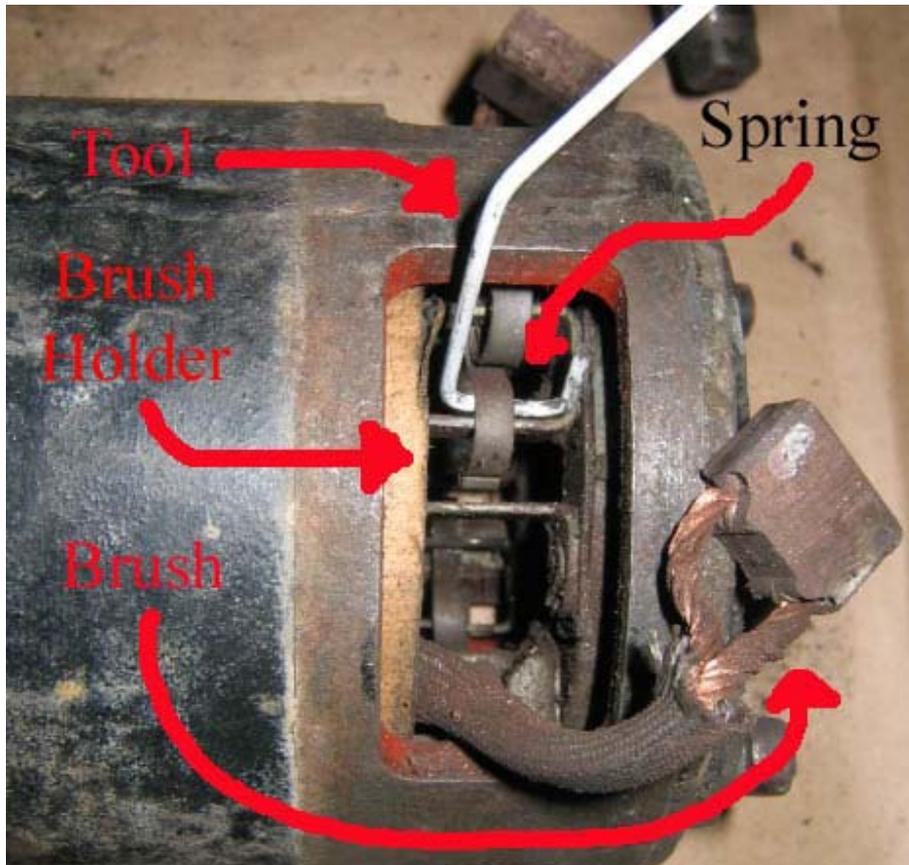
Fig. N1-51. Layout of starter motor, type M418G, 2½ litre and 2.6 litre Petrol models

- |                                       |                                   |
|---------------------------------------|-----------------------------------|
| 1 Yoke                                | 11 Field coil for starter         |
| 2 Bracket for starter, commutator end | 12 Brushes for starter motor, set |
| 3 Bracket, drive end                  | 13 Spring set for brushes         |
| 4 Armature                            | 14 Bolt for bracket               |
| 5 Bush, commutator end                | 15 Cover band                     |
| 6 Bush, pinion end                    | 16 Grease cap                     |
| 7 Pinion and sleeve                   | 17 Bolt (¼ in. BSF x 1½ in. long) |
| 8 Spring for pinion                   | 18 Spring washer                  |
| 9 Main spring for pinion              | 19 Nut (¼ in. BSF)                |
| 10 Nut for pinion                     |                                   |
- } Fixing starter motor to flywheel housing

Electricity comes from your battery, and runs through the brushes, into the rotor, it then runs through the coils, creating a magnetic field, then back out the brushes and back to negative side of your battery. It's the creation of this magnetic field that makes everything happen. The magnetic field generated in the armature is attracted to and repulsed from the field coil. This makes the armature rotate. As the armature rotates, the brushes send power to different coils, and it spins more, and hopefully starting your engine. As you can gather, there is very little to wear out on these old motors. So when your starter begins to die, many times it's either a bad ground, or the brushes/rotor that's the culprit.

To begin, remove the starter from your Landie. First disconnect the battery, undo the positive cable

to the rear of the motor. There are two bolts that hold it to the engine. Once you get it on the bench, remove the cover band around the case. The next step is what separates us from the animals; you're going to make a tool. A metal clothes-hanger from the closet will work. Cut it to a length so that you can hold it comfortably, and bend it in two places so that it has a U shaped hook at the end. This is our brush removal tool. The brushes are held into place by a spring. You hook the spring and pull it back so that you can remove the brushes.



There are four brushes, remove all of them. Now you can undo the two screws at the rear of the casing. The casing should separate now, hold the gear with one hand, the casing with the other, and pull them apart. Do so carefully so as not to damage anything. You should now have this:



You can now clearly see the rotor, and the brushes. Inspect them carefully. They'll probably be rather dirty, burned, and pitted. To begin, turn your attention the brushes, these will wear down eventually, and will have to be replaced. However, if they are long enough for the springs to keep them firmly against the rotor, then you won't need to replace them.

To renew them, tape some fine grain sandpaper to the rotor with the abrasive side out. You'll need to wrap the sandpaper in a clock wise direction when looking at the end of the rotor. Then reassemble the motor, put the brushes back in their guides, and place the spring over them. Now slowly rotate the gear by hand in a counter clockwise rotation so that you will sand the brushes down with the sandpaper, thus refreshing the surface.

Keep this up for a few minutes, and take the motor apart again. Clean the brushes with isopropyl alcohol and a rag. Also, clean the brush holders so that the brushes are able to slide freely in them. Now turn your attention to the rotor. Use some fresh sand paper and polish the surface of the rotor. When it is nice and shiny, you're almost done. The black stripes you see between the copper bits on the rotor is insulation. Do not damage this, it electrically isolates the contacts from each other. You'll probably have a lot of copper dust in there.

Clean with compressed air first, and then some more isopropyl alcohol. You can clean up the rest of the motor now if you want. Pay attention to the positive lead on the rear of the motor so there will be good connection when you re-install. Put everything back together the way you took it apart. You should now be able to reinstall the motor into your engine, and keep your fingers crossed that it will fire.